

Battery Inverter

Sunny Island



Part 2: Advanced Settings

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Sunny Island Off-grid Part 2 Agenda



- 1 Multifunction Relays
- 2 Generator/Grid Settings
- 3 Load Shedding
- 4 Other Useful Settings
- 5 Q&A

Multifunction Relays



What are the main uses of the Multifunction relays?

- Automatic generator
- Load shedding
- Time controlled
- Control of additional loads – excess solar, lead acid batteries only

Multifunction Relays



▼ Multifunction relay

Operating mode [A]	Automatic generator request	▼
Operating mode [B]	1-stage load shedding	▼
Operating mode slave 1 [A]	Off	▼
Operating mode slave 1 [B]	Off	▼
Operating mode slave 2 [A]	Off	▼
Operating mode slave 2 [B]	Off	▼

Up to 6 programmable relays per SI cluster.

- [A] – MFR1
- [B] – MFR2

Generator



- Sunny Island is compatible with a large range of Generators.
 - Refer to the white paper in regards to required Generator behaviour.
 - [Generator Whitepaper](#)
- Support of Autostart Generator via Multifunction Relay
- Recommended sizing of generator between 0.8 – 1.2 of nominal power of SI system.

Generator Multifunction relays

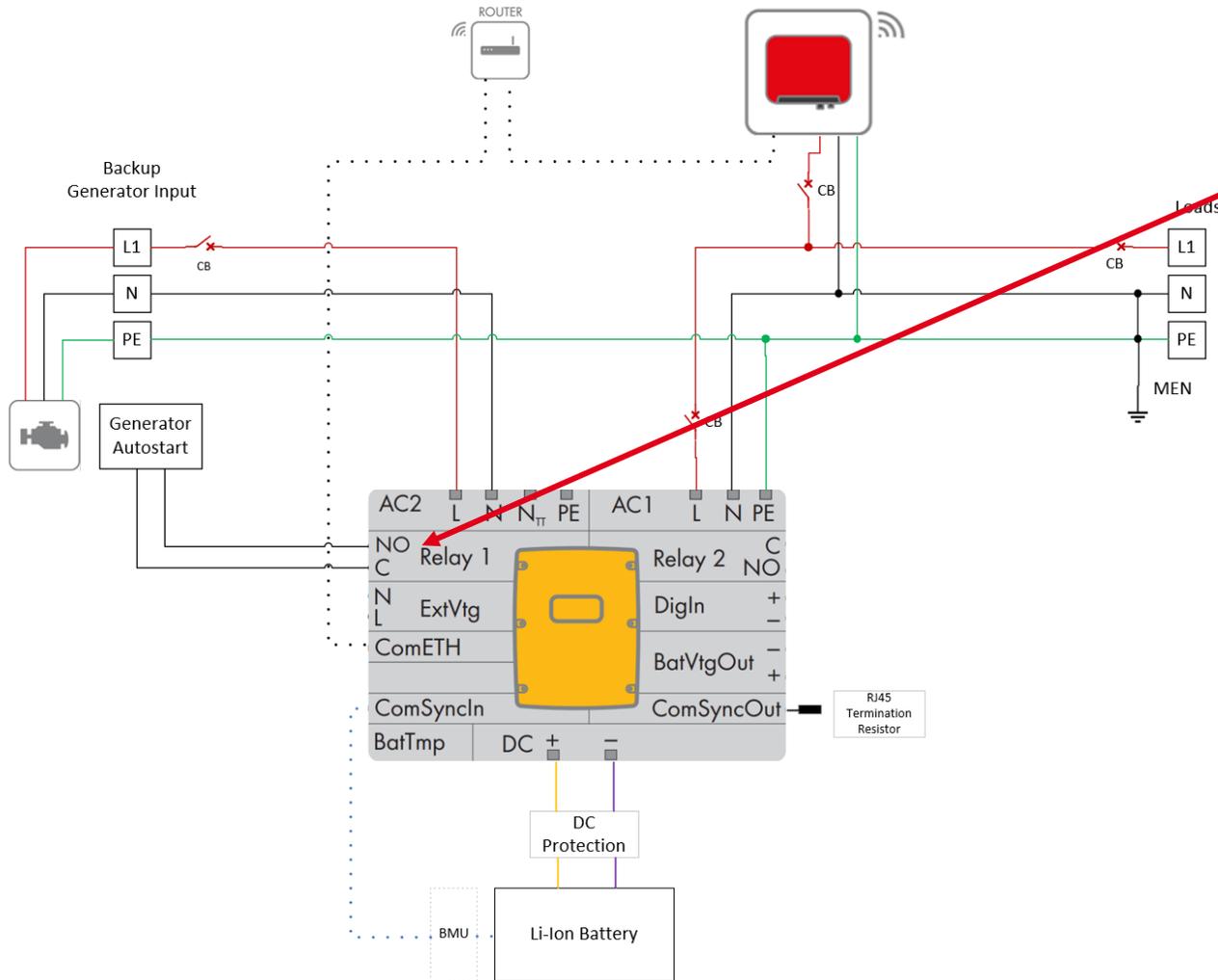


▼ Multifunction relay

Operating mode [A]	Automatic generator request ▼
Operating mode [B]	1-stage load shedding ▼

- **By default Multifunction Relay 1 is set to Automatic Generator Request.**
- **If autostart generator is used with Multicluster box 12.3-20, Relay 1 and 2 on Main master is reserved for system logic. Make sure to setup on a slave device or extension master.**

Generator Autostart Wiring



- Using MFR1, the NO and C terminals to connect to the generator autostart terminals.
- Dry contacts so if generator does not support this connect voltage as required.

Generator Autostart



- **Generator Request via SOC**
- **Generator Request via Power**
- **Generator Request via charge type (lead acid batteries only)**
- **Generator Request via Digital Input**
- **Time Controlled Generator operation**
- **Multicluster behaviour**

Generator Request via SOC



Generator configuration interface showing SOC settings.

Generator queries state of charge

Switch-on limit	<input type="text" value="40"/> %	(1 % ... 80 %)
Switch-off limit	<input type="text" value="80"/> %	(40 % ... 95 %)

Additional time range

Switch-on limit	<input type="text" value="40"/> %	(1 % ... 80 %)
Switch-off limit	<input type="text" value="80"/> %	(40 % ... 95 %)
Start time	<input type="text" value="00:00:00"/>	(00:00:00 ... 23:59:59)
End time	<input type="text" value="00:00:00"/>	(00:00:00 ... 23:59:59)

- Can setup 2 time ranges for generator to operate.
- Start and End time apply to the first section.
- Hours outside of the start and end time apply to the additional time range.

Generator Request via SOC



▼ Generator queries state of charge		
Switch-on limit	<input type="text" value="25"/> %	(1 % ... 80 %)
Switch-off limit	<input type="text" value="60"/> %	(40 % ... 95 %)
▼ Additional time range		
Switch-on limit	<input type="text" value="30"/> %	(1 % ... 80 %)
Switch-off limit	<input type="text" value="50"/> %	(40 % ... 95 %)
Start time	<input type="text" value="06:00:00"/>	(00:00:00 ... 23:59:59)
End time	<input type="text" value="22:00:00"/>	(00:00:00 ... 23:59:59)

Generator Request via Power



Generator request via power

Activated	No	▼
Switch-off power	2000	W (0 W ... 4,000 W)
Switch-on power	4000	W (2,000 W ... 300,000 W)
Average time	1 min	0 s (1 s ... 15 min)

- Is based on total site load.
- Switch on power – total site load on SI
- Switch off power – total site load on SI
- Average time – time at the switch on power before activating generator

