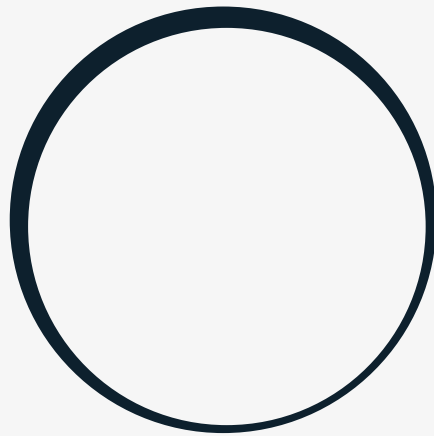




sonnen

Clean and affordable energy
for everyone is the biggest
challenge of our time.

Our goal is a world in which everyone is able to cover their energy needs with a decentralized and clean energy source.



s o n n e n

energy is yours



sonnen Overview

Cutting Edge Design

Residential Solution Becomes Part of Home



eco - white



eco - black



eco – white incl. extension cabinet




eco - silver

sonnenBatterie eco

- » Fully integrated, AC-coupled system and easy to install (“Plug & Play”)
- » Optimized self-consumption – Weather forecast, self-learning algorithm
- » Comfortable and easy control via App, Internet or Touch-Display
- » Broad portfolio for private households and small businesses
- » High software intelligence
 - Intelligent „Peak Shaving“
 - Demand Side Management
 - VPP Aggregation through remote control

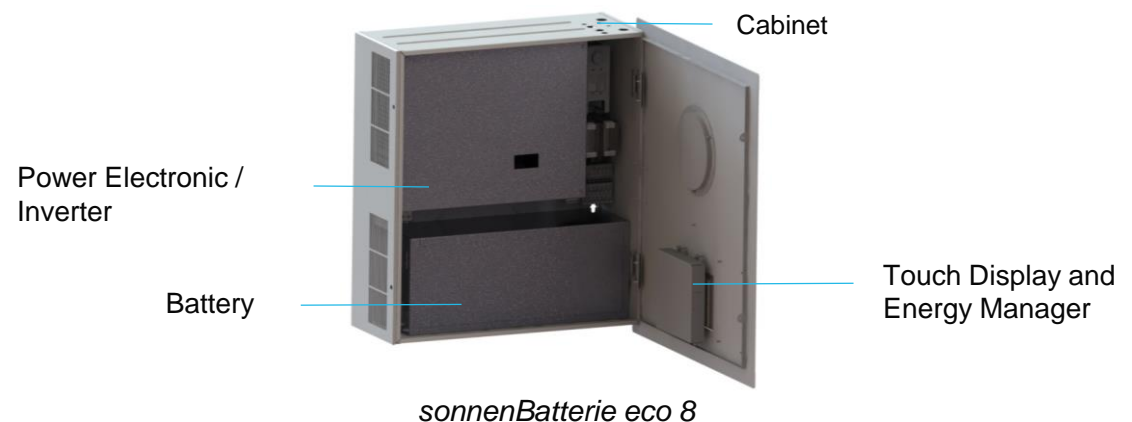


Remote control via mobile app,
tablet or laptop

SmartHome  **ready**®

Fully Integrated Storage System

- » Complete operable AC-system
- » Perfectly selected and synchronized components including Energy Management
- » Safe and reliable Lithium-Iron-Phosphate Battery (SONY) with unique Warranty of 10,000 cycles
- » Easy and cheap to install
- » sonnenBatterie is an approved system with thousands of installations since 2011



Safe and Reliable Technology

Multi-Level Safety Concept

- » Redundant safety shutdown of the battery system in case of overcharging/overvoltage
- » Safe and certified Lithium-Iron-Phosphate-Battery
- » Online monitoring of all relevant components (Voltage, Temperature)
- » Own battery test laboratory and quality management process
- » Certified and trained installers and partners
- » Professional 24/7 service

Certified Technology

- » Certificate of conformity for the new "Safety Guidelines for Li-Iron residential storage systems" of German Associations
- » sonnenBatterie eco is first storage system to fulfil new safety guidelines
- » Batteries checked by independent test institutes (e.g. ZSW)
- » Transport concept proofed by TÜV
- » sonnenBatterie eco with design approval

Partner



Residential Product Portfolio Europe/Australia



- » Basic cabinet with 2 kWh (eco 8.0) - can be wall-mounted
- » Extension cabinet for modular capacity up to 16 kWh (in 2 kWh steps) - Adding battery capacity at any time
- » 10,000 cycles @ 100% DOD
- » 10 year warranty

	eco 8/2	eco 8/4	eco 8/6	eco 8/8	eco 8/10	eco 8/12	eco 8/14	eco 8/16
Battery capacity in kWh	2,0	4,0	6,0	8,0	10,0	12,0	14,0	16,0
Battery technology	Lithium-Eisenphosphat							
Dimensions H/B/T in cm	70/64/22	184/64/22	184/64/22	184/64/22	184/64/22	184/64/22	184/64/22	184/64/22
Rated output inverter in W (charge and discharge)	1.500	2.500	3.000	3.300	3.300	3.300	3.300	3.300
Max. efficiency inverter	96 %							
Max. efficiency battery	98 %							

Residential Product Portfolio USA



- » Basic cabinet with 4 kWh (eco 4.0)
- » Extension cabinet for modular capacity up to 16 kWh - Adding battery capacity at any time
- » Back-Up + Off-Grid functionality included
- » 10,000 cycles @ 100% DOD
- » 10 year Warranty

	eco 4	eco 6	eco 8	eco 10	eco 12	eco 14	eco 16
Usable capacity (100% DOD)	4 kWh	6 kWh	8 kWh	10 kWh	12 kWh	14 kWh	16 kWh
Maximum storage power rating (at 25 deg C)	3kW	4kW	4kW	7kW	8 kW	8 kW	8 kW
Weight (approximate)	377 lbs.	437 lbs.	496 lbs.	622 lbs.	683 lbs.	741 lbs.	800 lbs.
Dimensions W"/H"/D" (approximate)	26/55/14				26/75/14		

Commercial Product Portfolio USA



- » 24-240 kWh (expandable in 24kWh increments)
- » Dimensions (h/w/d in cm, in)
- » Power unit: 71/140/64, 28/55/25
- » Battery unit (24kWh): 51/140/64, 20/55/25
- » Currently U.S. only, as regulatory environment has prevented development of commercial segment in Germany

sonnen is a Multiple Solution Provider

Ability to adress several use cases

Energy Management Hub for every Home

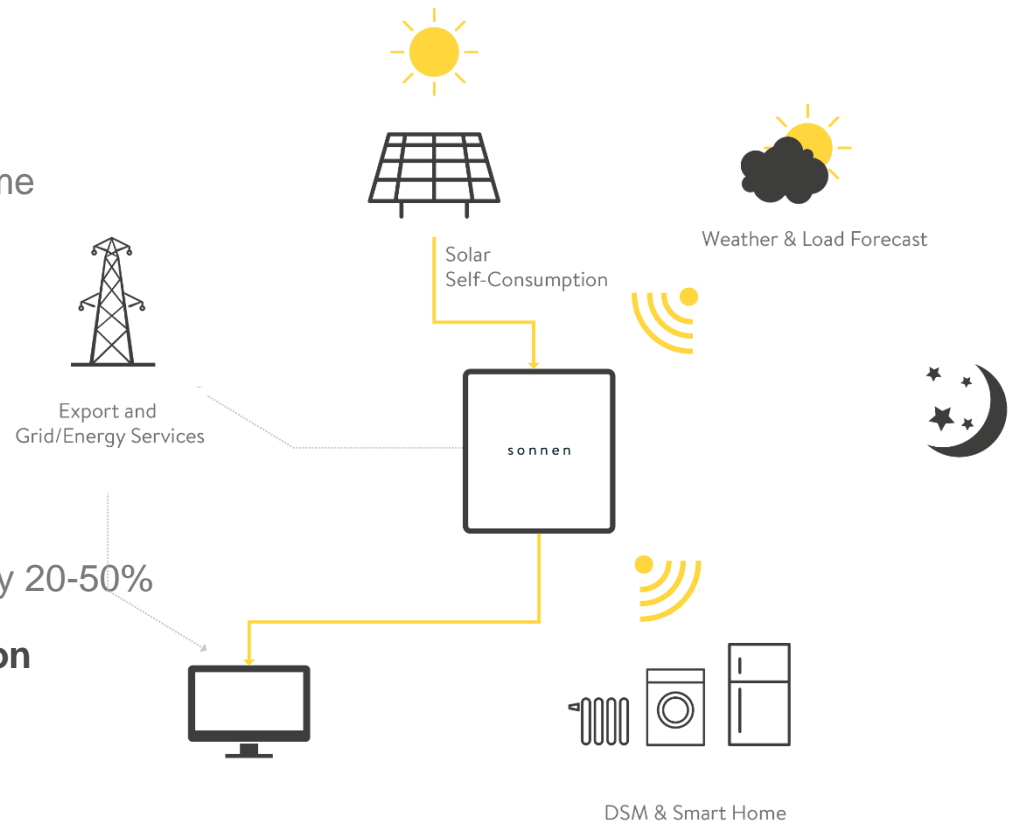
- » Solar day & night
- » Integration of Power and Heat
- » Demand-Side-Management and Smart Home
- » Tariff optimization (Time-of-Use Shifting)
- » Back-Up-Power
- » Data Monitoring and Analytics

Demand Charge Reduction

- » Intelligent Peak Shaving
- » Reduce commercial customers power bill by 20-50%

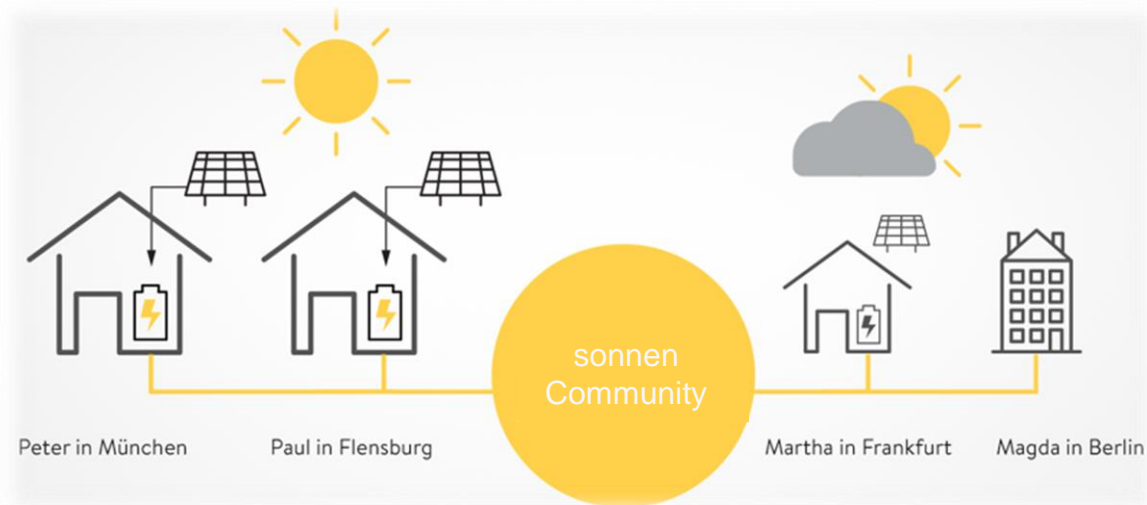
Grid Services and Energy Market Integration

- » Remote Control and VPP aggregation
- » Frequency Balancing Markets
- » Energy Trading / Arbitrage



sonnenCommunity Completes the Service Solution

sonnen starts the first of its kind decentralized Energy Sharing Community



- » Power Trading & Optimization by sonnen in the Community enables 100% independence of conventional utilities
- » Affordable and clean energy below market price
- » Attractive Technology features and services as add-on

sonnenCommunity Completes the Service Solution



- » Transparent Power Supply
- » Affordable and clean energy below market price
- » Opportunity to trade energy and achieve additional income / Savings

sonnen Market



2010

- Germany

2011

- Austria

2013

- Switzerland

2015

- Italy

2016

- USA
- UK
- Australia

2017+

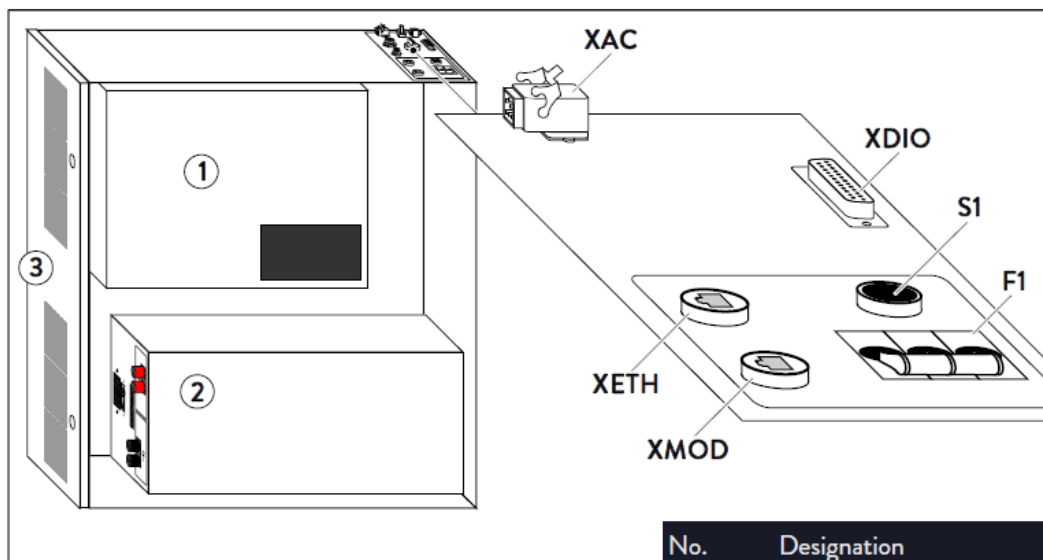
- Brazil, Mexico
- South Africa
- Rest of Europe
- Asia



sonnen Components

sonnenBatterie eco 8.0 – Single Phase

System Components



No.	Designation	Function
1	Battery inverter	Conversion of direct current into alternating current
2	Battery module	Storage of electrical power
3	Filter plate	Holder for filter pad
F1	fuse switch	On/off switch for storage system
XAC	AC supply connection	Connection to the public electrical mains
XDIO	Digital In- and Outputs	Interface to emit and receive digital signals
XETH	Ethernet port	Data connection to router for home network
XMOD	Modbus port	Data connection to power meter
S1	switch	Pressed during the switch-on procedure

