

Installation and commissioning manual sonnenCore+

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About this manual

This manual describes the installation and operation of the sonnenCore+ storage system. Read this manual carefully before beginning work and keep it near the storage system.

Target audience

This document is intended for the following audiences:

- Installer of the storage system
- Operator and end user

Some actions described in this document must only be performed by a trained and certified electrician. These actions are marked as follows:

Trained, electrically qualified person only!

Trained, electrically qualified persons are:

- Service partners authorized by sonnen Inc.
- Trained, electrically qualified persons with knowledge of all applicable regulations and standards.
- Trained, electrically qualified persons who have attended the training provided by sonnen.

Terminology

This document refers to the sonnenCore+ as a storage system.

This manual refers to the building being serviced by the storage system as a “house,” but the sonnenCore+ can be installed in any number of buildings or sites powered by 240VAC split phase electricity. “BESS” refers to Battery Energy Storage System.

For a full glossary of terms used in this manual, refer to Appendix.

Symbols used

Warnings

WARNING WORD



Warnings are indicated by this symbol and a warning word, which indicates the severity of the danger. Along with the warning are instructions for avoiding the danger.

The following warning words are used:

- **ATTENTION** indicates possible material damages.
- **CAUTION** indicates a possible hazardous situation which could result in minor or moderate injury.
- **WARNING** indicates a possible hazardous situation which could result in death or serious injury.
- **DANGER** indicates an imminent hazardous situation which will result in death or serious injury.

Important information



Important information without danger to injury, death, or material damage is indicated by this symbol.

Actions

Actions to be taken are marked with a ►. For example:

- Read this manual thoroughly before operating the storage unit.

Electrical symbols



Indicates protective earth (ground).

N Indicates the connection for the neutral conductor on permanently installed equipment.

Safety

Intended use

Any use of the system other than the intended use can cause serious injury, death, and damage to the product or other assets.

- Suitable for use in residential dwelling units where permitted.
- The storage system must only be used indoors, in a residential space, to store electrical power with the battery modules provided.



Failure to comply with the warranty conditions and the information listed in this installation and operating manual will void any warranty claims.

ATTENTION



The ESS shall be installed in accordance with the locally adopted building and fire codes. The ESS installation location must meet the working space requirements in NEC 110.26, and indoor units should be installed in a clean, dry location only. If the room or space is not finished or non-combustible, the walls and ceiling of the room are to be protected in accordance with the locally adopted building and fire codes. If installed in a garage or other location where the ESS can be impacted, the battery must be protected by approved barriers per the local building codes requirements.

Prohibited uses

DANGER

Danger to life due to electric shock!



Even if the utility grid fails, the storage system will continue delivering power. Before servicing the storage system:

- Turn off the storage system.
- Only authorized, electrically qualified persons can perform work on electrical parts.

Do not use the storage system;

- In vehicles
- In standing water or (>90%) humidity locations
- Do not use the storage system in areas at risk of filling with combustible dust (flour dust, sawdust, etc.)
- In direct sunlight
- In locations where the air ammonia content exceeds 20 ppm
- In presence of corrosive gases
- Elevations above 6,560 ft (2,000 meter) above sea-level
- Locations with ambient temperature outside 14°F - 122 °F (-10°C - 50°C)

General warnings

ATTENTION

In case of emergency:



► **First contact local emergency services**

► **Contact sonnen support team**

Phone: 1-818-824-6363

Email: service@sonnen-batterie.com

WARNING

This product can expose you to chemicals including lead, which is known to the State of California to cause cancer. For more information, go to www.P65Warnings.ca.gov.



ATTENTION

Damaging of the battery modules by deep discharge!



If the battery modules are disconnected from a power source for longer than six months, they can be damaged by excessive discharge.

► Bi-annually, connect to AC power source and allow it to charge the battery modules to 100%.

WARNING

Shock hazard!



This unit must be used with an external GFDI device as required by UL9540 and depending on the local code.

General safety instructions

- Do not modify the storage system.
- Do not use a damaged storage system.
- Ensure the following regulations are observed in the installation and connection of the storage system and the PV system:
 - Local, regional, national, and international regulations and guidelines
 - National Electric Code
 - ANSI/NFPA 70
 - Requirements of the servicing utility
- Ensure that all safety systems are in perfect working order.
- Read this manual with care.
- When working with the storage system, wear personal protective equipment, including safety glasses, insulated gloves, and safety shoes.
- Illumination shall be provided for all working spaces around the electrical equipment. Control by automatic means only is not permitted. The lighting outlets should be arranged so that persons changing lamps or making repairs on the lighting system are not endangered by live parts or other equipment.

WARNING

RISK OF ELECTRIC SHOCK



Residual voltage always present on DC terminals, and the battery modules cannot be turned off.

Avoid contact with terminals.

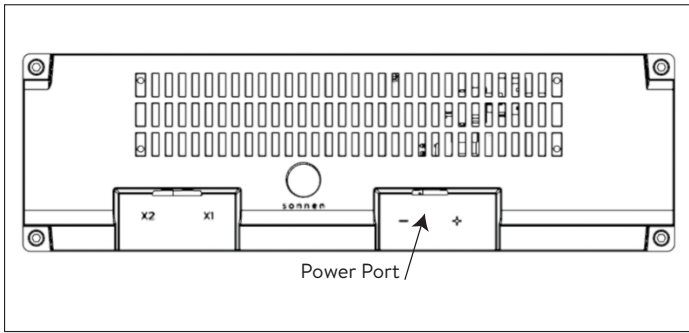


Fig. 1 sonnenModule 4 battery module

WARNING

Risk of burns!



When working on the storage system:

- ▶ Take off metallic jewelry.
- ▶ Turn off the storage system.
- ▶ Use insulated tools.
- ▶ Wear personal protective equipment, including safety glasses, insulated gloves, and safety shoes.

Fire-related instructions

CAUTION

Risk of injury from escaping electrolyte



Despite quality construction, cells inside the battery modules can still degrade or melt components in the event of mechanical damage, heat, or a fault.

- Standard class ABC or BC fire-extinguishers should be used.

Possible effects include:

- Heating of battery modules.
- Escaping electrolyte fluid.
- Smoke, which can irritate skin, eyes, and throat.

Consequently:

- Do not open battery modules.
- Do not physically damage battery modules (puncture, deform, disassemble, etc).
- Do not modify battery modules.
- Do not allow battery modules to heat up or get wet.
- Only operate battery modules in the proper environments.
- Do not short circuit battery modules or bring them into contact with metal.
- Do not use a battery module after it has short-circuited.
- Do not exhaustively discharge battery modules.

If contents escape:

- Do not enter the room.
- Avoid contact with the escaping electrolyte.
- Contact local fire department.

Despite diligent construction, fires are still possible. A fire can release substances contained in the battery modules.

In the event of a fire in or around the storage system:

- Only properly equipped fire fighters may enter the space.
- A fire in the storage system can be extinguished by conventional agents.
- As a last resort, water may be used to cool the battery modules that are still intact.

Battery module information

- The battery modules have a rated voltage of 102 VDC.
- The battery modules contain no metallic Lithium.

Specifications

Model number	SCORE-P10 (10 kWh)	SCORE-P20 (20 kWh)
Weight per unit (approximate)	353 lbs (160 kg)	525 lbs (238 kg)
Dimensions per unit W"/H"/D" (adjustable height from ground)	27 / 69.5 / 14 27 / 71.5 / 14 (with legs elevated)	
Grid integration	AC coupled	
Ambient temperature	32°F - 113°F (0°C - 45°C) 41°F - 95°F (5°C to 35°C) (MAX power)	
Applications	Time-of-use Solar self-consumption Emergency backup power	

Stacked Specifications

Number of stacked units	1	2	3
Usable capacity (SCORE-P10 / SCORE-P20)	10 kWh / 20 kWh	20 kWh / 40 kWh	30 kWh / 60 kWh
Nominal power rating (Grid-tied output at 104°F)	4.8 kVA	9.6 kVA	14.4 kVA
Inverter efficiency	94.4% peak		
Max Round-trip efficiency¹	85.8% peak		
On-grid pass through	35 A	200 A (requires AC Connections module)	200 A (requires AC Connections module)
Installation restrictions	None	None	External devices and configurations complying with Rule 21 may be required for CA

Off-grid Specifications

No disconnect / continuous operation (RMS)	0 A - 25 A	0 A - 50 A	0 A - 75 A
5s to disconnect (RMS)	30 A - 36 A	60 A - 72 A	90 A - 108 A
450ms to disconnect (RMS)	36 A - 50 A	72 A - 100 A	108 A - 150 A
Immediate shutdown	76 A peak	152 A peak	228 A peak

Table 1 Specifications

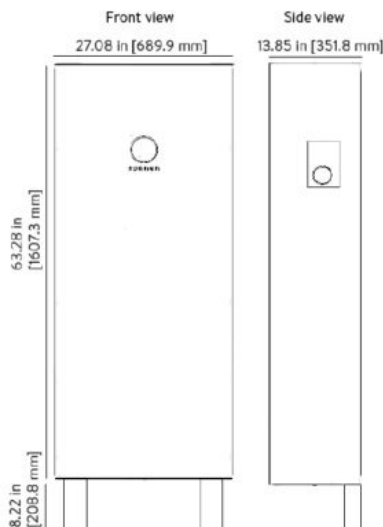


Fig. 2 Dimensions

General specifications

System cooling	Natural convection
Communication ports	Ethernet
Communication protocols / Control	API available to select partners
Seismic rating	IEEE 693
Noise emission	<25 dB
Total harmonic distortion	<5%
Max operation altitude	6562 ft (2000 m)
Maximum recommended PV inverter per sonnen system ²	6 kVA
Smallest room volume SCORE-P20	12.15 m ³

Compliance information

Certifications	UL1741, UL1973, UL9540, UN38.3, UL9540A
Grid connections	UL1741SA, UL1741SB, IEEE 1547, Prepa 2013
Transient protection	IEEE C62.41 Class B
Emissions	FCC Part 15 Class B (inverter)
Enclosure Rating	IP30
Warranty ³	10 year or 10,000 cycle system warranty – includes inverter, battery modules, cabinet and components

Battery specification



Nominal DC voltage	102 VDC
DC battery input voltage	96-112 VDC
Max charge current	39.99 A per module
Cell discharge ⁴	5 kWh with 100% DoD
Cell chemistry	Lithium Iron Phosphate
Over-current protection	Fuse protection

Key components

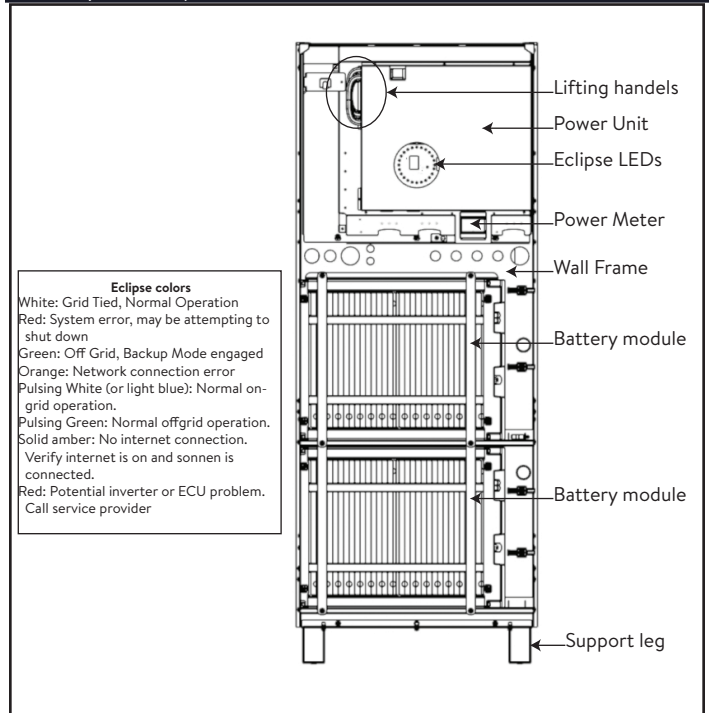


Fig. 3 sonnenCore+ key components

Table 2 General specifications

We reserve the right to make technical changes. The values, outputs, other technical data, images, and diagrams in this prospectus and in data sheets, advertisements, and other promotional documents are approximate guidelines in all cases where they have not been identified as binding.

1 Maximum round trip efficiency shown is calculated using the single cycle round trip efficiency (SCRTE) formula used by SGIP administration in the State of California, as of the date of publication of this Spec Sheet.

2 In off-grid mode, the battery has a maximum charge limitation of 4.48 kW for 1 system, 8.3 kW for a 2 stack system and 11.8 kW for a 3 stack system. In off-grid mode, exceeding these limits (accounting for load) will cause the microgrid to fail.

3 Please observe our applicable warranty conditions.

4 The sM4 battery modules are 5.5kWh in total capacity and represent 5kWh of usable capacity per module.

Storage and transport

Storing the system

Trained, electrically qualified person only!

Environmental conditions

While not in use, the system and battery modules must be stored under the following conditions:

- Ambient storage temperature of battery modules (<6 months) -4°F - 113°F (-20°C - 45°C)
- Ambient storage temperature of Inverter -4°F - 140°F (-20°C - 60°C)
- Humidity max. 90% (non-condensing)
- Properly ventilated
- Maximum elevation of 6,560 feet (2,000 meters) above sea level
- Fire safety regulations observed
- Free of dust
- Free of corrosive and explosive gases
- Free of vibrations
- Plain surface that can bear heavy weights
- Location meets local building codes

ATTENTION

Damage of the battery modules by discharge!



While in storage, battery modules will gradually lose charge. If they reach too low of a charge, the battery modules can be damaged or destroyed.

- Charge the battery modules to at least 85% before storing them.
- After six months, the battery voltage must be measured in the range of 101V-103V before installation. If battery voltage is outside of this range, the battery modules require charging. Contact sonnen service for guidance.

Transporting the system

Transporting the battery modules

Lithium ion battery modules are hazardous materials. Observe the following requirements:

- Follow national and international regulations for transport.
 - Transportation temperature range (<3 months) 14°F - 140°F (-20°C - 60°C)
- Consult an expert for hazardous materials.

The following data is relevant for transport:

 - Hazardous material: Class 9
 - UN number: UN3480 "lithium ion battery modules"
 - Weight of a battery module: 88 lb (40 kg)

Detecting damages in transit

The carrier can only be held liable for damage to the storage system if the damage is proven to have happened during transport.

Damages visible on packaging must be reported to the carrier immediately.

Concealed damages, time limits of the terms of the carrier apply.

While the carrier is present, review the following:

- Recipient address and number of pieces
- Possible open damages
- Possible concealed damages

Inspecting the battery modules

CAUTION

Risk of injury using damaged battery modules!



Damaged battery modules can leak materials that are hazardous to your health.

- ▶ Inspect battery modules for damage immediately after transport.

If damage is visible;

- ▶ Do not use the battery.
 - ▶ Contact sonnen's service department.
(818) 824-6363 (8am-8pm EST)
-

Adjusting the temperature after transport

ATTENTION

Damage of storage system by condensation.



If the storage system is colder than the ambient temperature, water may condense in the interior of the storage system, resulting in damage.

- ▶ Inspect the interior of the storage system before installing.
- ▶ Install the storage system only if no condensation is visible.

If the storage system was transported at temperatures below 32° F (0 °C):

- ▶ Place the storage system at a proper location.
 - ▶ Leave the storage system in this state for at least 24 hours before commissioning the storage system.
-

Moving the storage system

WARNING

Risk of injury lifting the storage system!



- Wear safety boots.
 - Ensure you have stable footing.
 - Use hand trucks while moving the storage system up or down stairs.
-

Pre-installation

Tools needed

- Wire stripping tool
- #4,6 Hex wrench
- Hand drill
- Utility knife
- Measuring tape
- Multimeter
- 10mm socket wrench
- Magnetic bubble level
- Laptop or other Internet-connected device
- Appropriate fasteners for wall type

Parts list

- 1x PV CT with cable "1000705"
- 1x Line 1 CT with cable "1000707"
- 1x Line 2 CT with cable "1000704"
- 2x Short Cat5e cable "1000541"
- 2x Medium Cat5e cable "1000532"
- 1x Long Cat5e cable "1000524"
- 4x Battery module power cable "1000625"
- 1x Power Unit
- 2 or 4x Battery modules
- 44x M6x16mm bolt
- 5x M6 Lock washer
- 2x M8x57mm bolt
- 2x Large cable entry plug
- 12x Small cable entry plug
- 1x Control panel access plug
- 2x Nylon cable tie

- 1x Cover
- 1x Wall frame
- 1x Wall bracket
- 2x Battery module shelf
- 1x Battery module protection cover
- 1x Left support bracket
- 1x Right support bracket
- 4x Battery module brace
- 2x Support leg

Installation basic steps

- ▶ Prepare installation location
- ▶ Inspect system for damage
- ▶ Run wire and cabling to installation location
- ▶ Install and secure Wall Frame
- ▶ Install Power UnitPlace and secure battery modules
- ▶ Complete all battery module communication connections
- ▶ Complete all battery module power connections
- ▶ Power up and commission system

Choosing a mounting location

Select a location with the following attributes:

- Ambient temperature between 32°F - 113 °F (0°C - 45°C)
- Humidity max. 90%, non-condensing
- Maximum elevation of 6,560 feet (2,000 meters) above sea-level
- Fire safety regulations observed (smoke detector recommended)
- Free of dust
- Free of corrosive and explosive gases
- Free of vibrations
- Flat surface of sufficient load-bearing capacity
- Easy access for installation team
- Compliant with all NFPA, NEC, and local building code

Clearance requirements

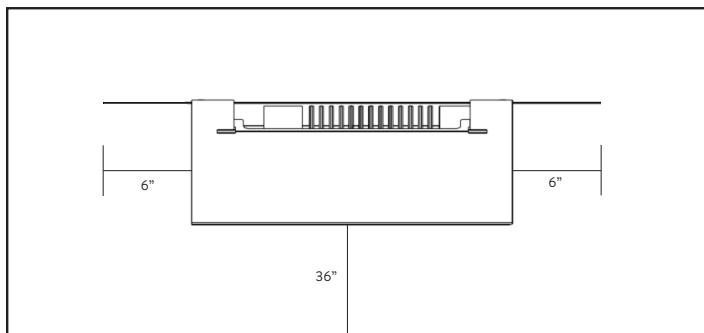


Fig. 4 Top view -clearance requirements

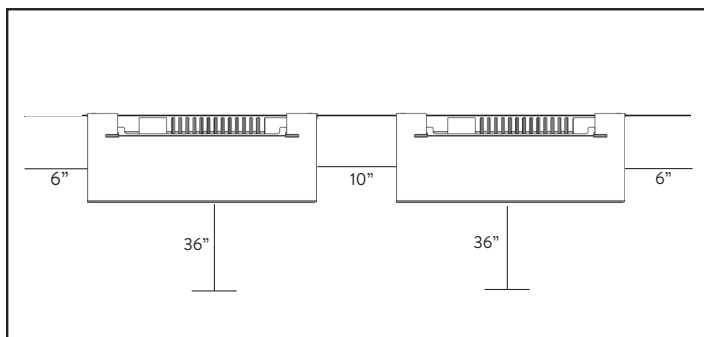


Fig. 5 Top view - multi-unit clearance requirements

Inspecting the storage system

- If there is any suspected damage or loose parts, stop installation, photograph the affected area, and contact sonnen's service department.

Service Support Line: +1 (818) 824-6363

Service@sonnen-batterie.com

Hours: M - F; 8 a.m. to 8 p.m. EST

Installation

ATTENTION

Installing a single sonnenCore+ begins below.



Stacking sonnenCore+ installation begins on [page 36](#).

Installing storage system components

1. Run wiring and cables to installation location

- ▶ Cables and wires of the appropriate wire gauge, type and ampacity should be run site.
- Grid & Microgrid
- Ethernet
- Included CT wires (if connected outside the ESS)
- E-Stop (Optional)

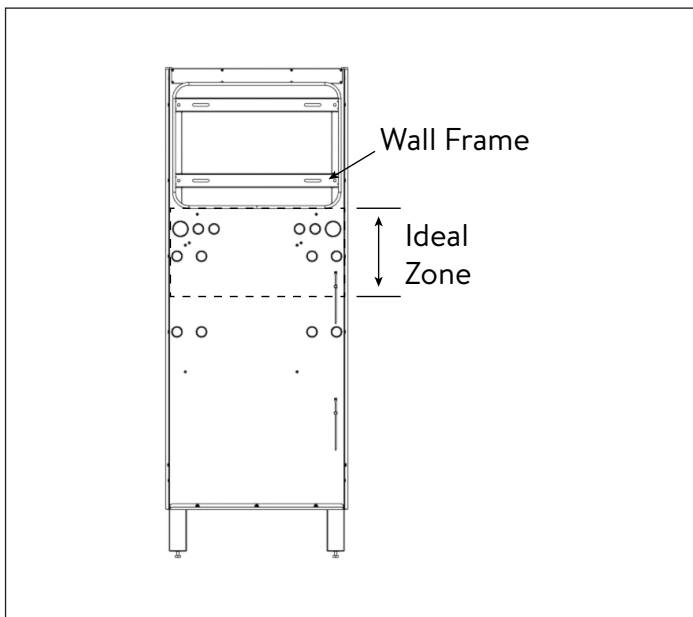


Fig. 6 Wiring and cable wall entry options

Cable entry into the system can be made through any opening in the Wall Frame in Ideal Zone.

- External conduit should be run AFTER the Wall Frame is installed and from BELOW.
- External conduit entry from ABOVE can be accommodated on the left 4"/10cm of the Wall

Frame, to avoid the Heat Sink.

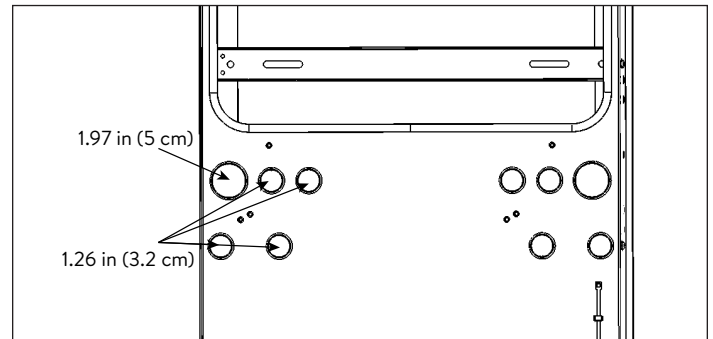


Fig. 7 Conduit sizes

- Grid connection
- Microgrid connection
- Ethernet connection
- E-Stop (Optional)

2. Prepare Wall Frame for installation on wall

- ▶ Remove the Wall Frame from the box and lay it down with the wall side facing up.

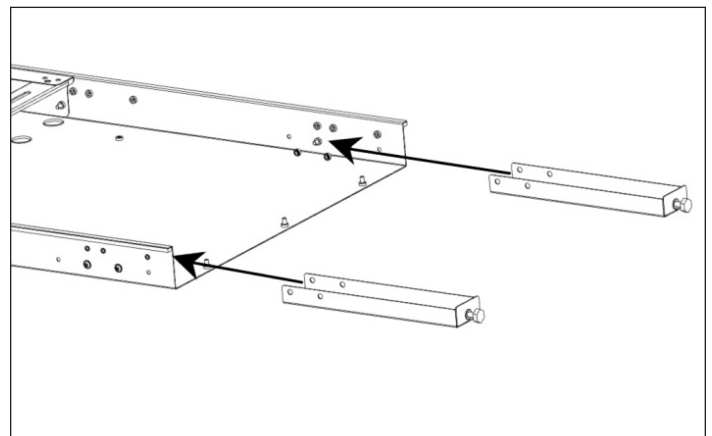


Fig. 8 Support leg screw locations

- ▶ Insert each Adjustment Foot into a Support Leg.
- ▶ Install the Wall Frame
- ▶ Tools needed:
 - Power hand-drill
 - Magnetic bubble level
 - #4 Hex wrench
- ▶ (OPTIONAL) If the wall is not flat or plumb, the unit comes with screws that allow it to adjust slightly to the wall.
 - ▶ With the Wall Frame on the ground, install

all eight wall plumb screws on either side of the Wall Frame edge, leave screws loose for now.

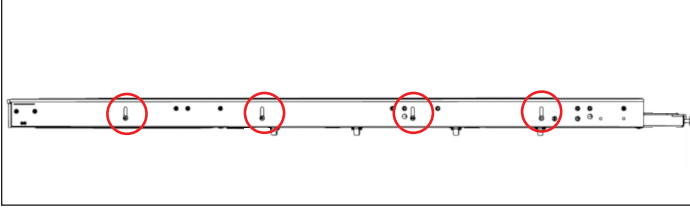


Fig. 9 Wall Plumb Screw locations

3. Prepare wall for mounting

- ▶ Find and mark stud locations on the wall.
- ▶ Feed the cables through their appropriate openings.
- ▶ Lean the Wall Frame against the wall such that the Wall Bracket slots align with the stud line.
- ▶ Place a magnetic bubble level on the Wall Frame and rotate the leveling screws under each Support Leg until the Wall Frame is level left to right.

4. Install Wall Frame

With the Wall Frame against the wall, ensuring it makes contact with the wall at each location, mark the drill location points.

- ▶ Put down the Wall Frame and drill all holes into the wall with a 3/16" drill bit. Furr out the holes in the wall if necessary.
- ▶ Lean the Wall Frame against the wall and secure with x (2"/5cm Wood screw and >1"/2.5cm washer or comparable fastener).
- ▶ (OPTIONAL) If loosening plumb screws was required, place magnetic bubble level on the Wall Frame and tighten each of the eight Wall Plumb Screws to make the unit plumb.

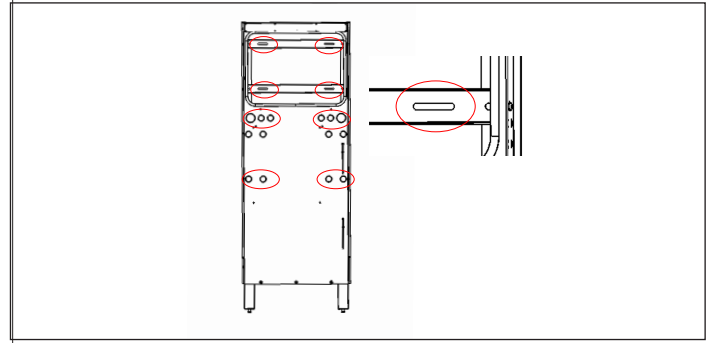


Fig. 10 Fastening the Wall Frame to the wall

- ▶ Fasten the Wall Frame in these locations. The Wall Brackets have slots if required. **Optional Support Leg removal.**

ATTENTION

Risk damaging battery ESS!



Wall must be capable of supporting 525 lbs (238 kg) across two vertical studs. Damage to ESS or property due to Removal of Support feet is not covered under warranty.

- ▶ Once the Wall Frame is secured to the wall, the Support Legs may be removed if desired. (Keep Adjustment Foot attached to Support Legs when storing)
- ▶ Install bottom vent plate using M6 bolts.

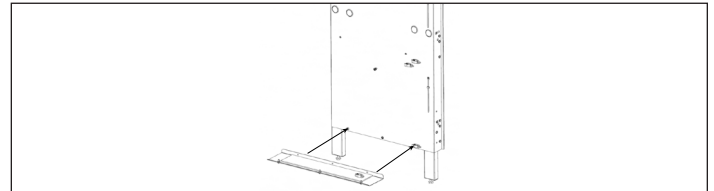


Fig. 11 Installing bottom Vent Plate

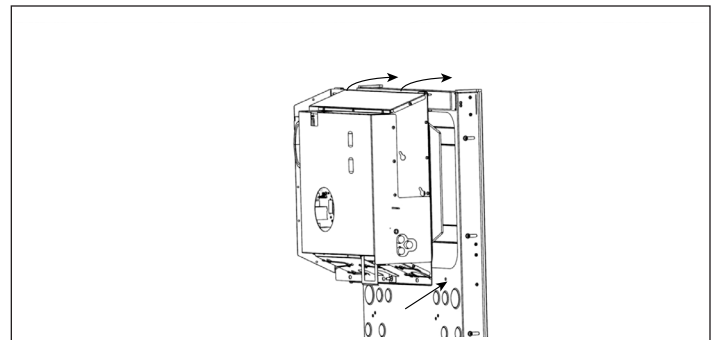


Fig. 12 Hanging Power Unit

5. Install the Power Unit

- ▶ Remove installation handles from the Power Unit storage location and slot them in on either side of the Power Unit to prepare for lifting.

- ▶ Holding the Installation Handles, and using the two hooks on the back of the Power Unit, hang the Power Unit on the Wall Frame from the very top edge.
- ▶ Align the 3x holes on the underside of the Power Unit with the corresponding threaded holes on the Wall Frame.
- ▶ Fasten the Power Unit to the Wall Frame using 2x M6 bolts and washers (ignore middle hole).
THIS WILL ELECTRICALLY GROUND THE FRAME.

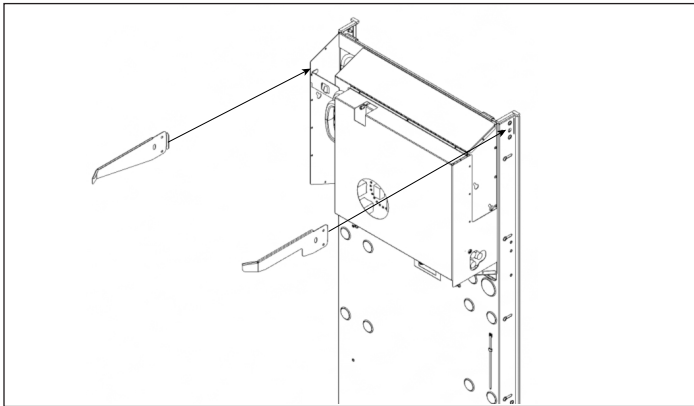


Fig. 13 Installing support brackets

- ▶ Fasten the support brackets bending inwards onto either side of the Wall Frame using M6 screws and washers.
- ▶ Ensure correct capacity is checked on the nameplate label: SCORE-P10 for 10 kWh or SCORE-P20 for 20 kWh.





sonnen, Inc. 1578 Litton Dr Stone Mountain, GA 30083		   	
sonnenCore / sonnenCore+ serial number: ##### initial password: ***** ambient temperature: 32...113°F degree of protection: IP30 weight: max 525 lbs certified to ANSI/CAN/UL: STD 9540		dc ratings - battery usable capacity: max 20 kWh operating voltage: 204.8 V maximum current: 40 A short circuit current: 2880 A cell technology: rechargeable lithium ion	
ac ratings - system output inverter topology: non-isolated mains connection: nominal split-phase voltage: 240V L-L/120V L-N nominal frequency: 60Hz rated active power: 4800 W rated apparent power: 4800 VA power factor: 0.5 lead...0.5 lag rated current: 20A short circuit current: 454A@12.13ms rated short time withstand current: 1.5 kA		model / usable battery capacity: <input type="checkbox"/> SCORE-P10 / 10 kWh <input type="checkbox"/> SCORE-P20 / 20 kWh note: this unit can be stacked, suitable for use in residential dwelling units where permitted. in case of emergency contact sonnen service team at +1 818 824 6363	

Fig. 14 sonnenCore+ nameplate label

6. Expansion from 10 kWh to 20 kWh

- ▶ For expansion instructions, refer to sCore+ expansion kit document.

Installing batteries

1. Install battery shelves

- ▶ Install 2x battery shelves with 6x total M6 bolts, 3 on the right and 3 on the left.

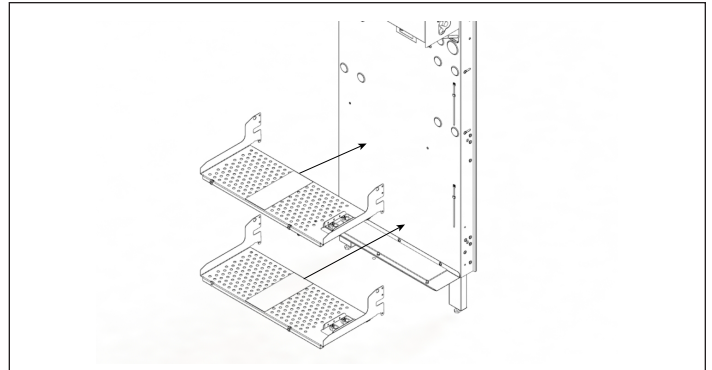


Fig. 15 Installing Battery Shelves

- ▶ Add battery cover using 2x M6 bolts.
- ▶ Install left and right support brackets using 2x M6 bolts each into the wall frame.