Generator Request via Charge Type



Generator request via charge type

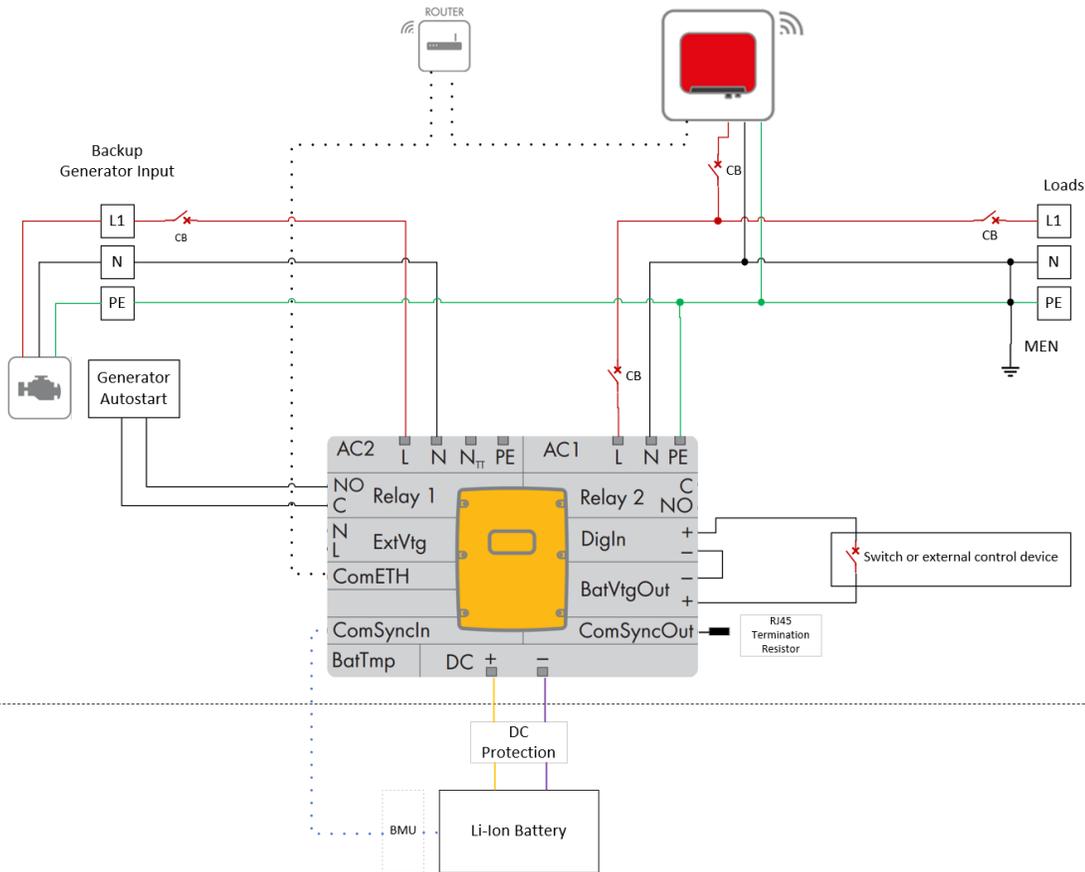
Charge type

- Full and equalization charge
- Equalization charge
- Full and equalization charge
- Full charge
- Off

- **Only for Lead acid batteries**
- For Full/Equalisation charges



Generator Request via Digital Input



- To be used with external Digital signal
- Useful to be able to turn on generator from inside the home.

Generator request via digital input

Reaction to digital input

Off
Off
On

Generator Request via Time-Controlled



Time-controlled generator operation

Activated	<input type="text" value="No"/>	
Start time	<input type="text" value="Jan 1, 2011 12:00:00 AM"/>	(Jan 1, 2011 12:00:00 AM ... Dec 31, 2099 11:59:59 PM)
Operating time	<input type="text" value="0"/> d <input type="text" value="0"/> h <input type="text" value="0"/> min <input type="text" value="0"/> s	(0 s ... 4 d 3 h 59 min)
Repeat cycle	<input type="text" value="Once"/> daily Once Weekly	

- **Time controlled generator operation, useful when you need to run the generator to keep the fuel fresh etc.**
- ***Choice of Daily, Single Run, Weekly***

Generator Autostart Settings



▼ Multifunction relay

Operating mode [A] Automatic generator request ▼

Operating mode [B] 1-stage load shedding ▼

▼ Generator

> Operation

▼ Generator

Automatic start	On ▼
Manual control	Automatic generator start ▼
Nominal current	10.000 A (0.000 A ... 50.000 A)
Request	Automatic generator start ▼
Current control mode	No ▼

Current control mode Off ▼

- If retrofitting generator to the Sunny Island system you do not need to recommission the inverter.
- Make sure parameters are set correctly for inverter to utilise generator.
- ***MFR is configured for automatic generator.***
- ***AC Side > Operation > External Sources > Generator***
- ***Generator > Generator***

Generator Autostart Settings



▼ Multifunction relay

Operating mode [A] Automatic generator request ▼

Operating mode [B] 1-stage load shedding ▼

▼ AC Side

> Inverter

> Measured values

▼ Operation

External sources Generator ▼

Grounding type TN grid ▼

Automatic frequency control Off ▼

Current control mode Off ▼

- If retrofitting generator to the Sunny Island system you do not need to recommission the inverter.
- Make sure parameters are set correctly for inverter to utilise generator.
- ***MFR is configured for automatic generator.***
- ***AC Side > Operation > External Sources > Generator***