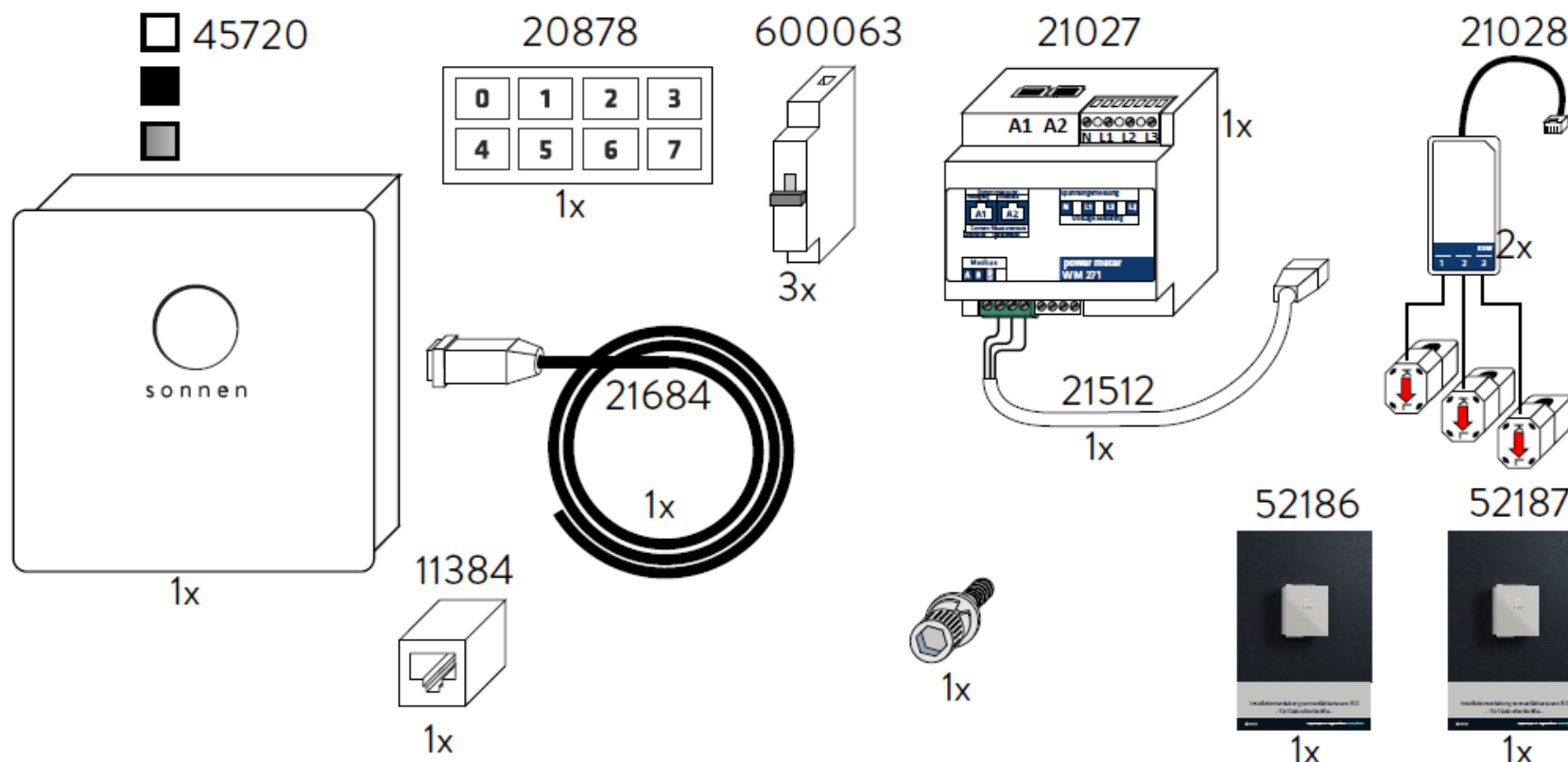
sonnenBatterie eco 8.0 – Single Phase

System Components



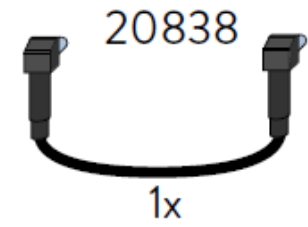
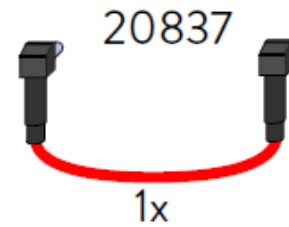
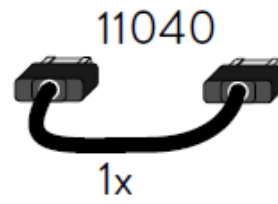
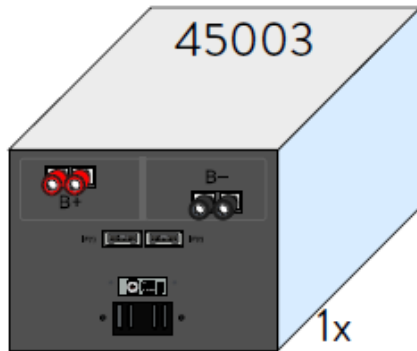
sonnenBatterie eco 8.0 – Single Phase

System Components – Main Cabinet



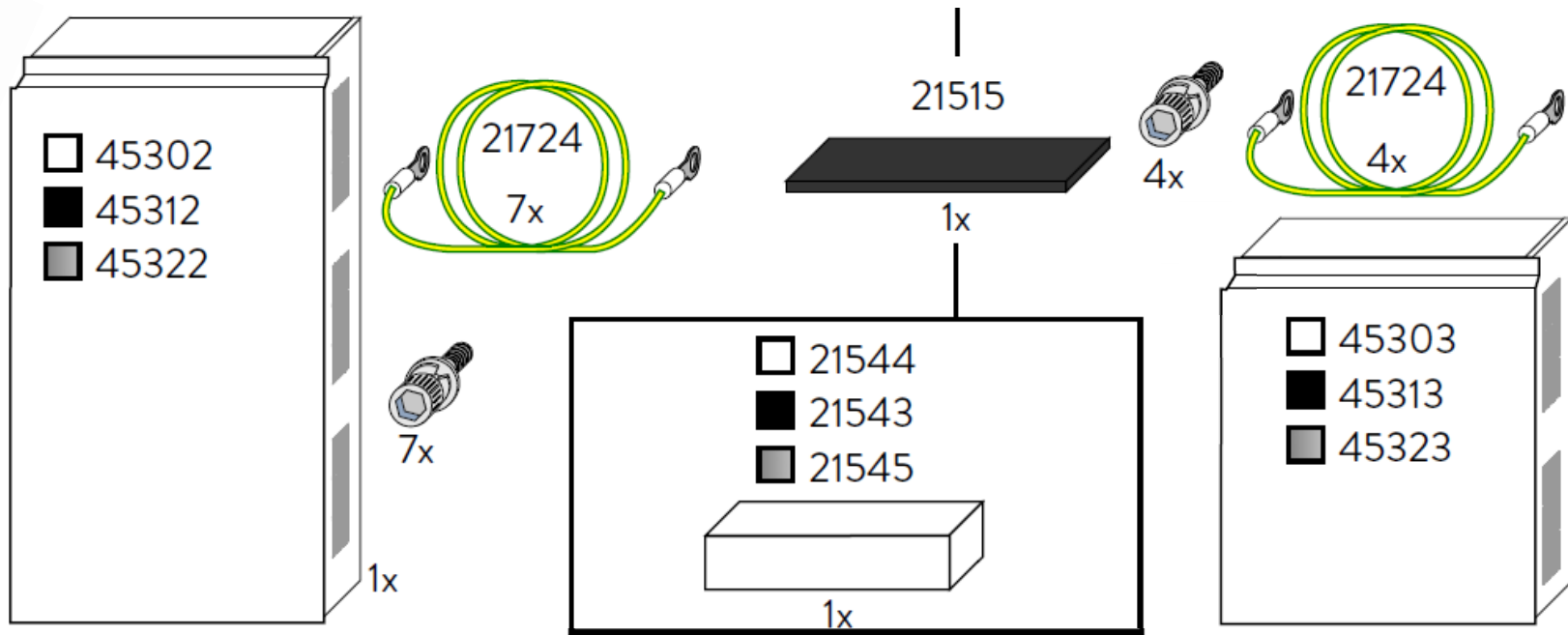
sonnenBatterie eco 8.0 – Single Phase

System Components – Battery Module



sonnenBatterie eco 8.0 – Single Phase

System Components Extension Cabinets & Pedestal



sonnenBatterie eco 8.0 – Single Phase

System Component Descriptions

11040	BMS communication line 30 cm
11082	Fuse plug
11384	RJ45 coupling
20837	DC line red
20838	DC line black
20878	Sticker numbering for battery modules
21027	Power meter
21028	KSW60-3 current transformer
21512	Modbus line
21515	Levelling mat
21543	Pedestal (color black)
21544	Pedestal (color white)
21545	Pedestal (color silver)
21684	AC cable

21724	Earth conductor
45003	Battery module
45302	Big extension cabinet (color white)
45312	Big extension cabinet (color black)
45322	Big extension cabinet (color silver)
45303	Small extension cabinet (color white)
45313	Small extension cabinet (color black)
45323	Small extension cabinet (color silver)
45720	Main cabinet (color white)
52186	Operating instructions
52187	Installation instructions
600063	B6 miniature circuit breaker



sonnen Installation

sonnenBatterie eco 8.2 – Single Phase

Technical Data

sonnenBatterie	eco 8.2/2	eco 8.2/4	eco 8.2/6	eco 8.2/8	eco 8.2/10	eco 8.2/12	eco 8.2/14	eco 8.2/16
System data (AC)								
Nominal voltage	230 V							
Nominal frequency	50 Hz							
Nominal power	1,500 W	2,000 W	2,500 W	2,500 W	2,500 W	2,500 W	2,500 W	2,500 W
Nominal current	6.5 A	8.7A	13.0 A	13.0 A	13.0 A	13.0 A	13.0 A	13.0 A
Mains connection	single-phase, L / N / PE							
Mains topology	TN / TT							
Mains connection fuse	miniature circuit breaker type B 16 A							
Battery data (DC)								
Cell technology	lithium iron phosphate (LiFePO ₄)							
Usable capacity	2.0 kWh	4.0 kWh	6.0 kWh	8.0 kWh	10 kWh	12 kWh	14 kWh	16 kWh
Nominal voltage	51.2 V							
Dimensions / weight with small extension cabinet (from 2 kWh up to 10 kWh)								
Dimensions (H/B/T) in cm	70/64/22	137/64 /22	137/64 /22	137/64 /22	137/64 /22	–	–	–
Weight in kg	53	88	115	142	169	–	–	–
Dimensions / weight with big extension cabinet (from 2 kWh up to 16 kWh)								
Dimensions (H/B/T) in cm	70/64/22	184/64 /22	184/64 /22	184/64 /22	184/64 /22	184/64 /22	184/64 /22	184/64 /22
Weight in kg	53	93	120	147	174	201	228	255

sonnenBatterie eco 8.2 – Single Phase

Technical Data

sonnenBatterie	eco 8.2/2	eco 8.2/4	eco 8.2/6	eco 8.2/8	eco 8.2/10	eco 8.2/12	eco 8.2/14	eco 8.2/16
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Power meter

Voltage measurement inputs	Nominal voltage (AC): 230 V (L-N), 400 V (L-L) max. connectible conductor cross-section: 1.5 mm ²							
Clamp-on current transformer	Max. measurable current: 60 A							

Safety

Protection class	I (PE conductor)							
Degree of protection	IP21							

Ambient conditions

Ambient temperature range	5°C ... 30°C							
Storage temperature range	0°C ... 40°C							
Transport temperature range	-15 °C ... 40°C							
Max. rel. humidity	90%							
Permissible installation altitude	2000 m above sea level							

Additional ambient conditions	<ul style="list-style-type: none"> • Installation room can be ventilated • Free from vibrations • Free from dust (especially flour dust or sawdust) • Free from corrosive and explosive gases (ammonia content max. 20 ppm) 							
	<ul style="list-style-type: none"> • No direct sunlight • Even floor, suitable for heavy loads • Free access to the installation location • The currently applicable building codes must be observed 							

sonnenBatterie eco 8.2 – Single Phase

Technical Data – Charge Rates

sonnenBatterie	eco 8.2/2	eco 8.2/4	eco 8.2/6	eco 8.2/8	eco 8.2/10	eco 8.2/12	eco 8.2/14	eco 8.2/16
90% Charge Duration (hrs)	1.5	1.5	2	2.5	3	3.5	4	4.5
Annual kWh's	2500	3300	4400	5500	6600	7700	8800	9900
Daily kWh's	6.85	9.04	12.05	15.07	18.08	21.10	24.11	27.12
Battery Capacity kW's	2	4	6	8	10	12	14	16
Nominal DC Battery Voltage	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2
Battery Ahr Capacity	39.1	78.1	117.2	156.3	195.3	234.4	273.4	312.5
90% Battery Ahr Capacity	35.2	70.3	105.5	140.6	175.8	210.9	246.1	281.3
DC Charging Rate (Amps)	23.4	46.9	52.7	56.3	58.6	60.3	61.5	62.5
Nominal AC Supply (Vac)	230	230	230	230	230	230	230	230
In AC Terms Battery Ahr Rate	8.7	17.4	26.1	34.8	43.5	52.2	60.9	69.6
AC Charge Rate (Amps)	5.8	11.6	13.0	13.9	14.5	14.9	15.2	15.5

sonnenBatterie eco 8.2 – Single Phase

Warnings



When carrying out electrical work on the storage system, the following must be observed:

- » Switch off the storage system.
- » Disconnect the relevant electrical circuits.
- » Secure against anyone switching on the device again.
- » Check that the device is disconnected from the power supply.
- » Only authorised electricians are permitted to carry out electrical work.

Touching components inside the storage system poses a danger to life due to electrocution.

- » Do not touch any components.
- » Do not remove any plastic covers.
- » Never reach below covers.

sonnenBatterie eco 8.2 – Single Phase

Warnings

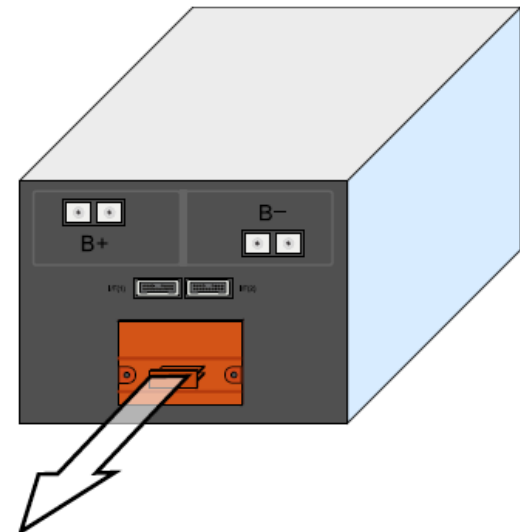


Risk of Burns:

- » Very high short-circuit currents are possible and the following must be observed when working with the battery modules:
- » The battery module is activated when the fuse connector is plugged in. The voltage runs between the plus and minus contacts of the battery module (nominal voltage of battery modules 51.2 V DC).
- » The battery module is deactivated when the fuse connector is unplugged. No voltage runs between the plus and minus contacts of the battery module. If all interconnected battery modules are deactivated, it is safe to work on a battery module.