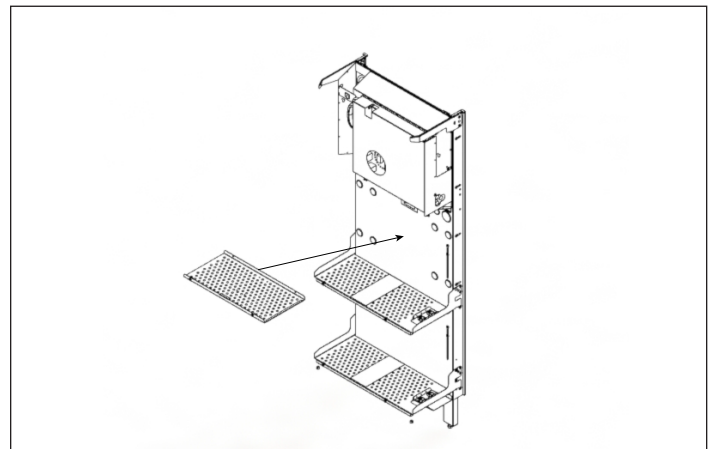


Fig. 16 Adding Battery Cover

2. Install batteries

- ▶ The upper battery shelf should only be in use for a 20 kWh installation.
- ▶ Both batteries should be placed on the bottom shelf and installed against the wall frame for 10 kWh installations.
- ▶ The battery shelf sticker shows that a battery should not be loaded on the top shelf for 10 kWh installation.
- ▶ For 20 kWh installation both shelves will be in use.
- ▶ Load batteries according to directions on shelf sticker.

- The front batteries must be flipped so that the connections face the connections on the back batteries. This is to ensure the wires are not bent.

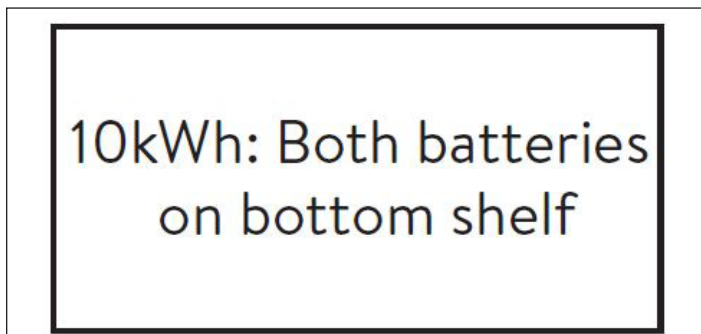


Fig. 17 Battery shelf sticker

- 10 kWh battery installation: Load bottom battery first on bottom shelf against the wall frame, then load second battery next to the first.

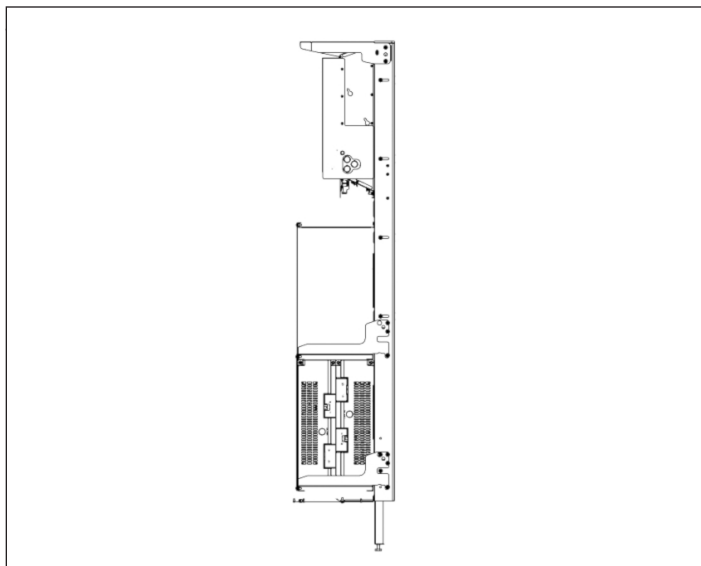


Fig. 18 10 kWh Installation of Batteries

- 20 kWh battery installation: Load bottom two batteries first installing the first one against the wall frame, then load top two batteries last.

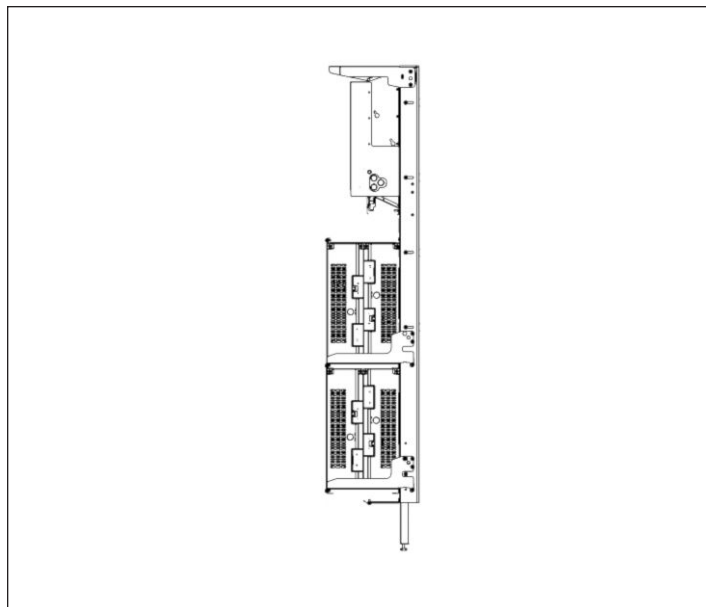


Fig. 19 20 kWh Installation of Batteries

- Ensure battery connections are facing outward and towards each other.

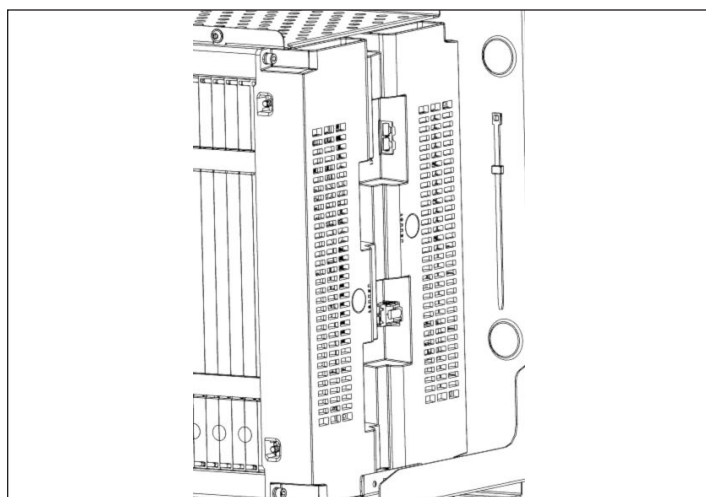


Fig. 20 Battery connections facing each other

- For 10 kWh: Using M6 bolts, install the top row battery braces on the top row first, then install battery braces on the bottom row. NOTE: Bottom brace will overlap top brace at bolt.

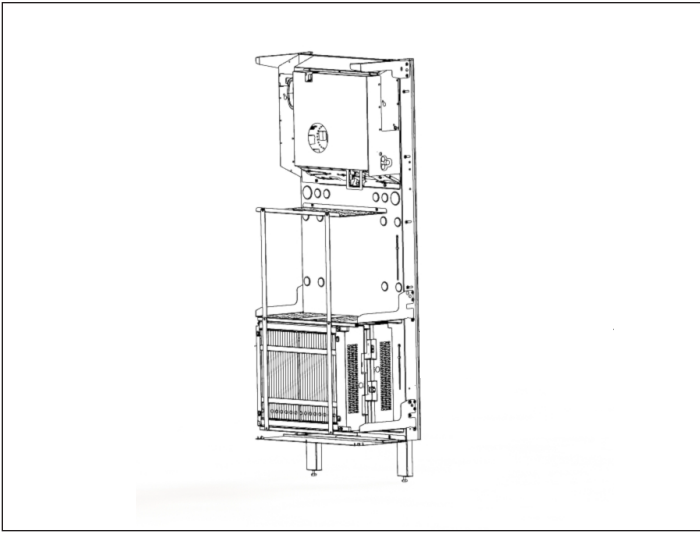


Fig. 21 Installing Battery Braces 10 kWh

- For 20 kWh: Using M6 bolts, install the top row battery braces on the top row first, then install battery braces on the bottom row. NOTE: Bottom brace will overlap top brace at bolt.

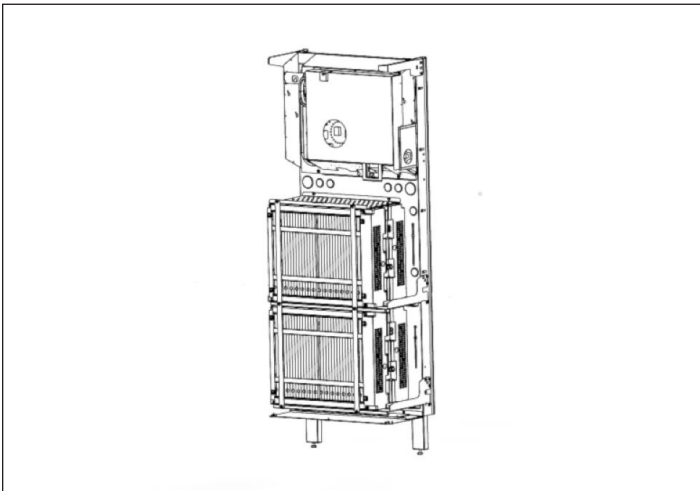


Fig. 22 Installing Battery Braces 20 kWh

Electrical connections

Electrical requirements external to ESS

- 40A circuit breaker required for Grid and Microgrid connections.
- L1, L2, Ground and Neutral wires (8AWG).
- All equipment must have a 10kA short circuit current rating.

sonnenModule 4 battery modules

The sonnenModule 4 battery module

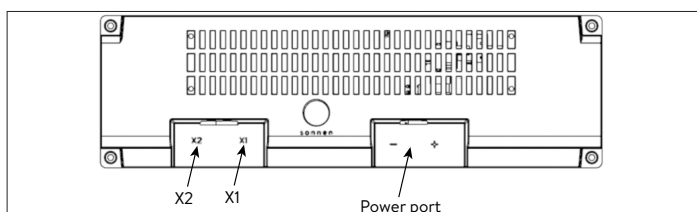


Fig. 23 sonnenModule 4 Battery module main connections

- X1 & X2- Used to connect battery modules together for communication.
- Power port - Used for power cable connections.

Power Unit connections

1. Install disconnect switch (Optional)

It is recommended to install a service disconnect switch between the storage system and grid power. Consult local NEC (National Electric Code) and AHJ (Authority having jurisdiction) for guidance.

2. Run power cables into the storage system

- Cables and wires of the appropriate wire gauge, type and ampacity should already be run through the Wall Frame conduit holes using appropriate connectors:
 1. Grid connection
 2. Microgrid connection
 3. 3x CT wires
 4. Ethernet

E-stop (Optional)

WARNING

Risk of burns!



When working on the storage system:

- Take off metallic jewelry.
- Turn off the storage system.
- Use insulated tools.
- Wear personal protective equipment, including safety glasses, insulated gloves, and safety shoes.

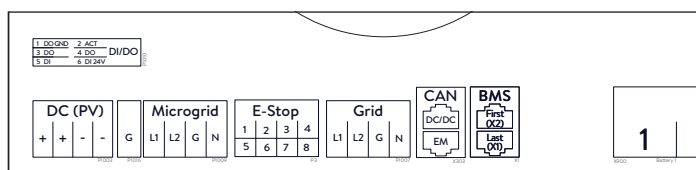


Fig. 24 E-Stop header location

Tools needed

- 24V 2-pole normally closed plunger
- 16 AWG UL1007 300V wire
- Remove the jumper from position 1 and 2 in the E-Stop header and run a section of cable from 1 and 2 to the first normally closed pole on the plunger.
- Remove the second jumper from position 3 and 4 in the E-Stop header and run a section of cable from 3 and 4 to the second normally closed pole on the plunger.

ATTENTION



The E-Stop plunger does not cut the AC Voltage or break the Pass-through circuit on the Energy Storage System. Additional design may be required if breaking AC voltage is required.

Connect current transformers

1. Current transformers (CT)

Each split-core CT can open to clamp around the conductor and has a 10ft cable. The Meter has 30ft of cabling connected to the Power Unit.

2. Connect current-measuring wires

Each CT assembly has 30ft of wire and therefore requires a maximum of 30ft of conduit length between the ESS and the CT site, including the amount inside the ESS. This cable assembly length cannot be extended.

- 1x PV CT
- 1x L1 CT
- 1x L2 CT

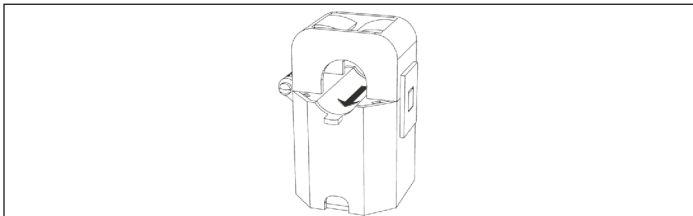


Fig. 25 Current transformers

- Production measurement
 - ▶ Clamp the "PV" CT to either the L1 or L2 AC output conductor from the PV inverter with the arrow towards the PV breaker.
- Protected loads measurement scenario
 - ▶ Clamp the "L1" CT to the L1 microgrid conductor inside the ESS with the arrow pointing away from the ESS AC terminals.
 - ▶ Clamp the "L2" CT to the L2 microgrid conductor inside the ESS with the arrow pointing away from the ESS AC terminals.
- Whole home measurement scenario
 - ▶ Clamp the "L1" CT to the L1 grid conductor inside the main load center with the arrow pointing towards the main panel.
 - ▶ Clamp the "L2" CT to the L2 grid conductor inside the main load center with the arrow pointing towards the main panel.
 - ▶ In all cases, the arrow on the measurement CTs should be facing "downstream", following the flow of energy from the grid to the

loads, as it would do if the battery were not discharging.

Connect AC connectors cables

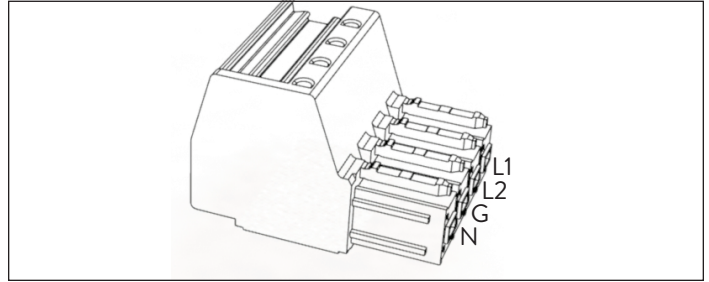


Fig. 26 Grid/Microgrid connectors

Tools needed:

- M4 hex wrench
- 1/8" narrow head screw driver

All external cabling will run through the provided openings in the Wall Frame to the Power Unit connections. Check the Power Unit Terminal Block Map for the wire placement to ensure they are placed in the correct ports.

- ▶ Use service loops for all conductors when cutting.
- ▶ Strip 5/8" from the L1, L2, Ground and Neutral wires (8AWG).

3. Install conduit plugs

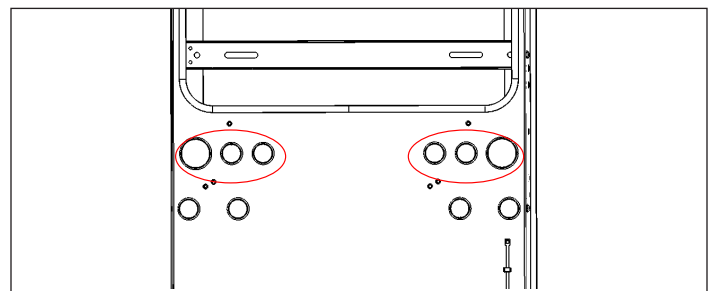


Fig. 27 Conduit plug location

- ▶ Install all conduit plugs over all conductors before attaching connectors. The conductor is required to pass through the plug, sealing around the cable.
- ▶ Place all plugs not being used to seal ESS from debris.
- ▶ Insert **Grid** L1, L2, G, N wires into a terminal connector and label it "Grid", pull back on the wire to ensure a secure connection.
- ▶ Insert **Microgrid** L1, L2, G, N wires into a terminal connector and label it "Microgrid", pull back on the wire to ensure a secure connection.

Neutral loop or Edison circuit will damage system;



Ensure there is no continuity between neutral conductors outside the ESS.

- ▶ Unplug the Microgrid connector from the Power Unit.
- ▶ Using a multimeter, ensure there is no continuity between the neutrals on the **Grid** and **Microgrid** terminal connectors. If tone is present (indicating continuity) then STOP the installation and DO NOT ENERGIZE the storage unit.
- ▶ Locate the origin of the shared neutral / ground and correct the wiring deficiency.

Connecting battery modules

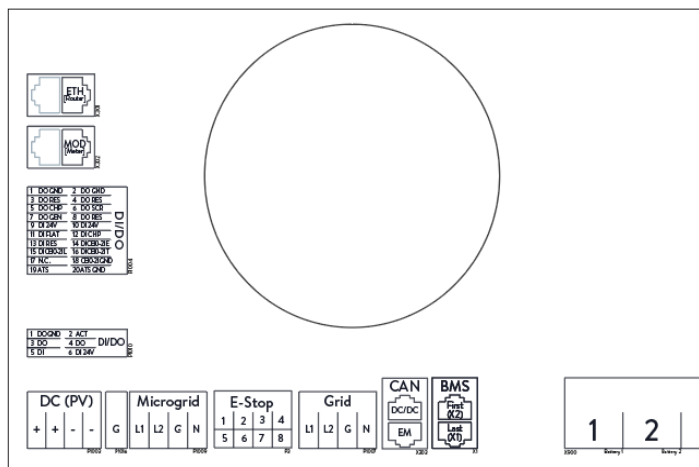


Fig. 28 Power Unit connections

The label is shown from the point of view of looking at the ports from below or the side, in front of the system.

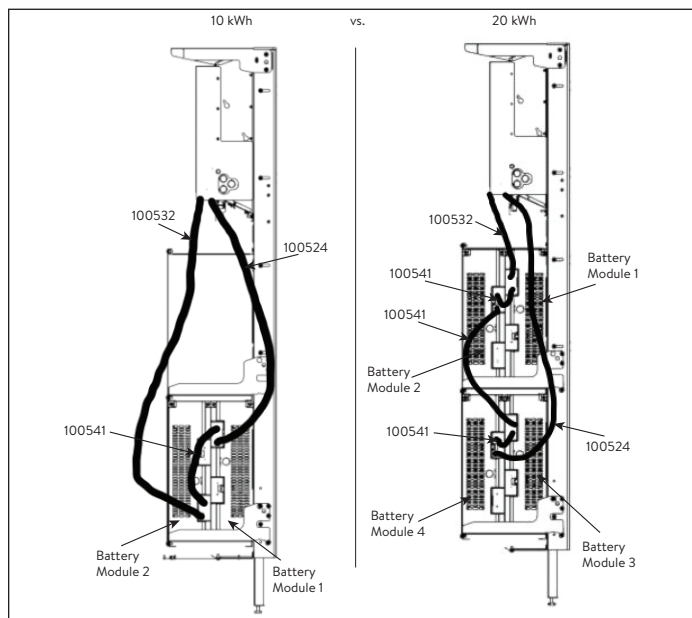


Fig. 29 sM4 X2 to X1 daisy-chain

4. Connect BMS communication cables

- ▶ Identify battery communication ports
 - X1 (Output)
 - X2 (Input)
- 2 batteries configuration:**
- ▶ Connect 100532 to "X2 First" port on the Power Unit and port "X2" on the battery module 2.
 - ▶ Connect 100541 to "X1" port on the battery module 2 and "X2" port on the battery module 1.
 - ▶ Connect 100524 to "X1" port on the battery module 1 to "X1 Last" port on the Power Unit (Refer to figure above).

4 batteries configuration:

- ▶ Connect 1000532 to "X2 First" port on Power Unit and "X2" port on the battery module 1.
- ▶ Connect 1000541 to "X1" port on the battery module 1 and "X2" port on the battery module 2.
- ▶ Connect 1000532 to "X1" port on battery module 2 and "X2" port on battery module 3.
- ▶ Connect 1000541 to "X1" port on battery module 3 and "X2" port on battery module 4.
- ▶ Connect 1000524 to "X1" port on battery module 4 and "X1 Last" port on the Power Unit (Refer to figure above).

5. Connect power cables

2 batteries configuration:

- ▶ Connect the DC power cable from Battery Terminal 1 on the power unit to the battery module 1
- ▶ Connect the DC power cable from Battery terminal 2 on the power unit to the battery module 2

4 batteries configuration:

- ▶ Connect the DC power cable from Battery Terminal 1 on the power unit to the battery module 1
- ▶ Connect the DC power cable from Battery Terminal 2 on the power unit to the battery module 2
- ▶ Connect the DC power cable from Battery Terminal 3 on the power unit to the battery module 3
- ▶ Connect the DC power cable from Battery Terminal 4 on the power unit to the battery module 4

6. Connect Ethernet cable

- ▶ Loop the Ethernet cable through the provided ferrite core in the accessory kit, three times before plugging it into the Power Unit port X301 "ETH".

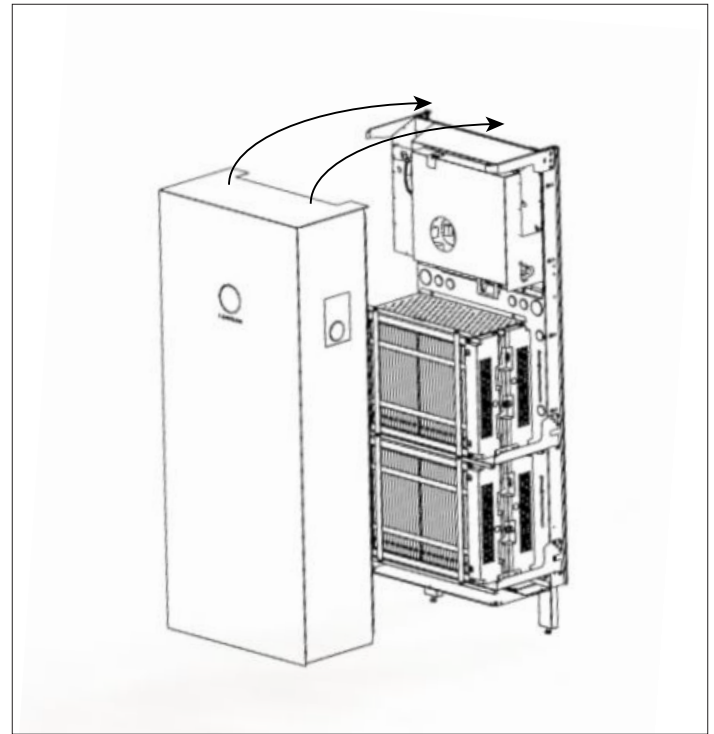


Fig. 30 Cover installation

Tools needed:

- 6mm hex wrench

- ▶ Hang the storage system cover on the same edge as the Power Unit, located on the top-front edge of the Wall Frame.

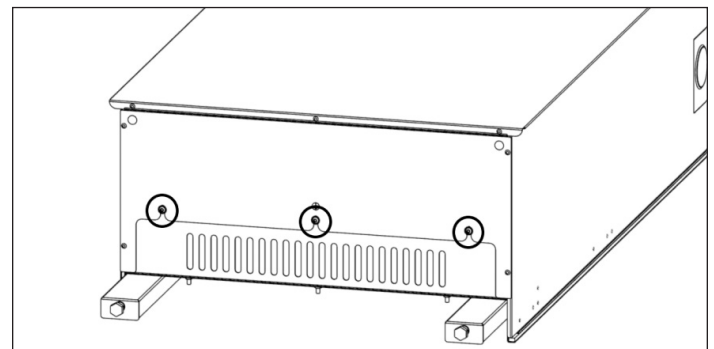


Fig. 31 Fastening the Cover

- ▶ Ensure the Bottom Vent Plate is inside the system.
- ▶ Fasten the Bottom Vent Plate to the using 3x M6 bolts with lock washers. Torque down to 10 in-lb.

THIS WILL ELECTRICALLY GROUND THE COVER.

Prerequisites

- The mounting location fulfills the requirements.
- All power wires are connected properly.
- All BMS communication cables are connected properly.
- The electrical connections fulfill all requirements of local, regional, and national regulations.
- The main distribution panel and protected loads panel are electrically isolated
- The electrical connections of the storage system have been performed correctly.
- The storage system has been connected to the Internet.

Table 3 Commissioning prerequisites

Commissioning

Commissioning first-time installation

Conditions:

- Storage system is in operation (LED indicator is pulsing white).
- Storage system is connected to the network.
- Check storage system to ensure that the appropriate software version is installed.
- Establish the connection between the laptop/PC and primary storage system, as described in the relevant installation instructions.
- Navigate to find-my.sonnen-batterie.com.

Commissioning assistant

1. Identify the storage system

- Visit <https://find-my.sonnen-batterie.com>.

Ensure the computer accessing the system is on the same network and identify the system being commissioned from the list and click “Configure”.

2. Log in to the storage unit

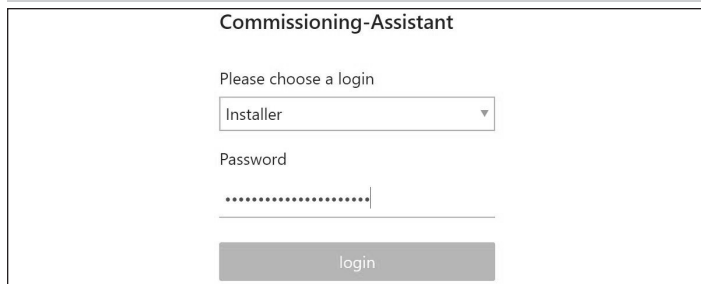


Fig. 32 Logging in to the storage system

- Log in to the storage unit.
- Login information:

Account: Installer

Password: one-time password is found on nameplate of ESS



The one-time password is used during commissioning and a new password is created and saved by the installer.

- Click “login”.



The Commissioning Assistant must be completed to use the storage system.

Connecting to sonnen

- Click the blue “Configure Assistant” button to enter the commissioning assistant tool.



Fig. 33 find-my.sonnen-batterie.com landing page

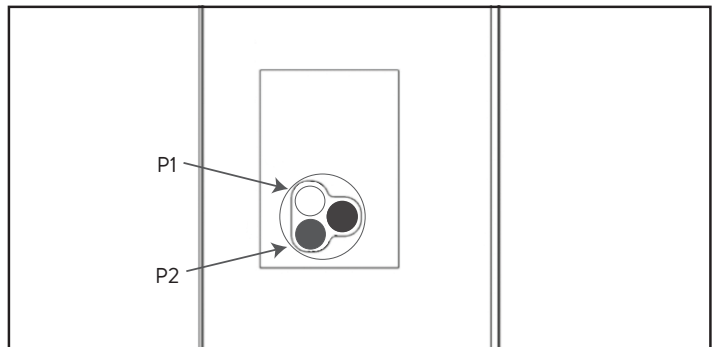


Fig. 34 Power buttons and label

- To login to the Commissioning Assistant, select “Installer” and enter the 9-digit initial password. Find password on storage system label. This is a one-time password and you will be prompted to create a new one upon logging in. If this password is forgotten in the future, contact sonnen service department to reset it.

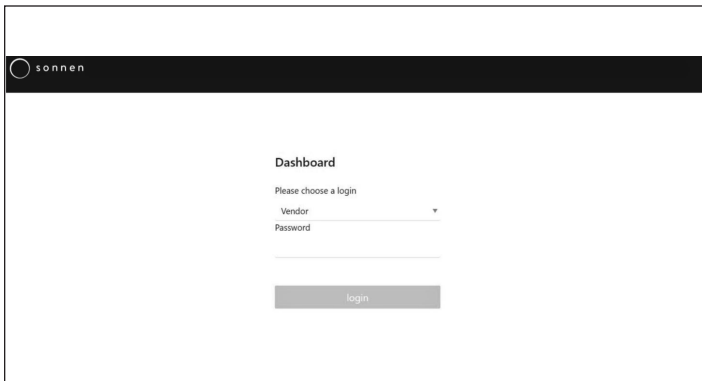


Fig. 35 Password entry

Commissioning

- Once inside, it should enter directly into the commissioning assistant. However, if not, click on the left side of the screen, as shown below.

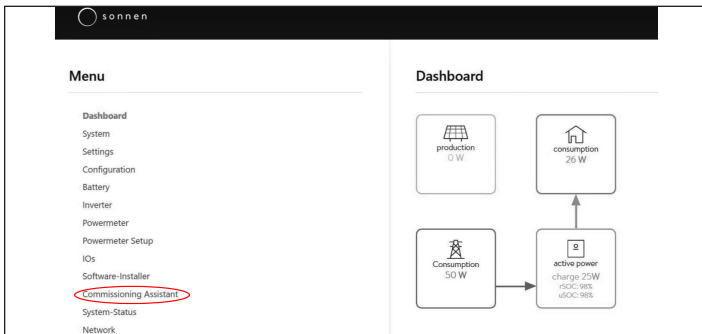


Fig. 36 Dashboard

- Once in the commissioning assistant, select the type of system being installed. Select sonnenCore.

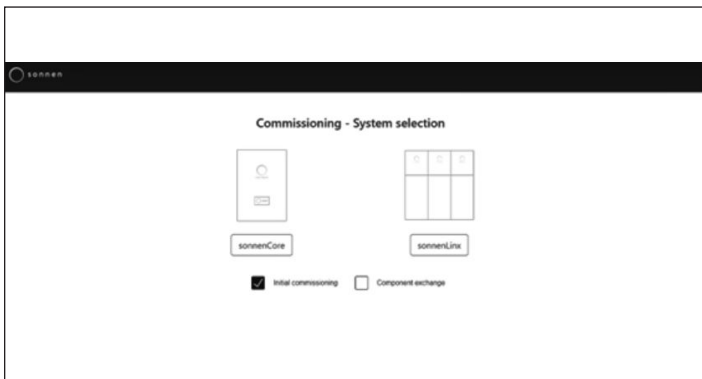


Fig. 37 System selection

- The software will likely update at this stage. It should take no longer than 15 minutes, but this is a good time to take care of any remaining work around the physical installation. When finished, click the “continue” button.

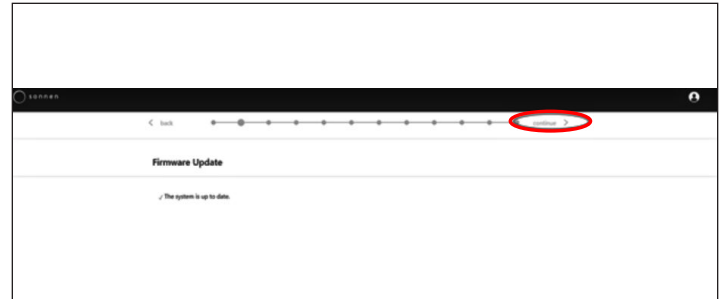


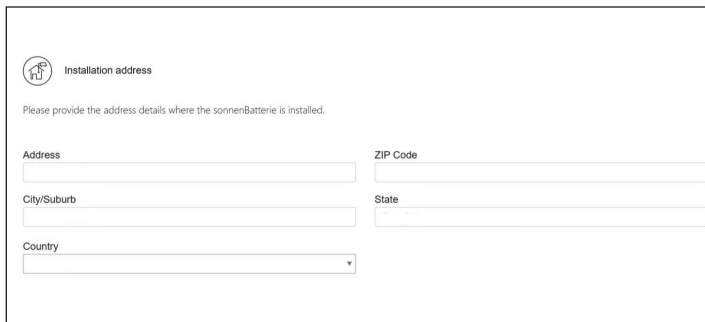
Fig. 38 Firmware update complete

Owner & Installer information

- The third page will ask for information about the battery owner, installation location, and installation company. These sections are all mandatory, so please make sure the owner is available to help fill it in.
- The Owner Information will be used to fill in the Customer Portal details for the battery owner. It is critical to enter the correct email here, as the invitation to the portal will be sent to this email. Don't enter a Customer ID unless given one by a sonnen technician.

Fig. 39 Owner information

- The Installation Address section requests information about where the battery is installed. This information will be displayed on the customer portal, and on partner portal.
- The “Address” line will be displayed as the battery name in the customer portal.



Installation address

Please provide the address details where the sonnenBatterie is installed.