Generator Protection Settings



Frequency monitoring

Lower minimum threshold	<input type="text" value="44.64"/>	Hz	(40.00 Hz ... 50.00 Hz)
Upper maximum threshold	<input type="text" value="60.00"/>	Hz	(50.00 Hz ... 70.00 Hz)
Hysteresis minimum threshold	<input type="text" value="0.02"/>	Hz	(0.00 Hz ... 2.00 Hz)
Hysteresis maximum threshold	<input type="text" value="0.02"/>	Hz	(0.00 Hz ... 2.00 Hz)

Voltage monitoring

Lower minimum threshold	<input type="text" value="172.50"/>	V	(172.50 V ... 230.00 V)
Upper maximum threshold	<input type="text" value="250.00"/>	V	(230.00 V ... 264.50 V)
Hysteresis minimum threshold	<input type="text" value="2.00"/>	V	(0.00 V ... 10.00 V)
Hysteresis maximum threshold	<input type="text" value="2.00"/>	V	(0.00 V ... 10.00 V)

Power monitoring

Maximum reverse power	<input type="text" value="100"/>	W	(0 W ... 5,000 W)		
Maximum reverse power tripping time	<input type="text" value="0"/>	min	<input type="text" value="30"/>	s	(0 s ... 15 min)

• Voltage and Frequency monitoring used as a window of operation before syncing in with the generator.

• Reverse Power protection settings.

Generator Protection Settings



▼ Generator			
▼ Operation			
Nominal frequency	50.00	Hz	(44.64 Hz ... 60.00 Hz)
Min. operating time	0 h 15 min 0 s		(0 s ... 6 h)
Min. idle period	0 h 15 min 0 s		(0 s ... 6 h)
Cooling time	0 h 5 min 0 s		(0 s ... 1 h)
Idle period after fault	0 d 1 h 0 min 1 s		(0 s ... 1 d)
Warm-up time	1 min 0 s		(5 s ... 15 min)
Type of current limitation	Fixed limit value for current limitation ▼		
Sensitivity of generator failure detection	Normal ▼		
Reactive power compensation	On ▼		

Grid Backup



- **Possible to use the grid as backup power/charging source.**
- **During commissioning select “Mains” and enter the current per phase.**
- **Possible to treat the grid as generator with the use of a Contactor and autogen settings.**
- **Automatic call on grid is very similar to that of the generator settings.**