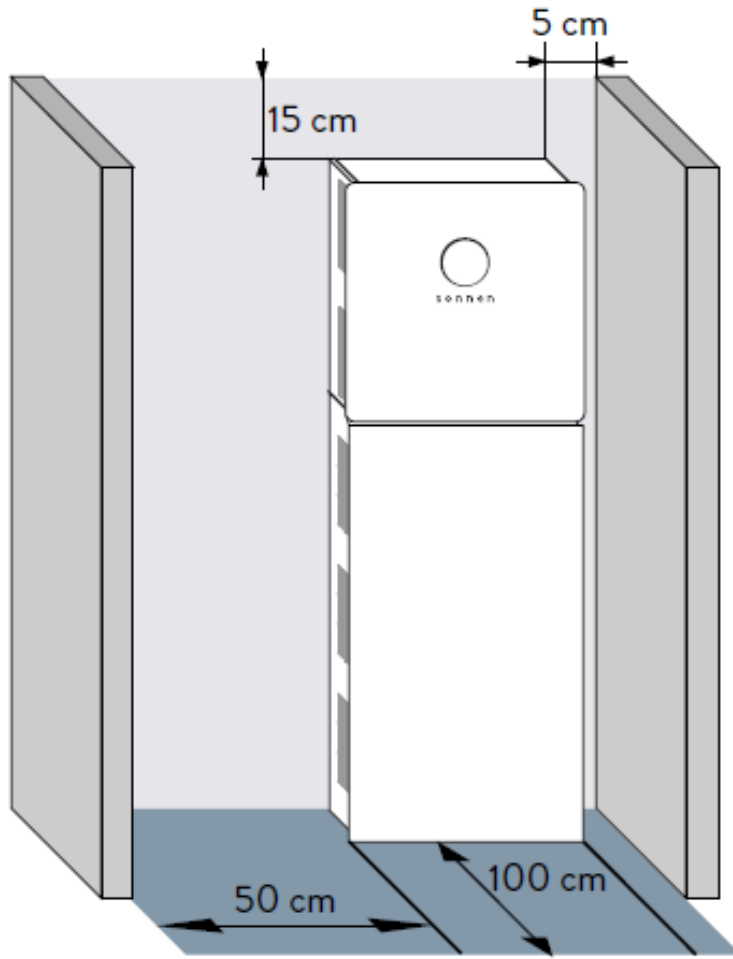
When working on the DC circuit:

- » Set aside metal jewellery.
- » Switch off the storage system.
- » Switch off the series fuse.
- » Fuse connectors on all battery modules ae supplied separately do not install until commissioning system.



sonnenBatterie eco 8.2 – Single Phase

Location Selection

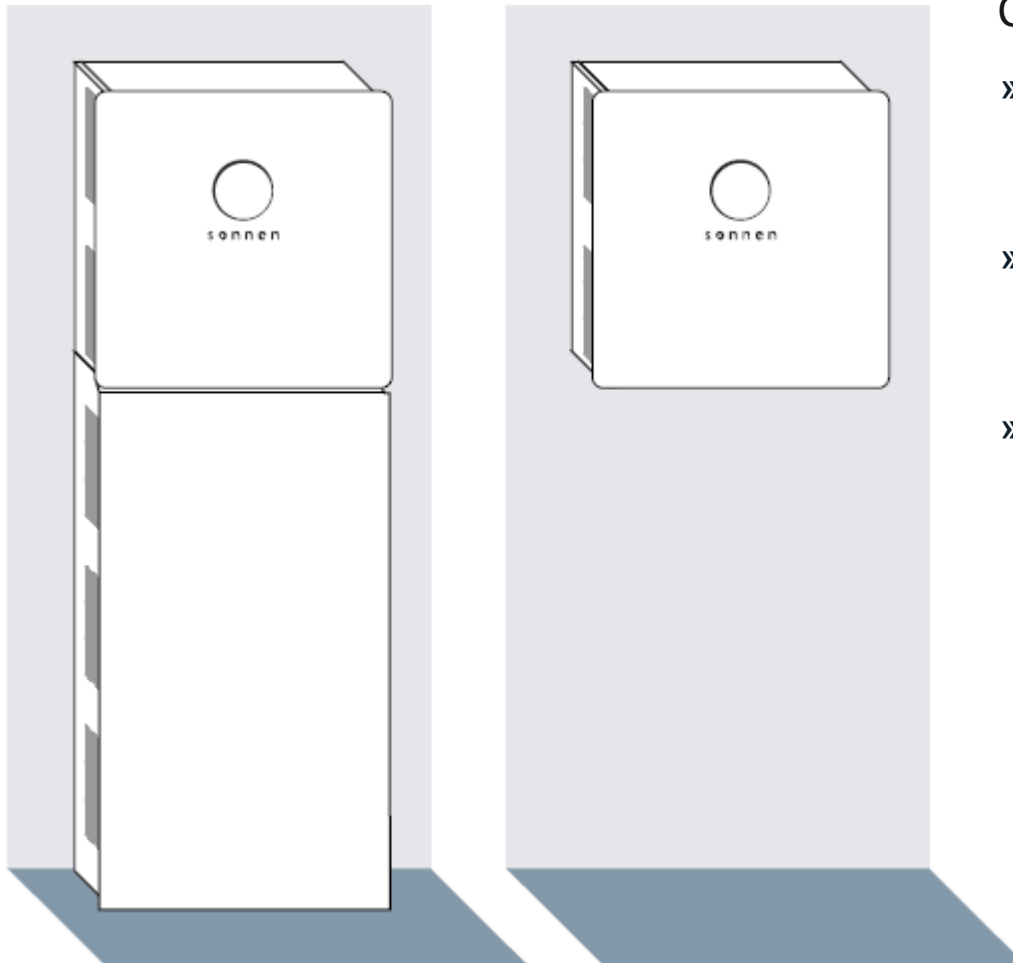


Observing minimum distances.

- » Observe the specified minimum distances to neighbouring objects.
- » The minimum distances ensure that:
 - » there is sufficient heat dissipation, the storage system door can be opened easily and
 - » there is sufficient space for maintenance work.

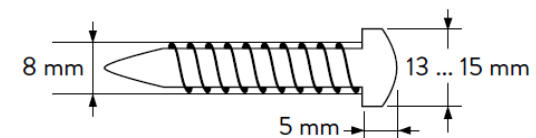
sonnenBatterie eco 8.2 – Single Phase

Location Selection



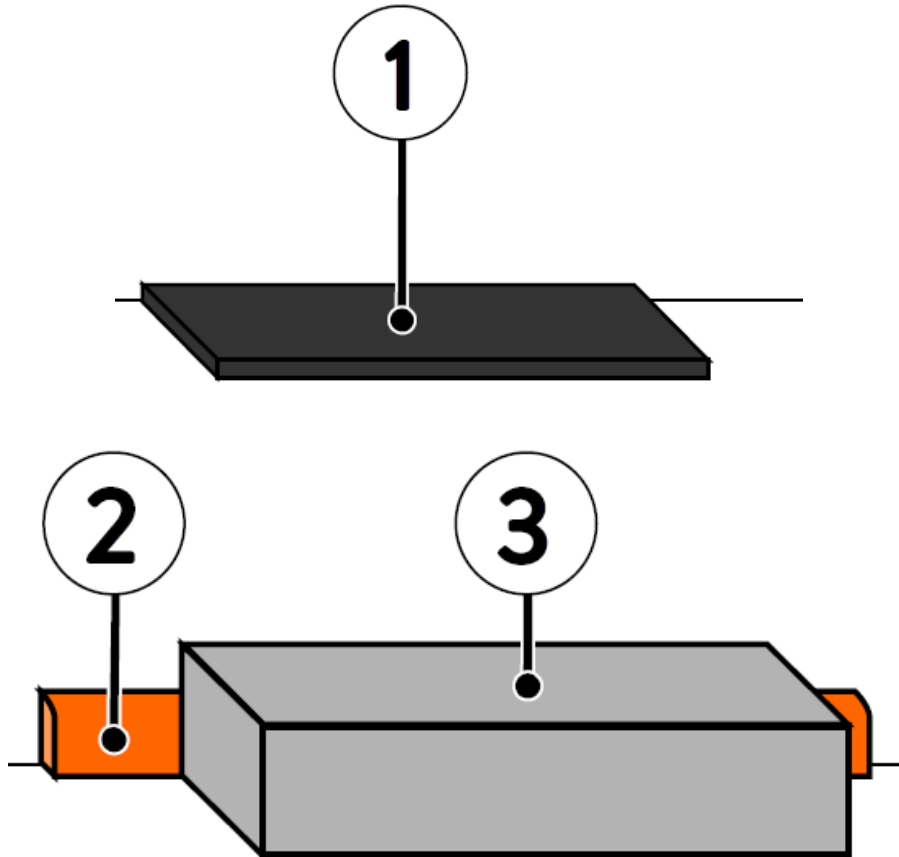
Component Options.

- » The storage system with the optional extension cabinet must be floor mounted.
- » A storage system without the optional extension cabinet must be mounted to the wall with screws.
- » Use only screws with the following properties:
 - » The diameter of the screw head (see figure) must be between 13 mm and 15 mm.
 - » The screw diameter must be 8 mm.
 - » The screw head must not exceed 5mm.



sonnenBatterie eco 8.2 – Single Phase

Levelling Mat or the Pedestal



The levelling mat (1) is part of the scope of delivery for the extension cabinet. It is used to compensate uneven floors.

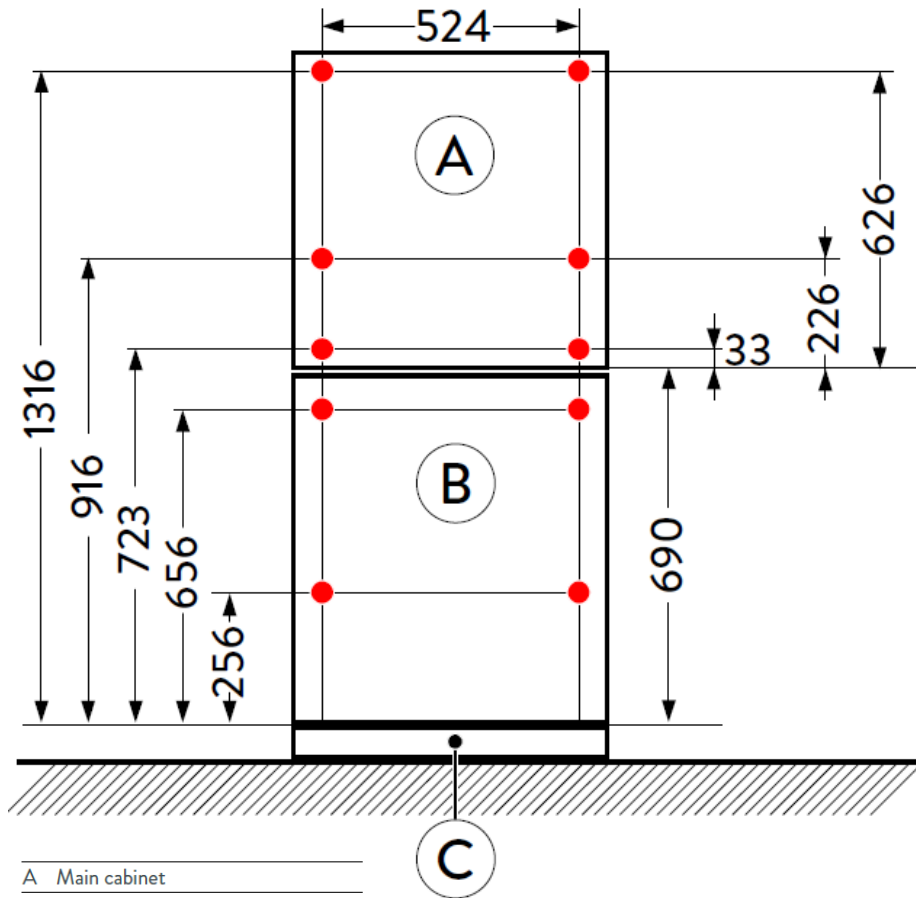
Alternatively the extension cabinet can be placed on an optional pedestal (3) instead of the levelling mat.

This is helpful if the extension cabinet doesn't meet flush with the wall (e.g. because a skirting board is mounted)..

» Place the levelling mat or the pedestal at the preferred installation location.

sonnenBatterie eco 8.2 – Single Phase

Setting Out Main Cabinet Plus Small Extension Cabinet (up to 10 kWh)



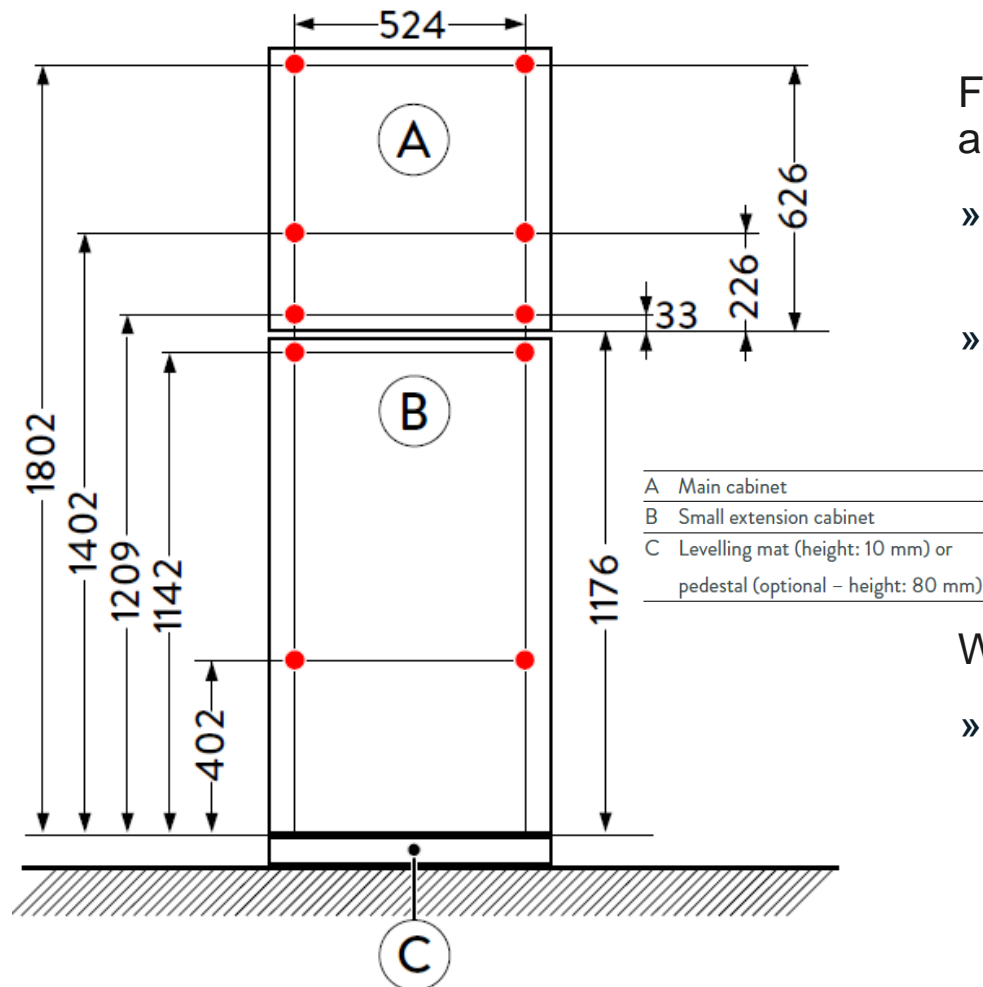
For storage systems consisting of main and small extension cabinet:

- » Drill the holes shown in red in figure on the left.
- » Note that the storage system must be placed on the levelling mat or the pedestal (C).