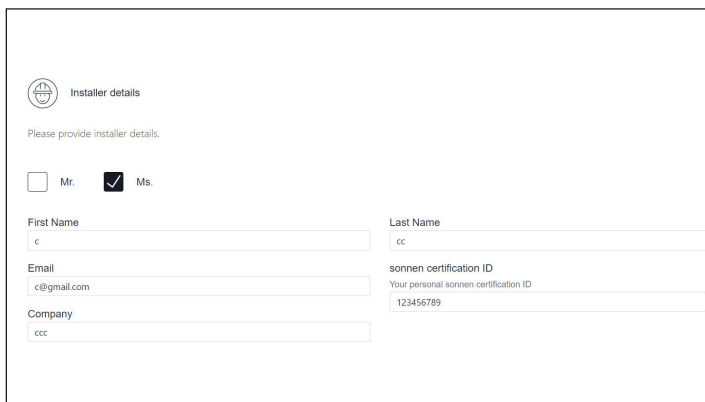
Address ZIP Code

City/Suburb State

Country

Fig. 40 Installation address

- ▶ The Installer Details section asks installers information. The sonnen Certification ID is the installer number given when completing the installation certification training online. This number will tie this battery to the Partner Portal account, so it is important to enter it without any errors.
- ▶ If not yet certified, visit our online certification program and complete that before finishing this process: <https://sonnenuniversity.talentlms.com/index>.



Installer details

Please provide installer details.

☐ Mr. ☒ Ms.

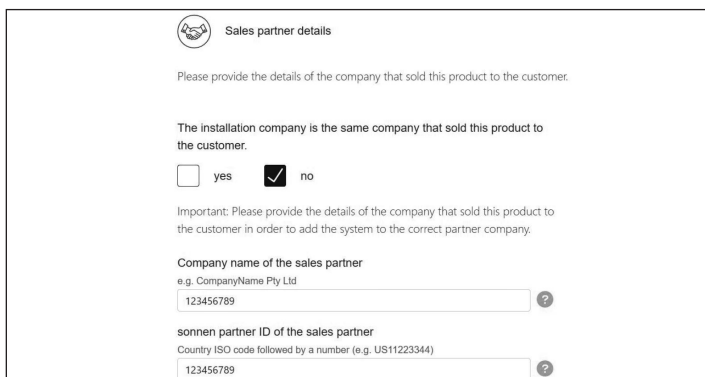
First Name Last Name

Email sonnen certification ID

Company Your personal sonnen certification ID

Fig. 41 Installer details

- ▶ The Sales Partner Details page asks about the company that sold the battery. If it is the same as the installer, this section will automatically fill in the details. If not, enter those in.



Sales partner details

Please provide the details of the company that sold this product to the customer.

The installation company is the same company that sold this product to the customer.

☐ yes ☒ no

Important: Please provide the details of the company that sold this product to the customer in order to add the system to the correct partner company.

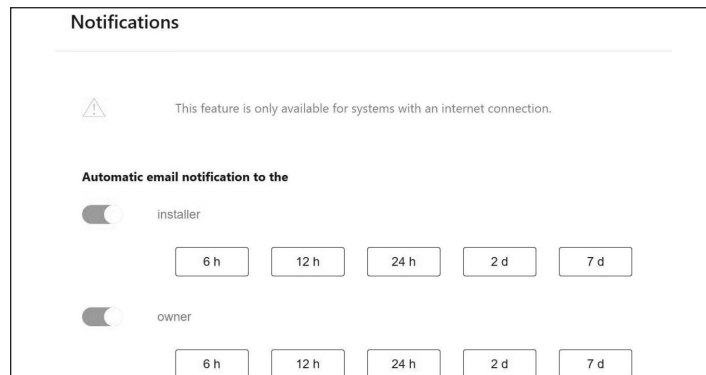
Company name of the sales partner
e.g. CompanyName Pty Ltd

sonnen partner ID of the sales partner
Country ISO code followed by a number (e.g. US11223344)

Fig. 42 Sales partner details

Notifications

- ▶ The Notifications tab asks about automatic information. These notifications will alert the owner or installer if connection is lost to the sonnenEvo. We recommend settings like those below, as these notifications can be used as a useful tool to identify power outages and adjust behavior, or to identify interruptions in internet connection before they lead to larger problems.



Notifications

This feature is only available for systems with an internet connection.

Automatic email notification to the

☒ installer

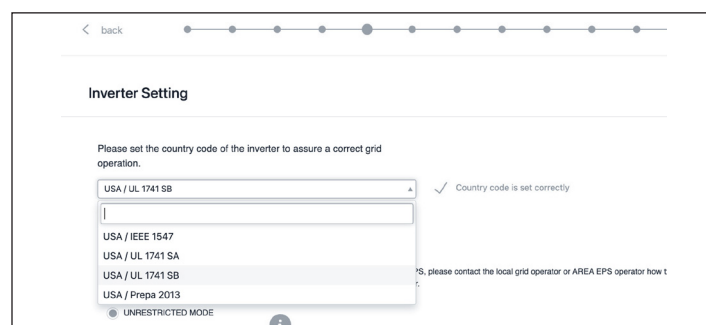
6 h 12 h 24 h 2 d 7 d

☒ owner

6 h 12 h 24 h 2 d 7 d

Fig. 43 Notifications page

Inverter settings



Inverter Setting

Please set the country code of the inverter to assure a correct grid operation.

USA / UL 1741 SB ✓ Country code is set correctly

USA / IEEE 1547

USA / UL 1741 SA

USA / UL 1741 SB

USA / Prepa 2013

UNRESTRICTED MODE

Fig. 44 Inverter setting - Country Code

- ▶ Select “USA/UL 1741 SB” in the menu item “Inverter Setting” as Country Code to load the inverter settings based on Grid Code UL 1741 SB.
- ▶ USA/IEEE 1547 is used for most mainland USA systems. USA/UL 1741 SB is used for systems requiring Rule 21 software, and USA/PREPA 2013 is used for systems in Puerto Rico.
- ▶ If located in California (which requires Rule 21) or Puerto Rico (which requires specific PREPA settings), please navigate back to the Inverter Settings page if the Commissioning Assistant skips it.

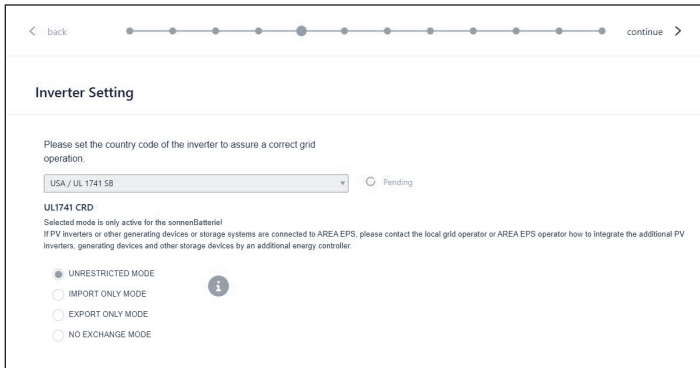


Fig. 45 Inverter settings - Pending

- The inverter settings are loaded according to the Country Code selection.

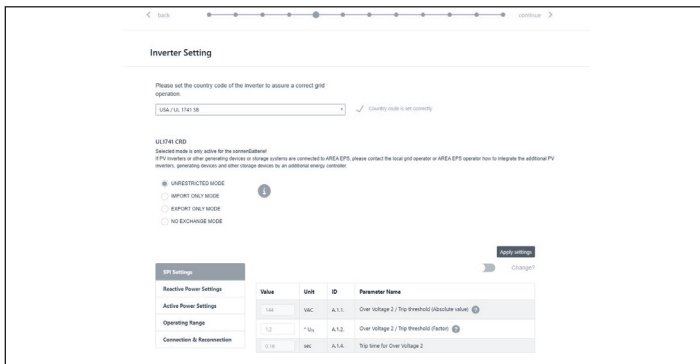


Fig. 46 Inverter setting - Country code is set correctly

- Wait until the message “Country code is set correctly” appears.
- The inverter settings are now set as listed in chapter Inverter settings for Grid Code UL 1741 SB [page 10].
- After the Country code “USA / UL 1741 SB” has been set, the parameters of the Grid Code setting can be changed manually in the “UL1741 CRD” area in the Grid Parameter Selector.

Refer to <https://sonnenusa.com/en/GridCodeSettingsUL1741/>.

1. Commissioning

If PCS modes are required, use the following steps.

- The PCS mode selector will appear in the Inverter setting page for US systems. By default, the “Unrestricted Mode” will be active. Click on a mode to set it on the system.

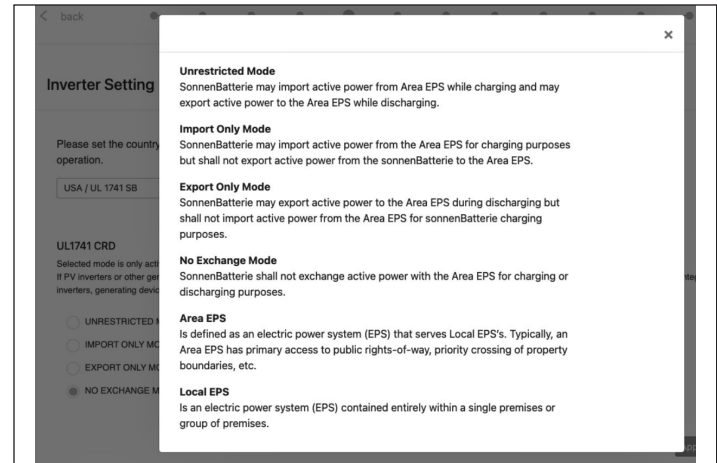


Fig. 47 Mode selector

- Click the info icon to open a popup window that explains the different mode settings.

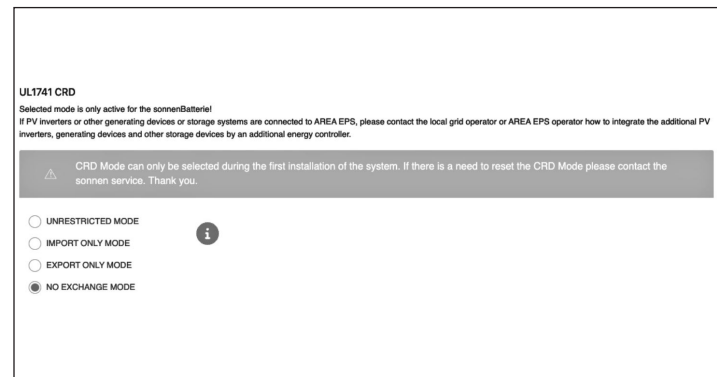


Fig. 48 PCS mode

- The installer can only change the PCS mode during the initial commissioning of the system. If the installer tries to change it later, the selector will be disabled and a warning will display. Only the Service or Vendor roles can change the mode after initial commissioning and this is password protected.

2. Inverter setting - California Rule 21

For compliance with California Rule 21, some parameters of the Grid Code Setting must be changed manually.

- Change all Grid Code setting parameters listed in the Inverter Setting for California Rule 21 chapter.

In the network parameter selector the parameters can be selected.

Value	Unit	ID	Parameter Name
144	VAC	A.1.1.	Over Voltage 2 / Trip threshold (Absolute value)
1.2	* U _N	A.1.2.	Over Voltage 2 / Trip threshold (Factor)
0.16	sec	A.1.4.	Trip time for Over Voltage 2
132	VAC	A.2.1.	Over Voltage 1 / Trip threshold (Absolute value)
1.1	* U _N	A.2.2.	Over Voltage 1 / Trip threshold (Factor)
13	sec	A.2.4.	Trip time for Over Voltage 1
105.6	VAC	A.4.1.	Under Voltage 1 / Trip threshold (Absolute value)
0.88	* U _N	A.4.2.	Under Voltage 1 / Trip threshold (Factor)
21	sec	A.4.4.	Trip time for Under Voltage 1
84	VAC	A.5.1.	Under Voltage 2 / Trip threshold (Absolute value)

Fig. 49 Inverter Setting – network parameter selector

On the left side of the network parameter selector is where to choose between the areas “SPI Settings, Reactive Power Settings, Active Power Settings, Operating Range and Connection & Reconnection”.

The menu item “Reactive Power Settings” consists of four sub-areas “CosPhi fix, Q fix, Q (U), Q (P)”, which can be selected via the drop-down list.

Value	Unit	ID	Parameter Name
50	%Pn	B.5.4.	Q(P) Active power setpoint P2
20	%Pn	B.5.5.	Q(P) Active power setpoint P1
20	%Pn	B.5.6.	Q(P) Active power setpoint P'1
50	%Pn	B.5.7.	Q(P) Active power setpoint P'2
100	%Pn	B.5.8.	Q(P) Active power setpoint P'3
44	%Sn	B.5.9.	Q(P) Reactive power setpoint Q3

Fig. 50 Inverter Setting – Menu item “Reactive Power Settings”

3. Changing the parameters of grid code setting

- Activate the “Change?” slider.

Value	Unit	ID	Parameter Name
144	VAC	A.1.1.	Over Voltage 2 / Trip threshold (Absolute value)
1.2	* U _N	A.1.2.	Over Voltage 2 / Trip threshold (Factor)
0.16	sec	A.1.4.	Trip time for Over Voltage 2
132	VAC	A.2.1.	Over Voltage 1 / Trip threshold (Absolute value)
1.1	* U _N	A.2.2.	Over Voltage 1 / Trip threshold (Factor)
13	sec	A.2.4.	Trip time for Over Voltage 1
105.6	VAC	A.4.1.	Under Voltage 1 / Trip threshold (Absolute value)
0.88	* U _N	A.4.2.	Under Voltage 1 / Trip threshold (Factor)
21	sec	A.4.4.	Trip time for Under Voltage 1
84	VAC	A.5.1.	Under Voltage 2 / Trip threshold (Absolute value)

Fig. 51 Inverter setting - Change activated

- Select the parameter to be changed in the

network parameter selector.

- Change the value of the parameter.
- Then, click on the “Apply settings” button.

Value	Unit	ID	Parameter Name
144	VAC	A.1.1.	Over Voltage 2 / Trip threshold (Absolute value)
1.2	* U _N	A.1.2.	Over Voltage 2 / Trip threshold (Factor)
0.16	sec	A.1.4.	Trip time for Over Voltage 2
132	VAC	A.2.1.	Over Voltage 1 / Trip threshold (Absolute value)
1.1	* U _N	A.2.2.	Over Voltage 1 / Trip threshold (Factor)
13	sec	A.2.4.	Trip time for Over Voltage 1
105.6	VAC	A.4.1.	Under Voltage 1 / Trip threshold (Absolute value)

Fig. 52 Inverter setting - Settings successful

- Wait until the message “The settings have been successfully made in the inverter” appears.

PV System

- The PV System page requests information about the PV system. If there is no PV system installed, unselect the top slider, and click Continue. If there is a PV System, enter the peak power, in watts, and select the “Connection Type”, which is the number of phases connected to the PV system. 1~ (1 phase) is standard in the USA.
- The bottom slider is “off” by default. This functionality is not available with any USA products. Please leave this “off”.

Fig. 53 PV System

Power meter

- The Power Meter settings may seem intimidating. We recommend clicking the “description” button directly below the pictures

to open a more detailed overview of this setting.

- Essentially, if measuring Whole Home Consumption, with the CTs located upstream of the BESS, common with stacked sonnenEvo systems or with a Whole Home Self Consumption Kit in a VPP or Time of Use area, select “Grid Measurement”. If measuring loads with the CTs located downstream of the BESS, common with a single sonnenEvo system with a Protected Loads Panel and no desire to maximize self-consumption of PV energy, select “Differential Measurement”.

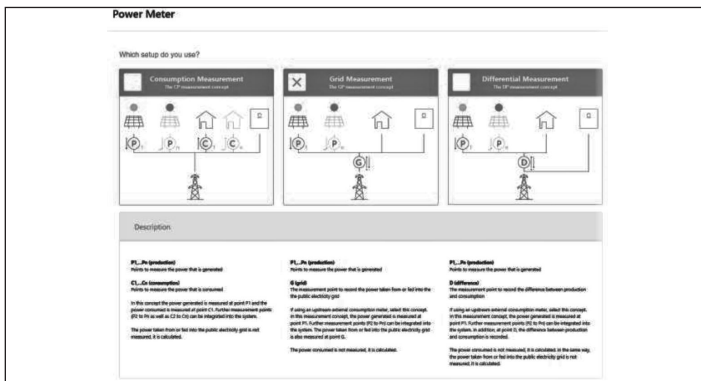


Fig. 54 Power meter settings

Configuration

Set the meter data on the Configuration page. Also verify the measurement values here. If they are negative, now is a great time to reverse the CTs so the measurements are correct.



Don't forget to validate the consumption measurement values!

- These may be pre-set. If so, there's no need to configure them. If they are not set, or are set incorrectly, follow these instructions:
 - Meter type should always be EM210.
 - Direction will depend on previous setting.
 - If “Differential Measurement” measurement selected, the consumption meter will be set for “D – Difference”.
 - If “Grid Measurement” selected, the consumption meter will be set for “G – Grid”. Validate that the measured consumption is correct for the chosen loads with a clamp on

meter.

- PV meter will be “P – Production”.
- Modbus ID will always be 4.
- Channel will be 1 for consumption meters and 2 for production meters.
- Again, remember to validate the measurement values with the actual consumption and production values.

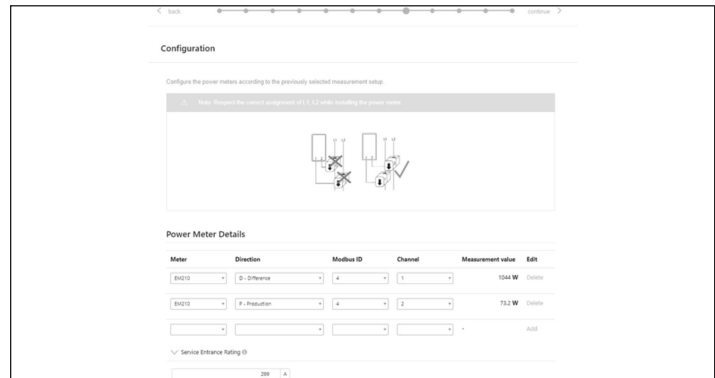


Fig. 55 Configuration

Features - Operating mode

On the Features page select a variety of operating modes and features. In general, each operating mode can be paired with a number of other features, so the pictures included in this section show the potential functionality – not the recommended settings for your customer. Each feature and operating mode will be detailed below.

- **Feature – Generator** - While sonnen eco and ecoLinx systems do support generator integration, the sonnenEvo does not. Leave this option unselected for best performance.
- **Feature - AC Microgrid** - This section activates the microgrid functionality for the storage system. Select this section.
- **Reenabling Time** - If the storage system over-discharges in offgrid mode, it will turn off to protect the batteries. The Reenabling Times are 7-minute periods during which the system will activate the microgrid with the goal of turning on the PV System and charging the battery from excess PV. Select times during which the sun will be up and the PV system will be generating enough power to provide for house loads and charge the sonnen. May set up to

three times in case the system cannot charge during the first two. We recommend educating the customer on reducing consumption if the battery turns off due to over-discharge. If there is no PV System, leave these settings at default.

- **Frequency Shift** – When offgrid, the storage system will shift the frequency upwards when it hits 95% SOC to trigger the PV system to turn off to avoid over-charging the batteries. This setting allows to adjust the frequency to which it will shift the grid. Selected number should be 10X what the desired frequency is (e.g., 609 for 60.9Hz). Default is 60.9Hz, which should be sufficient in most mainland settings. Higher frequencies may be used in areas with unstable grids where PV systems often have widened disconnection ranges.
- **Feature - Backup Buffer** - The Backup Buffer will limit the discharge of the batteries for Self-Consumption or Time of Use operation. This will always reserve a percentage of the battery to power a microgrid in case of a power outage.
- **SonnenKNX module** – This feature is not active in the USA. Leave this option unselected for best performance.

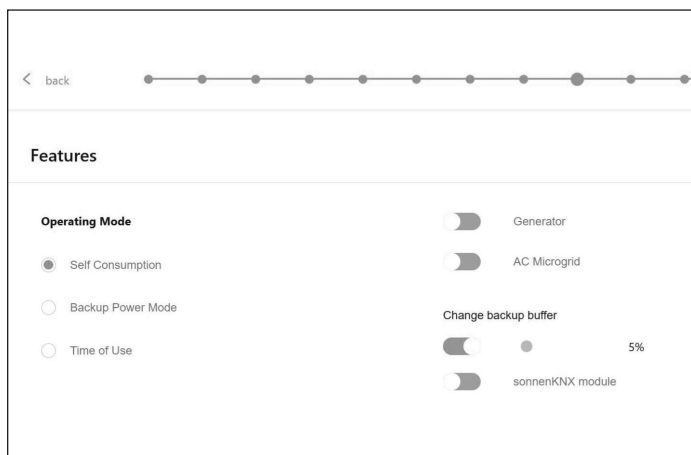


Fig. 56 Self-Consumption mode with AC Microgrid and Backup Buffer

- **Operating Mode – Self-Consumption** - Self-Consumption operating mode maximizes solar self-consumption. The solar is used to power loads and charge batteries. When there is not enough solar to power loads, the batteries will discharge to cover consumption. This mode

does not use the grid to charge the batteries.

- **Operating Mode – Backup Power Mode** - In this mode, the storage system remains at a full charge until the grid power is lost. Solar will work during the grid outage and can be used to both power loads and charge the batteries if there is any excess solar to do so. The grid is also used to charge the batteries.
- **Operating Mode – Time of Use** - If customer has a Time of Use utility rate structure, they may want to use this mode. In Time of Use mode, the battery will discharge against house loads only during High Tariff Windows and will not charge from the grid during these times, charging only from excess PV. These times will be dictated by the utility company rate structure.
- All times are in 24h “military” time.

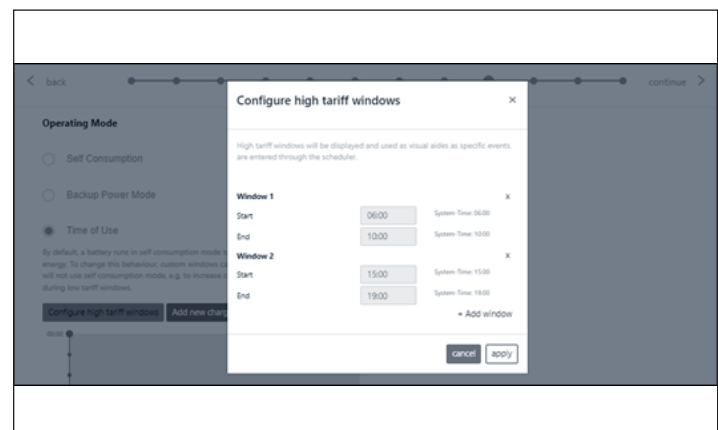


Fig. 57 Time of use - high tariff window

After a high tariff window, the battery will once again charge from the grid, so it has enough stored energy for the next high tariff window. The customer may have times during which they don't want the battery to discharge but also want to limit charging from the grid, for example during a “shoulder” rate that is not as high as a high tariff time, but also not low tariff. To limit grid charging during a time that is not high tariff, set a Charge Event by clicking “Add new charge event”.

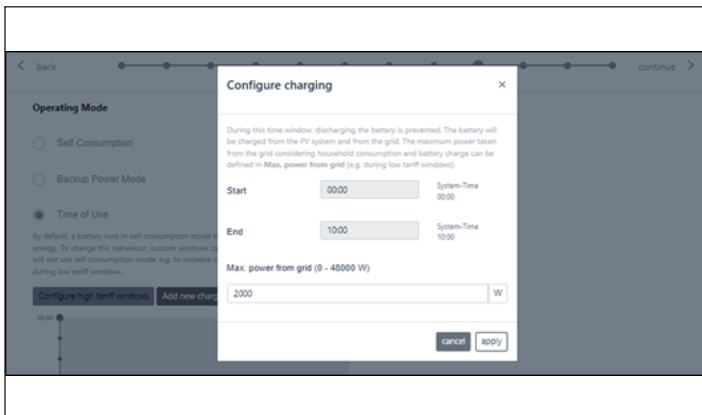


Fig. 58 Time of use - charging window

Below image is an example of the Time of Use setting on the battery system. The storage system will discharge to load from 04:00am to 09:00am or until the battery reaches the backup buffer, whichever comes first. It will charge only with excess PV from 09:00am to 14:00pm as set maximum power from the grid 0W. See image below. Starting at 14:00pm it will discharge against house load until 23:00pm or the battery reaches the backup buffer, whichever comes first. From 23:00pm to 04:00am the system is charging from the grid.



Fig. 59 Time of use

System test

The System Test page is the last change to verify everything is working. Ensure the number of modules, PV production, and home consumption values are correct before moving on to the last step.

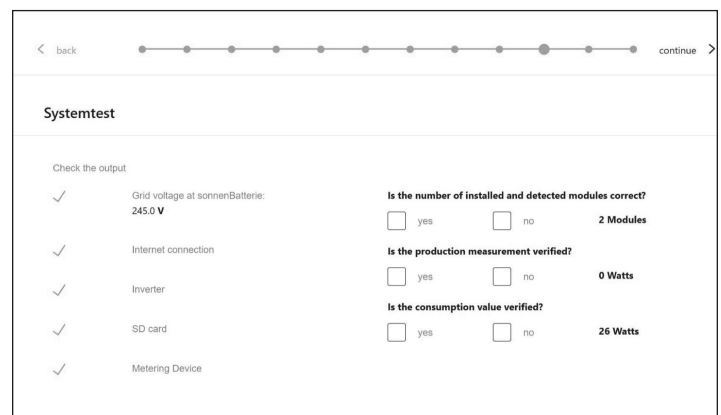


Fig. 60 System test page

Completion

- Read and follow the check list on this page, then check the box at the bottom before moving on.

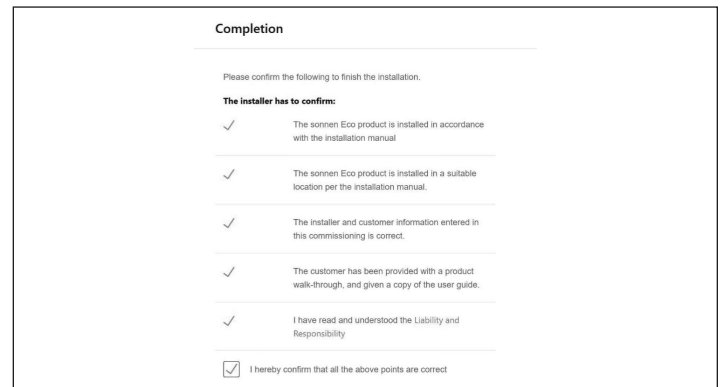


Fig. 61 Completion page

The commissioning is not complete, and an email will be sent to the customer email address that was entered on the Owner & Installer Information page. If they do not receive the email, send it again from this page.

- Once they have received the email, click “Start sonnenBatterie”.

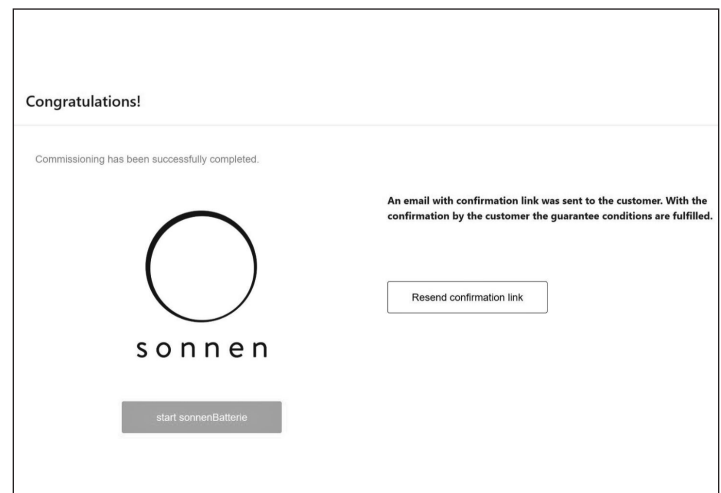


Fig. 62 Congratulations! page

Display on internet portal

- The internet portal presents current information and data for the stacked storage systems. Data from all three storage systems will be aggregated and displayed as a single sonnen energy system.
- The description of the individual operating steps, the displays and diagrams and the registration process can be found in the operating instructions for the storage system.
- To view the data for on-grid/off-grid stacking, the system must be registered with the serial number of the primary storage system. The data for the entire system, such as the PV production, consumption and discharge, is displayed on the internet portal for the primary storage system.

Internet portal

The storage system must connect to sonnen's servers to enable control of the storage system via the web portal and smart-phone app. This connection is protected by industry-standard security against unauthorized access. sonnen and service partners will only access the storage system for maintenance and monitoring.

An anonymous evaluation of log data enables further improvements and monitoring of hardware and software.

Establish connection to the Internet

- Ensure the router acts as a DHCP server and configures newly connected network devices automatically.
- Ensure the following TCP and UDP ports are permitted for the following services in the router:



The listed ports are generally pre-configured on the routers.

TCP Port	Service
22	SecureShell (ssh)
37	Time Server (ntp)
80	Online Check (http)
222	VPN (Server connection, ssl)
232	VPN (backup)
443	App control (https)
UDP Port	
1196	(Server connection, ssl)

Table 4 Required open ports for storage system

The storage system connects automatically with the Internet. There are no further steps required.

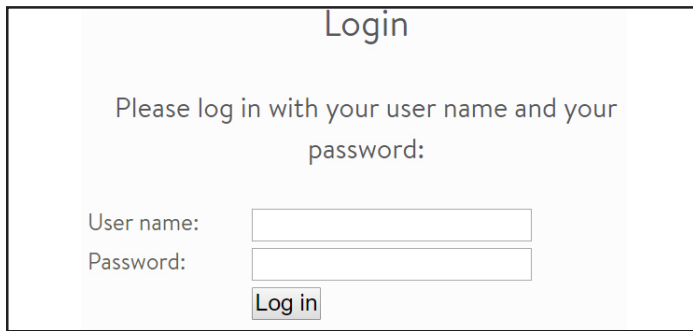
Inside the Internet portal

Real-time and historical data regarding the storage system can be viewed via the Internet portal.

An email will be received with a welcome to the sonnenCommunity shortly after storage system is commissioned. This email will be sent to the address listed during commissioning.

If the email is not received, check the spam folder. The email is sent from “energiezukunft@sonnenbatterie.de” and is often stuck in spam folders. If email is not received, email service@sonnen-batterie.com and it will be resent.

- Log in to the portal
- Type the following address in internet browser: <https://my.sonnen.de/>



Login

Please log in with your user name and your password:

User name:

Password:

Log in

Fig. 63 Login window

- Enter the login information selected at first-time login.

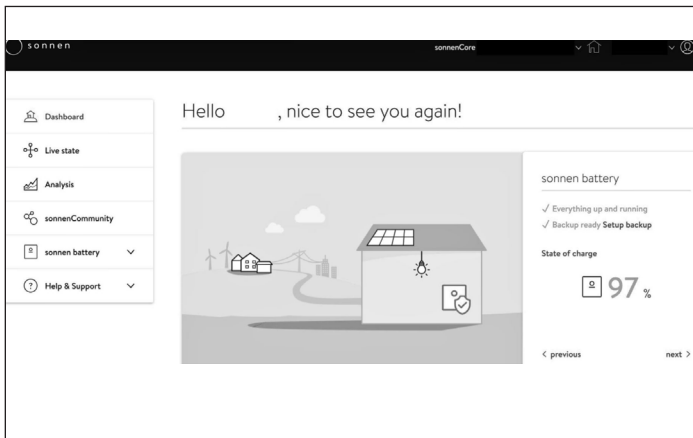


Fig. 64 Portal overview screen

View each element by clicking next and previous:

- PV system - Current production from your PV system.
- Consumption - Energy being used in the house.
- sonnenCommunity - Information about the sonnenCommunity. Click or scroll down for more information.
- sonnen battery - Current status and State of Charge of the sonnen battery.

Live state page

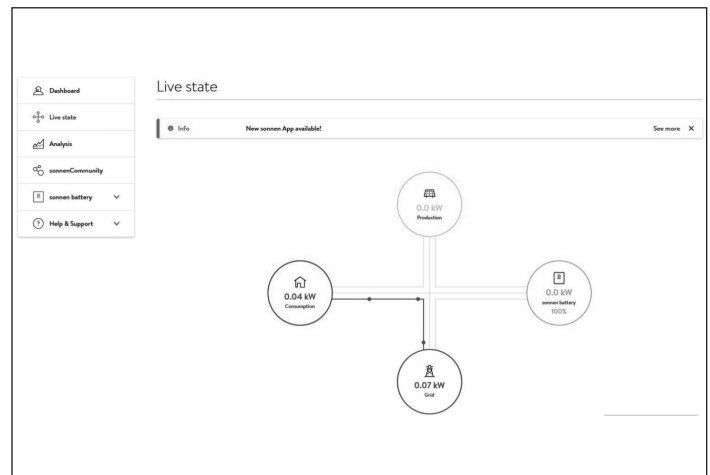


Fig. 65 Live state

This display shows key pieces of information regarding where the power is going in the entire system using yellow line indicators:

- Production - indicates the amount of power the PV system is producing as measured by the storage system.
- Consumption - a measure of how much power is being consumed by the loads the storage system is supplying.
- Feed-In - the amount of excess PV that is passed through the storage system towards the utility.