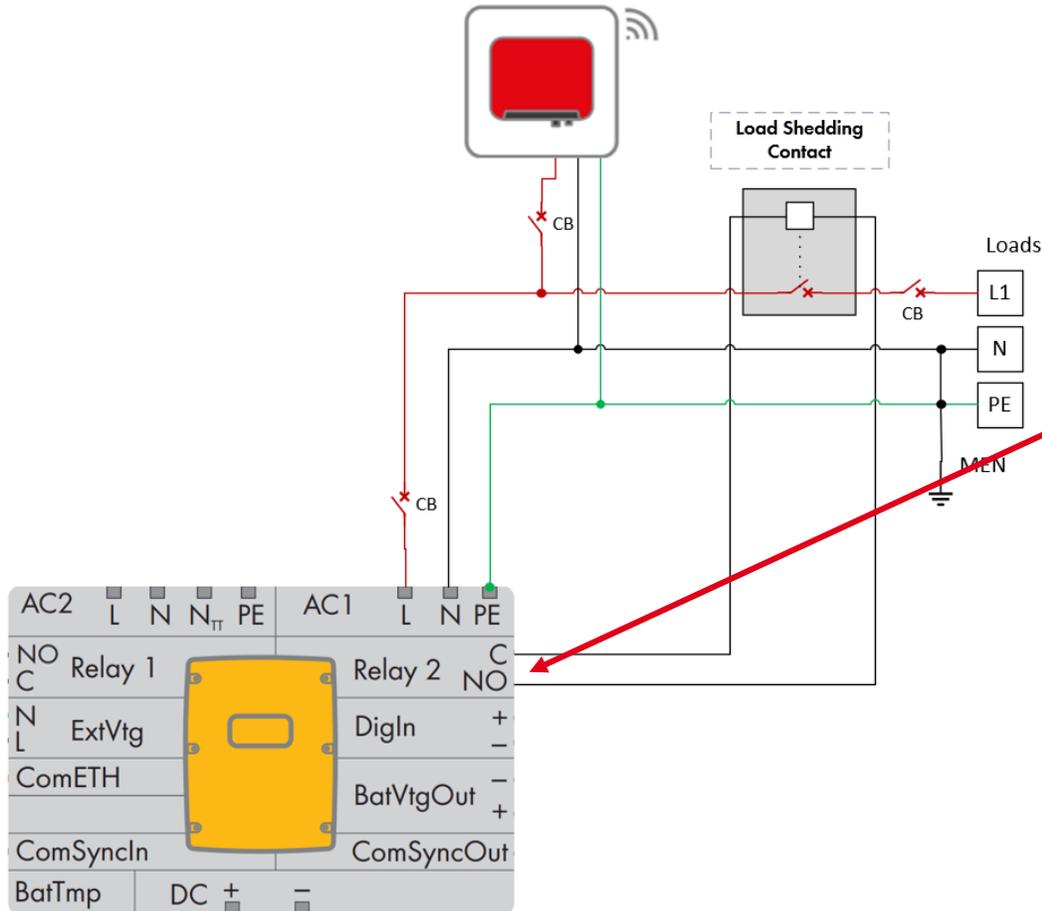
Load Shedding



What is load shedding?

- **Designed to prevent further discharge of batteries.**
- **Can be strategically placed to only turn off certain loads or whole home during low SOC conditions.**
- **Always wire the load shedding contact after the PV input so that batteries can continue charging.**

Load Shedding Wiring



- Relay 2 is by default programmed for Load shedding.
- NO contact to be used.
- As Multifunction relays are voltage free, provide your own voltage source such as from the AC1 output of the SI.

Load Shedding Settings



▼ Load shedding 1

Limit of battery state of charge for start % (1 % ... 50 %)