- A Main cabinet
- B Small extension cabinet
- C Levelling mat (height: 10 mm) or pedestal (optional – height: 80 mm)

sonnenBatterie eco 8.2 – Single Phase

Setting Out Main Cabinet Plus Big Extension Cabinet (up to 16 kWh)



For storage systems consisting of main and small extension cabinet:

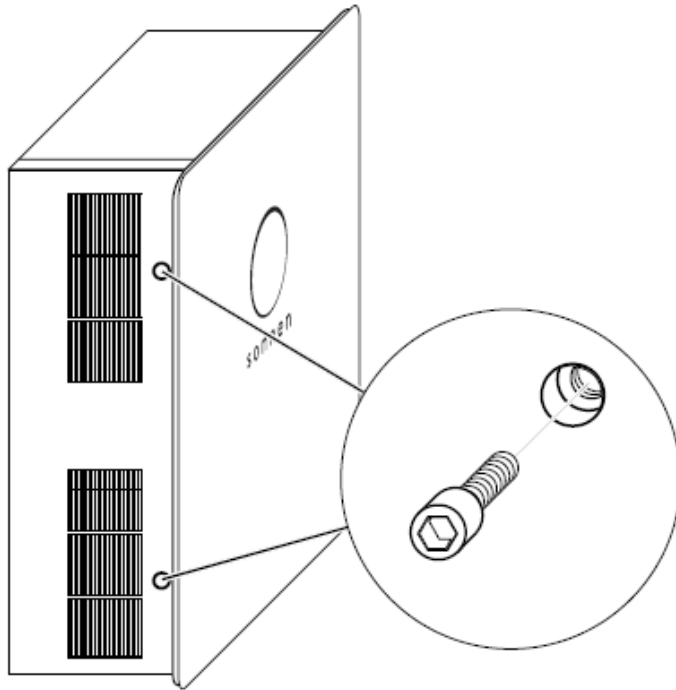
- » Drill the holes shown in red in figure on the left.
- » Note that the storage system must be placed on the levelling mat or the pedestal (C).

Without extension cabinet:

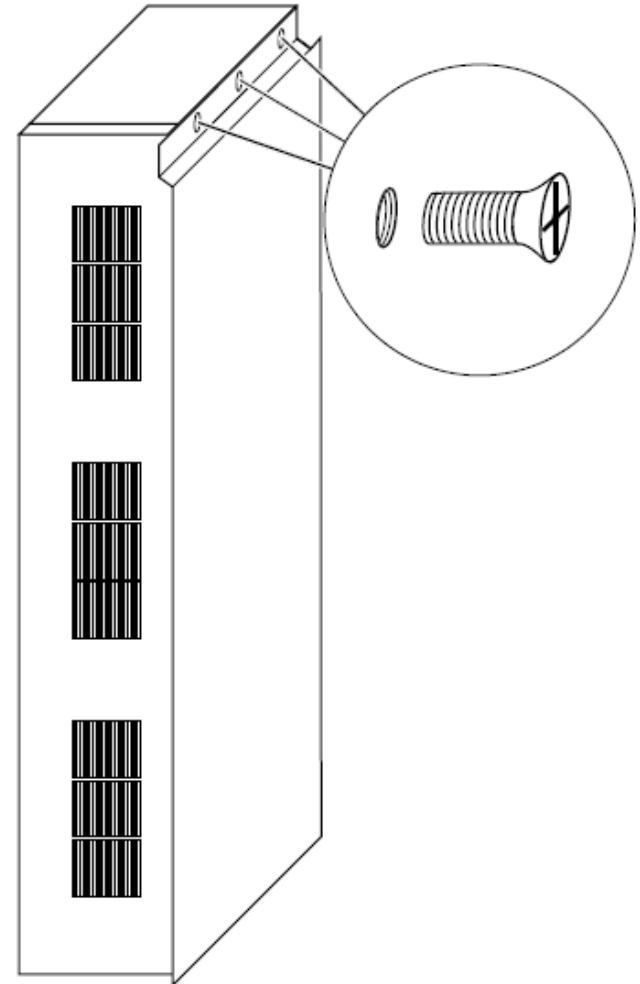
- » If the storage system is used without extension cabinet it is a good idea to observe the dimensions provided in one of the two figures. That way no new holes need to be drilled if the storage system is extended at a later time.

sonnenBatterie eco 8.2 – Single Phase

Opening the Main Cabinet Doors & Extension Housing Cover

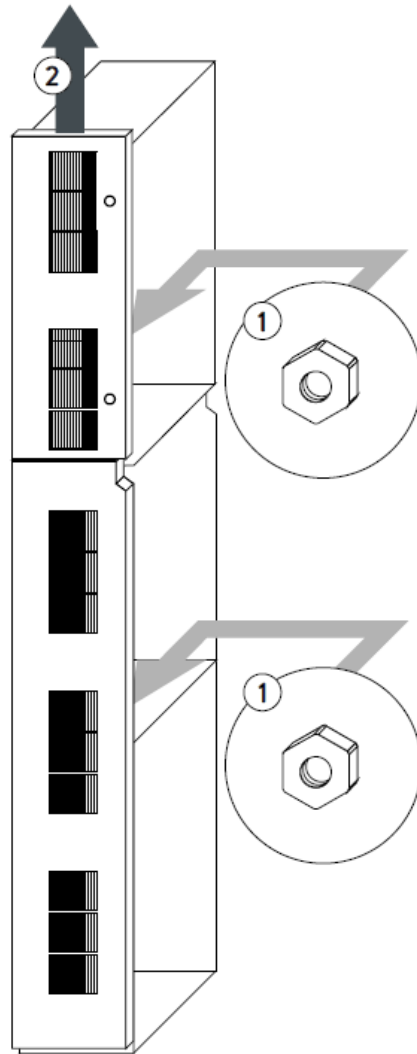


- » Remove the two Allen screws on the left hand side of the main cabinet, the three screws on the extension housing.
- » The main cabinet door can then be opened, the extension housing cover slides up.



sonnenBatterie eco 8.2 – Single Phase

Removing the Filter Plates



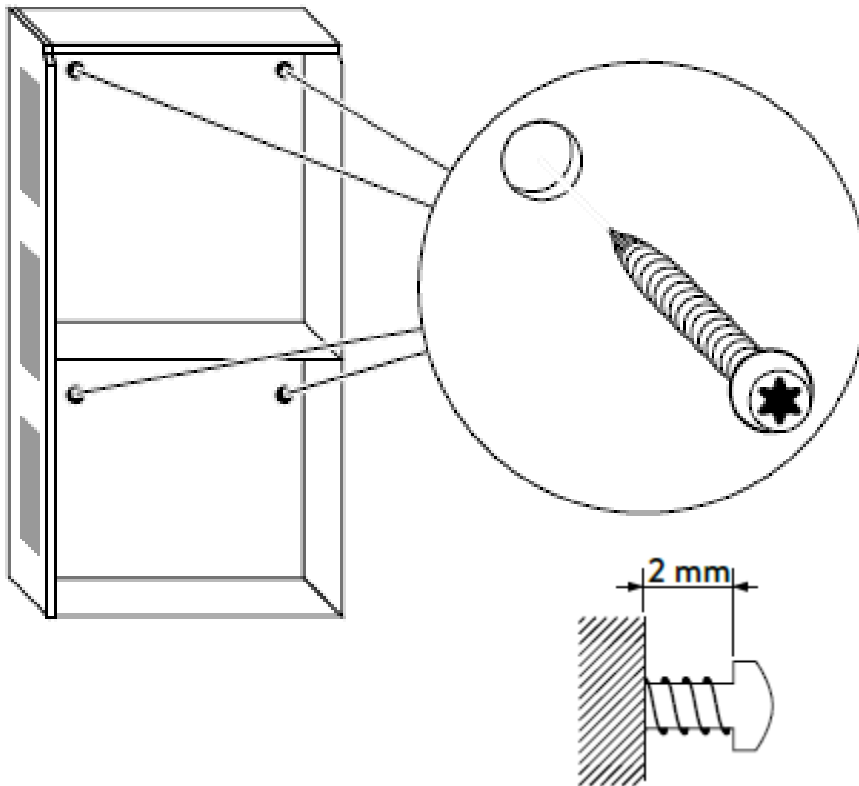
The filter plates of the main and optional extension cabinet can be removed.

Removing them makes it easier to install the battery modules later.

- » Remove the nuts (1) inside the main and extension cabinet.
- » Slide the covers up (2) and take off the cover and place it to the side..

sonnenBatterie eco 8.2 – Single Phase

Mounting the Extension Housing



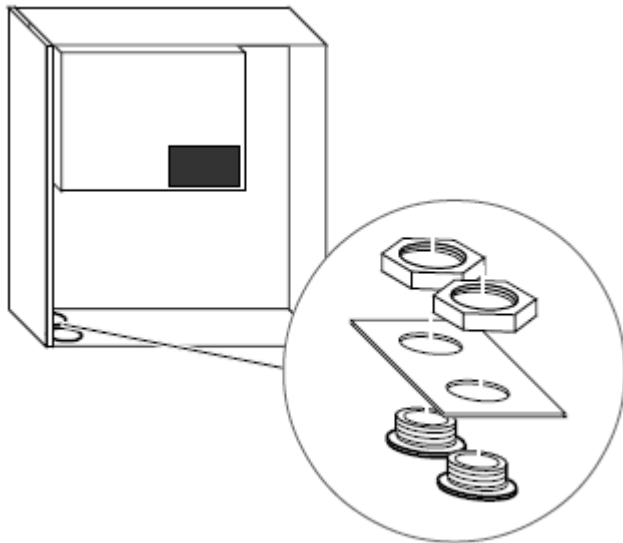
There are keyhole attachments on the rear of the main cabinet.

The main cabinet is mounted using these attachments..

- » The screw should not be completely screwed in.
- » The screw head should protrude from the wall by approx. 2 mm

sonnenBatterie eco 8.2 – Single Phase

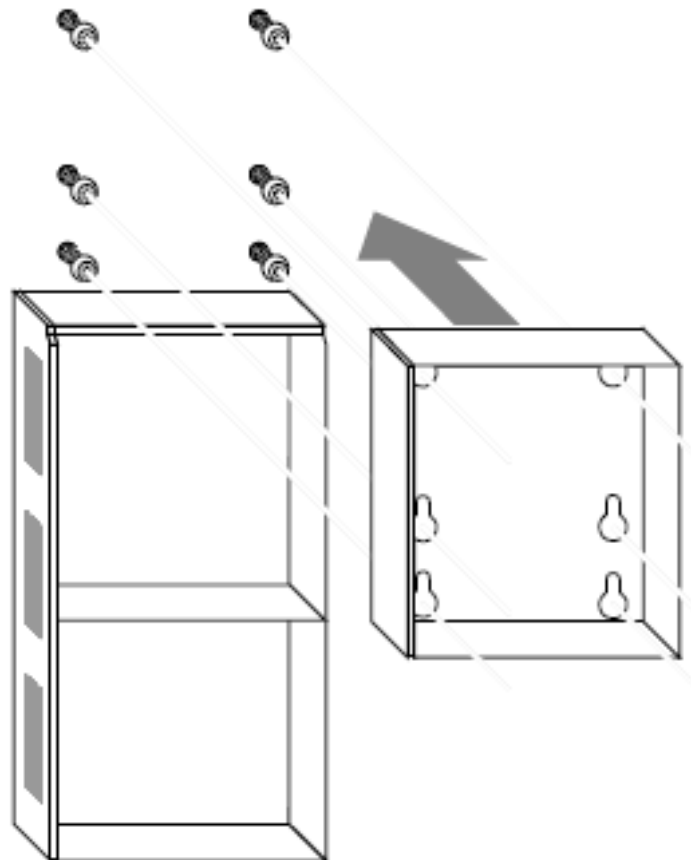
Mounting the Main Cabinet



Remove the blind caps.

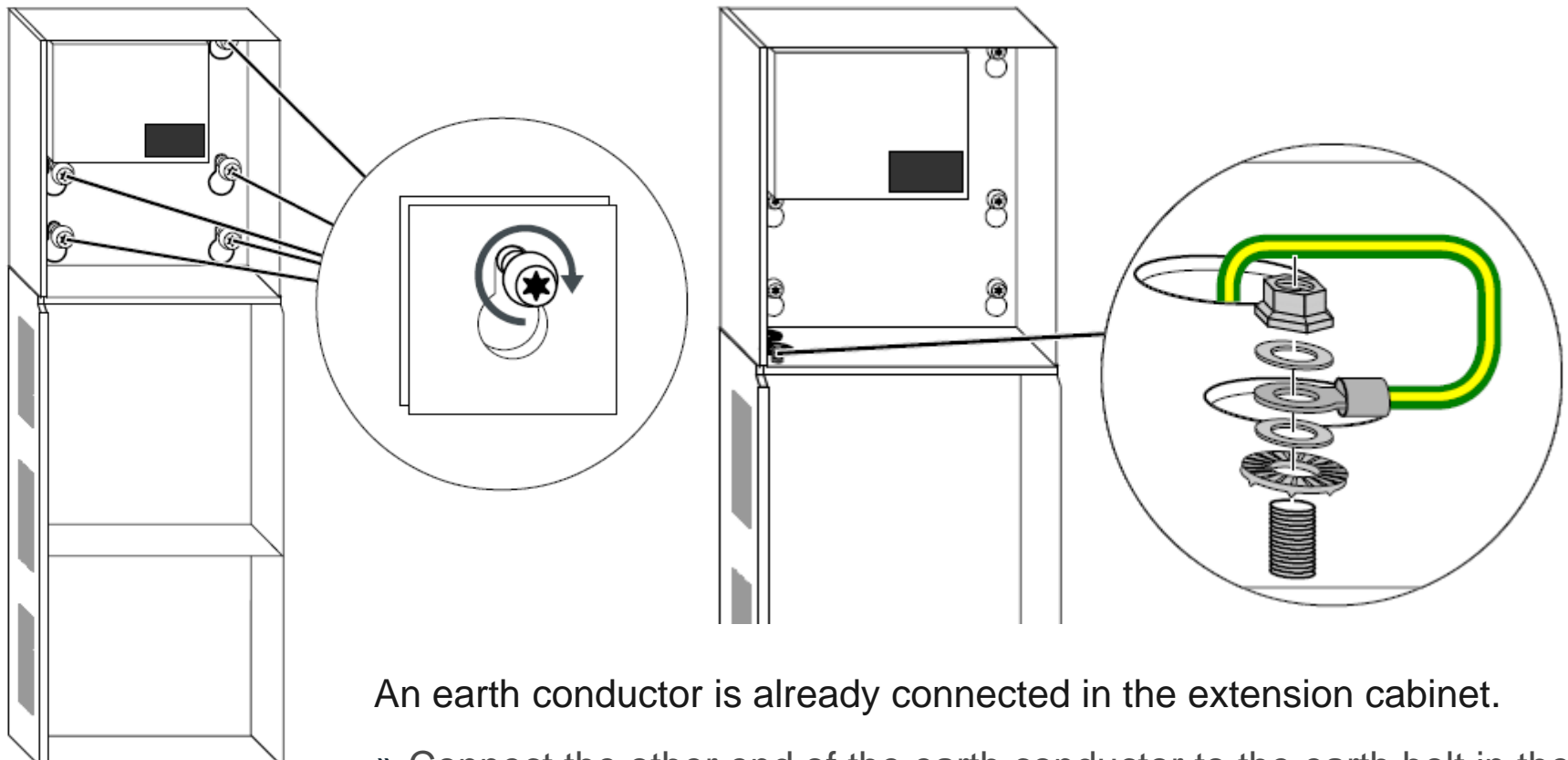
The blind caps are located at the bottom of the main cabinet.