Analysis page

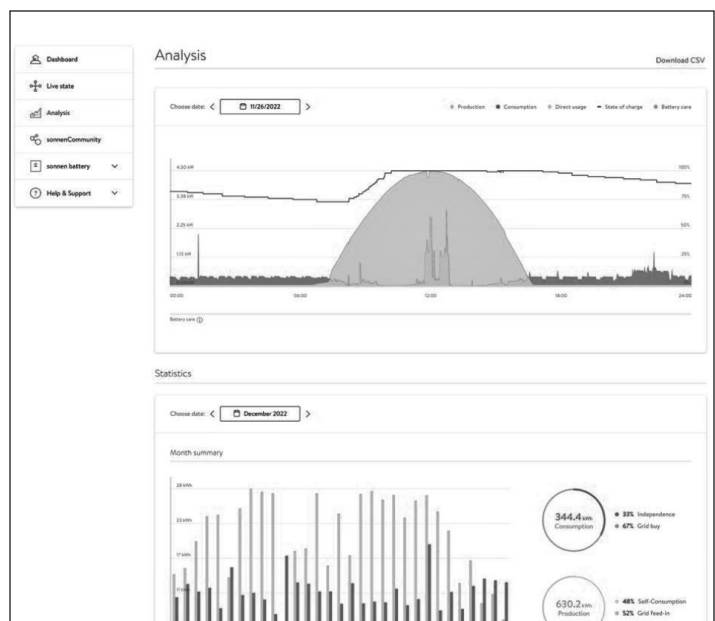


Fig. 66 Analysis page

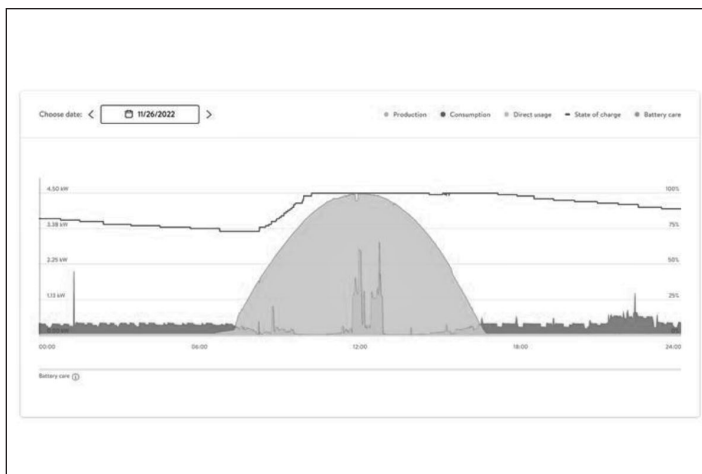


Fig. 67 History view

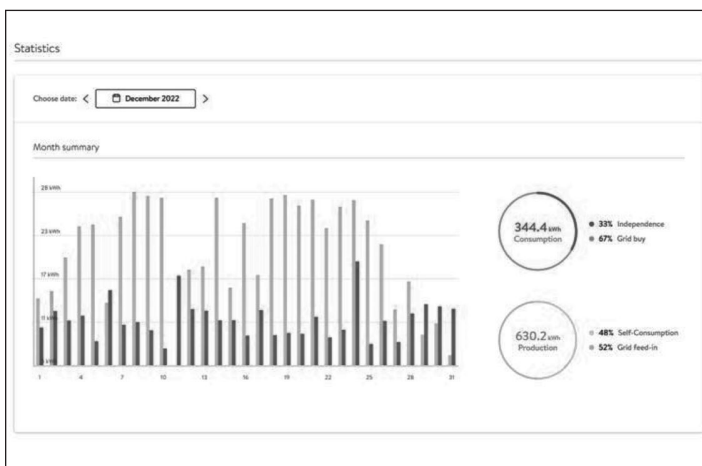


Fig. 68 Statistics

The Analysis page shows history at the top of the page and statistics below. The user can select or deselect elements of the view at the top of the graph.

Statistics shows battery behavior in more detailed terms: how independent the customer is from the grid, what percentage of consumption comes from solar, etc.

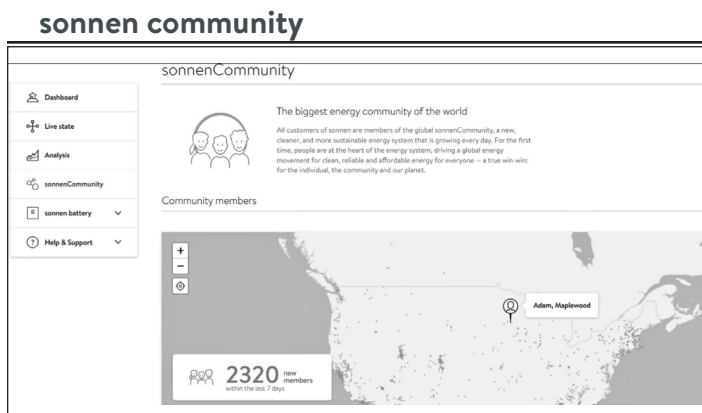


Fig. 69 sonnen community

The sonnen community tab shows information about the global sonnenCommunity and how the customer and their battery connect to local sonnen users.

sonnen battery page

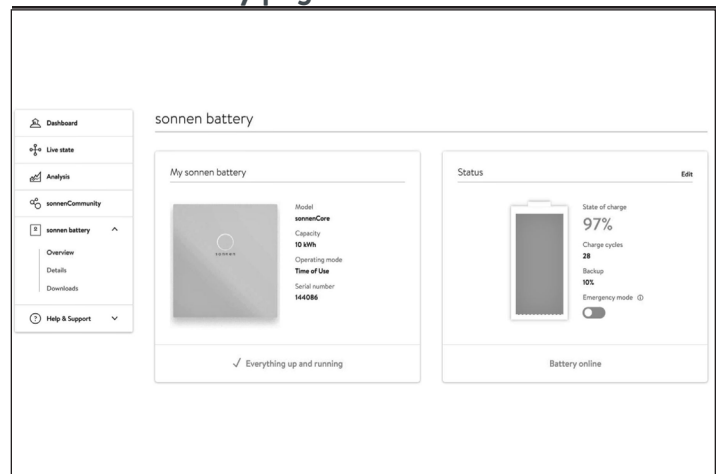


Fig. 70 sonnen battery page

sonnen battery page has 3 options: Overview shows the battery status and main attributes. It also shows State of Charge.

ATTENTION



This is the point where the user can set the battery to emergency mode if there is an outage planned or expected.

- Reset the backup buffer after deactivating emergency mode. It will be automatically set to 10%.
- Reset backup buffer by clicking “Edit” on the status section:

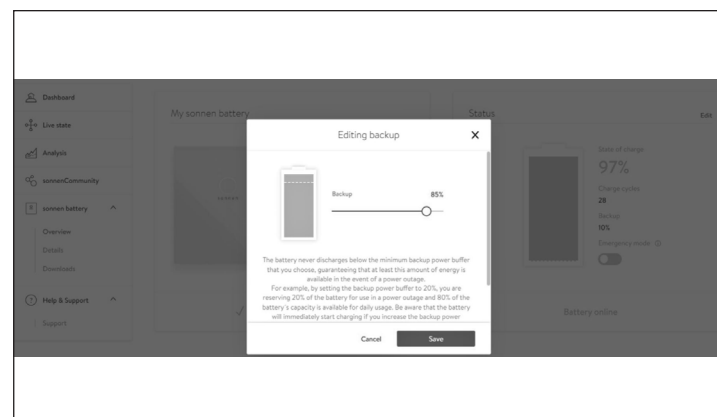


Fig. 71 Editing backup

sonnen battery details

Fig. 72 sonnen battery

Downloads

Fig. 73 Downloads

This page is where sonnen information and manuals can be downloaded.

Help and support

Fig. 74 Help and support

Help and support is the page to contact sonnen service team and find self help.

About me

Fig. 75 About me page

Under the user name is the About me section. This shows the information for the account holder.

Change password

Fig. 76 Change password

This page allows the user to change the password for their account.

Settings

Fig. 77 Settings

This page allows the user to set service function. Service function MUST be selected if the installer is to be able to monitor and help support the storage system.

UL 1741 CRD: PCS

UL 1741 CRD: PCS

PCS controlled current	20A
PCS controlled voltage	240VAC
Devices compatible with PCS	Carlo Gavazzi Meter, EM210 Carlo Gavazzi CT CTV1X60A333MV Carlo Gavazzi CT CT-V4X200A333MV sonnenInverter 4

ATTENTION



The maximum operating current of this system may be controlled electronically. Refer to manufacturer's instructions for more information.

WARNING



The maximum operating currents in controlled busbars or conductors are limited by the settings of the power control system and may be lower than the sum of the currents of the connected controlled power sources.

ATTENTION



PCS controlled current setting:
20 A.

ATTENTION



Only qualified personnel shall be permitted to set or change the setting of the maximum operating current of the PCS. The maximum PCS operating current setting shall not exceed the busbar rating or conductor ampacity of any PCS controlled busbar or conductor.

ATTENTION



PCS shall be programmed such that the system does not exceed the limitations of the over-current devices in the panel-board and connected circuit. The PCS shall be coordinated with the limits defined by NEC 210.20, 705.12 or NFPA 70 2020 edition section 705.13.

WARNING



This system is equipped with a power control system (PCS) which is suitably rated to provide branch circuit over-current protection. The controlled current setting shall not exceed the rating of any controlled busbars or conductor ampacity.

Configuration of power control settings system or changes to settings shall be made by qualified personnel only. Incorrect configuration or setting of the power control settings may result in unsafe conditions.

ATTENTION



PCS configuration access is reserved to sonnen approved representatives, including installers who have successfully completed the sonnen university certification course. PCS login credentials must remain confidential, and cannot be shared without the consent of sonnen, Inc.

PCS configuration requirements

- Stable LAN internet connection to ESS
- Internet enabled device (PC, Laptop, Tablet)
- Web browser

Decommissioning

Shutting the storage system down

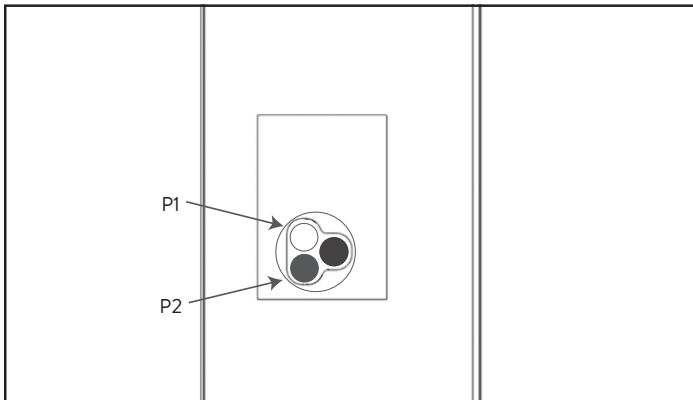


Fig. 78 Power disconnect button (P1)

Shut down the storage system

1. Physical shutdown

- ▶ Press in Power disconnect button (P1)

Emergency switch-off

- ▶ Press Emergency button

Recycling and certificates

The sonnen energy storage system battery modules comply with RoHS and contains none of the following substances: lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE).

Do not dispose of the sonnen energy storage system or its battery modules in anywhere other than certified electronics and battery facility! You must comply with federal, state, and local laws regarding battery disposal, which vary by location.

As per the limited warranty, the battery module replacement is free of charge during the warranty period, provided that it is part of a qualifying Covered Product that has been operated and maintained in accordance with the terms of the limited warranty and the Terms & Conditions provided with the product. In the case of failure outside of the limited warranty, the battery module will be replaced at the end user's expense. All battery module or sonnen energy storage system equipment replacements must be carried

out by a sonnen certified installer. Contact sonnen service or the company that installed the storage system to coordinate the these actions.

For all returned electrical equipment, sonnen uses R2 Certified recycling facilities.

Preparing battery modules for shipment (RMA)

WARNING

Risk of burns!



When working on the storage system:

- ▶ Take off metallic jewelry.
- ▶ Turn off the storage system.
- ▶ Turn off the main disconnect.
- ▶ Use insulated tools
- ▶ Wear personal protective equipment.

- ▶ Ensure entire storage system is turned off.
- ▶ Disconnect all batteries near the affected battery, cables, etc.
- ▶ Remove affected battery.

ATTENTION



End of single storage system installation section.

Stacking product description



These on-grid/off-grid stacking instructions are additional to the applicable product documentation for the sonnenCore+. The product documentation, above all the installation instructions, must always be observed.

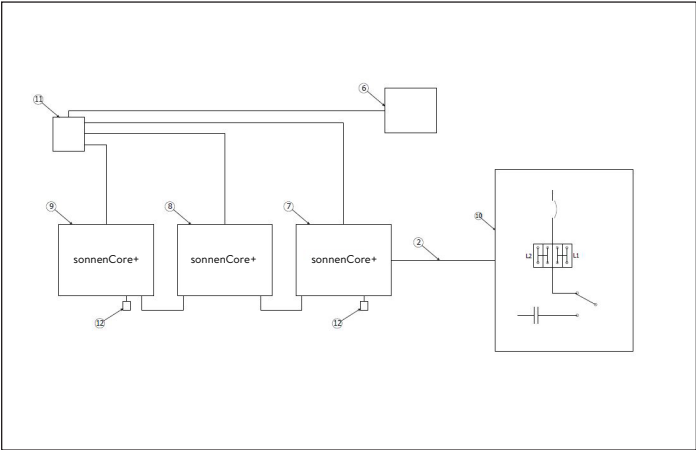


Fig. 79 AC connections module communication components

System components			
2	Modbus	9	Secondary BESS 2
6	Ethernet line*	10	AC connections module
7	Primary BESS	11	Communications switch
8	Secondary BESS 1	12	CAN terminator

Table 5 AC connections module communication components

*not included in scope of delivery

- On-grid/off-grid stacking consists of two to three individual sonnenCore+.
- All sonnenCore+ are the same type and have identical capacities (number of battery modules) installed.
- During installation one sonnenCore+ is designated as the primary BESS while the others are designated as secondary BESS. The primary BESS controls the two secondary BESS after installation is complete. The primary BESS should be the one closest to the AC

connections module because the modbus cable runs between the two.

- Ethernet cables need to connect all three systems via one internet switch or the modem if it has enough ports. Connect the communication cable (CAT6) to the EM meter in AC connections module to the primary BESS.
- The external switch can be omitted if a router with a sufficient number of free slots is available.

Stacking installation

Selecting the installation location

Important information



The heavy floor load applied by the sonnenCore+ must be taken into account when selecting the installation location. The specified weight for the entire system can be found in the section Product description. Applicable building codes must be observed in each case!

Observing minimum distances

- Observe the specified minimum distances to neighboring objects, walls and ceilings.

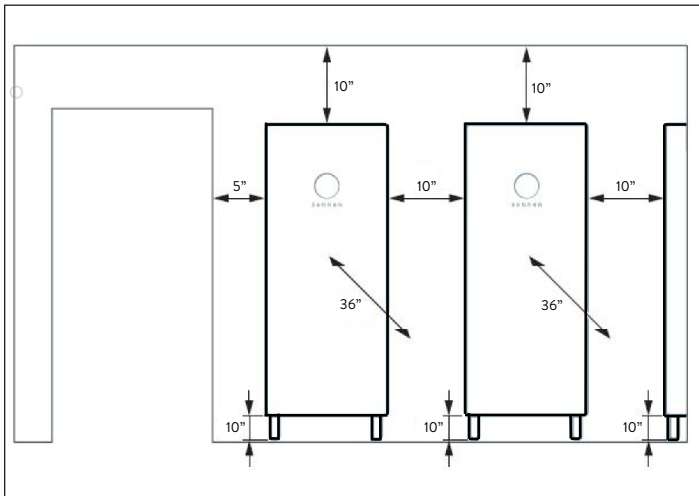


Fig. 80 Minimum distances sonnenCore+

The minimum distances ensure that the following conditions are met:

- Sufficient heat dissipation.
- Easy opening of the sonnenCore+.
- Sufficient space for installation and maintenance work.

Prohibited uses

DANGER

Danger to life due to electric shock!



Even if the utility grid fails, the storage system will continue delivering power. Before servicing the storage system:

- Turn off the storage system.
- Only authorized, electrically qualified persons can perform work on electrical parts.

Do not use the storage system;

- In vehicles
- In standing water or (>90%) humidity locations
- Do not use the storage system in areas at risk of filling with combustible dust (flour dust, sawdust, etc.)
- In direct sunlight
- In locations with the air ammonia content exceeds 20 ppm
- In presence of corrosive gases
- Elevations above 6,560 meters above sea-level
- Avoid direct contact with salt water and areas with a high salt water moisture content in the environment. Installations within 1.2 km range of salt water, please contact customer care.
- Locations where ambient temperature regularly exceeds 32°F - 113 °F (0°C - 45°C).

General warnings

ATTENTION

Damaging of the battery modules by deep discharge!



If the battery modules are disconnected from a power source for longer than six months, they can be damaged by excessive discharge.

- ▶ Bi-annually, connect to AC power source and allow it to charge the battery modules to 100%.

General safety instructions

- Do not modify the storage system.
- Do not use a damaged storage system.
- Ensure the following regulations are observed in the installation and connection of the storage system and the PV system:
 - Local, regional, national, and international regulations and guidelines
 - National Electric Code
 - ANSI/NFPA 70
 - Requirements of the servicing utility
- Ensure that all safety systems are in perfect working order.
- Read this manual with care.
- When working with the storage system, wear personal protective equipment, including safety glasses, insulated gloves, and safety shoes.
- Illumination shall be provided for all working spaces around the electrical equipment. Control by automatic means only is not be permitted. The lighting outlets should be arranged so that persons changing lamps or making repairs on the lighting system are not endangered by live parts or other equipment.

WARNING

RISK OF ELECTRIC SHOCK



Residual voltage always present on DC terminals, and the battery modules cannot be turned off.

Avoid contact with terminals.

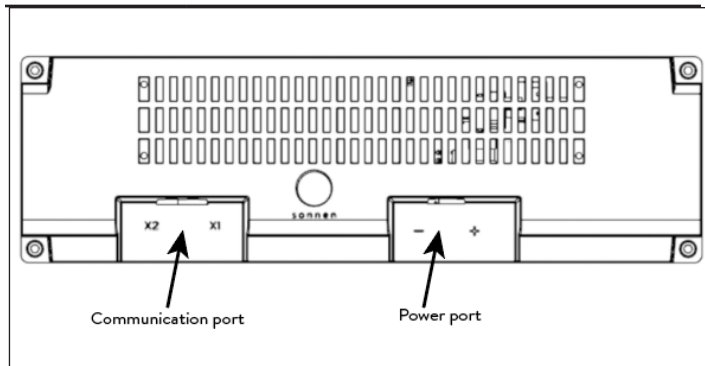


Fig. 81 sonnenModule 4 battery module

WARNING

Risk of burns!



When working on the storage system:

- ▶ Take off metallic jewelry.
- ▶ Turn off the storage system.
- ▶ Use insulated tools.
- ▶ Wear personal protective equipment, including safety glasses, insulated gloves, and safety shoes.

Installation

Installing storage system components

1. Run wiring and cables to installation location

- ▶ Cables and wires of the appropriate wire gauge, type and ampacity should be run site.
- Grid & Microgrid
- Ethernet
- Included CT wires (if connected outside the ESS)
- E-Stop (Optional)

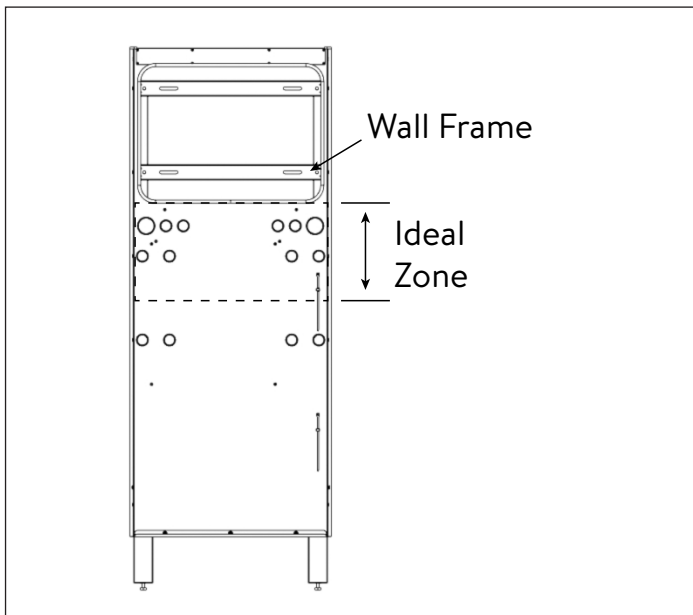


Fig. 82 Wiring and cable wall entry options

Cable entry into the system can be made through any opening in the Wall Frame in Ideal Zone.

- External conduit should be run AFTER the Wall Frame is installed and from BELOW.
- External conduit entry from ABOVE can be accommodated on the left 4"/10cm of the Wall Frame, to avoid the Heat Sink.

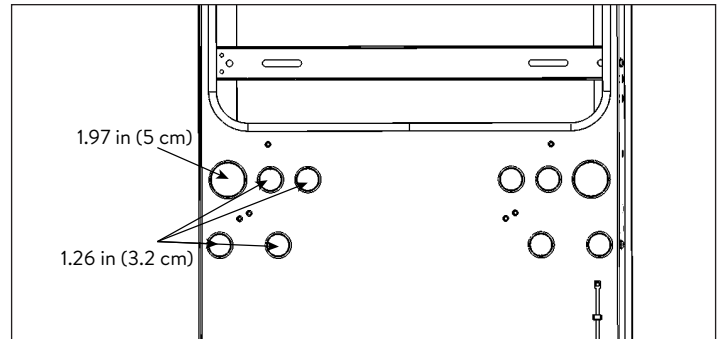


Fig. 83 Conduit sizes

- Grid connection
- Microgrid connection
- Ethernet connection
- E-Stop (Optional)

2. Prepare Wall Frame for installation on wall

- ▶ Remove the Wall Frame from the box and lay it down with the wall side facing up.

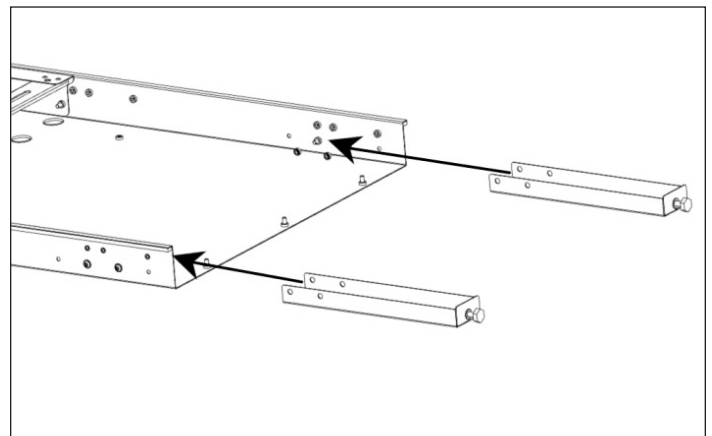


Fig. 84 Support leg screw locations

- ▶ Insert each Adjustment Foot into a Support Leg.
- ▶ Install the Wall Frame
- ▶ Tools needed:
 - Power hand-drill
 - Magnetic bubble level
 - #4 Hex wrench
- ▶ (OPTIONAL) If the wall is not flat or plumb, the unit comes with screws that allow it to adjust slightly to the wall.
 - ▶ With the Wall Frame on the ground, install all eight wall plumb screws on either side of the Wall Frame edge, leave screws loose for now.

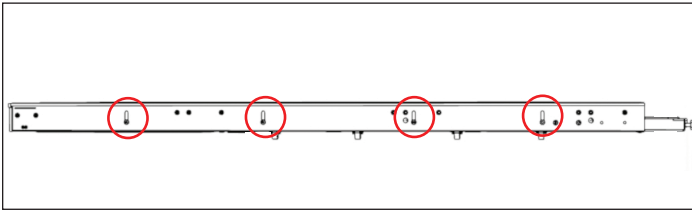


Fig. 85 Wall Plumb Screw locations

3. Prepare wall for mounting

- ▶ Find and mark stud locations on the wall.
- ▶ Feed the cables through their appropriate openings.
- ▶ Lean the Wall Frame against the wall such that the Wall Bracket slots align with the stud line.
- ▶ Place a magnetic bubble level on the Wall Frame and rotate the leveling screws under each Support Leg until the Wall Frame is level left to right.

4. Install Wall Frame

With the Wall Frame against the wall, ensuring it makes contact with the wall at each location, mark the drill location points.

- ▶ Put down the Wall Frame and drill all holes into the wall with a 3/16" drill bit. Furr out the holes in the wall if necessary.
- ▶ Lean the Wall Frame against the wall and secure with x (2"/5cm Wood screw and >1"/2.5cm washer or comparable fastener).
- ▶ (OPTIONAL) If loosening plumb screws was required, place magnetic bubble level on the Wall Frame and tighten each of the eight Wall Plumb Screws to make the unit plumb.

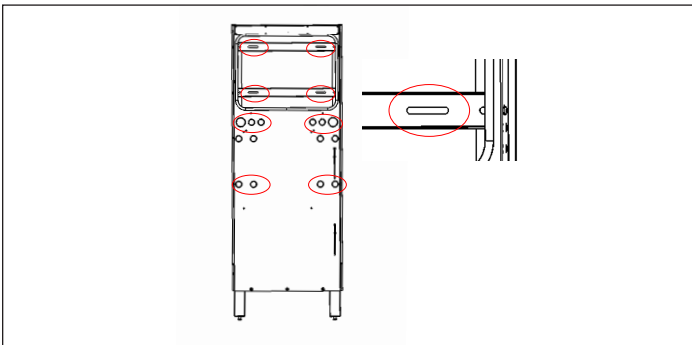


Fig. 86 Fastening the Wall Frame to the wall

- ▶ Fasten the Wall Frame in these locations. The Wall Brackets have slots if required. **Optional**

Support Leg removal.

ATTENTION

Risk damaging battery ESS!



Wall must be capable of supporting 525 lbs (238 kg) across two vertical studs. Damage to ESS or property due to Removal of Support feet is not covered under warranty.

- ▶ Once the Wall Frame is secured to the wall, the Support Legs may be removed if desired. (Keep Adjustment Foot attached to Support Legs when storing)
- ▶ Install bottom vent plate using M6 bolts.

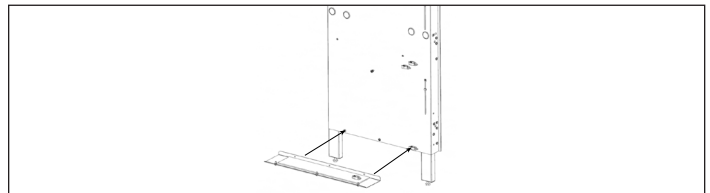


Fig. 87 Installing bottom Vent Plate

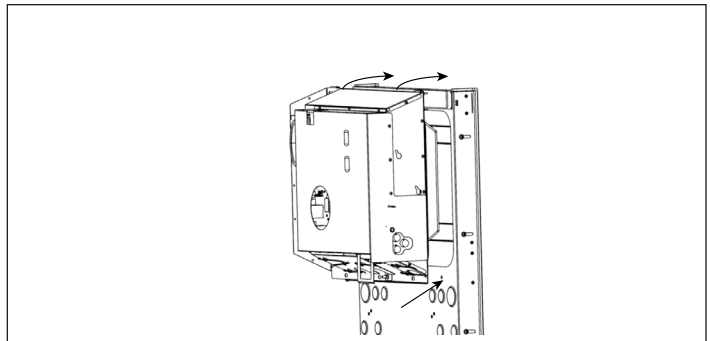


Fig. 88 Hanging Power Unit

5. Install the Power Unit

- ▶ Remove installation handles from the Power Unit storage location and slot them in on either side of the Power Unit to prepare for lifting.
- ▶ Holding the Installation Handles, and using the two hooks on the back of the Power Unit, hang the Power Unit on the Wall Frame from the very top edge.
- ▶ Align the 3x holes on the underside of the Power Unit with the corresponding threaded holes on the Wall Frame.
- ▶ Fasten the Power Unit to the Wall Frame using 2x M6 bolts and washers (ignore middle hole).

THIS WILL ELECTRICALLY GROUND THE FRAME.

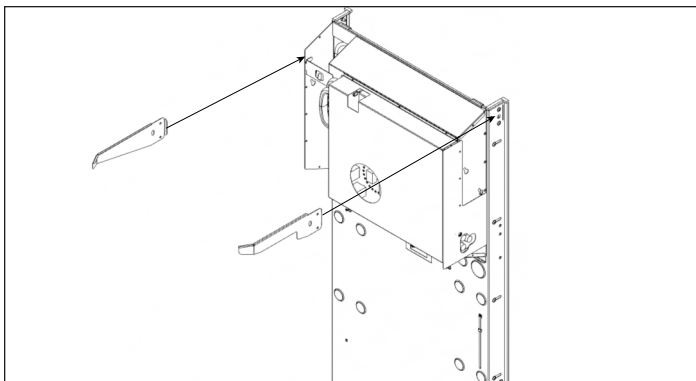


Fig. 89 Installing cover guides

- Fasten the cover guides bending inwards onto either side of the Wall Frame using M6 screws and washers.
- Ensure correct capacity is checked on the nameplate label: SCORE-P10 for 10 kWh or SCORE-P20 for 20 kWh.





sonnen, Inc. 1578 Litton Dr Stone Mountain, GA 30083		   	
sonnenCore / sonnenCore+ serial number: ##### initial password: ***** ambient temperature: 32...113°F degree of protection: IP30 weight: max 525 lbs certified to ANSI/CAN/UL: STD 9540		dc ratings - battery usable capacity: max 20 kWh operating voltage: 204.8 V maximum current: 40 A short circuit current: 2880 A cell technology: rechargeable lithium ion	
ac ratings - system output inverter topology: non-isolated mains connection: nominal split-phase voltage: 240V L-L/120V L-N nominal frequency: 60Hz rated active power: 4800 W rated apparent power: 4800 VA power factor: 0.5 lead...0.5 lag rated current: 20A short circuit current: 454A@12.13ms rated short time withstand current: 1.5 kA		model / usable battery capacity: <input type="checkbox"/> SCORE-P10 / 10 kWh <input type="checkbox"/> SCORE-P20 / 20 kWh note: this unit can be stacked. suitable for use in residential dwelling units where permitted. in case of emergency contact sonnen service team at +1 818 824 6363	

Fig. 90 sonnenCore+ nameplate label

6. Expansion from 10 kWh to 20 kWh

- For expansion instructions, refer to sCore+ expansion kit document.