Limit of battery state of charge for stop % (30 % ... 90 %)

▼ Additional time range

Start time (00:00:00 ... 23:59:59)

End time (00:00:00 ... 23:59:59)

Limit of battery state of charge for start % (1 % ... 50 %)

Limit of battery state of charge for stop % (30 % ... 90 %)

▼ Load shedding 2

Limit of battery state of charge for start % (1 % ... 50 %)

Limit of battery state of charge for stop % (30 % ... 90 %)

▼ Additional time range

End time (00:00:00 ... 23:59:59)

Start time (00:00:00 ... 23:59:59)

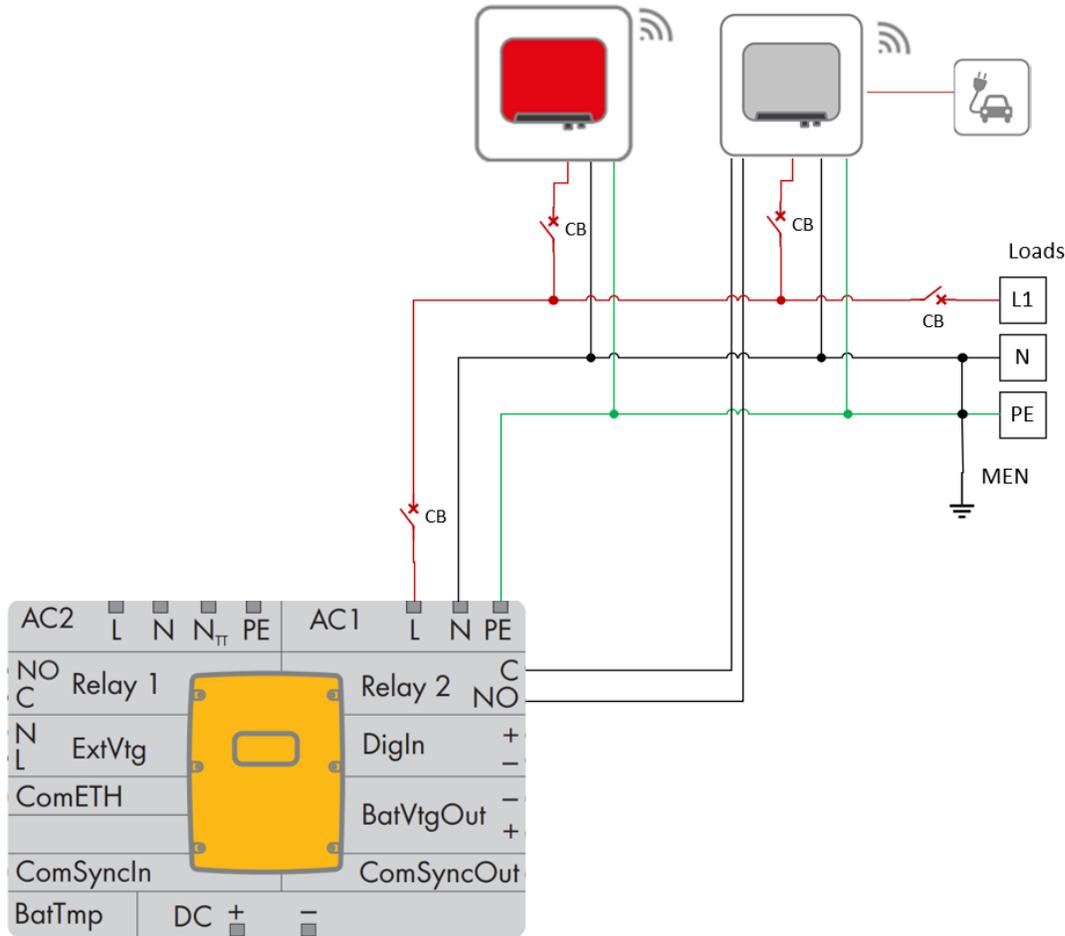
Limit of battery state of charge for start % (1 % ... 50 %)