Hang the main cabinet on the previously mounted screws.



sonnenBatterie eco 8.2 – Single Phase

Mounting the Main Cabinet

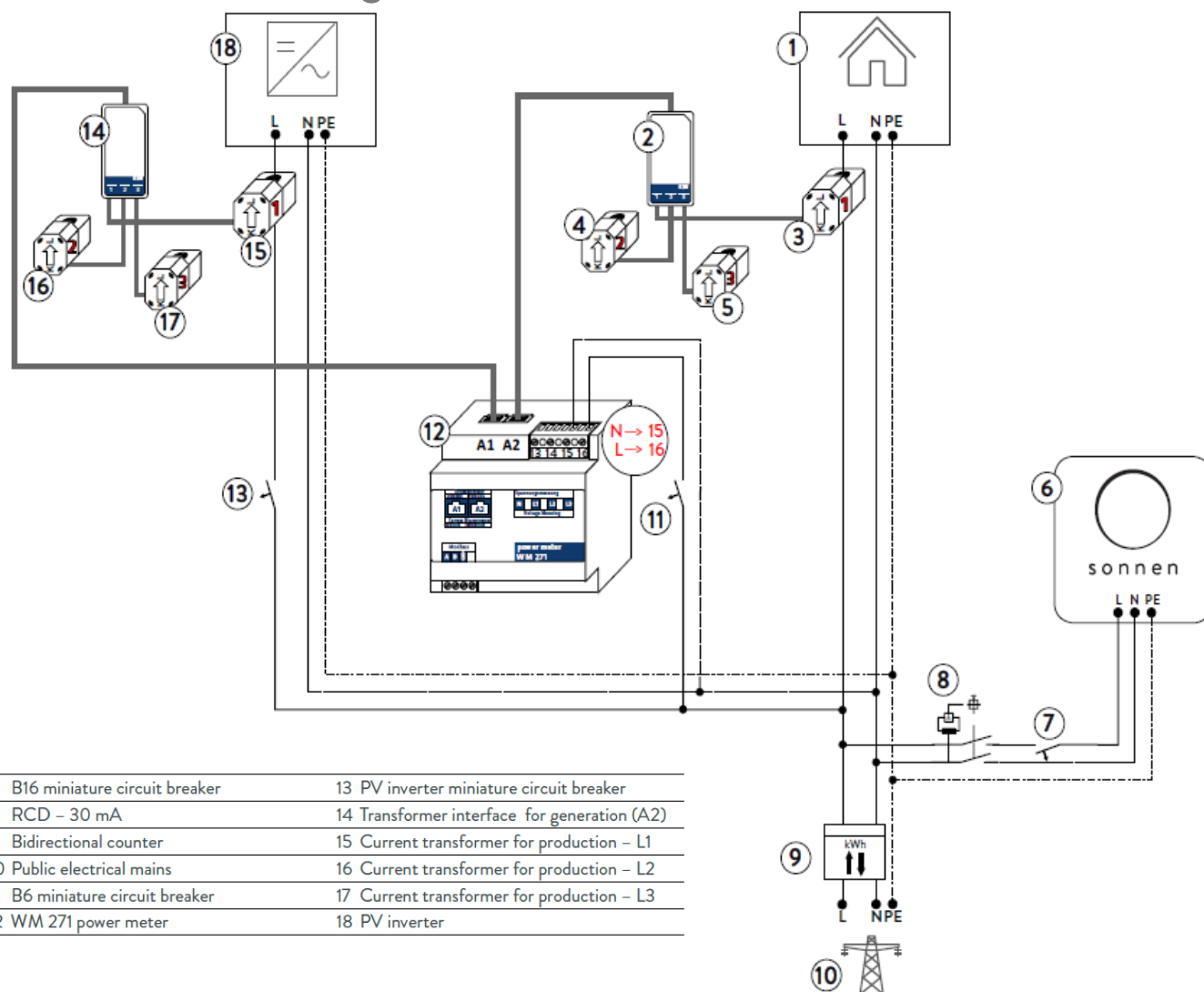


An earth conductor is already connected in the extension cabinet.

- » Connect the other end of the earth conductor to the earth bolt in the main cabinet.

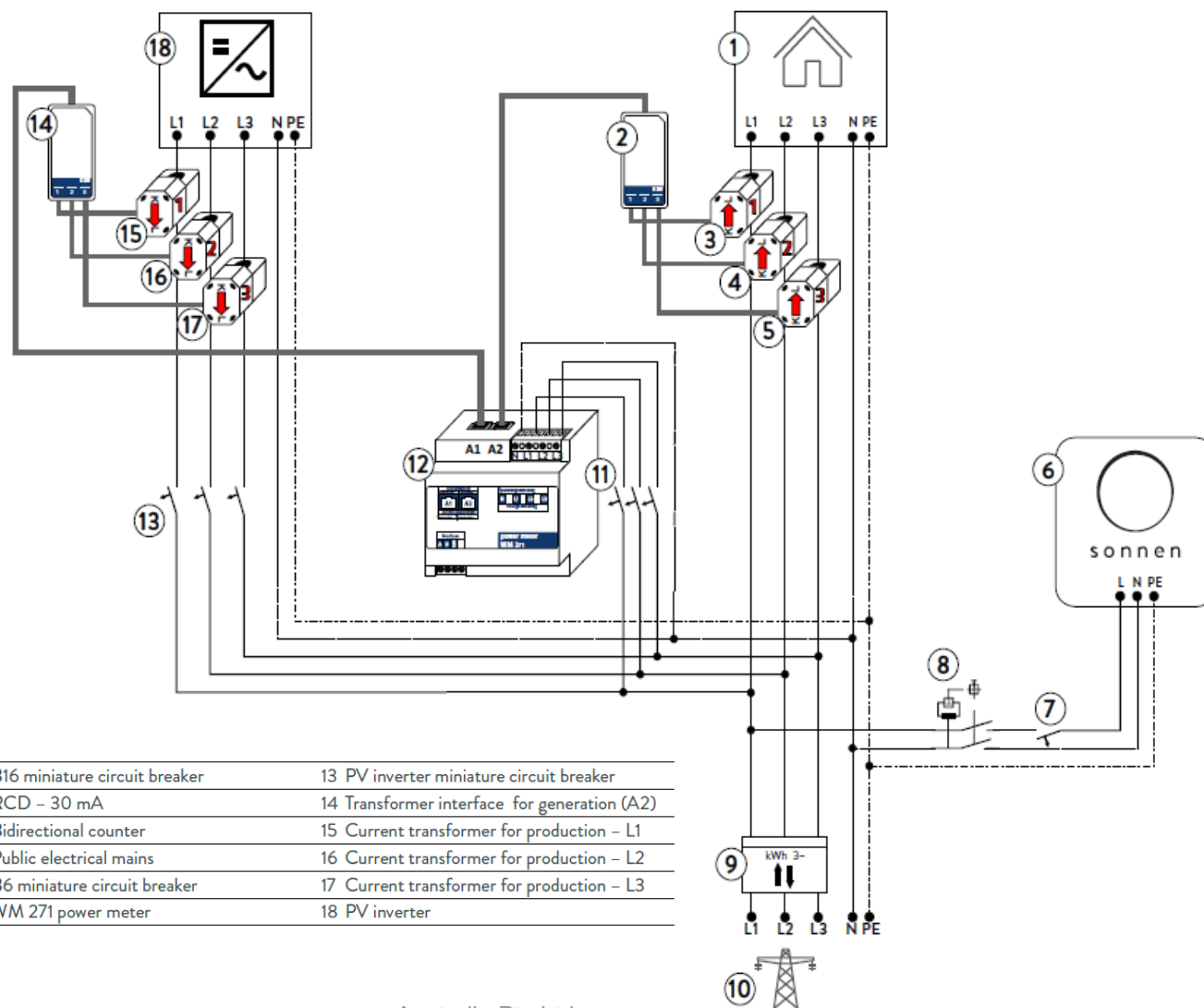
sonnenBatterie eco 8.2 – Single Phase

Electrical Connections - Metering



sonnenBatterie eco 8.2 – Three Phase

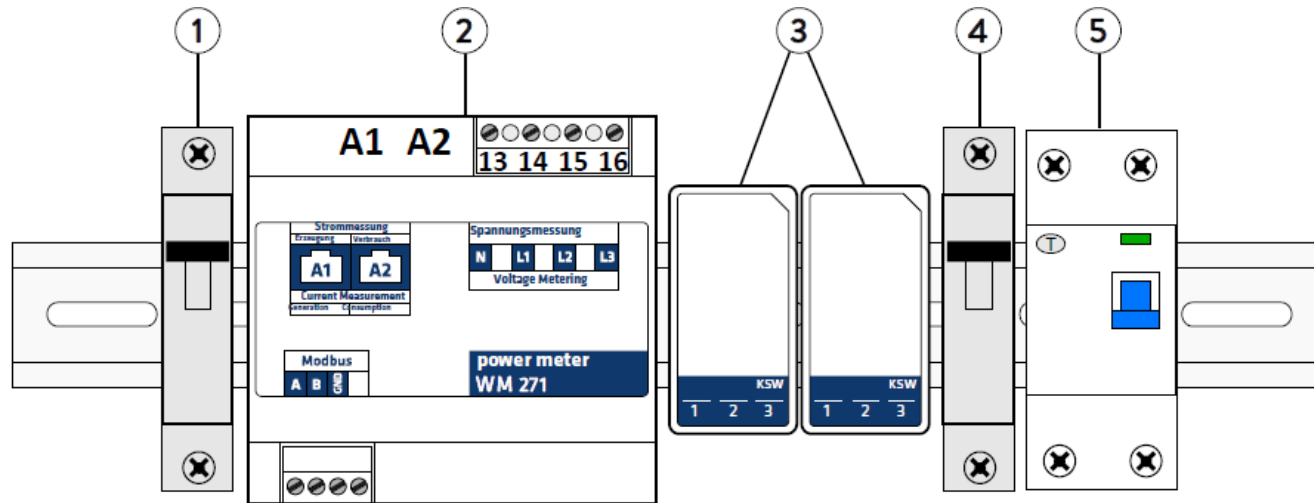
Electrical Connections - Metering



1 Consumers in building	7 B16 miniature circuit breaker	13 PV inverter miniature circuit breaker
2 Transformer interface for consumption (A2)	8 RCD – 30 mA	14 Transformer interface for generation (A2)
3 Current transformer for consumption – L1	9 Bidirectional counter	15 Current transformer for production – L1
4 Current transformer for consumption – L2	10 Public electrical mains	16 Current transformer for production – L2
5 Current transformer for consumption – L3	11 B6 miniature circuit breaker	17 Current transformer for production – L3
6 Storage system	12 WM 271 power meter	18 PV inverter

sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Meter Board Components

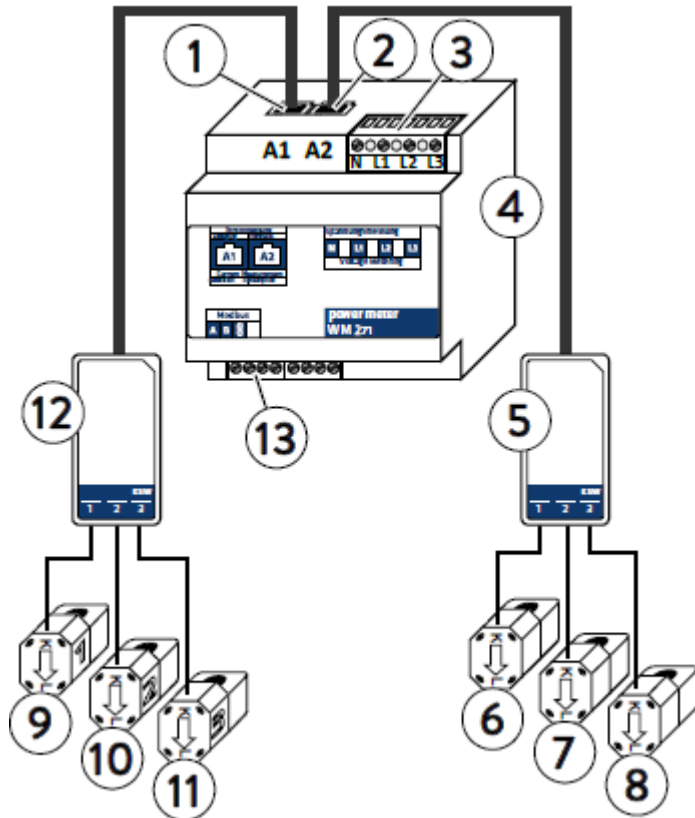


Approx. 25 cm of free space on a mounting rail is required for placing the components.