Stacking electrical installation

Circuit diagram

NOTES:

1. 200A rated fused disconnect with 200A fuses (optional)
2. 200A current transformer
3. AC connections module
4. 100A rated square-D panel, HOM612L100SCP or equivalent
5. sonnenCore+ BESS
6. 200A electrical load panel
7. 60A current transformer
8. PV solar

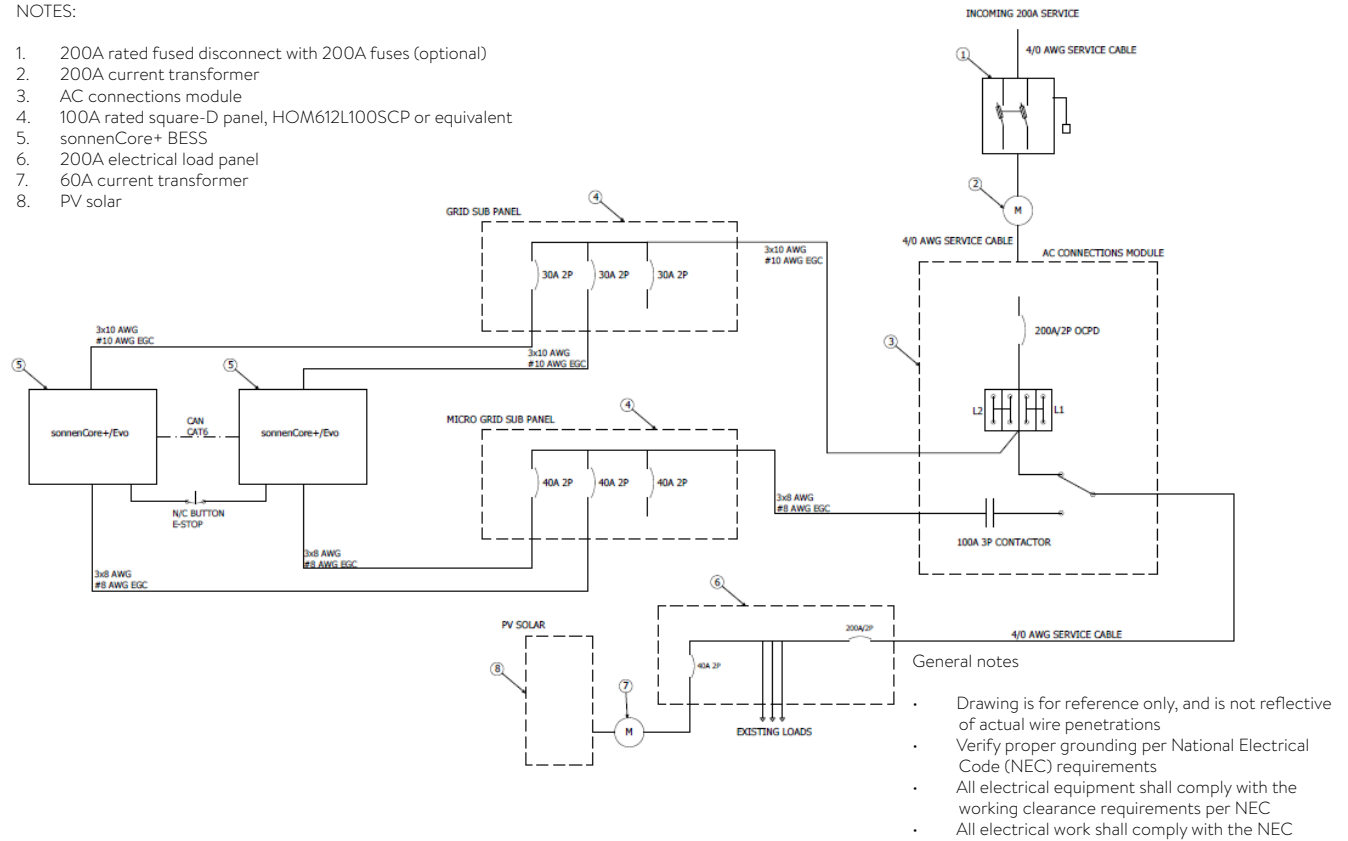


Fig. 91 Overview circuit diagram - electrical connection of stacking

AC connections module specifications

Dimensions W"/H"/D"	16.4 / 36 / 8.3	Short-circuit current rating	10 KA with circuit breakers
Weight	67 lbs (30 kg)	Transition	Open transition ("Break before make")
Voltage	120/240 V	Enclosure	Type 1 Indoor
Passthrough rating	200 A RMS	Certification	UL1008

Table 6 AC connections module specifications

Grid and microgrid subpanel specifications

Current rating	100 A	Enclosure	Indoor rated
Voltage	120/240 V	Reference PN	Square-D HOM612L100FCP or similar
Number of spaces	6		

Table 7 Grid and Microgrid subpanel specifications

AC connections module components

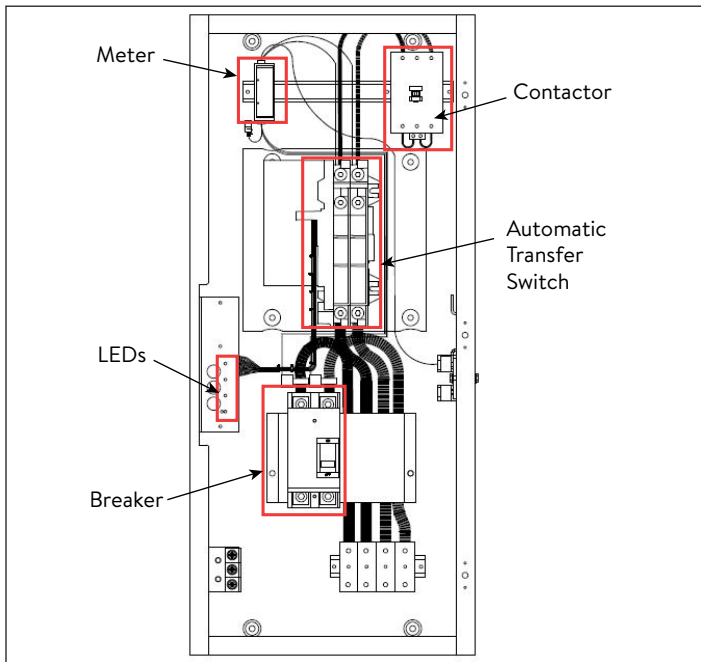


Fig. 92 AC connections module components

AC connections module LED panel

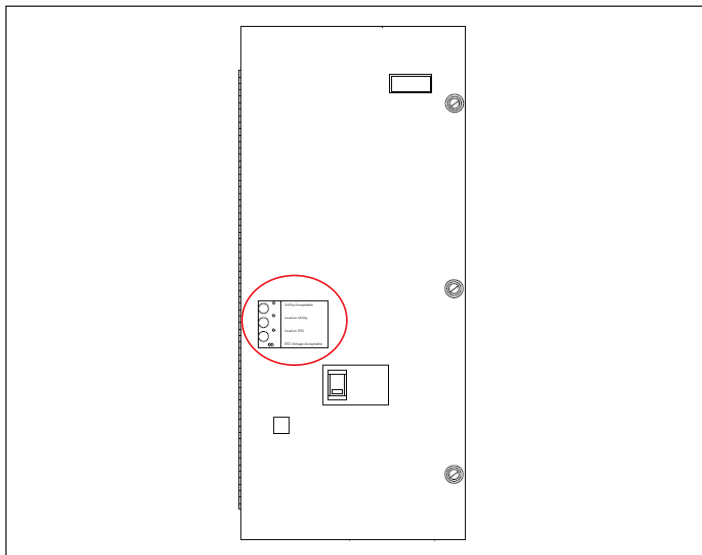


Fig. 93 AC connections module LED panel

LED panel lights:

- The top green indicator light represents grid voltage.
- The two middle lights, green on top and red on bottom, represents the position of the transfer switch.
- The bottom red light represents the microgrid.

AC connections module connections

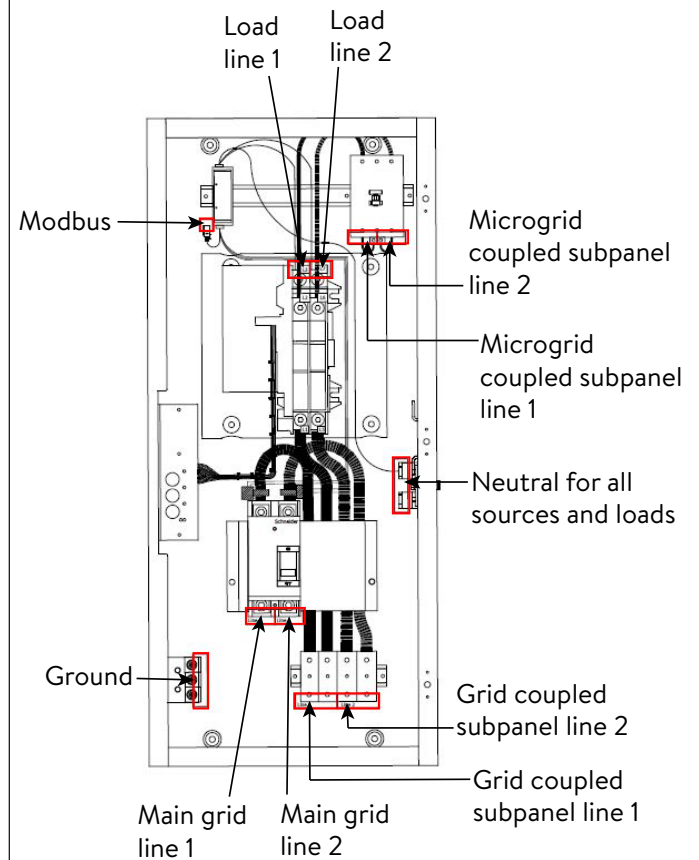


Fig. 94 AC connections module connections

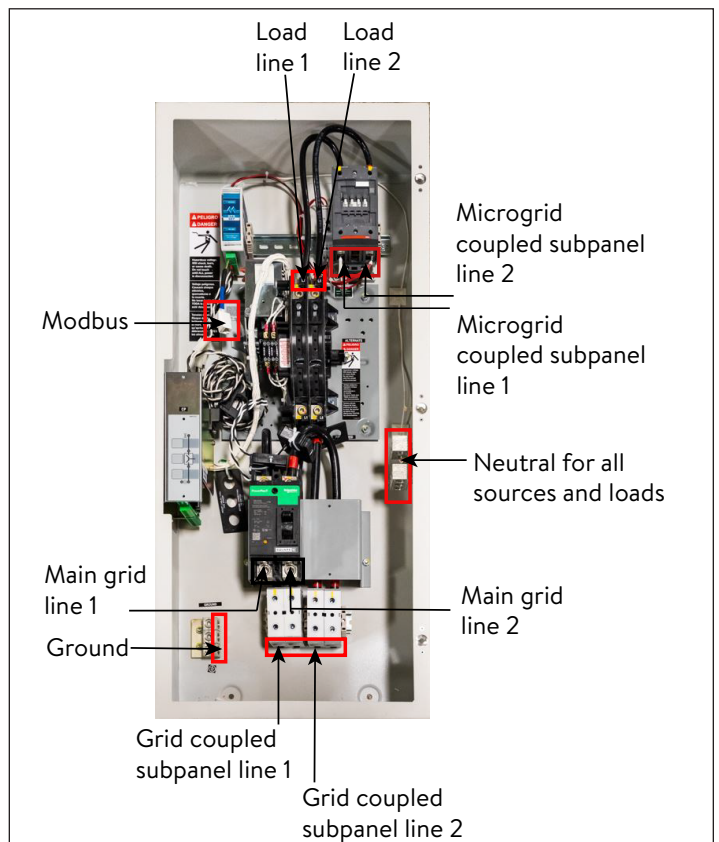


Fig. 95 AC connections module connections picture

System wiring configuration

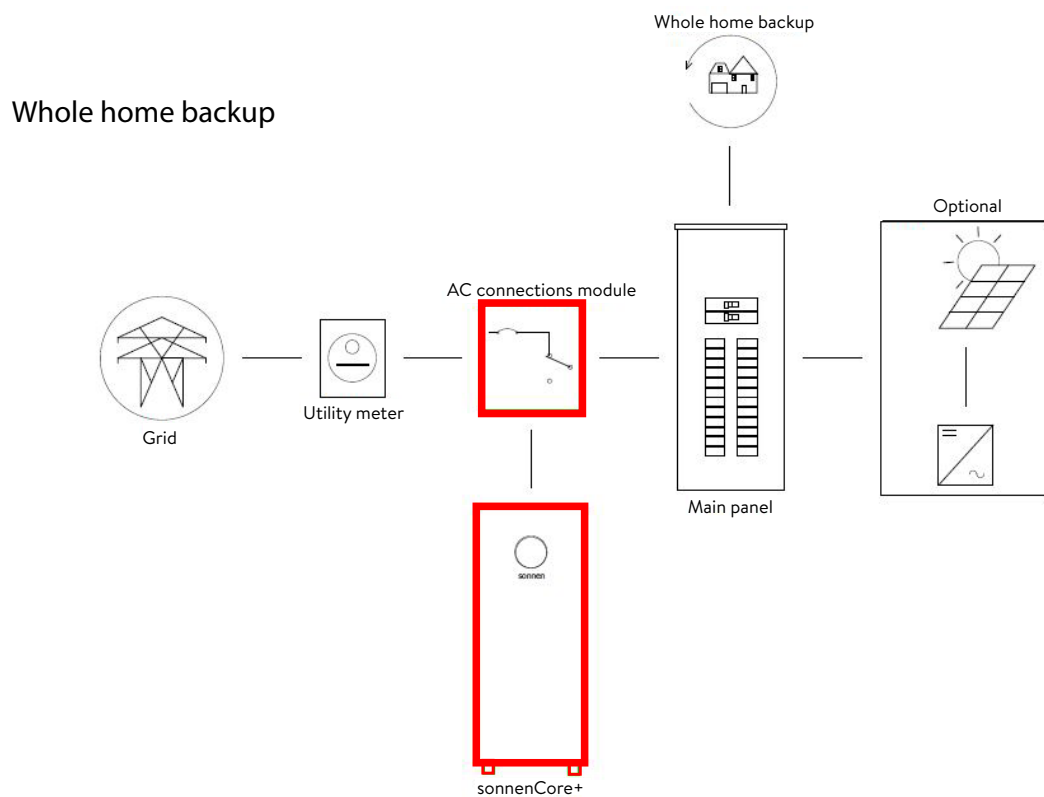


Fig. 96 Whole home backup

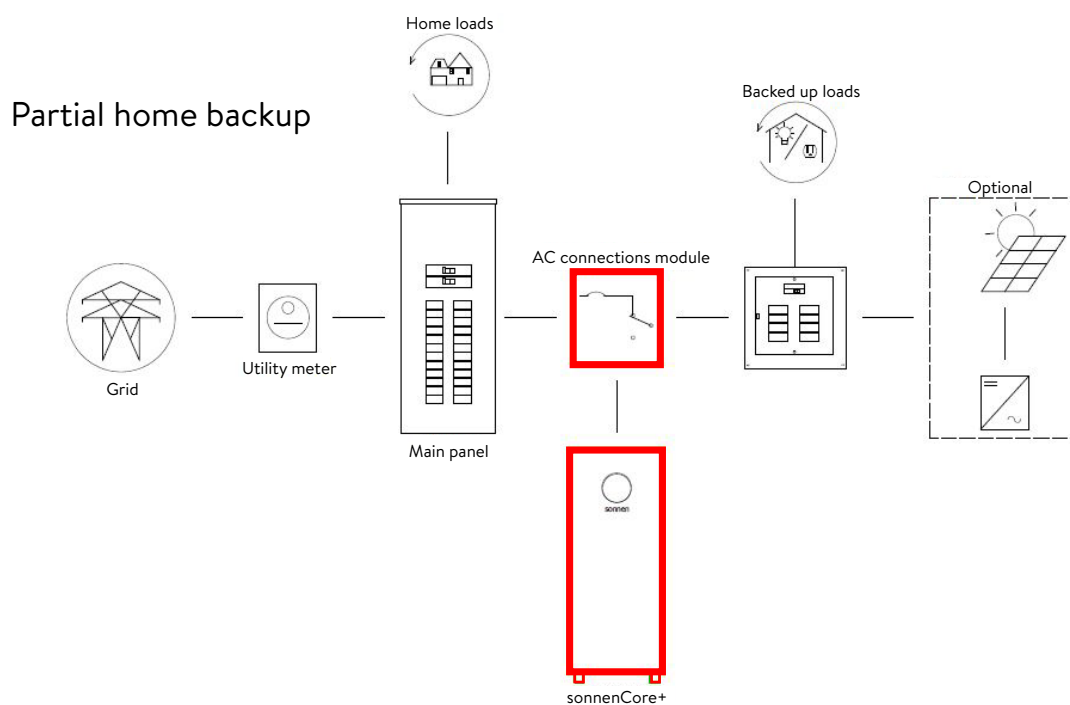


Fig. 97 Partial home backup

AC connections module internal parts list

- 1x AC connections module “1002250”
- 3x DIN rail 100mm “28078”
- 1x 3 pole 230 V/ 60 Hz 100 A
- 1x Multi-voltage timer
- 4x 230 A Single pole terminal block
- 2x 230 A Jumper bar
- 1x Black 3/0 gauge CB to terminal cable
- 1x Red 3/0 gauge CB to terminal cable
- 1x Black 3/0 gauge terminal to ATS cable
- 1x Red 3/0 gauge terminal to ATS cable
- 1x Black 2 AWG ATS to contactor cable
- 1x Red 2 AWG ATS to contactor cable
- 1x Meter kit
- 1x 208 - 600 Vac L-L 3 or 4 wire, Modbus
- 1x CT 200 A 0-333 mV, split core L1 “1002304”
- 1x CT 200 A 0-333 mV, split core L2 “1002306”
- 1x CT 100 A 0-333 mV, split core “1002309”
- 1x Plug, RJ45, coupler, female
- 2x Witness mark sticker “1002275”
- 2x Terminal block end stop “10441”

Stacking parts list

- Up to 3x sonnenCore+ (sonnen provided)
- 1x AC connections module (sonnen provided)
- 1x Designated “grid” subpanel
- 1x Designated “microgrid” subpanel
- Up to 3x 30A/2P Square D breakers
- Up to 3x 40A/2P Square D breakers
- 1x 4-port network switch

General information about installation

- Always observe the specifications in the installation instructions for the sonnenCore+.

Wire Legend							
Starts	Connects	Conduit	COM	L1	L2	N	G
Residence Meter	AC connections module	2"		3/0	3/0	3/0	#6
AC connections module	Residence load panel	2"		3/0	3/0	3/0	#6
AC connections module	Sub panel grid	1.25"		#2	#2	#2	#8
AC connections module	Sub panel microgrid	1.25"		#2	#2	#2	#8
Sub panel grid	sonnenCore+	0.5"		#10	#10	#10	#12
Sub panel microgrid	sonnenCore+	0.75"		#8	#8	#8	#10
AC connections module	sonnenCore+	0.5"-N/A	CAT6 STP				
sonnenCore+	sonnenCore+	0.5"-N/A	CAT6 STP				
sonnenCore+	Router	0.5"-N/A	CAT6 STP				
Router	sonnenCore+ (primary)	0.5"-N/A	CAT6 STP				
Router	sonnenCore+ (secondary 1)	0.5"-N/A	CAT6 STP				
Router	sonnenCore+ (secondary 2)	0.5"-N/A	CAT6 STP				

Table 8 Wire legend

WARNING

Electrical work on the storage system and electrical distributor.



- Danger to life due to electrocution!
- Switch off the storage system to electrically isolate it.
- Disconnect the relevant electrical circuits.
- Secure against anyone switching on the device again.
- Wait five minutes so the capacitors can discharge.
- Check that the device is disconnected from the power supply.
- Only licensed electricians are permitted to carry out electrical work.

Installing AC connections module

- Remove AC connections module from box and identify mounting hardware.
- Before installing, perforate the AC connections module to run wires in. The installer must remove all metal shavings from the perforation process before mounting the AC connections module.
- Identify installation area on the wall and find a single mounting stud.
- Use mounting bolts to attach AC connections module to stud (have anchors in place or plywood before mounting AC connections module) leaving room for conduit, wires and additional hardware.

Electrical connection

1. Wiring components

- The circuit diagram overview shows an example of how to electrically connect the maximum of 3 sonnenCore+ in a stacked configuration.
- Note the overview circuit diagram in Appendix 5

and stacked circuit diagram.

- Identify placement of all hardware for installation.
- Begin electrical connection between devices as per circuit diagram.

2. Grid connection

- Connect appropriately sized cables from incoming grid service to 200A breaker located at bottom of the AC connections module. The AC connections module is grid service entrance rated, but it is recommended to have overcurrent protection between the module and the grid service.
- Refer to figure below for connection sequence.

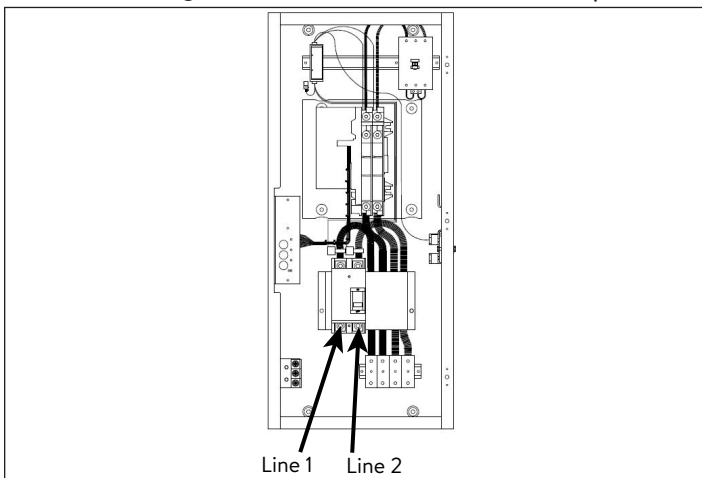


Fig. 98 Grid connection

NOTE: Torque for these lugs QBL22200 28N.m or 250 lb.in.

3. Load connection

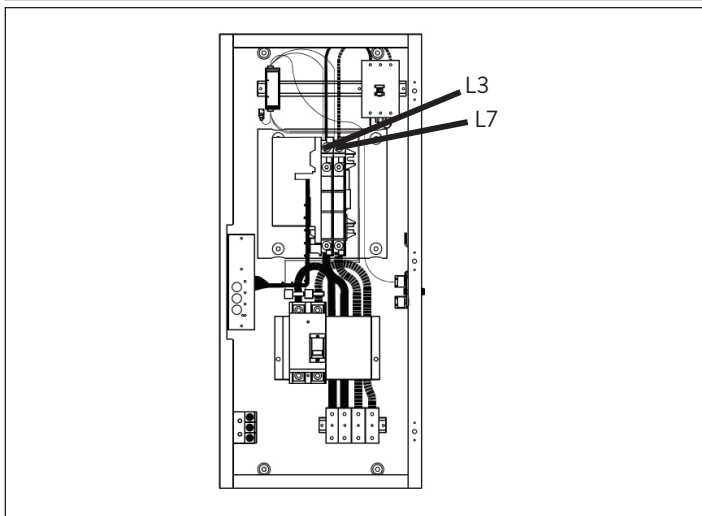


Fig. 99 Load connection

NOTE: Torque for L3 and L7 is 22.6 N.m or 200 lb.in.

- Terminate an appropriately sized wire from the main loads panel to the terminals L3 and L7 in the AC connections module. This conductor will feed power to the main loads panel.

4. Grid subpanel connection

- The AC Connections Module only has inputs for 1 “Grid” and 1 “Microgrid”. Therefore, the two “split-phase subpanels” referred in the “wiring components” table and shown as components 8 and 9 in the overview circuit diagram are used as bus bars to combine multiple sonnenCore+ and protect the combiners.
- Populate the 100A grid subpanels with a 30A breaker for each sonnenCore+.
- Terminate a 10 AWG cable connection from each sonnenEvo grid terminal to a 30A breaker.
- Route a 2 AWG cable connection from the Grid subpanel main feeder lugs to the Grid distribution terminal blocks located at the bottom of the AC connections module. Refer to the figure below for connection sequence.
- Ensure L1, L2, Neutral and Ground connections are consistent on all components.

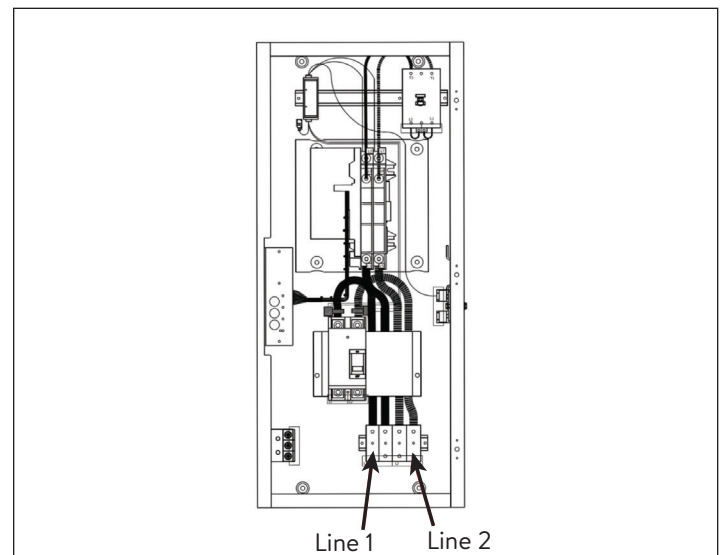


Fig. 100 Grid subpanel connection

NOTE: Torque for ZS95 TB is 9.25 N.m or 81.7 lb.in.

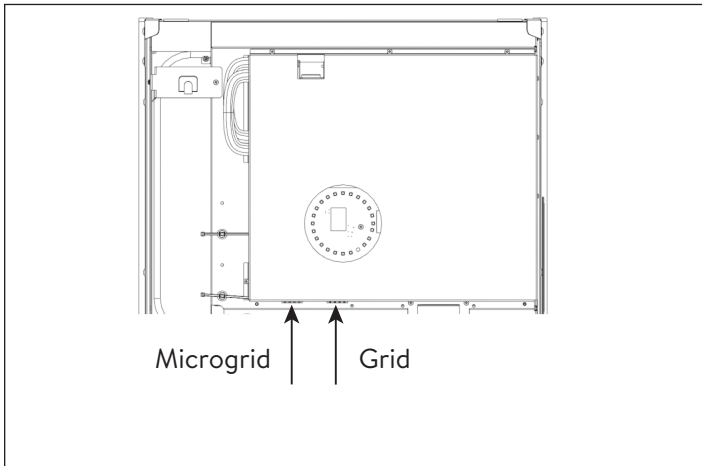


Fig. 101 Grid and microgrid wire connection

5. Microgrid subpanel connection

- ▶ Populate the 100A Microgrid subpanels with a 40A breaker for each sonnenEvo.
- ▶ Terminate an 8 AWG cable connection from each sonnenEvo Microgrid terminal to a 40A breaker.
- ▶ Route a 2 AWG cable connection from the Microgrid subpanel main feeder lugs to the Microgrid 100A contactor located at the top right of the AC connections module. Refer to figure for connection sequence.
- ▶ Ensure L1, L2, Neutral and Ground connections are consistent on all components.

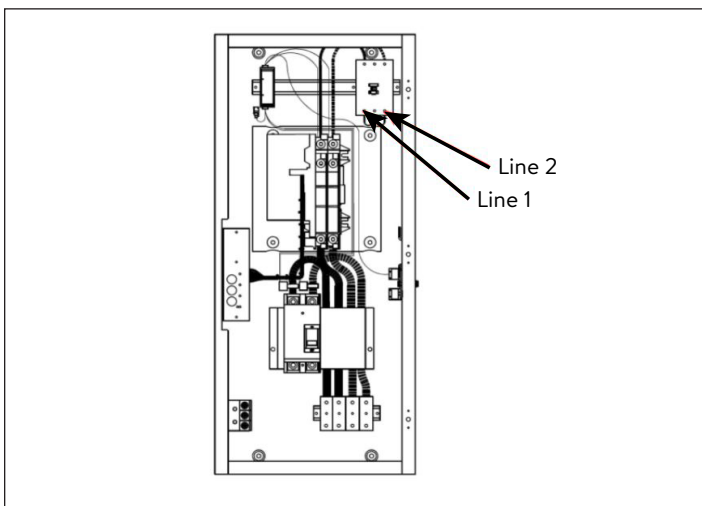


Fig. 102 Microgrid subpanel connection

NOTE: Torque 3 N.m or 27 lb.in.

6. Modbus connection

- The modbus line delivers meter information from the AC connections module to the stacked BESS.
- ▶ Remove meter modbus connection of primary BESS and connect meter modbus to AC connections module.
- ▶ Route a CAT6 cable from the ethernet coupler located on the top left corner of the AC connections module to the modbus terminal on the primary BESS. Only one modbus connection is required for meter communication.

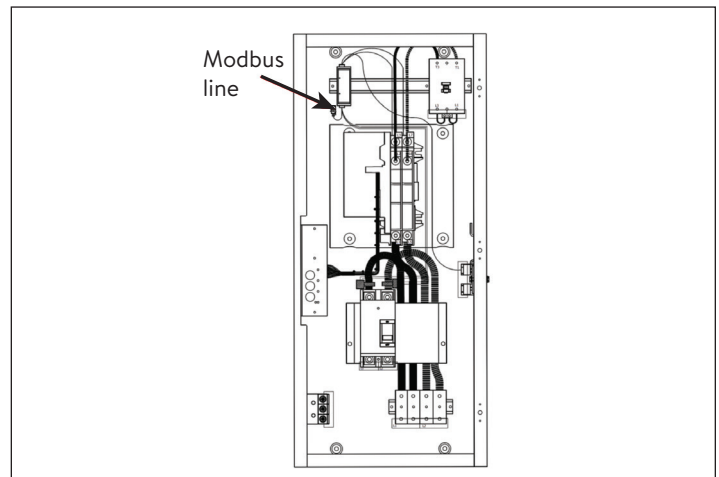


Fig. 103 Modbus line

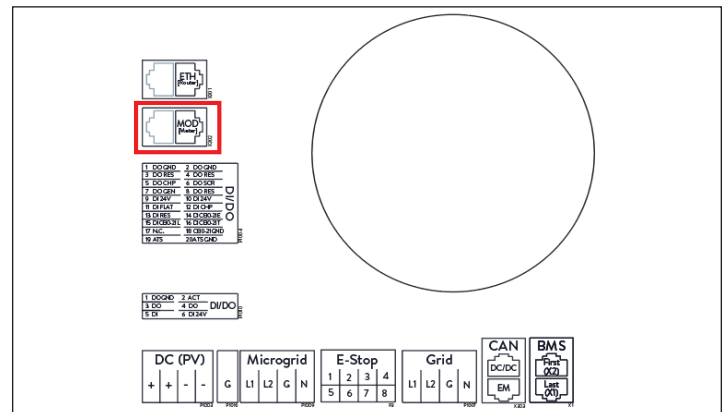


Fig. 104 Modbus connection

7. Canbus connection

- The Canbus connection is required for the offgrid operation of the stacked units. The CAN connections are connected in a daisy chain sequence from one BESS to the next. A terminating resistor must be present on both ends of the chain.
- ▶ For stacking 2 storage systems, connect the CAN communication cable (shielded CAT6) from the ethernet dongle on the primary BESS to secondary BESS 1.
- ▶ For stacking 3 storage systems, continue the chain by removing the terminating resistor from the secondary BESS 1 and connecting another CAN communication cable from the ethernet dongle on the secondary BESS 1 to secondary BESS 2.

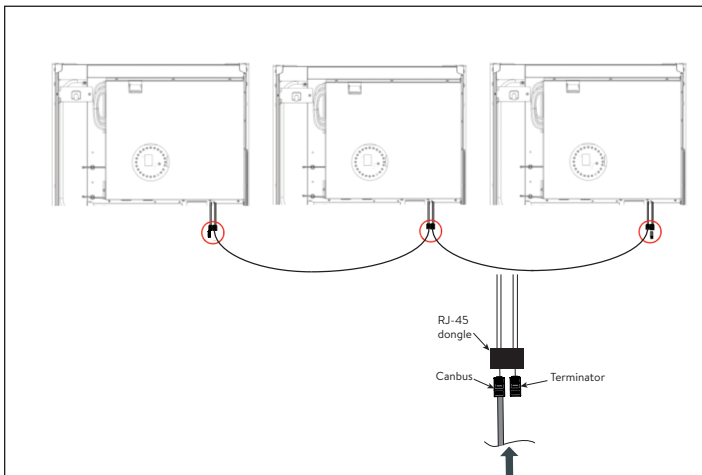


Fig. 105 Canbus and terminator connections

8. Connecting Ethernet lines

If the customer router has a sufficient number of free slots, the storage systems can be connected directly to the router.

- ▶ Connect the Ethernet lines as shown in circuit diagram. Each unit must be connected to the router or switch.
- Note that the Ethernet lines, switch and router are not included in scope of delivery.

9. J1 jumper disconnect

WARNING



Do not stick hands inside power unit protective cover. Danger of electrocution.

- ▶ To allow sonnenCore+ stacking, the J1 jumper harness needs to be disconnected from every sonnenCore+ in the system by removing joining pin from the connectors. This pin will be needed to operate units individually or troubleshoot individual power units, so it is recommended to save it by sticking it to the door or power unit with a piece of tape.



Fig. 106 J1 jumper harness

10. Neutral-ground test

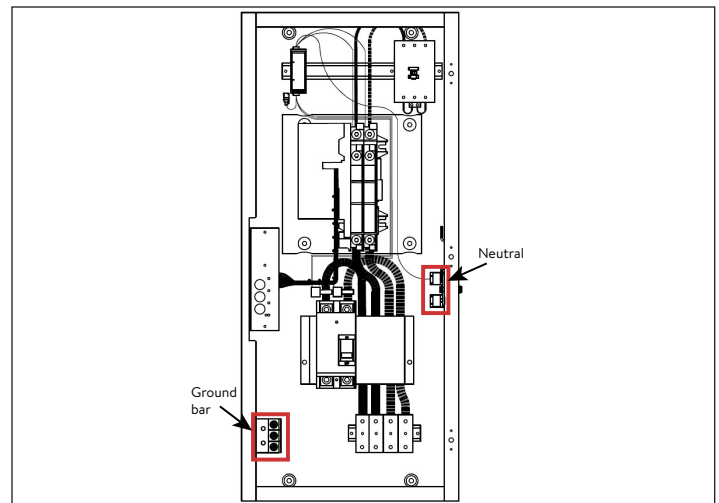


Fig. 107 Neutral-ground

ATTENTION



Test load panel for Neutral-ground connection.