Limit of battery state of charge for stop % (30 % ... 90 %)

- Select the MFR being used for load shedding function and then choose from one of the 3 options available.
- **1-stage load shedding**
- **1-stage load shedding or 1st stage with 2-stage load shedding**
- **2nd stage for 2-stage load shedding**

1. Screenshots shown with FW 3.xx.xx.R or later.

Load Shedding Extra Uses



- Use with a manual generator to give an indication to turn on/off the generator.
- Use of excess power when SOC > X% (lithium battery system).
- Controlling SMA EV charger to prevent excess usage of battery system.

Useful Settings – Automatic Frequency Control



▼ Operation	
External sources	Generator ▼
Grounding type	TN grid ▼
Automatic frequency control	Off ▼
Current control mode	Off ▼

- It is designed to assist in preventing AC powered clocks from running fast due to the FSPC.
- Located in AC Side > Operation > Automatic Frequency Control

1. Screenshots shown with FW 3.xx.xx.R or later.

Useful Settings – Control of Additional Loads



▼ Multifunction relay

Operating mode [A]	Automatic generator request
Operating mode [B]	Battery compartment fan Battery fan in Multicluster ComSync Control of add. loads
Operating mode slave 1 [A]	Learning in emer op Electrolyte pump

▼ Control of add. loads

Minimum time for the use of excess energy	0 d 0 h 10 min	(0 min ... 25 d 0 min)
Voltage difference for the use of excess energy	0.15 V	(0.00 V ... 0.40 V)

- **Used with lead acid batteries only.**
- **Can turn on a load when battery voltage reaches target voltage.**
- Extra logic check after x amount of time to make sure that batteries maintain charge.

1. Screenshots shown with FW 3.xx.xx.R or later.

Useful Settings – Nominal voltage



Device

Country settings

Cooling system

Inverter

Maximum active power	4,600 W
Reference voltage selection	Nominal voltage
Frequency droop P(f)	-0.199 Hz/kW (-1.400 Hz/kW ... 1.400 Hz/kW)
Voltage droop Q (V)	-1.729 V/kVar (-8.000 V/kVar ... 8.000 V/kVar)
Maximum AC charge current	20.000 A (0.000 A ... 20.000 A)
Maximum active power output	4600 W (0 W ... 100,000 W)
Nominal voltage	230 V (202 V ... 253 V)
Nominal frequency	50 Hz (45 Hz ... 65 Hz)

- For sites where distance/voltage drop is an issue the nominal voltage of the SI can be increased.
- Device > Inverter > Nominal Voltage

1. Screenshots shown with FW 3.xx.xx.R or later.



Q&A

The background of the slide is a photograph of a swimming pool. In the foreground, a person is diving into the water, creating a large splash. In the middle ground, two other people are standing on the pool deck, looking towards the camera. The background is filled with lush green trees under a bright sky. The overall scene is bright and sunny.

Thank you!

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