- » The miniature circuit breaker (1) protects the connection line to the storage system.
- » The power meter (2) and the transformer interfaces (3) are used to measure the consumption and generation of power in the building.
- » The miniature circuit breaker (4) protects the line that is connected to the input for measuring the voltage of the power meter (2).
- » The RCD (5) protects against high touch voltage in the event of a fault.

sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Power Meter



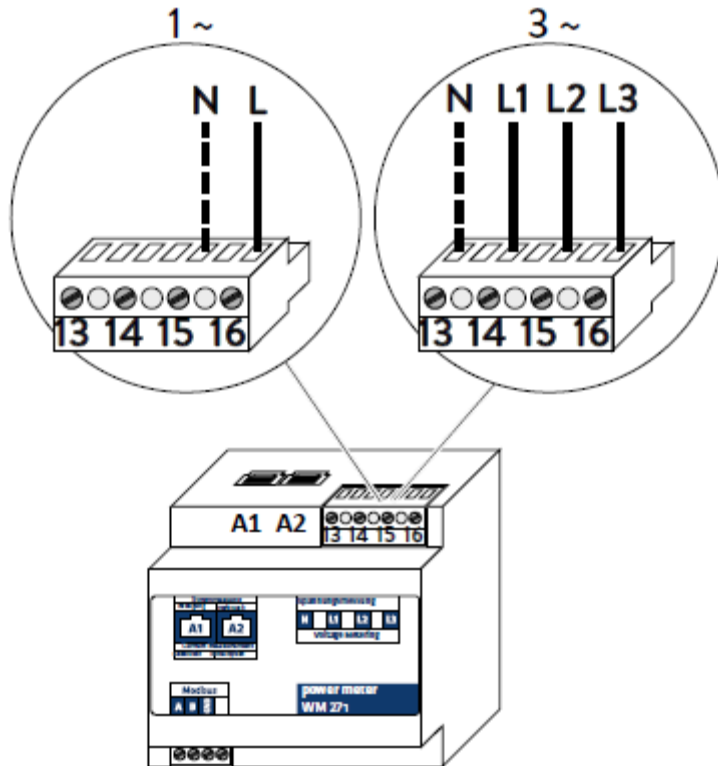
The following points must be observed when connecting the power meters:

» The lines connected to the voltage measurement terminal strip (3) must be protected by the supplied miniature circuit breakers (B6). The supplied miniature circuit breakers do not have to be installed if the lines are already protected by existing circuit breakers.

- 1 A1 – input for generation
- 2 A2 – input for consumption
- 3 Voltage measurement terminal strip
- 4 Power meter
- 5 Transformer interface for consumption
- 6, 7, 8 Clamp-on current transformer for consumption – L1, L2, L3
- 9, 10, 11 Clamp-on current transformer for generation – L1, L2, L3
- 12 Transformer interface for generation
- 13 Modbus terminal strip

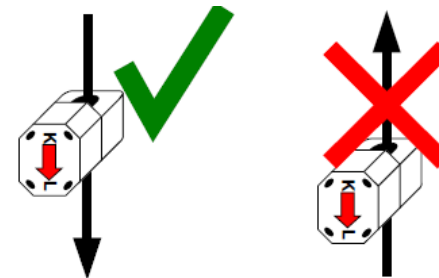
sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Power Meter



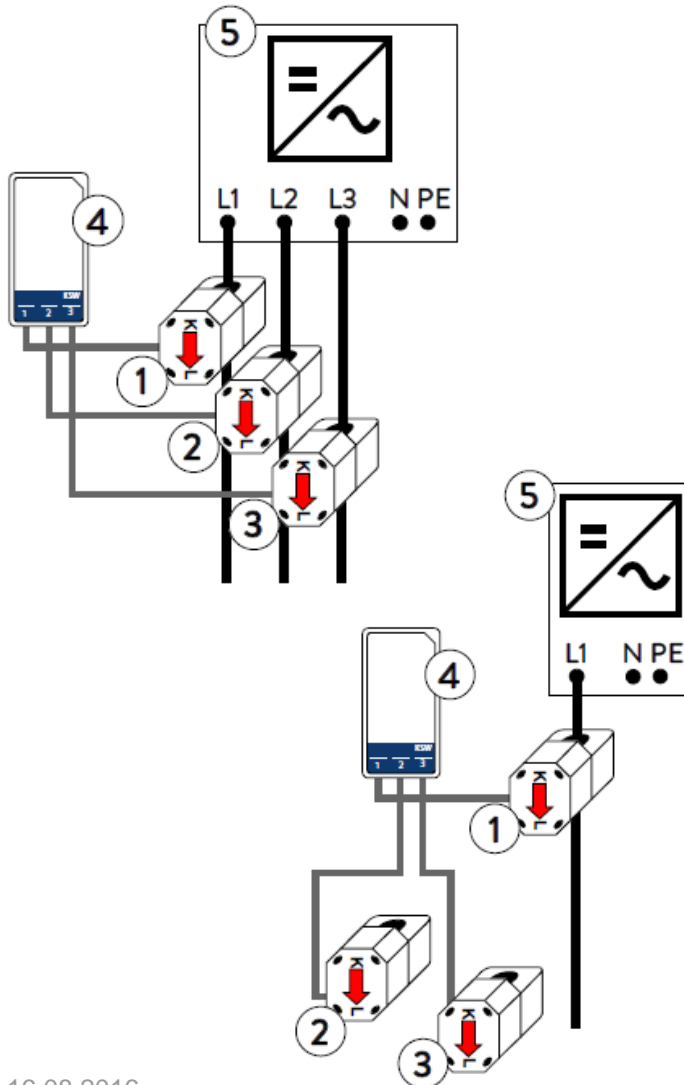
The connection to the voltage terminal strip depends on the number of phases.

- » In the case of a single-phase (1~) mains, the voltage terminal strip must be wired like it is shown on the left part of the figure. In case of a three phase (3~) mains wire as shown on the right part of the figure .
- » The clamp-on current transformers are clamped across the affected lines.
- » The energy flow direction of the clamp-on current transformer must be observed.
- » The energy flow in the line must run from K to L.



sonnenBatterie eco 8.2 – Single Phase

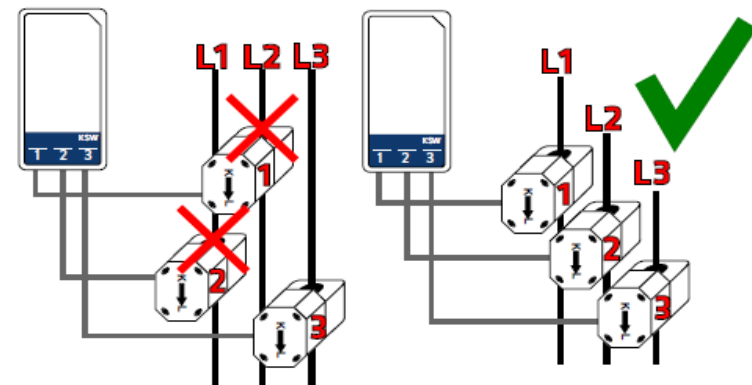
Electrical Connections – Power Meter – PV Inverter Output



In the case of a one-phase PV inverter or a single-phase mains, only the clamp-on current transformer for the phase in question is connected. The other two clamp-on current transformers must not be connected.

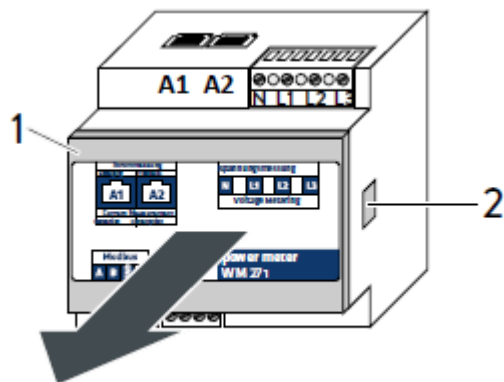
Do not confuse the phases.

Power measurement only works if the current and voltage of the same phase are measured.



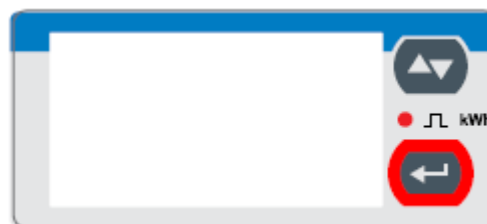
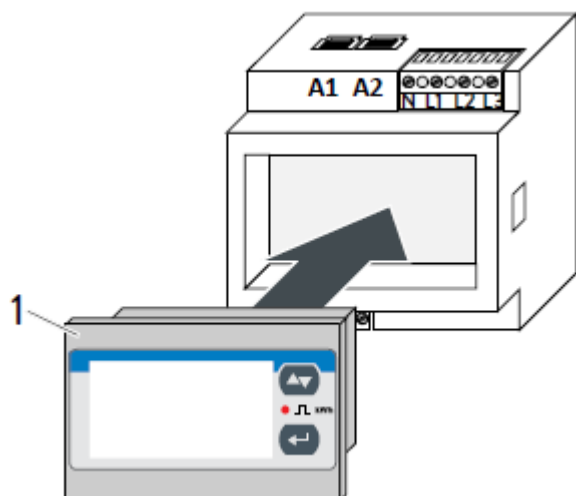
sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Power Meter – Programming



Remove rotate and replace the touch display.

- » Supply the power meter with energy.
- » Press for a longer period of time until the password entry screen appears.
- » Follow the instructions in the manual provided for the six stages to setup the meter



sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Connection Panel

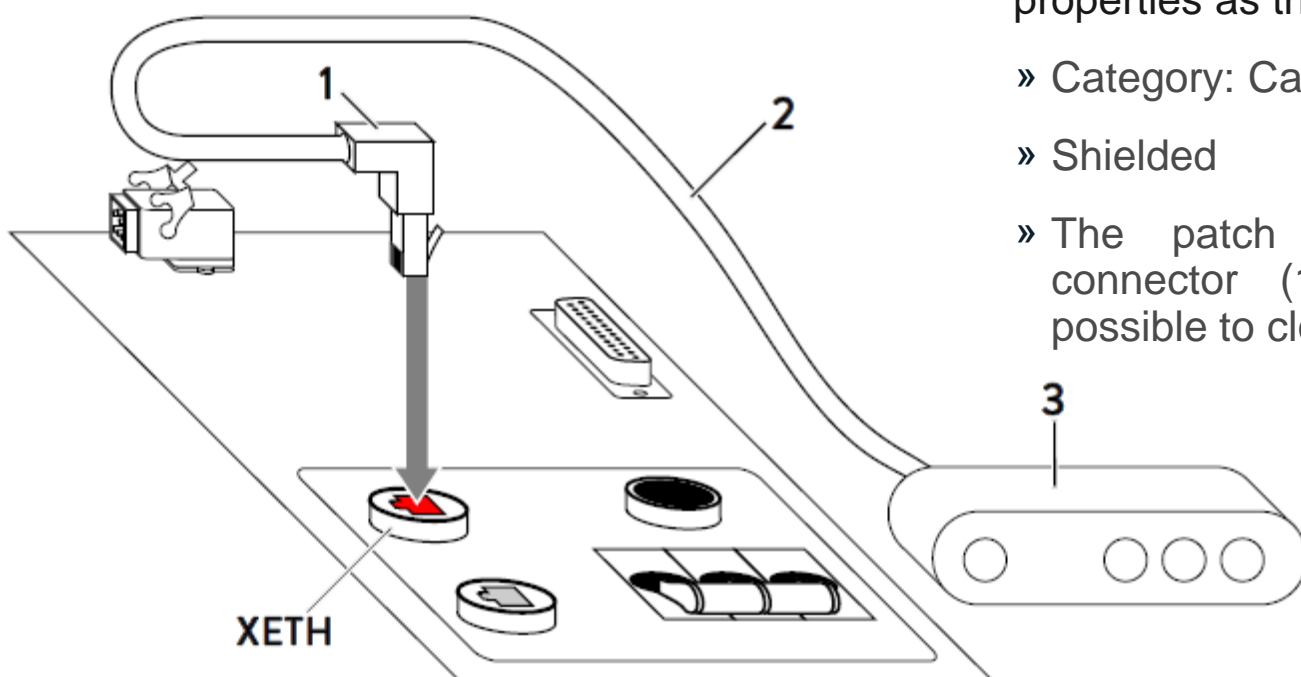


sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Ethernet Connection

Use a patch cable with the following properties as the Ethernet line:

- » Category: Cat 5 e
- » Shielded
- » The patch cable has an angled connector (1). Otherwise it is not possible to close the cover.

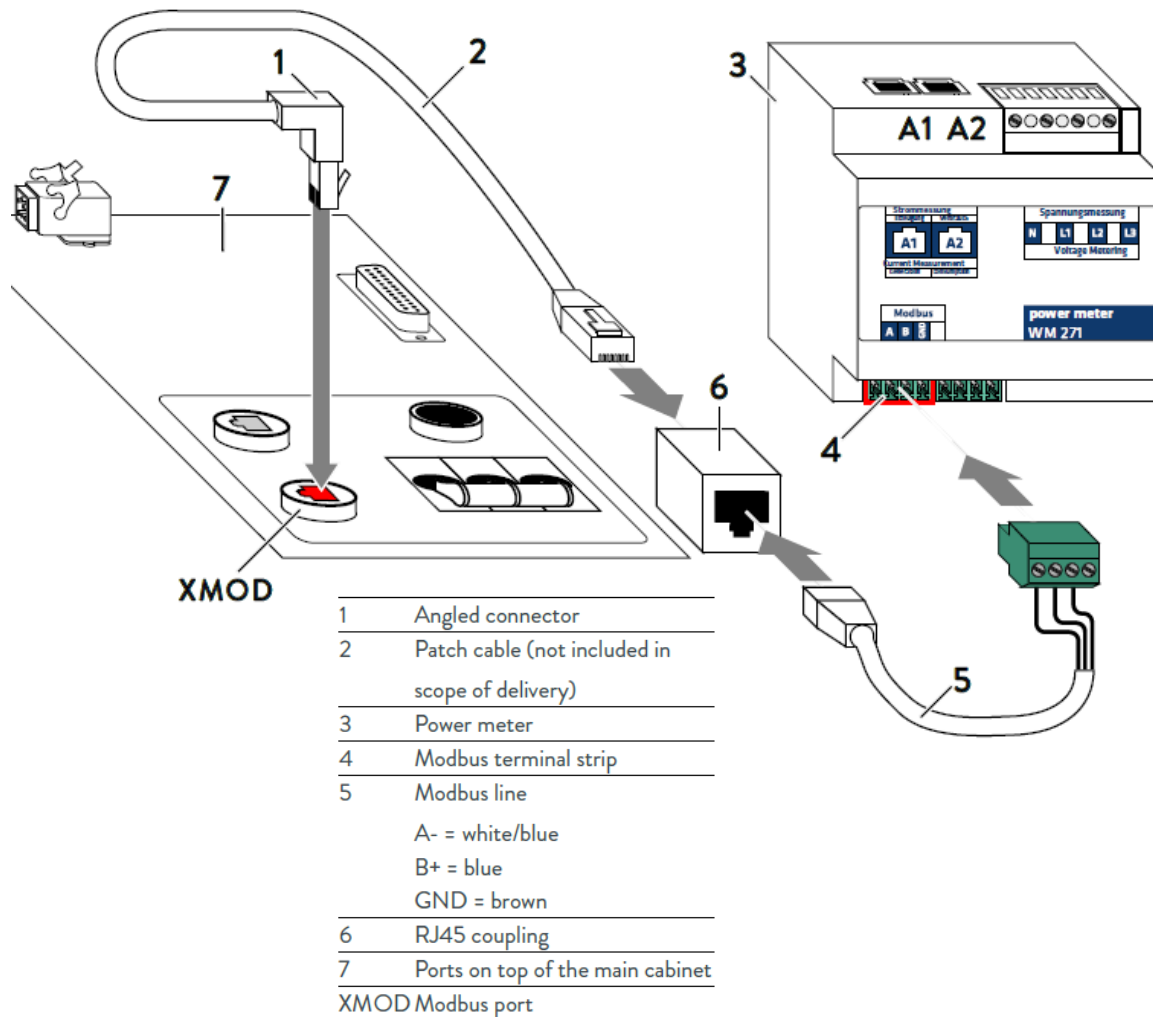


- | | |
|------|---|
| 1 | Angled connector |
| 2 | Patch cable (not included in scope of delivery) |
| 3 | Router of the home network |
| XETH | Ethernet port |