- ▶ With grid or service voltage on, perform a voltage meter test between the ground bar and the neutral bar.
- ▶ If voltage measured between ground and neutral is below 1 V it passes, if the measurement is above 1 V it fails.
- ▶ If it passes, turn power back off and continue with installation and commissioning.
- ▶ If it fails, verify the ground path to earth. Then, verify neutral path to service.
- ▶ Ensure ground continuity from earth to AC connections module using a multi-meter and resistance tone.
- ▶ If the test fails, ensure electrical connections are tight. If any found loose, tighten and retest.
- ▶ If it fails again, disconnect load panel, ground and neutral from AC connections module and re-perform the test.
- ▶ If it passes now, the problem is with the load panel.
- ▶ If it fails again, contact sonnen service team.

Installing batteries

1. Install battery shelves

- ▶ Install 2x battery shelves with 6x total M6 bolts, 3 on the right and 3 on the left.

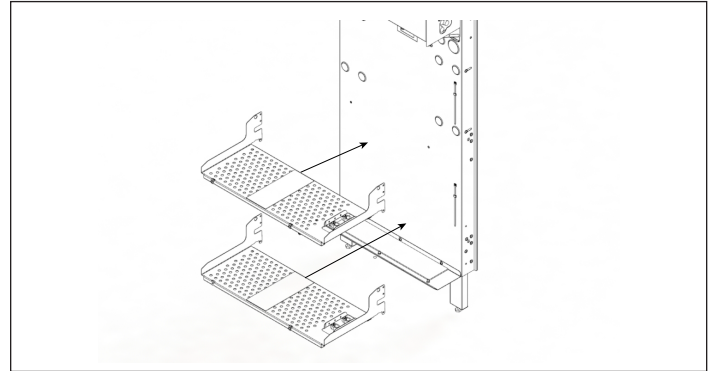


Fig. 108 Installing Battery Shelves

- ▶ Add battery cover using 2x M6 bolts.
- ▶ Install left and right support brackets using 2x M6 bolts each into the wall frame.

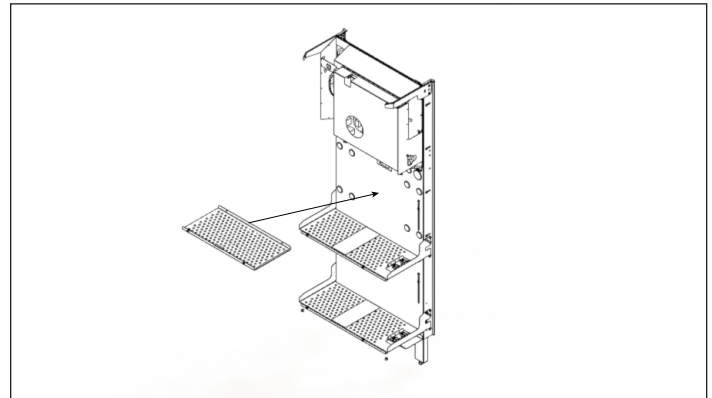


Fig. 109 Adding Battery Cover

2. Install batteries

- ▶ The upper battery shelf should only be in use for a 20 kWh installation.
- ▶ Both batteries should be placed on the bottom shelf and installed against the wall frame for 10 kWh installations.
- ▶ The battery shelf sticker shows that a battery should not be loaded on the top shelf for 10 kWh installation.
- ▶ For 20 kWh installation both shelves will be in use.
- ▶ Load batteries according to directions on shelf sticker.
- ▶ The front batteries must be flipped so that the

connections face the connections on the back batteries. This is to ensure the wires are not bent.

**10kWh: Both batteries
on bottom shelf**

Fig. 110 Battery shelf sticker

- 10 kWh battery installation: Load bottom battery first on bottom shelf against the wall bracket, then load second battery next to the first.

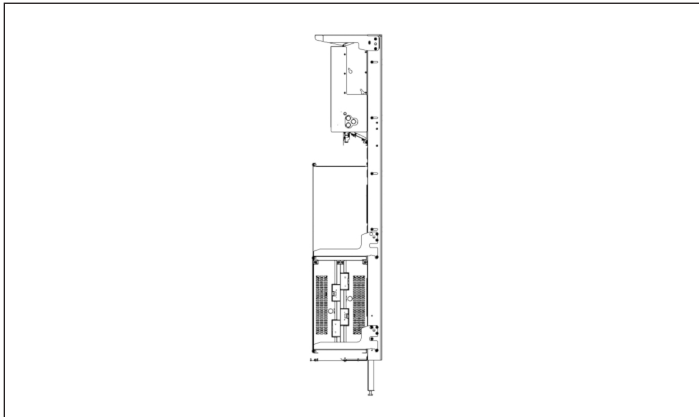


Fig. 111 10 kWh Installation of Batteries

- 20 kWh battery installation: Load bottom two batteries first installing the first one against the wall bracket, then load top two batteries last.

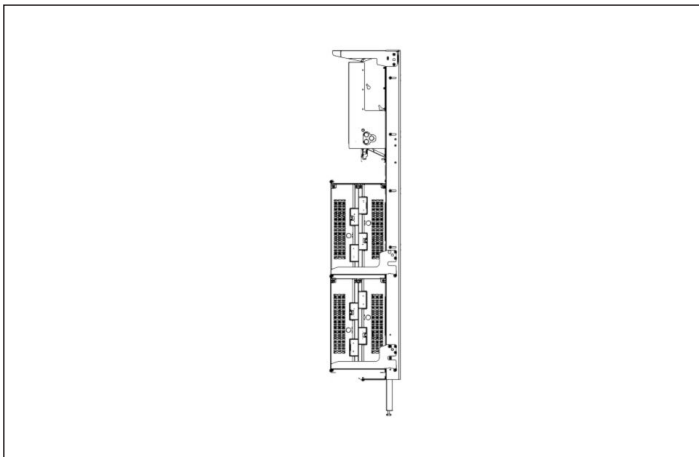


Fig. 112 20 kWh Installation of Batteries

- Ensure battery connections are facing outward and towards each other.

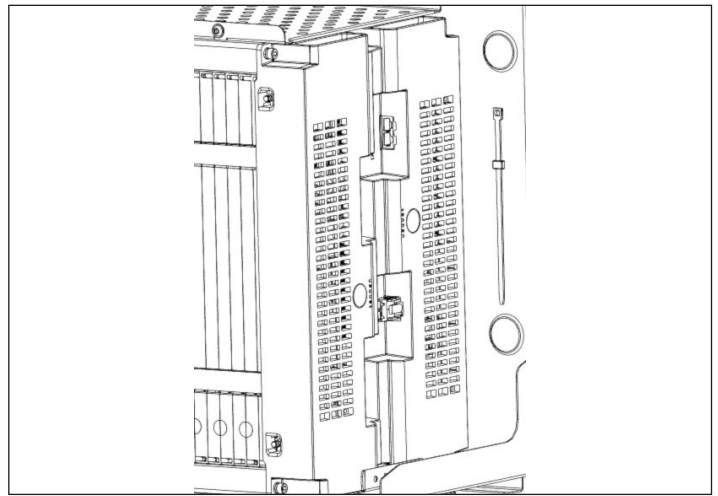


Fig. 113 Battery connections facing each other

- For 10 kWh: Using M6 bolts, install the top row straight battery braces on the top row first, then install straight battery braces on the bottom row. NOTE: Bottom brace will overlap top brace at bolt.

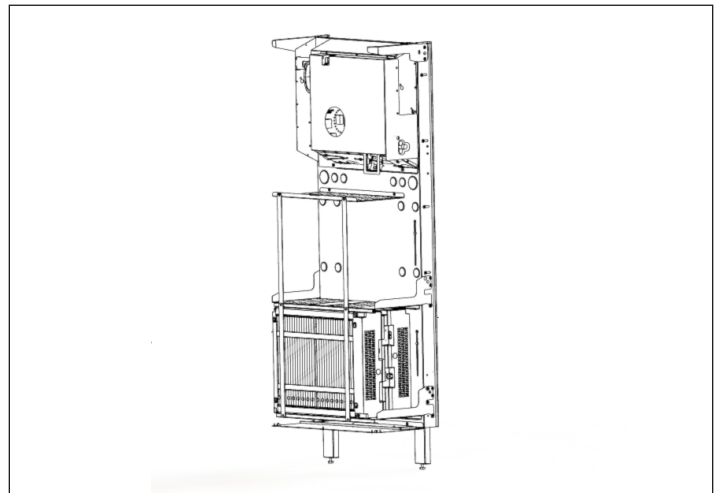


Fig. 114 Installing Battery Braces 10 kWh

- For 20 kWh: Using M6 bolts, install the top row straight battery braces on the top row first, then install straight battery braces on the bottom row. NOTE: Bottom brace will overlap top brace at bolt.

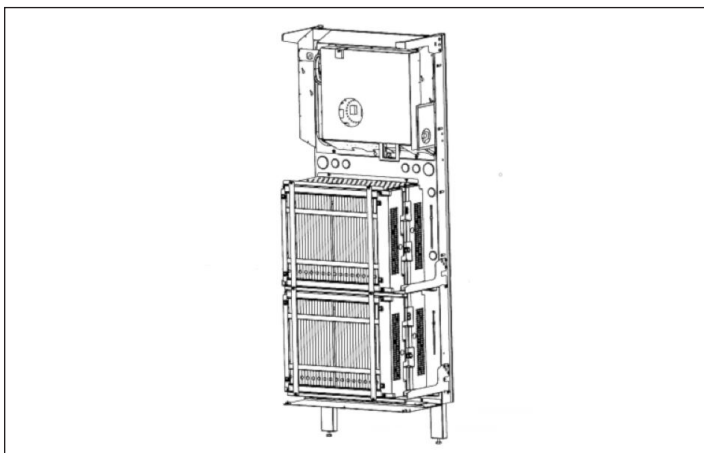


Fig. 115 Installing Battery Braces 20 kWh

Selecting the measurement concept

- Measurement concept refers to the specific way the sonnenEvo measures production and consumption and the location of the meters. In this section, the installer will select the location of the CTs and connections based on the selected measurement section. In the commissioning portion, you must select the measurement concept to match CT location. The three measurement concepts are Grid, Consumption and Differential.
- The pre-installed CTs are for Grid measurement concept. There are two PV CTs, one is found in the AC connections module and the other is found in the Accessory Kit. NOTE: Either can be used for PV measurement.

1. Grid measurement

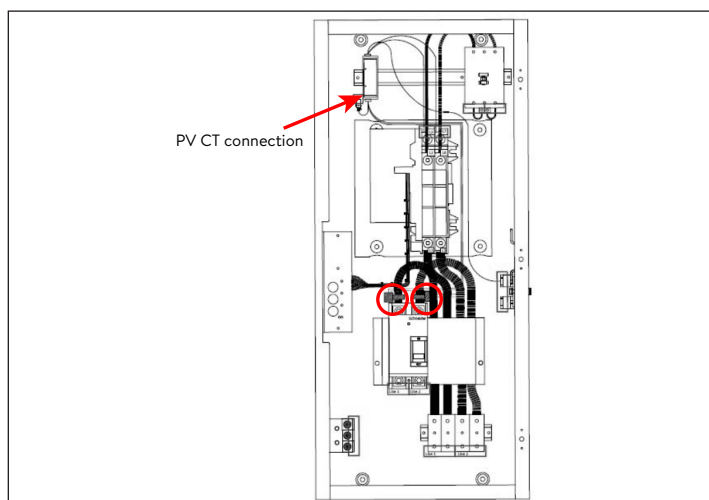


Fig. 116 Grid measurement/PV CT connection

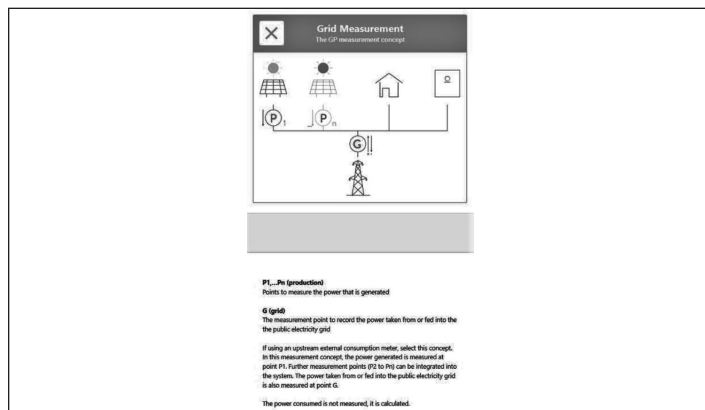


Fig. 117 Grid measurement settings

- The grid measurement concept (standard measurement concept) assumes the consumption meters are upstream of all loads, the sonnen batteries and the PV system.
- Place PV CT around PV conductor, then connect PV CT connector to meter positioned inside AC connections module.
- The consumption is calculated as the measured “consumption meter” value minus measured PV production minus sonnen battery discharge.

Power Unit connections

1. Install disconnect switch (Optional)

It is recommended to install a service disconnect switch between the storage system and grid power. Consult local NEC (National Electric Code) and AHJ (Authority having jurisdiction) for guidance.

2. Run power cables into the storage system

- Cables and wires of the appropriate wire gauge, type and ampacity should already be run through the Wall Frame conduit holes using appropriate connectors:

1. Grid connection
2. Microgrid connection
3. 3x CT wires
4. Ethernet

E-stop (Optional)

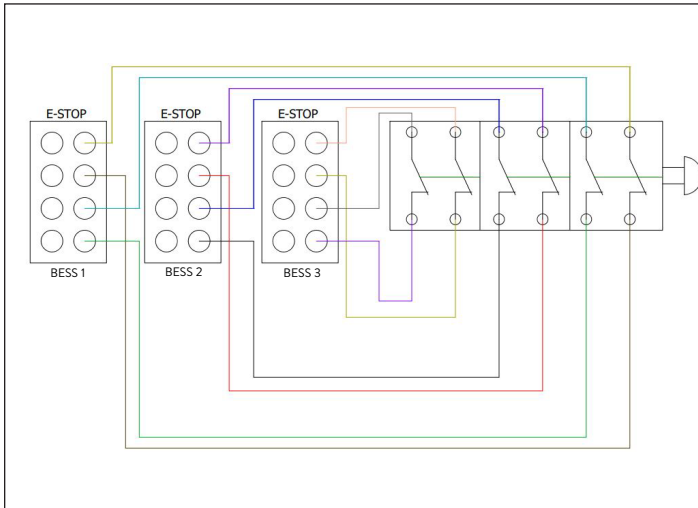


Fig. 118 E-Stop for 3 stack

WARNING

Risk of burns!



When working on the storage system:

- Take off metallic jewelry.
- Turn off the storage system.
- Use insulated tools.
- Wear personal protective equipment, including safety glasses, insulated gloves, and safety shoes.

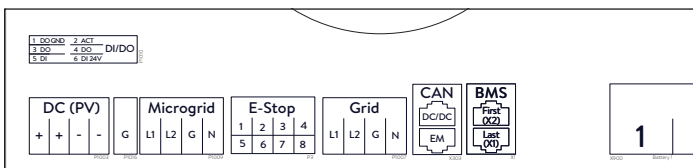


Fig. 119 E-Stop header location

Tools needed

- 24V 2-pole normally closed plunger
- 16 AWG UL1007 300V wire
- Remove the jumper from position 1 and 2 in the E-Stop header and run a section of cable from 1 and 2 to the first normally closed pole on the plunger.
- Remove the second jumper from position 3

and 4 in the E-Stop header and run a section of cable from 3 and 4 to the second normally closed pole on the plunger.

ATTENTION



The E-Stop plunger does not cut the AC Voltage or break the Pass-through circuit on the Energy Storage System. Additional design may be required if breaking AC voltage is required.

For stacked installations individual E-Stop buttons cannot be installed. There must be one single E-Stop for all BESS.

CAUTION



Cannot parallel E-Stop connectors.

Each BESS requires 2 NC contacts. Stacking installation requires 4-6 NC contacts connecting to one switch.

NOTE: Contact sonnen Design for assistance.
design@sonnen-batterie.com.

Connect current transformers

1. Current transformers (CT)

Each split-core CT can open to clamp around the conductor and has a 10ft cable. The Meter has 30ft of cabling connected to the Power Unit.

2. Connect current-measuring wires

Each CT assembly has 30ft of wire and therefore requires a maximum of 30ft of conduit length between the ESS and the CT site, including the amount inside the ESS. This cable assembly length cannot be extended.

- 1x PV CT
- 1x L1 CT
- 1x L2 CT

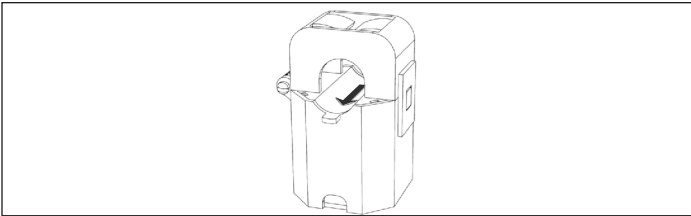


Fig. 120 Current transformers

- Production measurement
 - ▶ Clamp the "PV" CT to either the L1 or L2 AC output conductor from the PV inverter with the arrow towards the PV breaker.
- Protected loads measurement scenario
 - ▶ Clamp the "L1" CT to the L1 microgrid conductor inside the ESS with the arrow pointing away from the ESS AC terminals.
 - ▶ Clamp the "L2" CT to the L2 microgrid conductor inside the ESS with the arrow pointing away from the ESS AC terminals.
- Whole home measurement scenario
 - ▶ Clamp the "L1" CT to the L1 grid conductor inside the main load center with the arrow pointing towards the main panel.
 - ▶ Clamp the "L2" CT to the L2 grid conductor inside the main load center with the arrow pointing towards the main panel.
 - ▶ In all cases, the arrow on the measurement CTs should be facing "downstream", following the flow of energy from the grid to the loads, as it would do if the battery were not discharging.

Connect AC connectors cables

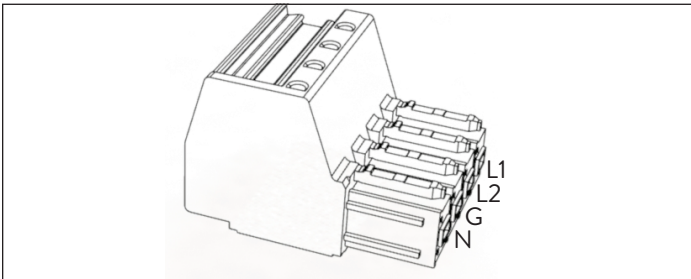


Fig. 121 Grid/Microgrid connectors

Tools needed:

- M4 hex wrench
- 1/8" narrow head screw driver

All external cabling will run through the provided openings in the Wall Frame to the Power Unit

connections. Check the Power Unit Terminal Block Map for the wire placement to ensure they are placed in the correct ports.

- ▶ Use service loops for all conductors when cutting.
- ▶ Strip 5/8" from the L1, L2, Ground and Neutral wires (8AWG).

3. Install conduit plugs

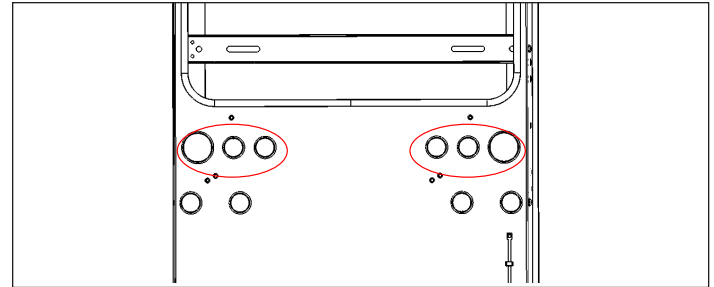


Fig. 122 Conduit plug location

- ▶ Install all conduit plugs over all conductors before attaching connectors. The conductor is required to pass through the plug, sealing around the cable.
- ▶ Place all plugs not being used to seal ESS from debris.
- ▶ Insert **Grid** L1, L2, G, N wires into a terminal connector and label it "Grid", pull back on the wire to ensure a secure connection.
- ▶ Insert **Microgrid** L1, L2, G, N wires into a terminal connector and label it "Microgrid", pull back on the wire to ensure a secure connection.

ATTENTION

Neutral loop or Edison circuit will damage system;



Ensure there is no continuity between neutral conductors outside the ESS.

- ▶ Unplug the Microgrid connector from the Power Unit.
- ▶ Using a multimeter, ensure there is no continuity between the neutrals on the **Grid** and **Microgrid** terminal connectors. If tone is present (indicating continuity) then STOP the installation and DO NOT ENERGIZE the storage unit.
- ▶ Locate the origin of the shared neutral / ground and correct the wiring deficiency.

Connecting battery modules

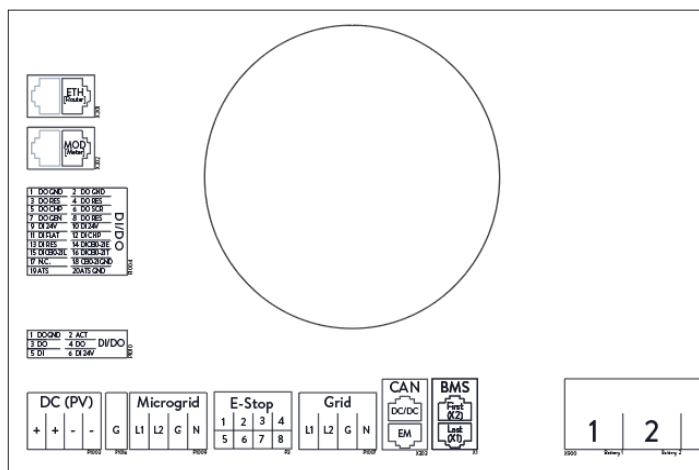


Fig. 123 Power Unit connections

The label is shown from the point of view of looking at the ports from below or the side, in front of the system.

sM4 BMS cables

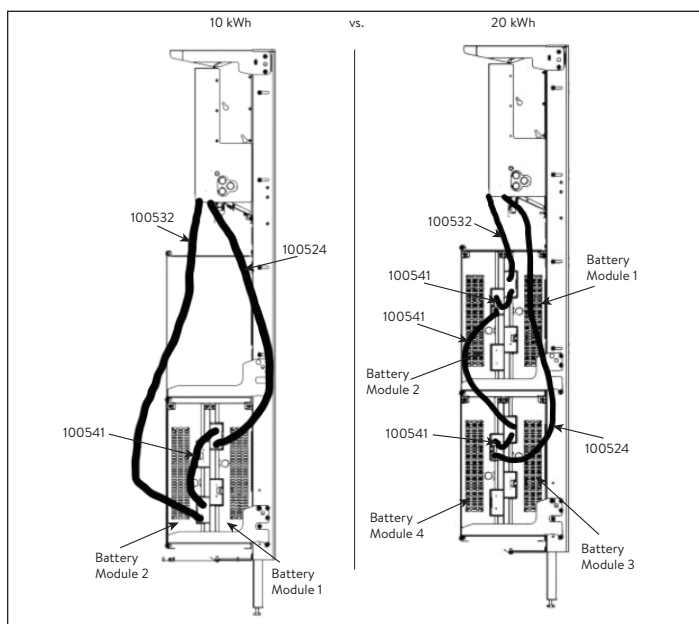


Fig. 124 sM4 X2 to X1 daisy-chain

4. Connect BMS communication cables

- Identify battery communication ports
- X1 (Output)
- X2 (Input)

2 batteries configuration:

- Connect 100532 to "X2 First" port on the Power Unit and port "X2" on the battery module 2.
- Connect 100541 to "X1" port on the battery module 2 and "X2" port on the battery module 1.

- Connect 100524 to "X1" port on the battery module 1 to "X1 Last" port on the Power Unit (Refer to figure above).

4 batteries configuration:

- Connect 1000532 to "X2 First" port on Power Unit and "X2" port on the battery module 1.
- Connect 1000541 to "X1" port on the battery module 1 and "X2" port on the battery module 2.
- Connect 1000532 to "X1" port on battery module 2 and "X2" port on battery module 3.
- Connect 1000541 to "X1" port on battery module 3 and "X2" port on battery module 4.
- Connect 1000524 to "X1" port on battery module 4 and "X1 Last" port on the Power Unit (Refer to figure above).

5. Connect power cables

2 batteries configuration:

- Connect the DC power cable from Battery Terminal 1 on the power unit to the battery module 1
- Connect the DC power cable from Battery terminal 2 on the power unit to the battery module 2

4 batteries configuration:

- Connect the DC power cable from Battery Terminal 1 on the power unit to the battery module 1
- Connect the DC power cable from Battery Terminal 2 on the power unit to the battery module 2
- Connect the DC power cable from Battery Terminal 3 on the power unit to the battery module 3
- Connect the DC power cable from Battery Terminal 4 on the power unit to the battery module 4

6. Connect Ethernet cable

- Loop the Ethernet cable through the provided ferrite core in the accessory kit, three times before plugging it into the Power Unit port X301 "ETH".

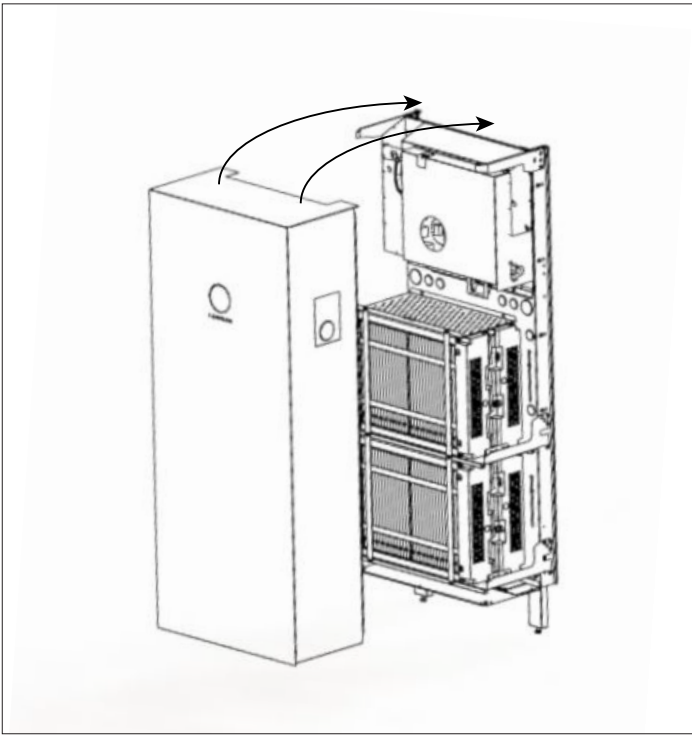


Fig. 125 Cover installation

Tools needed:

- 6mm hex wrench

- Hang the storage system cover on the same edge as the Power Unit, located on the top-front edge of the Wall Frame.

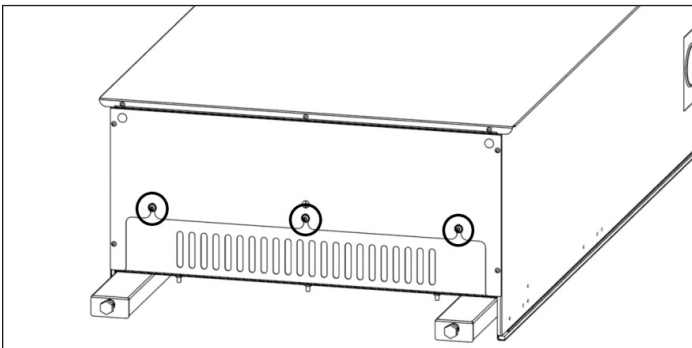


Fig. 126 Fastening the Cover

- Ensure the Bottom Vent Plate is inside the system.
- Fasten the Bottom Vent Plate to the using 3x M6 bolts with lock washers. Torque down to 10 in-lb.

THIS WILL ELECTRICALLY GROUND THE COVER.

Prerequisites

- The mounting location fulfills the requirements.
- All power wires are connected properly.
- All BMS communication cables are connected properly.
- The electrical connections fulfill all requirements of local, regional, and national regulations.
- The main distribution panel and protected loads panel are electrically isolated
- The electrical connections of the storage system have been performed correctly.
- The storage system has been connected to the Internet.

Stacked commissioning

Commissioning first-time installation

Conditions:

- All storage systems are in operation (eclipse is pulsing white).
- All storage systems are connected to the network.
- ▶ Check each storage system individually to ensure that the appropriate software version is installed.
- ▶ Proceed as follows to configure and commission the storage system on-grid/off-grid stacking.
- ▶ Establish the connection between the laptop/PC and primary storage system, as described in the relevant installation instructions.
- ▶ Navigate to find-my.sonnen-batterie.com.
- If an emergency switch is installed, ensure it is not activated.
- On-Grid start: Ensure green Power Disconnect button is in the out position (P1), then turn on supply breaker in main load center.
- Off-grid start (no utility grid): Press in and hold button (P2) until the eclipse is lit up green, this may take up to 1 minutes.
- The sonnen Logo will turn WHITE: On-Grid or GREEN: Off-grid when the start-up sequence has completed successfully (5 min).

Before commissioning

- ▶ Ensure storage system is properly installed and connected to the home's network using a Shielded Cat 5 or Cat 6 cable through the "ETH [Router]" port on the power unit. It is the topmost, front Ethernet connection outlined in the red box below.

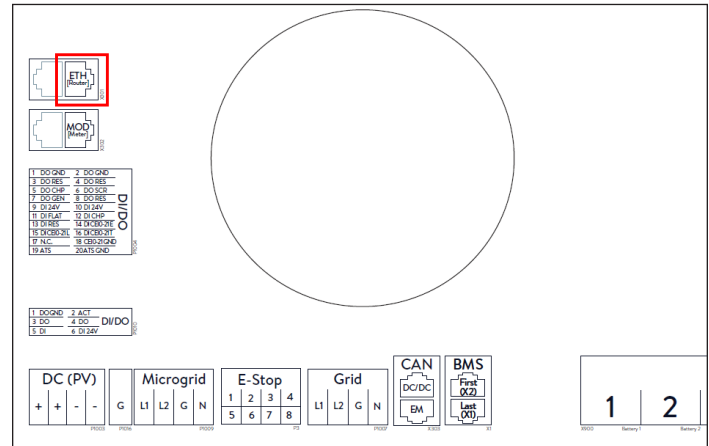


Fig. 127 Ethernet connections

- ▶ The eclipse on the front of the storage system should be pulsing white if AC power is already on. If it is off, ensure the green power disconnect button (P1) is in the "out" position as illustrated in Image below.
- ▶ If the eclipse is pulsing yellow, check that the system is properly connected to the internet.
- ▶ If the eclipse is pulsing red, check to make sure the installed wiring is correct. It may take up to 5 minutes for the eclipse to begin pulsing white on startup.



Fig. 128 Power button in "on" position



Fig. 129 Power button in “off” position

- The next steps will require a password that is printed on the side of the storage system. Installer should use the password from primary or leader system. Before leaving the system to complete the computer work, we recommend taking a picture of the label above the power button. The required password is a 9-digit number labeled “initial password” on the left column of this sticker.



Fig. 130 Power button and stickers

Connecting to sonnen

- With the storage system powered on, connect device to the same local area network (LAN) as the system and visit <https://find-my.sonnen-batterie.com>. This page will automatically bring up any sonnen batteries on the home network. If sonnen system does not appear, ensure that it is online and that device is connected to the same network.
- Click the blue “Configure Assistant” button next to the Leader system serial number to enter the commissioning assistant tool.

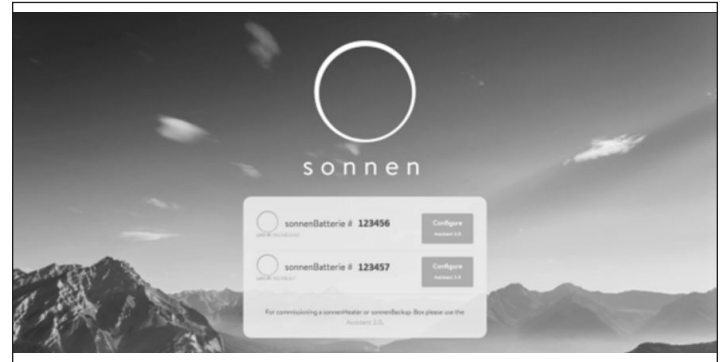


Fig. 131 find-my.sonnen-batterie.com landing page

- To login to the Commissioning Assistant, select “Installer” and enter the 9-digit initial password. Installer can get password from primary or leader system.
- Create a new on upon logging in. If password is forgotten, contact sonnen service to reset it.

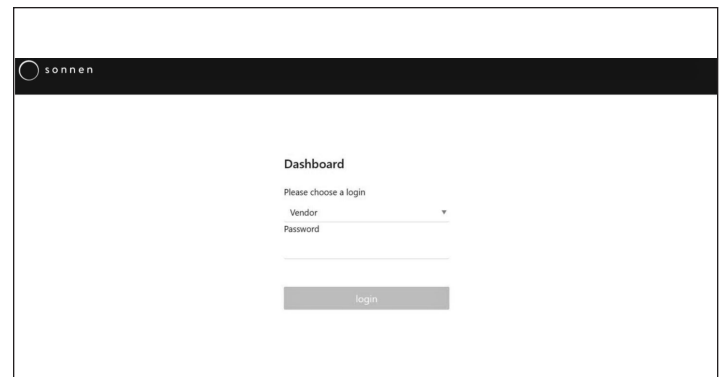


Fig. 132 Password entry

Commissioning

- Once inside, the installer will likely enter directly into the commissioning assistant. However, if not, the installer will need to click it on the left side of the screen, as shown below.