- » The storage system automatically establishes the connection to the internet once the Ethernet line has been correctly connected.

sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Modbus Line

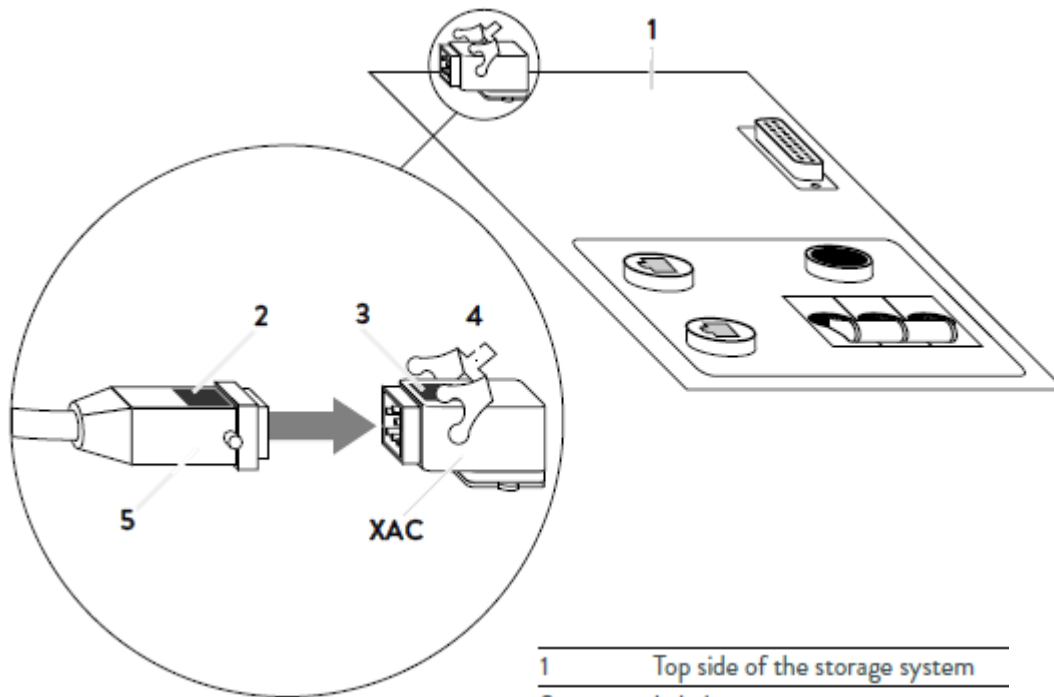


Measurement data is transmitted from the power meter to the storage system using the Modbus line:

- » Category: Cat 5 e
- » Shielded
- » The patch cable has an angled connector (1). Otherwise it is not possible to close the cover.
- » Connect the patch cable (1) as shown in the following figure.

sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Main AC Connection



1	Top side of the storage system
2	Label
3	Label
4	Locking device
5	Plug of the AC line
XAC	AC supply connection

The following points must be observed when carrying out electrical work on the storage system or on the electrical supply:

- » Switch off the storage system.
- » Disconnect the relevant electrical circuits.
- » Secure against anyone switching on the device again.
- » Check that the device is disconnected from the power supply.
- » Only authorised electricians are permitted to carry out electrical work..

sonnenBatterie eco 8.2 – Single Phase

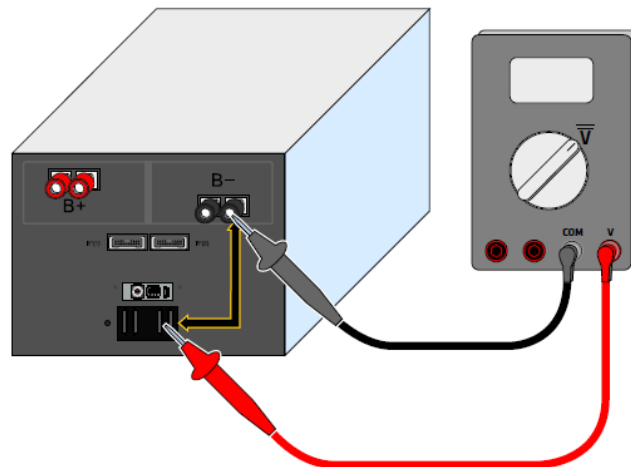
Electrical Connections – Battery Modules



Before working on the battery modules remove the battery fuse connector.

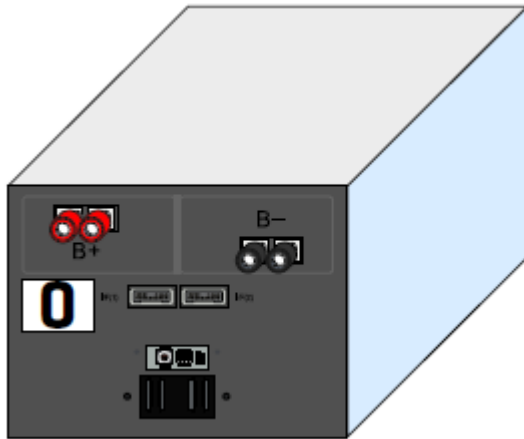
Differing battery module voltages lead to high compensating currents when the storage system is switched on.

- » Measure the voltages between the internal plus and minus poles of all battery modules (see figure below) and note these down.
- » The battery modules are only allowed to be installed if the maximum deviation between the measured voltages is less than 1 V.
- » If the deviation is greater than 1 V notify the service team.



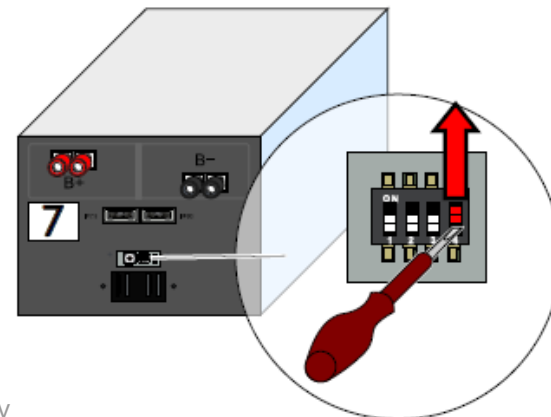
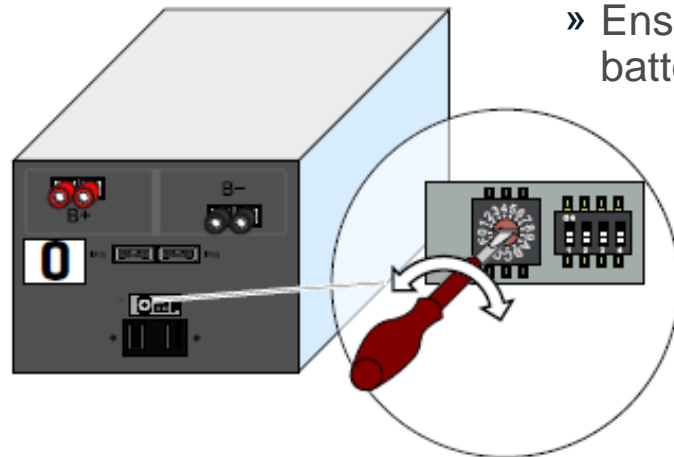
sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Battery Modules – Numbering the Modules



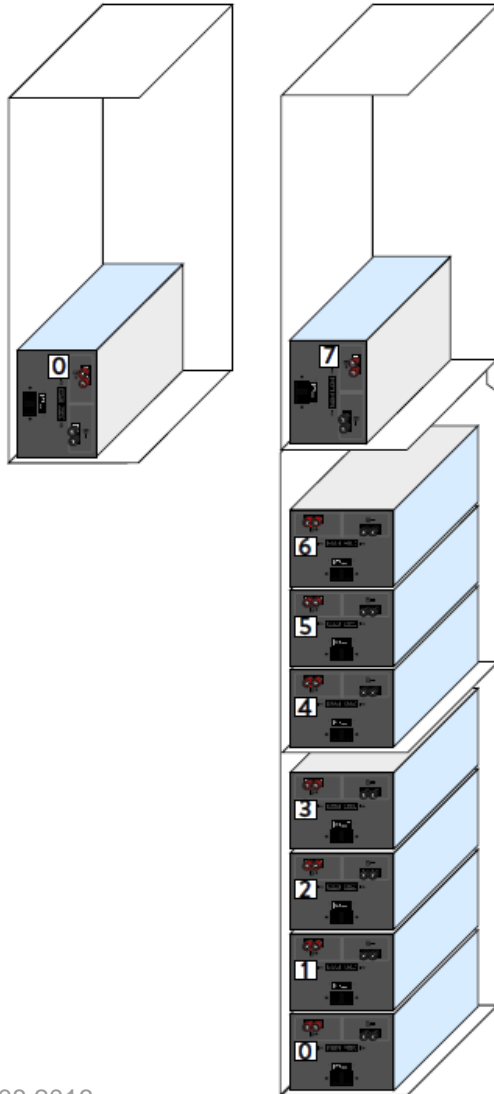
Apply the stickers to the modules, numbering will start at zero.

- » Set the communication addresses for the battery modules using the rotary switch.
- » The communication address needs to match the number of the battery module.
- » Slide the termination switch (switch 4) of the battery module with the highest number¹ up (switch position ON).
- » Ensure that the termination switches of all other battery modules are in switch position OFF..



sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Battery Modules – Positioning the Modules



If no extension cabinet is used:

- » Position the battery module as shown in the left part of the image.

If the extension cabinet is used:

- » Position the battery modules as shown in the right part of the image.

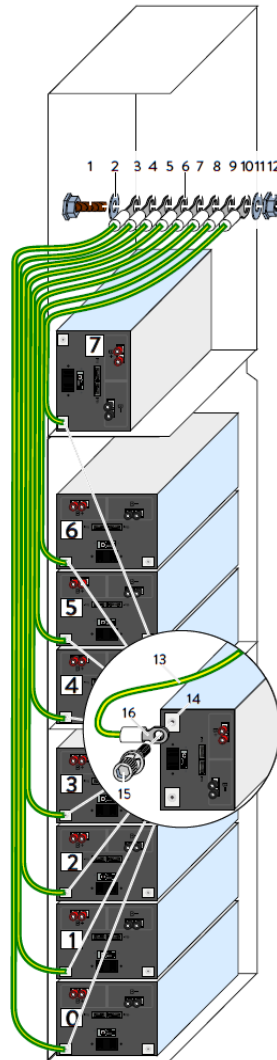
If the extension cabinet is used but not completely full:

- » Position the battery modules from the floor up without any gaps between numbering the lowest module as 0.

sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Battery Modules – Grounding

1	Earth bolt
2, 11	Washer
3 – 10, 16	Cable lug
12	Locking nut
13	Earth conductor
14	Earth connection of the battery module
15	Socket screw



Grounding of the battery modules:

- » Connect all earthing wires to the earthing pin (1).
- » Take care of the positioning of the components (2) to (12). The cable lugs have to be arranged circularly.
- » Tighten the locking nut (12) with a torque of 5 Nm.
- » Connect the other end of the earth conductors to the earth connections (14) of the battery modules.
- » Tighten the socket screws (15) with a torque of 4 Nm.

sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Battery Modules – DC Line Connection

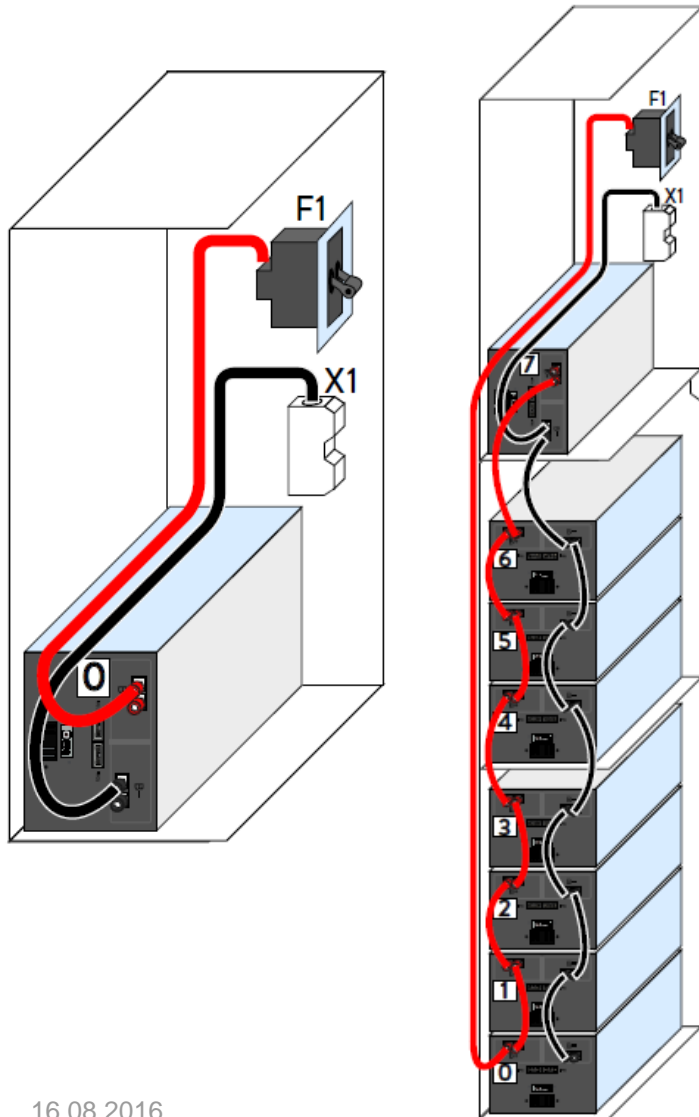


Incorrectly connected DC lines can cause a short circuit and thus high heat generation. Improperly connected DC lines can also create high resistance at the point of contact. As very high currents flow through the DC circuit, this high contact resistance can lead to great loss of energy (electrical energy is converted into heat).