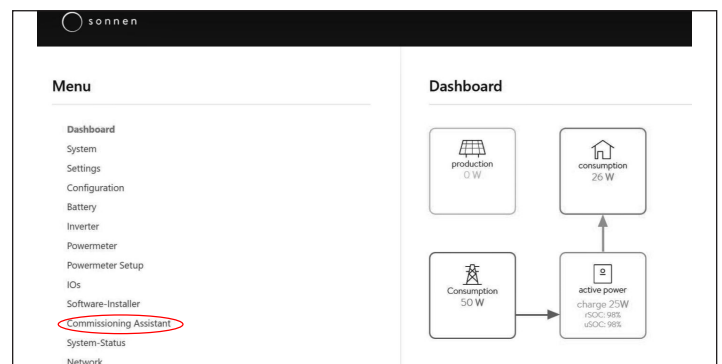


Fig. 133 Backend dashboard

- Once in the commissioning assistant, select the type of storage system you are installing.

► Select multiple system.

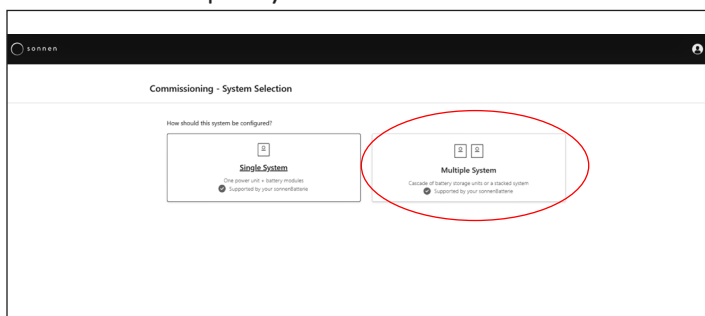


Fig. 134 System selection

Fig. 135 Setup

- Select 1 phase and input the serial number for the primary storage system. Then, enter the serial number for the secondary storage system.
- Select Start Pairing, this will take around 4-5 minutes.
- The software will likely update at this stage. It should take no longer than 15 minutes, but this is a good time to take care of any remaining work around the physical installation. When finished, click the “continue” button.

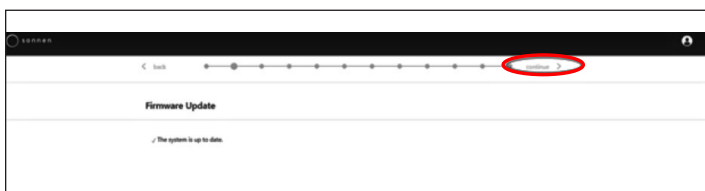


Fig. 136 Firmware update complete

Owner & Installer information

- The third page will ask for information about the storage system owner, installation location, and installation company. These sections are all mandatory, so make sure the owner is available to help fill it in.
- The Owner and Installer Information will be used to fill in the Customer Portal details for the storage system owner. It is critical to enter

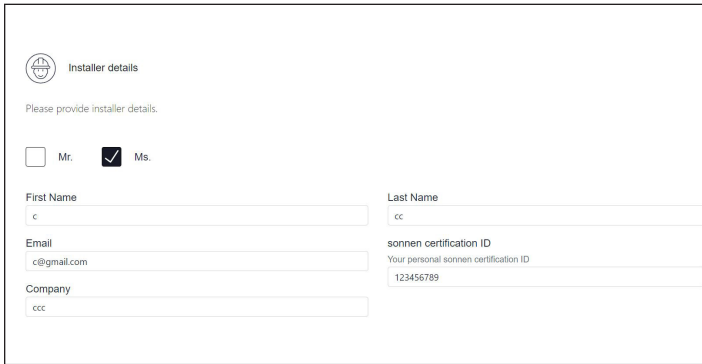
the correct email here, as the invitation to the portal will be sent to this email. Don't enter a Customer ID unless given one by a sonnen technician.

Fig. 137 Owner and installer information

- The Installation Address section requests information about where the storage system is installed. This information will be displayed on the customer portal, and on the partner portal.
- The “Address” line will be displayed as the storage system name in the customer portal.

Fig. 138 Installation address

- The Installer details section asks for installer information. The sonnen Certification ID is the installer number given when completing the installation certification training online. This number will tie this storage system to the Partner Portal account, so it is important to enter it without any errors.
- If installer has not yet been certified, they will need to visit our online certification program and complete that before finishing this process: <https://sonnenuniversity.talentlms.com/index>.



Installer details

Please provide installer details.

☐ Mr. ☒ Ms.

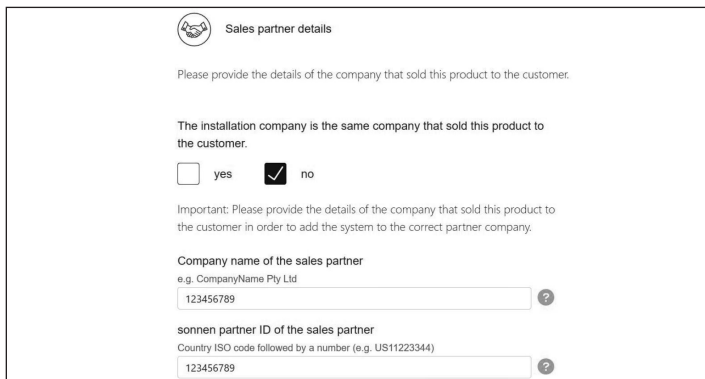
First Name: c Last Name: cc

Email: c@gmail.com sonnen certification ID: 123456789

Company: ccc

Fig. 139 Installer details

- ▶ The Sales partner details page asks about the company that sold the storage system. If it is the same as the installer, this section will automatically fill in the details. If not, those will need to be entered.



Sales partner details

Please provide the details of the company that sold this product to the customer.

The installation company is the same company that sold this product to the customer.

☐ yes ☒ no

Important: Please provide the details of the company that sold this product to the customer in order to add the system to the correct partner company.

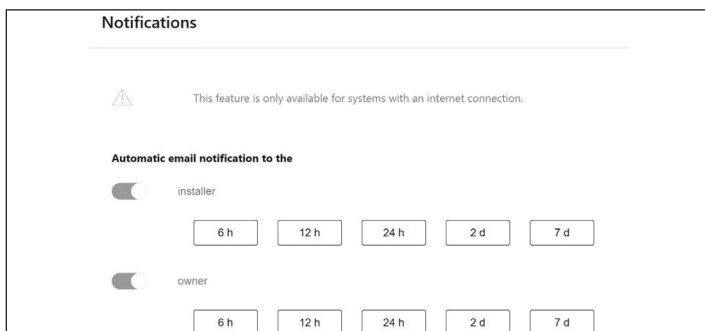
Company name of the sales partner
e.g. CompanyName Pty Ltd
123456789

sonnen partner ID of the sales partner
Country ISO code followed by a number (e.g. US11223344)
123456789

Fig. 140 Sales partner details

Notifications

- ▶ The Notifications tab asks about automatic information. These notifications will alert the owner or installer if connection is lost to the storage system. We recommend settings like those below, as these notifications can be used as a useful tool to identify power outages and adjust behavior, or to identify interruptions in internet connection before they lead to larger problems.



Notifications

This feature is only available for systems with an internet connection.

Automatic email notification to the

☒ installer

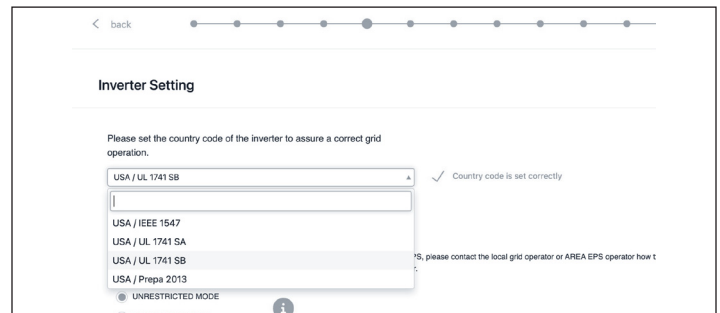
6 h 12 h 24 h 2 d 7 d

☒ owner

6 h 12 h 24 h 2 d 7 d

Fig. 141 Notifications page

Inverter settings



Inverter Setting

Please set the country code of the inverter to assure a correct grid operation.

USA / UL 1741 SB Country code is set correctly

USA / IEEE 1547

USA / UL 1741 SA

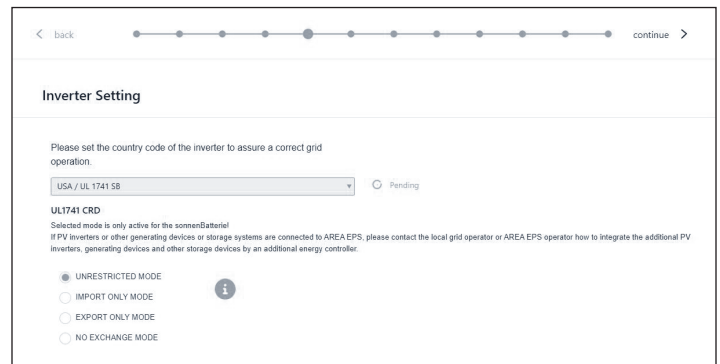
USA / UL 1741 SB

USA / Prepa 2013

UNRESTRICTED MODE

Fig. 142 Inverter setting - Country Code

- ▶ Select “USA/UL 1741 SB” in the menu item “Inverter Setting” as Country Code to load the inverter settings based on Grid Code UL 1741 SB.
- ▶ USA/IEEE 1547 is used for most mainland USA systems. USA/UL 1741 SB is used for systems requiring Rule 21 software, and USA/PREPA 2013 is used for systems in Puerto Rico.
- ▶ If located in California (which requires Rule 21) or Puerto Rico (which requires specific PREPA settings), navigate back to the Inverter Settings page if the Commissioning Assistant skips it.



Inverter Setting

Please set the country code of the inverter to assure a correct grid operation.

USA / UL 1741 SB Pending

UL1741 CRD

Selected mode is only active for the sonnenBatterie!

If PV inverters or other generating devices or storage systems are connected to AREA EPS, please contact the local grid operator or AREA EPS operator how to integrate the additional PV inverters, generating devices and other storage devices by an additional energy controller.

UNRESTRICTED MODE

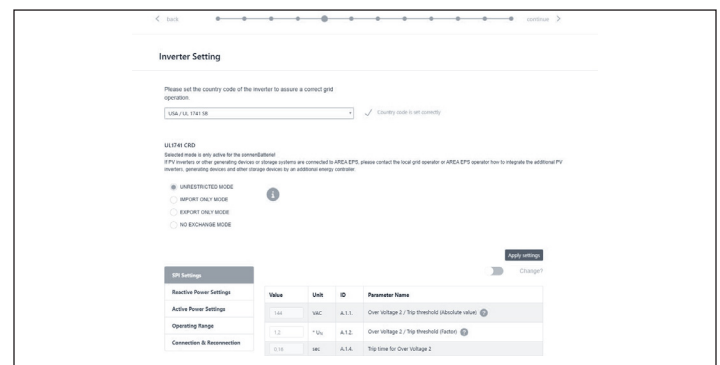
IMPORT ONLY MODE

EXPORT ONLY MODE

NO EXCHANGE MODE

Fig. 143 Inverter setting - Pending

- ▶ The inverter settings are loaded according to the Country Code selection.



Inverter Setting

Please set the country code of the inverter to assure a correct grid operation.

USA / UL 1741 SB Country code is set correctly

UL1741 CRD

Selected mode is only active for the sonnenBatterie!

If PV inverters or other generating devices or storage systems are connected to AREA EPS, please contact the local grid operator or AREA EPS operator how to integrate the additional PV inverters, generating devices and other storage devices by an additional energy controller.

UNRESTRICTED MODE

IMPORT ONLY MODE

EXPORT ONLY MODE

NO EXCHANGE MODE

Grid Settings

Parameter Name	Value	Unit	ID
Reactive Power Settings			
Active Power Settings	140	WAC	A.1.1
Operating Range	1.2	%	A.1.2
Connection & Reconnection	0.15	sec	A.1.4

Fig. 144 Inverter setting - Country code is set correctly

- Wait until the message “Country code is set correctly” appears.

The inverter settings are now set as listed in chapter Inverter settings for Grid Code UL 1741 SB [page 10].

After the Country Code “USA / UL 1741 SB” has been set successfully, the parameters of the Grid Code Setting can be changed manually in the “UL 1741 CRD” area in the Grid Parameter Selector.

Refer to <https://sonnenusa.com/en/GridCodeSettingsUL1741/>.

1. Commissioning

If PCS modes are required, use the following steps.

- The PCS mode selector will appear in the Inverter setting page for US systems. By default, the “Unrestricted Mode” will be active. Click on a mode to set it on the system.

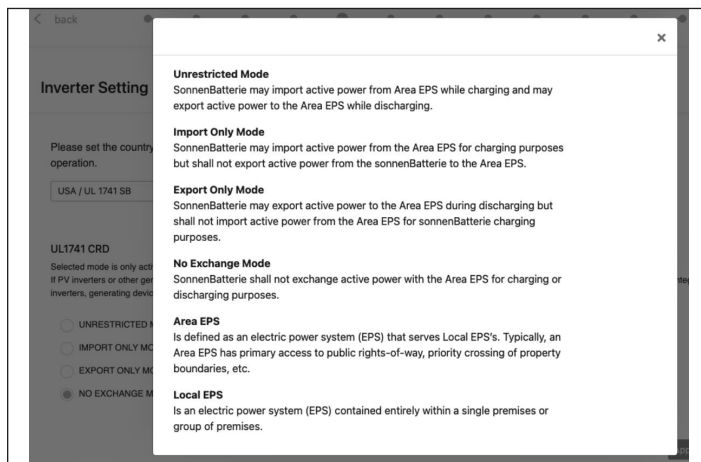


Fig. 145 Mode selector

- Click the info icon to open a popup window that explains the different mode settings.

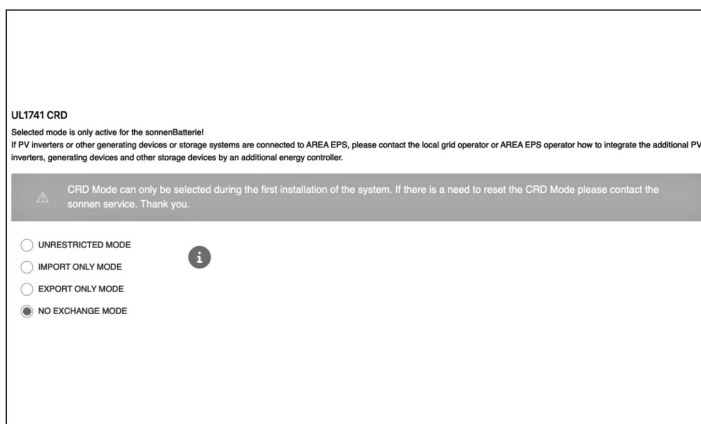


Fig. 146 PCS mode

- The installer can only change the PCS mode during the initial commissioning of the system. If the installer tries to change it later, the selector will be disabled and a warning will display. Only the Service or Vendor roles can change the mode after initial commissioning and this is password protected.

2. Inverter setting - California Rule 21

For compliance with California Rule 21, some parameters of the Grid Code Setting must be changed manually.

- Change all Grid Code setting parameters listed in the chapter for Inverter Settings for Grid Code California Rule 21 [page 9].

In the network parameter selector the parameters can be selected.

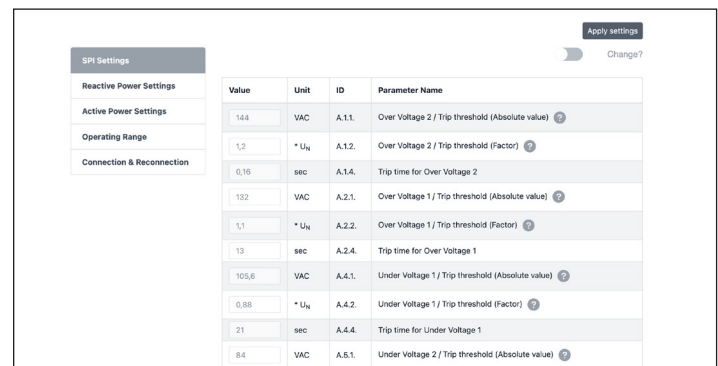


Fig. 147 Inverter Setting – network parameter selector

On the left side of the network parameter selector is where to choose between the areas “SPI Settings, Reactive Power Settings, Active Power Settings, Operating Range and Connection & Reconnection”.

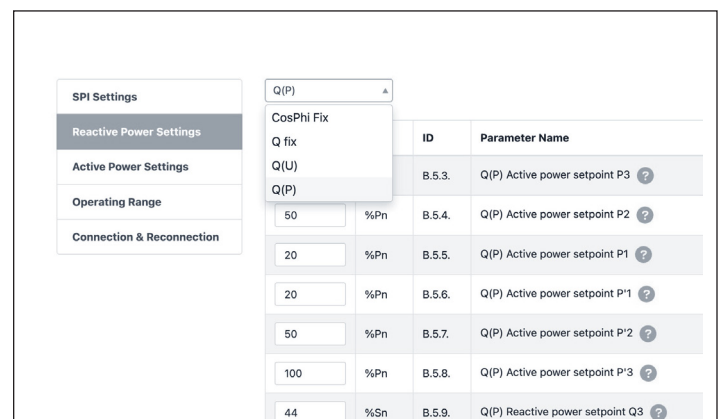


Fig. 148 Inverter Setting – Menu item “Reactive Power Settings”

The menu item “Reactive Power Settings” consists of four sub-areas “CosPhi fix, Q fix, Q (U), Q (P)”, which can be selected via the drop-down list.

3. Changing the parameters of Grid Code setting

- ▶ Activate the “Change?” slider.

Value	Unit	ID	Parameter Name
144	VAC	A.1.1.	Over Voltage 2 / Trip threshold (Absolute value)
1.2	* U _N	A.1.2.	Over Voltage 2 / Trip threshold (Factor)
0.16	sec	A.1.4.	Trip time for Over Voltage 2
132	VAC	A.2.1.	Over Voltage 1 / Trip threshold (Absolute value)
1.1	* U _N	A.2.2.	Over Voltage 1 / Trip threshold (Factor)
13	sec	A.2.4.	Trip time for Over Voltage 1
105.6	VAC	A.4.1.	Under Voltage 1 / Trip threshold (Absolute value)
0.88	* U _N	A.4.2.	Under Voltage 1 / Trip threshold (Factor)
21	sec	A.4.4.	Trip time for Under Voltage 1
84	VAC	A.5.1.	Under Voltage 2 / Trip threshold (Absolute value)

Fig. 149 Inverter setting - Change activated

- ▶ Select the parameter to be changed in the network parameter selector.
- ▶ Change the value of the parameter.
- ▶ Then, click on the “Apply settings” button.

The settings have been set successfully in the inverter!

Value	Unit	ID	Parameter Name
144	VAC	A.1.1.	Over Voltage 2 / Trip threshold (Absolute value)
1.2	* U _N	A.1.2.	Over Voltage 2 / Trip threshold (Factor)
0.16	sec	A.1.4.	Trip time for Over Voltage 2
132	VAC	A.2.1.	Over Voltage 1 / Trip threshold (Absolute value)
1.1	* U _N	A.2.2.	Over Voltage 1 / Trip threshold (Factor)
13	sec	A.2.4.	Trip time for Over Voltage 1
105.6	VAC	A.4.1.	Under Voltage 1 / Trip threshold (Absolute value)

Fig. 150 Inverter setting - Settings successful

- ▶ Wait until the message “The settings have been successfully made in the inverter” appears.

4. Inverter Firmware upgrade required

Inverter Setting

Please set the country code of the inverter to assure a correct grid operation.

USA / IEEE 1547 ✓ Country code is set correctly

Synchronize grid-code

Inverter Firmware Upgrade Required

To use the country code, an inverter firmware upgrade is required. Please start the upgrade.

The upgrade can take 45-60 minutes. The firmware upgrade must not be interrupted, the system must not be switched off and there must be a permanent internet connection.

Installed C28 version: 1.5.3 - Required C28 version: >= 1.11
Installed M3 version: 1.5.3 - Required M3 version: >= 1.11

Start Upgrade

Fig. 151 Firmware upgrade required

- ▶ The minimum firmware requirement for stacking is 1.11. To update inverter firmware click on start to upgrade the primary storage system.
- ▶ If the secondary storage system has the inverter firmware less than 1.11, the installer must update the secondary storage system.

Synchronize grid-code

To run a stack, all systems must use the same grid-code.

Some of the systems of the stack need to update their inverter firmware. Please update the inverter firmware of the systems indicated below. Once all systems have the correct inverter firmware, refresh the status and continue to set the grid-code on all nodes.

Refresh status

Primary storage system

#135874 USA / UL 1741 SA

Secondary storage systems

#152383 USA / UL 1741 SA

Inverter firmware update required! Update firmware

Fig. 152 Synchronize grid-code

- ▶ Click on Update firmware on the bottom right highlighted in blue.

sonnen

Dashboard

Please choose a login

Vendor

Password

login

Fig. 153 Commissioning-Assistant login

- ▶ Installer must login to Commissioning assistant again to set up follower system.

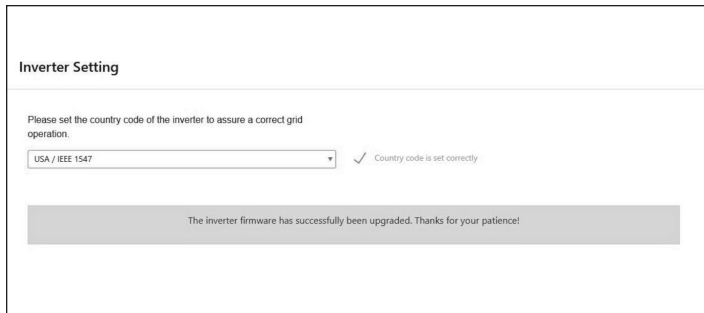


Fig. 154 Inverter setup complete

- Now the installer will be directed back to commissioning assistant to finish setup of leader.

PV System

- The PV System page requests information about the PV system. If there is no PV system installed, unselect the top button, and click Continue. If there is a PV System, enter the peak power, in watts, and select the “Connection Type”, which is the number of phases connected to the PV system. 1~ is standard in the USA.
- The bottom slider is “off” by default. This functionality is not available with any USA products. Please leave this “off”.

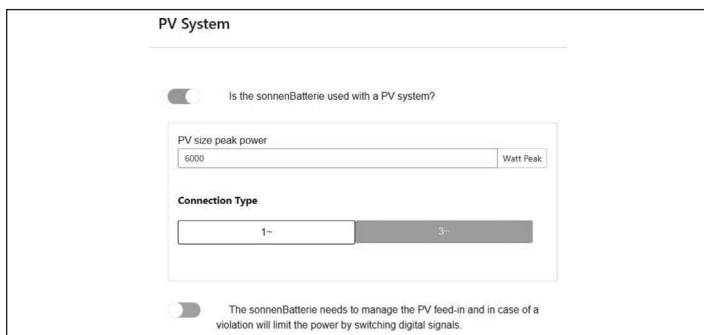


Fig. 155 PV System

- If the inverter update occurs during commissioning, the installer needs to return to the system selection page and repair the system.

Power meter

- For Power Meter settings, we recommend clicking the “description” button directly below the pictures to open a more detailed overview of this setting.
- Essentially, if measuring Whole Home Consumption, with the CTs located upstream of the ESS (Energy storage system), common with

stacked sonnenCore+ systems or with a Whole Home Self Consumption Kit in a VPP or Time of Use area, select “Grid Measurement”.

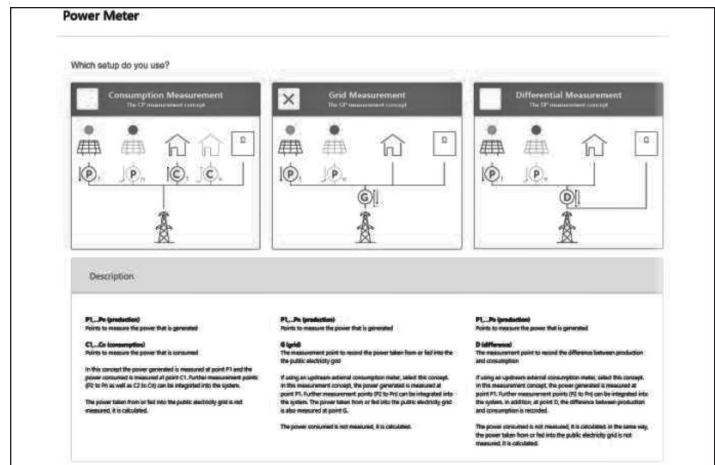


Fig. 156 Power meter settings

Configuration

- Set the meter data on the Configuration page. Also verify the measurement values here. If they are negative, now is the time to reverse the CTs so the measurements are correct. This is an important step – Don’t forget to validate the consumption measurement values.
- These may be pre-set. If so, there’s no need to configure them. If they are not set, or are set incorrectly, follow these instructions:
 - Meter type should always be EM210.
 - Direction will depend on previous setting.
 - If “Grid Measurement” selected, the consumption meter will be set for “G – Grid”. Validate that the measured consumption is correct for the chosen loads with a clamp on meter.
 - The PV meter will be “P – Production”.
 - Modbus ID will always be 4.
 - Channel will be 1 for consumption meters and 2 for production meters.
 - Remember to validate the measurement values with the actual consumption and production values.
 - The installer needs to write the value according to the main circuit breaker or main fuse.

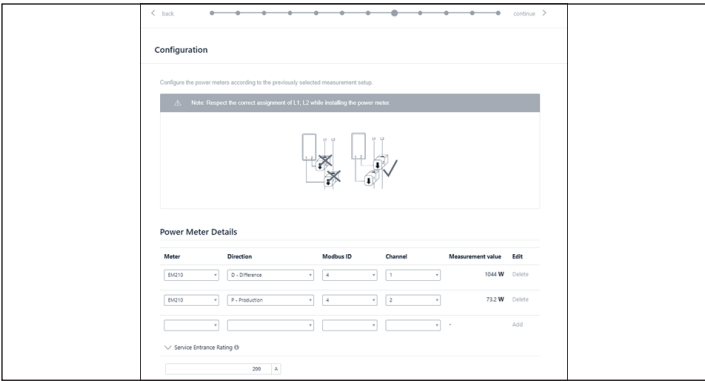


Fig. 157 Configuration

Features - Operating mode

The Features page allows to select a variety of operating modes and features. In general, each operating mode can be paired with a number of other features, so the pictures included in this section show the potential functionality – not the recommended settings for your customer. Each feature and operating mode will be detailed below.

Feature - AC Microgrid - This section activates the microgrid functionality for the storage system.

- Select this section.

Reenabling Time - If the BESS over-discharges in offgrid mode, it will turn off to protect the batteries. The Reenabling Times are 7-minute periods during which the system will activate the microgrid with the goal of turning on the PV System and charging the battery from excess PV. Select times during which the sun will be up and the PV system will be generating enough power to provide for house loads and charge the storage system. It may set up to three times in case the system cannot charge during the first two. We recommend educating the customer on reducing consumption if the battery turns off due to over-discharge. If there is no PV System, leave these settings at default.

Frequency Shift – When offgrid, the storage system will shift the frequency upwards when it hits 95% SOC to trigger the PV system to turn off to avoid over-charging the batteries. This setting allows to adjust the frequency to which it will shift the grid. Selected number should be 10X what the

desired frequency is (e.g., 609 for 60.9Hz). Default is 60.9Hz, which should be sufficient in most mainland settings. Higher frequencies may be used in areas with unstable grids where PV systems often set to a wider disconnection range.

Feature - Backup Buffer - The Backup Buffer will limit the discharge of the batteries for Self-Consumption or Time of Use operation. This will always reserve a percentage of the battery to power a microgrid in case of a power outage.

SonnenKNX module – This feature is not active in the USA. Leave this option unselected for best performance.



Fig. 158 Self-Consumption mode with AC Microgrid and Backup Buffer

Self-Consumption - Operating Mode – Self-Consumption operating mode maximizes solar self-consumption. The solar is used to power loads and charge batteries. When there is not enough solar to power loads, the batteries will discharge to cover consumption. This mode does not use the grid to charge the batteries.

Operating Mode – Backup Power Mode - In this mode, the storage system remains at a full charge until the grid power is lost. Solar will work during the grid outage and can be used to both power loads and charge the batteries if there is any excess solar to do so. The grid is also used to charge the batteries.

Operating Mode – Time of Use - If customer has a Time of Use utility rate structure, they may want to use this mode. In Time of Use mode, the battery

will discharge against house loads only during High Tariff Windows and will not charge from the grid during these times, charging only from excess PV. These times will be dictated by the utility company rate structure.

All times are in 24h “military” time.

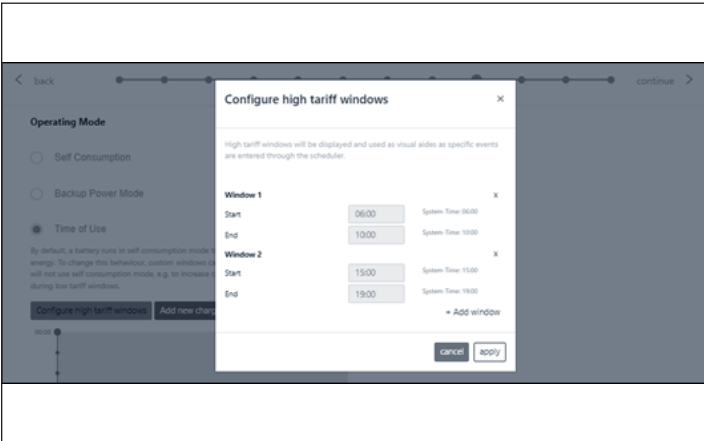


Fig. 159 Time of use - high tariff window

After a high tariff window, the battery will once again charge from the grid, so it has enough stored energy for the next high tariff window. The customer may have times during which they don’t want the battery to discharge but also want to limit charging from the grid, for example during a “shoulder” rate that is not as high as a high tariff time, but also not low tariff. To limit Grid charging during a time that is not high tariff, set a Charge Event by clicking “Add new charge event”.

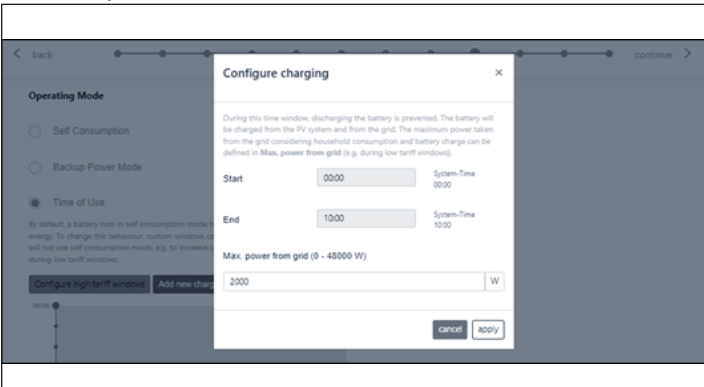


Fig. 160 Time of use - charging window

The installer must set multiple charge events to a fully charged stacked storage system. Set multiple windows for short times of charging events for the system to charge to 100 percent.

Here is one example how to set multiple

charge events in a stacked unit to charge up to 100 percent. This storage system will discharge to load starting from 8:00am-00:00am or until the battery reaches the backup buffer, whichever comes first. From 00:00am to 2:00am the system is charging from the grid. From 2:00am-4:00am the system is charging from the grid. Same way system is charging from the grid in 4:00am-6:00am charge event window and 6:00am-8:00am charge event window to make battery ready to discharge on high tariff.



Fig. 161 Time of use

System test

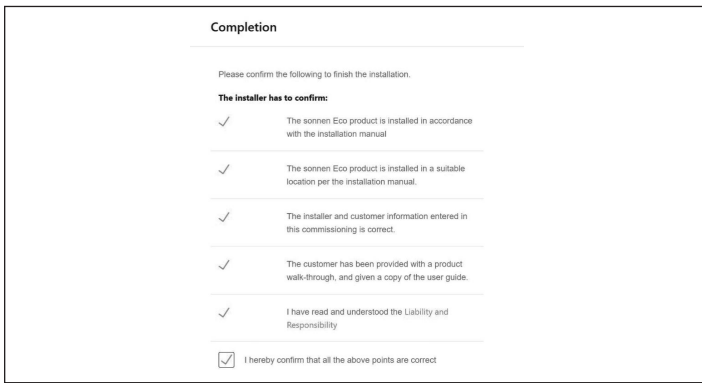
- The System Test page is the last chance to verify everything is working. Ensure the number of modules, PV production, and home consumption values are correct before moving on to the last step.



Fig. 162 System test page

Completion

- Read and follow the check list on this page, then check the box at the bottom before moving on.



Completion

Please confirm the following to finish the installation.

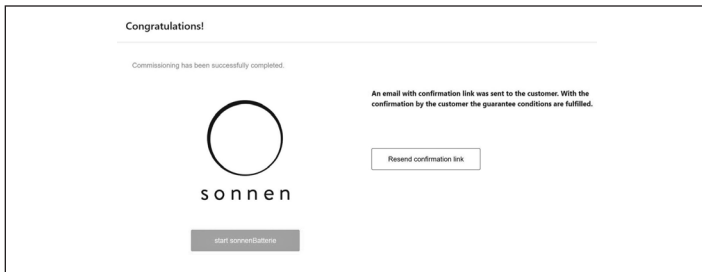
The installer has to confirm:

- ☒ The sonnen Eco product is installed in accordance with the installation manual.
- ☒ The sonnen Eco product is installed in a suitable location per the installation manual.
- ☒ The installer and customer information entered in this commissioning is correct.
- ☒ The customer has been provided with a product walk-through, and given a copy of the user guide.
- ☒ I have read and understood the Liability and Responsibility.

☒ I hereby confirm that all the above points are correct


Fig. 163 Completion page

- The commissioning is now complete, and an email will be sent to the customer email address that was entered on the Owner & Installer Information page. If they do not receive the email, you can send it again from this page.
- Once they have received the email, click “start sonnenBatterie”.



Congratulations!

Commissioning has been successfully completed.



sonnen

An email with confirmation link was sent to the customer. With the confirmation by the customer the guarantee conditions are fulfilled.

[Resend confirmation link](#)

[start sonnenBatterie](#)

Fig. 164 Congratulations! page

Completing stacked installation

Checking stacking

- Proceed as follows to check the status of the individual storage systems in the on-grid/off-grid stacking:
- On the web interface of the storage system, navigate to the Stacking page.
- Check the status of the individual storage system in the overview.

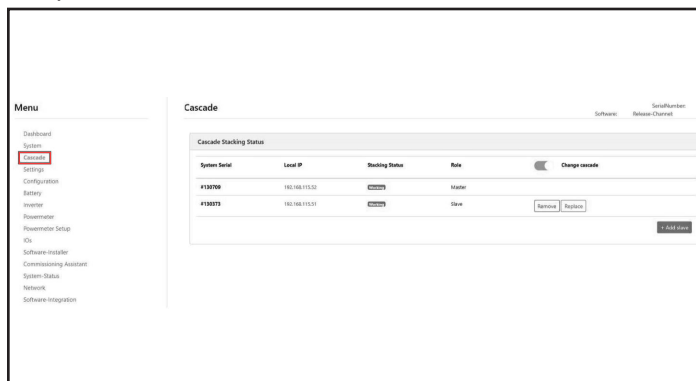


Fig. 165 Stacking page

- The Stacking option can be used to add more secondary storage systems, replace systems or remove them.

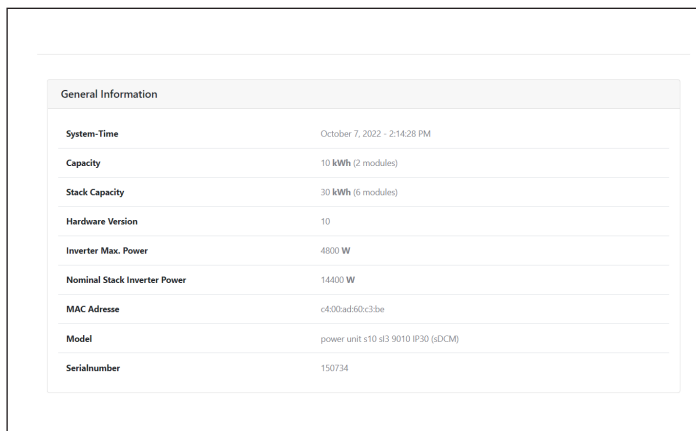


Fig. 166 General information

- Please check stack capacity and nominal stack inverter power.

Changing IP address allocation method (Optional)

- In some IT networks it is necessary to allocate static IP addresses to individual network subscribers in order to avoid addressing conflicts. Frequent reallocation of network addresses can lead to stacking malfunctions.

- Proceed as follows to change the IP address allocation method from Automatic (DHCP) to Manual (Static IP):
- On the web interface of the storage system, navigate to the Network page.

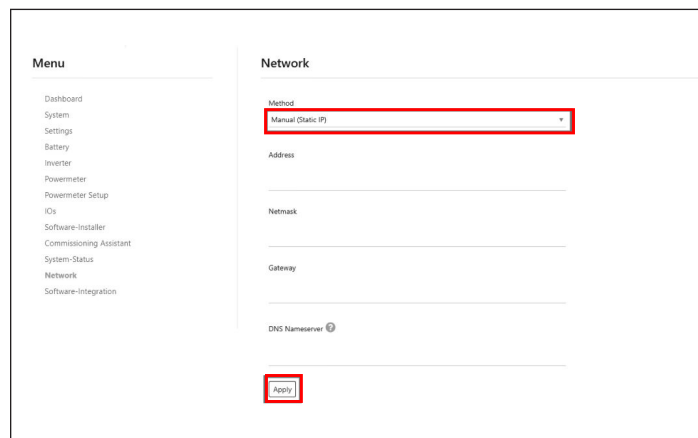


Fig. 167 Network page

- Under Method, select Manual (Static IP) from the dropdown menu.
- Enter the rest of the information and save this by clicking on Apply.

Display on internet portal

- The internet portal presents current information and data for the stacked storage systems. Data from all three storage systems will be aggregated and displayed as a single sonnen energy system.
- The description of the individual operating steps, the displays and diagrams and the registration process can be found in the operating instructions for the storage system.
- To view the data for on-grid/off-grid stacking, the system must be registered with the serial number of the primary storage system. The data for the entire system, such as the PV production, consumption and discharge, is displayed on the internet portal for the primary storage system.

Internet portal

The storage system must connect to sonnen's servers to enable control of the storage system via the web portal and smart-phone app. This connection is protected by industry-standard security against unauthorized access. sonnen and service partners will only access the storage system for maintenance and monitoring.

An anonymous evaluation of log data enables further improvements and monitoring of hardware and software.

Establish connection to the Internet

- Ensure the router acts as a DHCP server and configures newly connected network devices automatically.
- Ensure the following TCP and UDP ports are permitted for the following services in the router:



The listed ports are generally pre-configured on the routers.

TCP Port	Service
22	SecureShell (ssh)
37	Time Server (ntp)
80	Online Check (http)
222	VPN (Server connection, ssl)
232	VPN (backup)
443	App control (https)
UDP Port	
1196	(Server connection, ssl)

Table 9 Required open ports for storage system

The storage system connects automatically with the Internet. There are no further steps required.

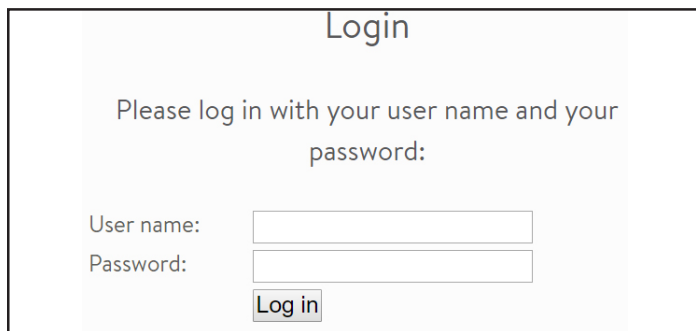
Inside the Internet portal

Real-time and historical data regarding the storage system can be viewed via the Internet portal.

An email will be received with a welcome to the sonnenCommunity shortly after storage system is commissioned. This email will be sent to the address listed during commissioning.

If the email is not received, check the spam folder. The email is sent from “energiezukunft@sonnenbatterie.de” and is often stuck in spam folders. If email is not received, email service@sonnen-batterie.com and it will be resent.

- Log in to the portal
- Type the following address in internet browser: <https://my.sonnen.de/>



Login

Please log in with your user name and your password:

User name:

Password:

Log in

Fig. 168 Login window

- Enter the login information selected at first-time login.

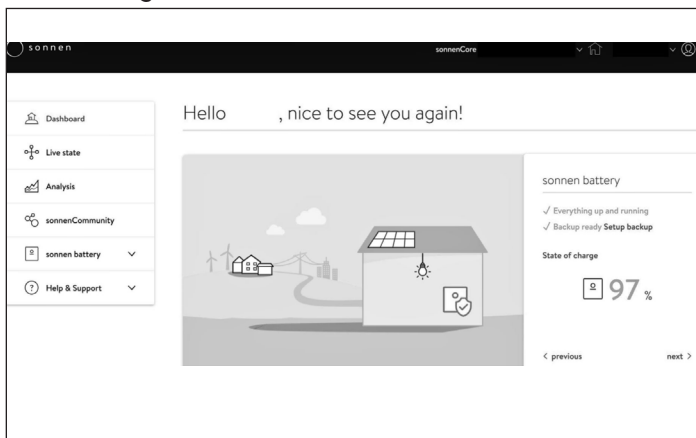


Fig. 169 Portal overview screen

View each element by clicking next and previous:

- PV system - Current production from your PV system.
- Consumption - Energy being used in the house.
- sonnenCommunity - Information about the sonnenCommunity. Click or scroll down for more information.
- sonnen battery - Current status and State of Charge of the sonnen battery.

Live state page

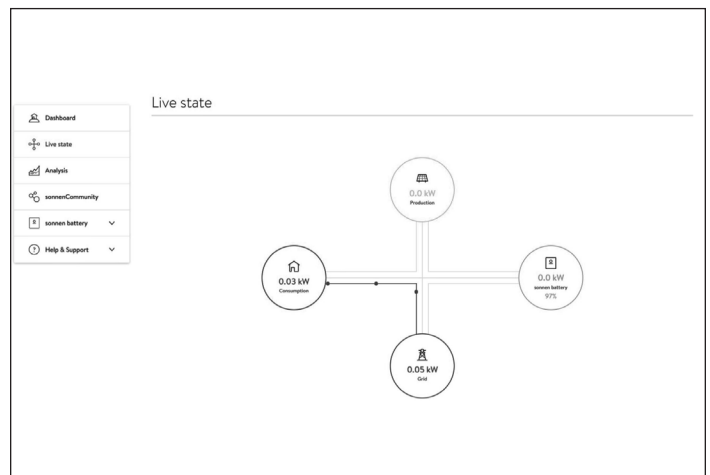


Fig. 170 Live state

This display shows key pieces of information regarding where the power is going in the entire system using yellow line indicators:

- Production - indicates the amount of power the PV system is producing as measured by the storage system.
- Consumption - a measure of how much power is being consumed by the loads the storage system is supplying.
- Feed-In - the amount of excess PV that is passed through the storage system towards the utility.

Analysis page

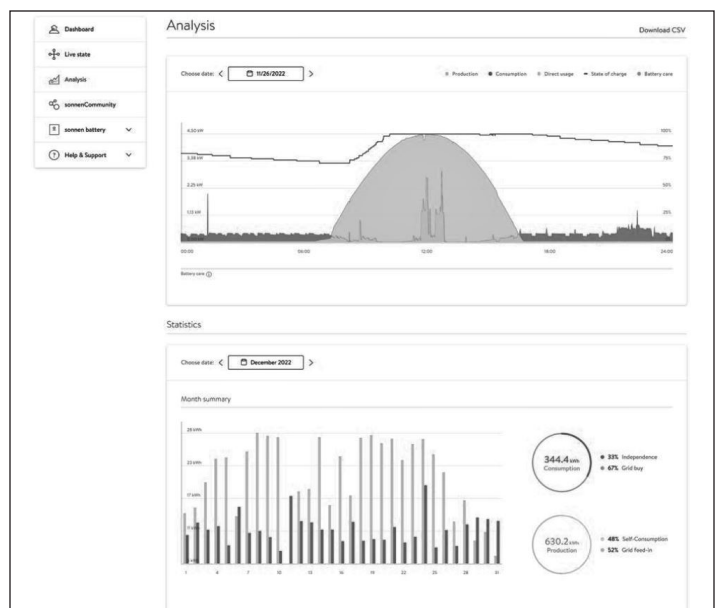


Fig. 171 Analysis page

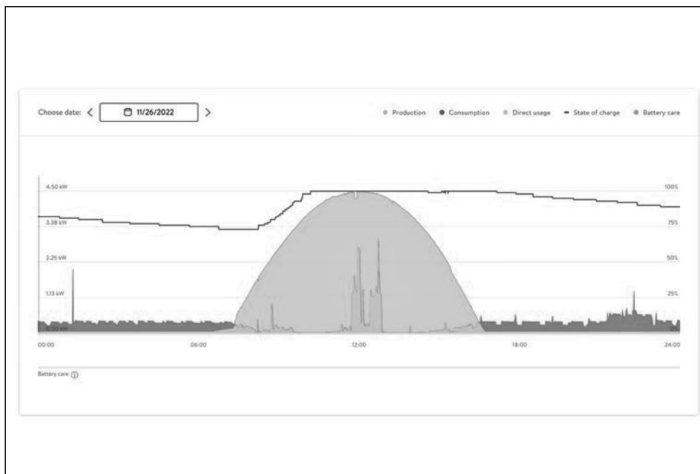


Fig. 172 History view

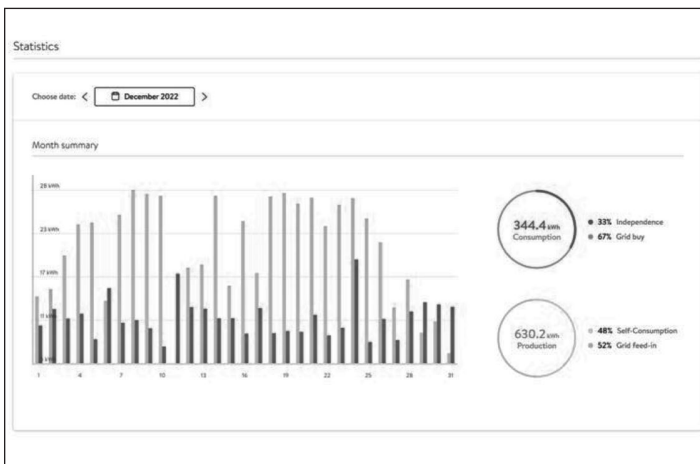


Fig. 173 Statistics

The Analysis page shows history at the top of the page and statistics below. The user can select or deselect elements of the view at the top of the graph.

Statistics shows battery behavior in more detailed terms: how independent the customer is from the grid, what percentage of consumption comes from solar, etc.

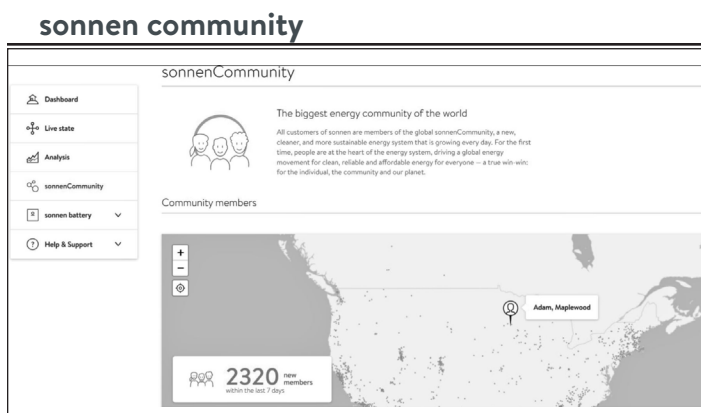


Fig. 174 sonnen community

The sonnen community tab shows information about the global sonnenCommunity and how the customer and their battery connect to local sonnen users.

sonnen battery page

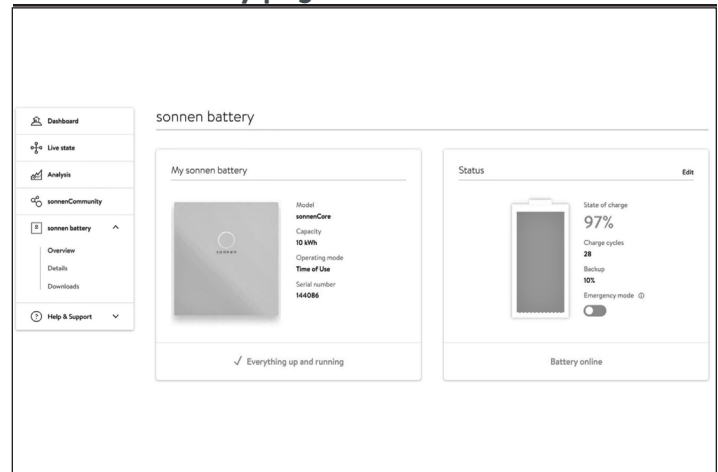


Fig. 175 sonnen battery page

sonnen battery page has 3 options: Overview shows the battery status and main attributes. It also shows State of Charge.

ATTENTION



This is the point where the user can set the battery to emergency mode if there is an outage planned or expected.

- Reset the backup buffer after deactivating emergency mode. It will be automatically set to 10%.
- Reset backup buffer by clicking “Edit” on the status section:

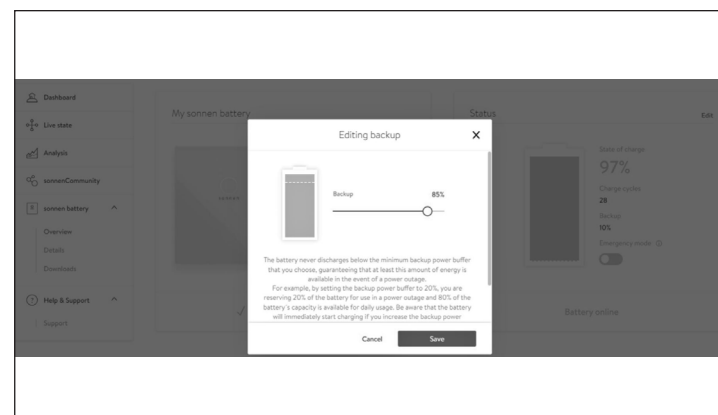


Fig. 176 Editing backup

sonnen battery details

Details of sonnen battery

Tech Specs

Model
sonnenCore

Serial number
144086

Max. output power
4.8 kW

Number of battery modules
2

Software version
1.9.1.869915

Battery technology
Lithium-iron phosphate

Charge Cycles
28

History of your sonnen battery PowerUnits:

Installation

Installation date
11/10/2020

Installation location
sonnenCore #144086, 55119 Maplewood, United States

Installer

Installer name
Minnesota Renewable Energies

Installer address
2724 9th St, Glencoe, 55336 Glencoe, US

Installer phone number
612-440-1196

Installer email address
aaron@busnetic.net

Fig. 177 sonnen battery

Downloads

Downloads

No results

Documents language: EN

Fig. 178 Downloads

This page is where sonnen information and manuals can be downloaded.

Help and support

Help & Support

Support

Let us know if you have any questions. We're happy to help. Just fill in the message box below and send it to us.

Topic
Please choose a topic

Your Message
Type your message here.

Send

Some questions are easier to answer by phone!
You can as well give us a call at: Mo - Fr 8am - 8pm EST
1-818-824-6363

Fig. 179 Help and support

Help and support is the page to contact sonnen service team and find self help.

About me

My Account

About me
Password
Settings

Back

About Me

Here you can find your personal information about your sonnen account.

Name

Last name

Email

Mobile phone number

Fig. 180 About me page

Under the user name is the About me section. This shows the information for the account holder.

Change password

My Account

About me
Password
Settings

Back

Change your password

You can change your password here.

Current password

at least 10 characters a number a special character

New password

Confirm password

Fig. 181 Change password

This page allows the user to change the password for their account.

Settings

My Account

About me
Password
Settings

Back

Settings

Here you can configure your sonnen hardware products for remote maintenance.

Privacy permissions

Service function

With the activation of the service function, you allow that your partner is able to do a technical monitoring on your system. With the help of this, you grant your service partner the best possibilities to react in case of failure.

Fig. 182 Settings

This page allows the user to set service function. Service function MUST be selected if the installer is to be able to monitor and help support the storage system.

Maintenance and care

To ensure proper operation, periodic cleaning and software function control of the storage system are required.

Care of the storage system

ATTENTION



Risk of damage by improper cleaning utensils!

- Only use cleaning solutions and tools listed in this chapter.
- Do not use high-pressure cleaning equipment.
- Do not use abrasive cleaners.

Cleaning the enclosure

- When the cover appears dirty, clean the exterior with a soft, damp cloth. Do not clean the interior of the system.

Checking the storage unit

Monthly:

- Check the area around storage unit for safety hazards or potential maintenance issues, including debris and chemical vapors that can degrade electrical insulation.

Appendix 1. Glossary

Appliances: Devices that consume power. These may include small appliances, such as a blender, or large ones, such as a water heater.

Autonomy: A measurement of how little you rely on the grid for energy. The more renewable energy you produce and consume, the higher your autonomy.

Backup mode (or off-grid mode): A mode of operation in which the sonnenCore+ provides power stored in its battery modules when the utility grid power is unavailable.

Backup readiness: When the storage system emphasizes backup readiness, it maintains a specified state of charge, such as 85%, in its battery modules to provide power in the event of an outage.

Battery modules: The energy storage modules in the sonnenCore+.

BESS: Battery Energy Storage System.

Capacity: The amount of energy that can be stored in the sonnenCore+, measured in kilowatt-hours.

Consumption: The amount of power being used by appliances.

Deep discharge: Bringing the battery module's charge to such a low level that it damages the battery. For the modules used by the sonnenCore+, this requires leaving a module at an extremely low level (0%-1%) for weeks or months.

Discharge: When the storage system provides power to your house or building.

Feed-In: When the storage system provides power to the utility grid.

Grid: The power source provided by utility companies, as opposed to self-generated power.

Kilowatt-hour: A measurement of energy equal to one kilowatt delivered for one hour.

Load-shedding: The method of removing power to appliances either to keep the load within power requirements or to maximize battery time.

Main disconnect circuit breaker: A circuit breaker that cuts all power to and from the storage system when opened.

Main service panel: The main panel to which all appliances are connected.

Micro-grid: The grid created by your power generation system, as opposed to the utility grid.

Modbus: A serial protocol that enables communications between smart devices.

Photovoltaic: A photovoltaic system of solar-power panels.

Production: The power generated by your solar panels.

Protected loads panel: A panel providing power to the most important appliances in the house or building, such as a refrigerator, freezer, or heater. This sub-panel is isolated from the main service panel by a switch to prevent electrical feedback.

RCD (Residual current device): An electrical safety device that quickly breaks an electrical circuit when detecting leakage current from system.

Self-consumption: The method of using solar power to power appliances rather than using grid power.

State of charge: The percentage of charge available in the storage system's battery modules.

Storage system: The sonnenCore+, which combines an inverter, battery modules, and other hardware and proprietary algorithms to make solar power an even more cost-effective power source.

Transfer switch: A switch, either manual or automatic, that changes the power source from the utility grid to self-generated power in the event of a loss of power.

Appendix 2. Warranty

The warranty provided at <https://sonnenusa.com/en/warranty/> overrides any printed versions of sonnen's warranty.

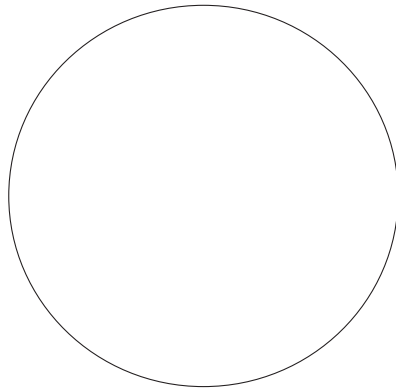
Appendix 3. Nameplates and labels



1 DO GND	2 DO GND	D/D0
3 DO RES	4 DO RES	
5 DO CHP	6 DO SCR	
7 DO GEN	8 DO RES	
9 DI 24V	10 DI 24V	
11 DI FLAT	12 DI CHP	
13 DI RES	14 DI CBO 2/E	
15 DI CBO 2/L	16 DI CBO 2/T	
17 N.C.	18 CBO 2/GND	
19 ATS	20 ATS GND	

1 DO GND	2 ACT	D/D0
3 DO	4 DO	
5 DI	6 DI 24V	

DC (PV)	Microgrid	E-Stop	Grid	CAN	BMS
+	L1 L2 G N	1 2 3 4	L1 L2 G N	DC/DC	First (X2)
-		5 6 7 8		EM	Last (X1)



⚠ WARNING
HAZARDOUS VOLTAGE.
To reduce risk of injury, read all instructions.
RISK OF ELECTRIC SHOCK.
More than one live circuit. See diagram.

⚠ ADVERTENCIA
VOLTAJE PELIGROSO.
Para reducir el riesgo de lesiones, lee todas las instrucciones.
RIESGO DE DESCARGA ELÉCTRICA.
Hay más de un circuito activo. Ver diagrama.

⚠ AVERTISSEMENT
TENSION DANGEREUSE.
Pour réduire le risque de blessure lire toutes les instructions.
RISQUE DE CHOC ÉLECTRIQUE.
Cet appareil est alimenté par plusieurs circuits sous tension.
Voir le schéma.

⚠ WARNING
HAZARDOUS VOLTAGE.
Contact will cause electric shock or burn. Disconnect battery modules before servicing.
RISK OF ELECTRIC SHOCK.
Hazardous live parts inside this power supply are energized from the battery modules even when input AC power is disconnected.

⚠ ADVERTENCIA
VOLTAJE PELIGROSO.
El contacto provocará una descarga eléctrica o quemadura.
Desconectar los módulos de baterías antes de hacerles mantenimiento.
RIESGO DE DESCARGA ELÉCTRICA.
Las piezas activas peligrosas dentro de esta fuente de alimentación se energizan desde la fuente de batería incluso cuando la energía de CA de entrada está desconectada.

⚠ AVERTISSEMENT
TENSION DANGEREUSE.
Contactage pourrait provoquer un choc électrique ou des brûlures.
Déconnecter les modules de batterie hors tension avant l'entretien.
RISQUE DE CHOC ÉLECTRIQUE.
Risque de choc électrique. Ce bloc d'alimentation comporte des pièces sous tension dangereuse alimentées par les piles même lorsqu'il est débranché du secteur.

DC (BATT)			
1	2	3	4
Battery 1	Battery 2	Battery 3	Battery 4

PN-1000709 Rev 000

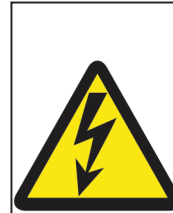
sonnen, Inc.
1578 Litton Dr
Stone Mountain, GA 30083

sonnenCore / sonnenCore+

serial number: #####
initial password: *****
ambient temperature: 32...113°F
degree of protection: IP30
weight: max 525 lbs
certified to ANSI/CAN/UL: STD 9540
ac ratings - system output
inverter topology: non-isolated
mains connection: nominal split-phase
voltage: 240V L-L/120V L-N
nominal frequency: 60Hz
rated active power: 4800 W
rated apparent power: 4800 VA
power factor: 0.5 lead...0.5 lag
rated current: 20A
short circuit current: 454A@12.13ms
rated short time withstand current: 1.5 kA



dc ratings - battery
usable capacity: max 20 kWh
operating voltage: 204.8 V
maximum current: 40 A
short circuit current: 2880 A
cell technology: rechargeable lithium ion
model / usable battery capacity:
☐ SCORE-P10 / 10 kWh
☐ SCORE-P20 / 20 kWh
note:
this unit can be stacked.
suitable for use in residential dwelling units where permitted.
in case of emergency contact sonnen service team at +1 818 824 6363

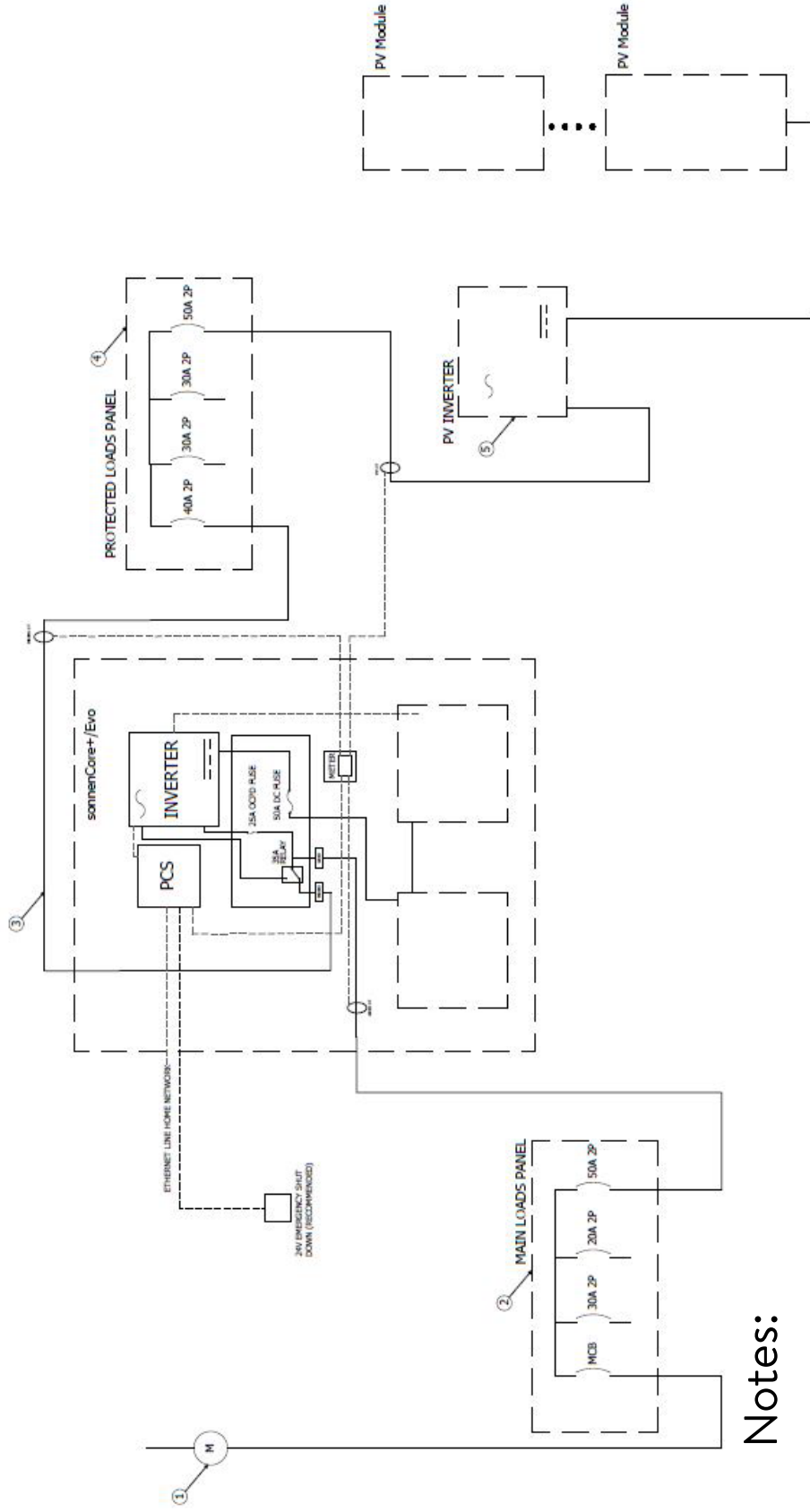


⚠ WARNING
The maximum operating current of this system may be controlled electronically.
Refer to manufacturer's instructions for more information.

⚠ ADVERTENCIA
La corriente máxima de funcionamiento de este sistema puede controlarse electrónicamente.
Consulte las instrucciones del fabricante para obtener más información.

⚠ AVERTISSEMENT
Le courant de fonctionnement maximal de ce système peut être contrôlé électroniquement.
Reportez-vous aux instructions du fabricant pour plus d'informations.

Appendix 4. Typical system layout

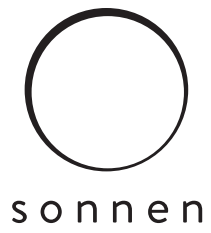


Notes:

1. Service meter
2. Home main loads panel
3. sonnenCore+
4. Protected loads subpanel
5. Optional PV inverter

Appendix 5. Battery installation parts

	10 kWh	20 kWh
Battery Module	2	4
Battery power cable	2	4
Short BMS cable	1	3
Medium BMS cable	1	1
Long BMS Cable	1	1



sonnen Inc.

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O info@sonnen-batterie.com