- » Check all plug connections. Only red lines are allowed to be plugged into red sockets. Only black lines are allowed to be plugged into black sockets.
- » Ensure that all DC lines are plugged into the sockets all the way.
- » Ensure that all battery modules are connected in parallel, i.e. all plus poles of the battery modules are connected together (red to red). Likewise, ensure that all minus poles of the battery modules are connected together (black to black).

sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Battery Modules – DC Line Connection

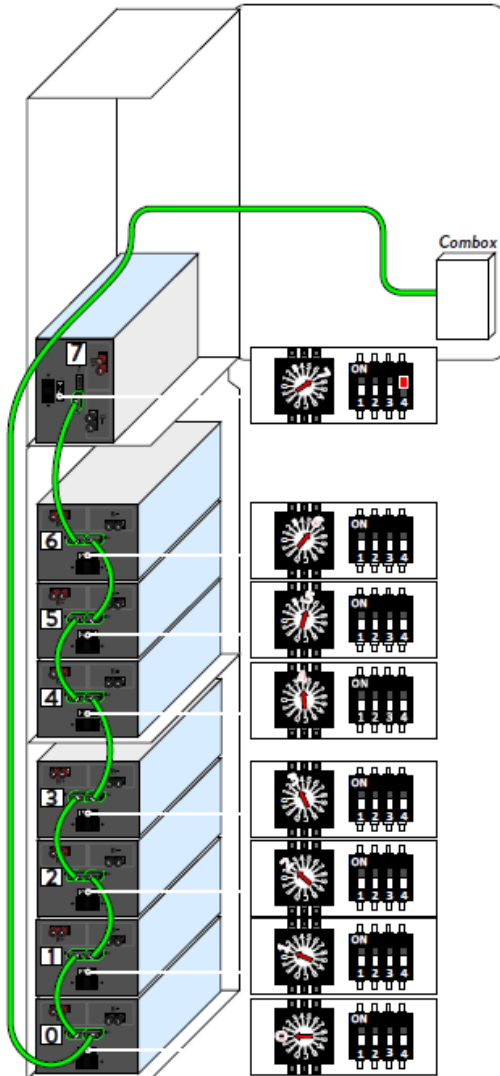


Connect the DC lines as shown, observe the following points.

- » The plus line is connected from F1 to the plus pole of battery module 0.
- » The minus line is connected from terminal X3 to the minus pole of the last battery module (with the highest number).
- » With a sonnenBatterie eco 8/2 this is battery module 0,
- » with a sonnenBatterie eco 8/4 this is battery module 1,
- » with a sonnenBatterie eco 8/6 this is battery module 2, and so on...
- » with a sonnenBatterie eco 8/16 this is battery module 7.

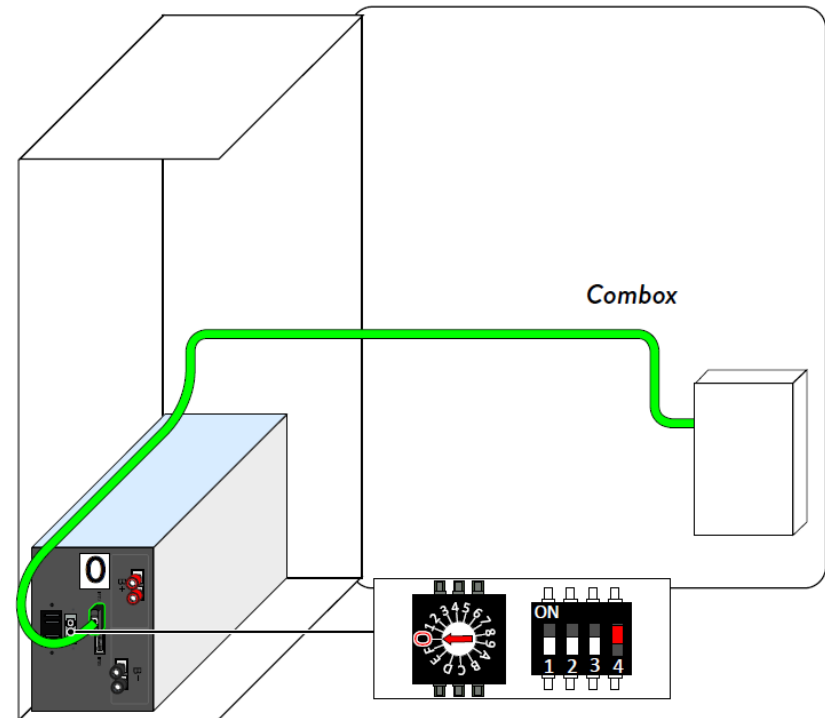
sonnenBatterie eco 8.2 – Single Phase

Electrical Connections – Battery Modules – BMS Connection



Connect the BMS lines as shown in the following figures.

Use the supplied BMS communication lines.



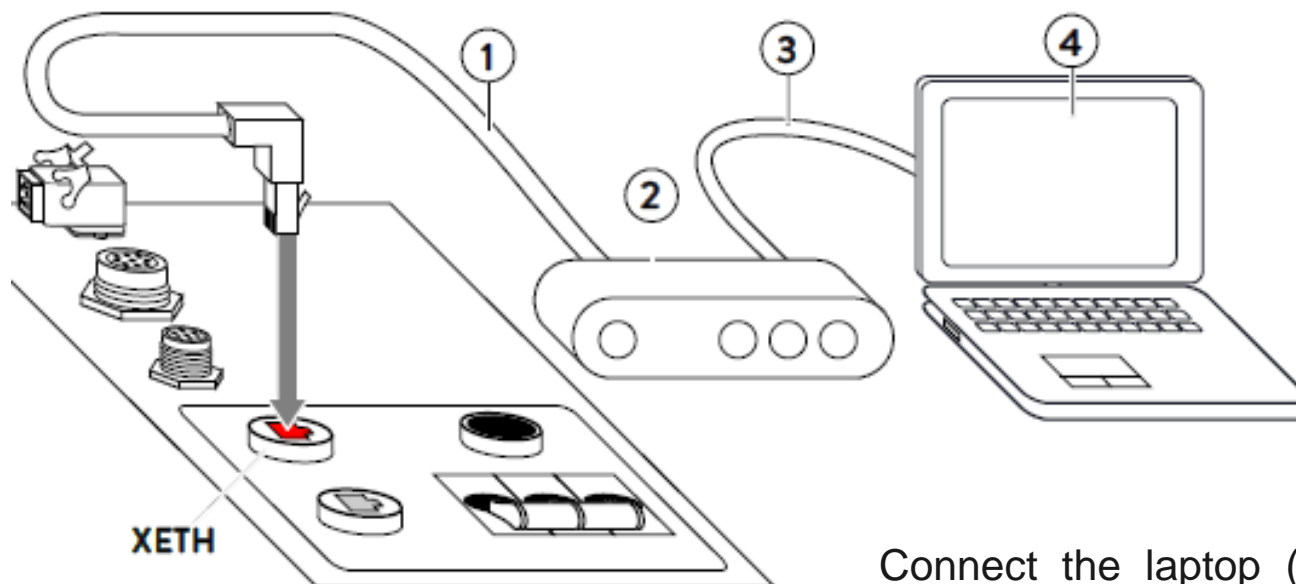
sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning

OK	Points to check
<input type="checkbox"/>	The installation location meets the requirements.
<input type="checkbox"/>	All DC lines are completely and correctly connected.
<input type="checkbox"/>	The Modbus line is correctly connected.
<input type="checkbox"/>	The Ethernet line is correctly connected.
<input type="checkbox"/>	The AC supply is correctly connected.
<input type="checkbox"/>	The AC line meets the requirements of all local and national guidelines for line dimensions.
<input type="checkbox"/>	The dimensions of the miniature circuit breaker installed in the AC line are correct.
<input type="checkbox"/>	A residual current device (RCD) has been correctly installed.

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Establishing Connection



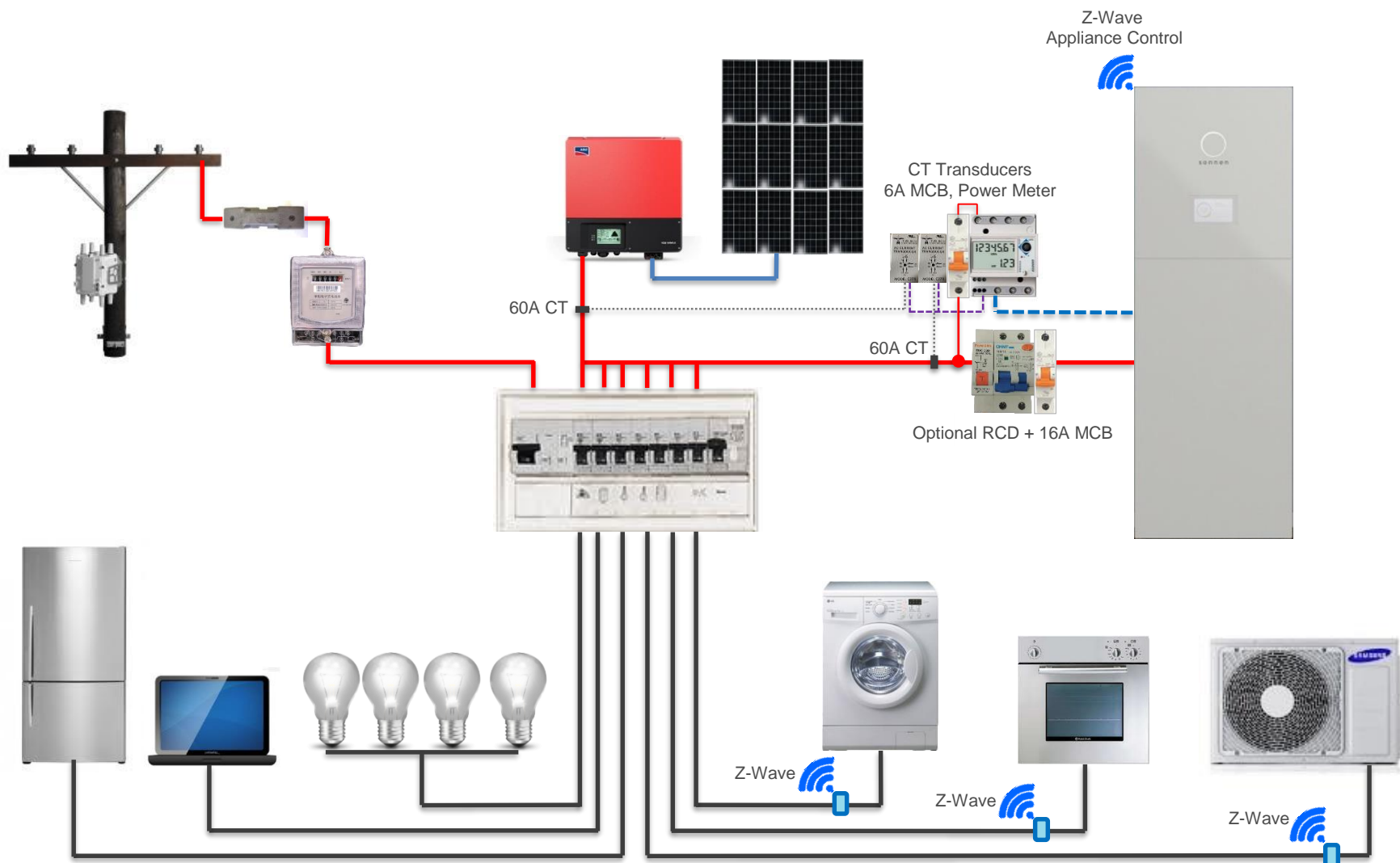
1	Ethernet line
2	Router of the home network
3	Ethernet line
4	Laptop
XETH	Ethernet port at the top side of the storage system

Connect the laptop (2) to the router of the home network.

The storage system must also be connected to the router of the home network.

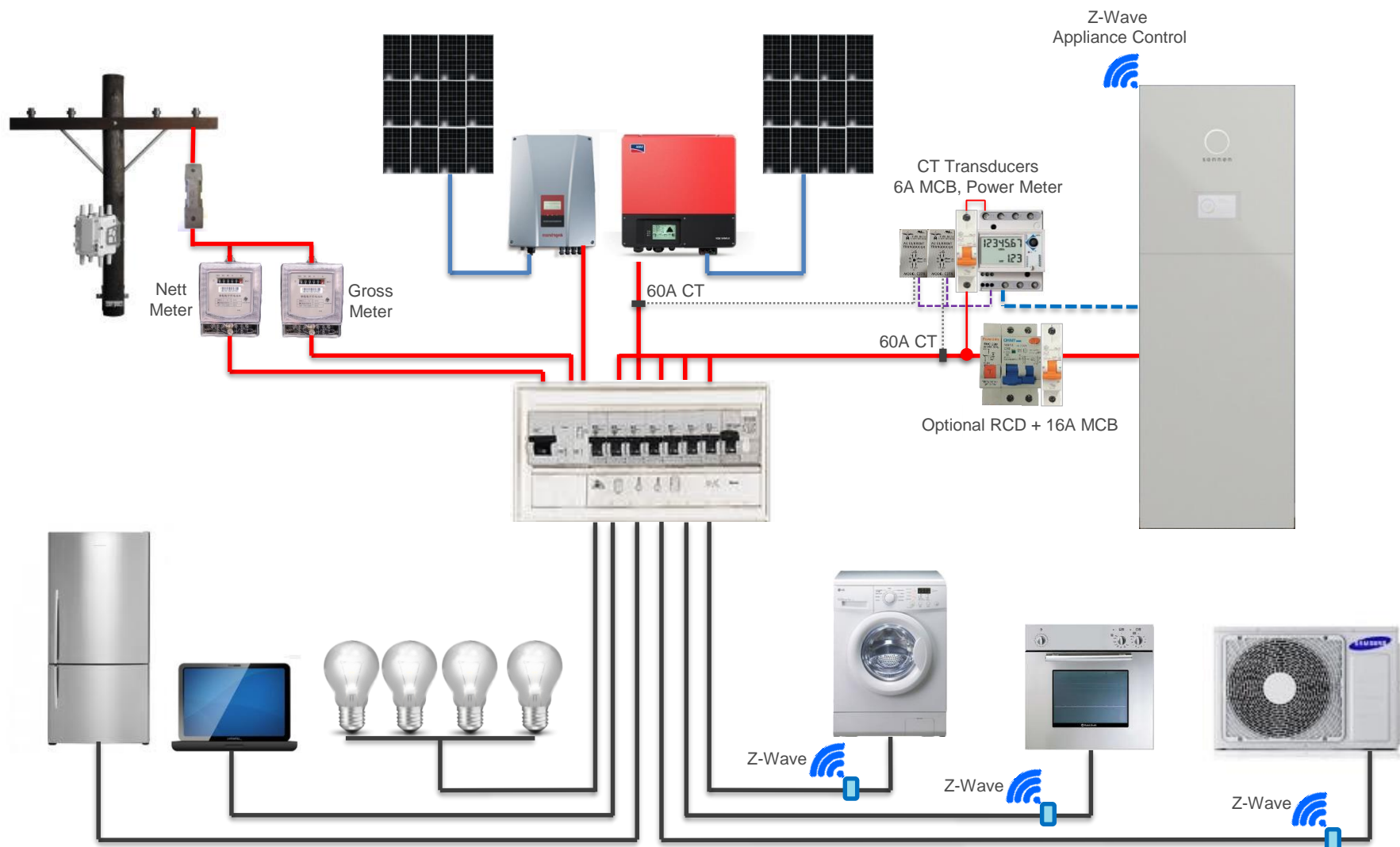
Sonnen – Domestic Installation Diagram

Single Phase – Retro Fit Net Feed PV



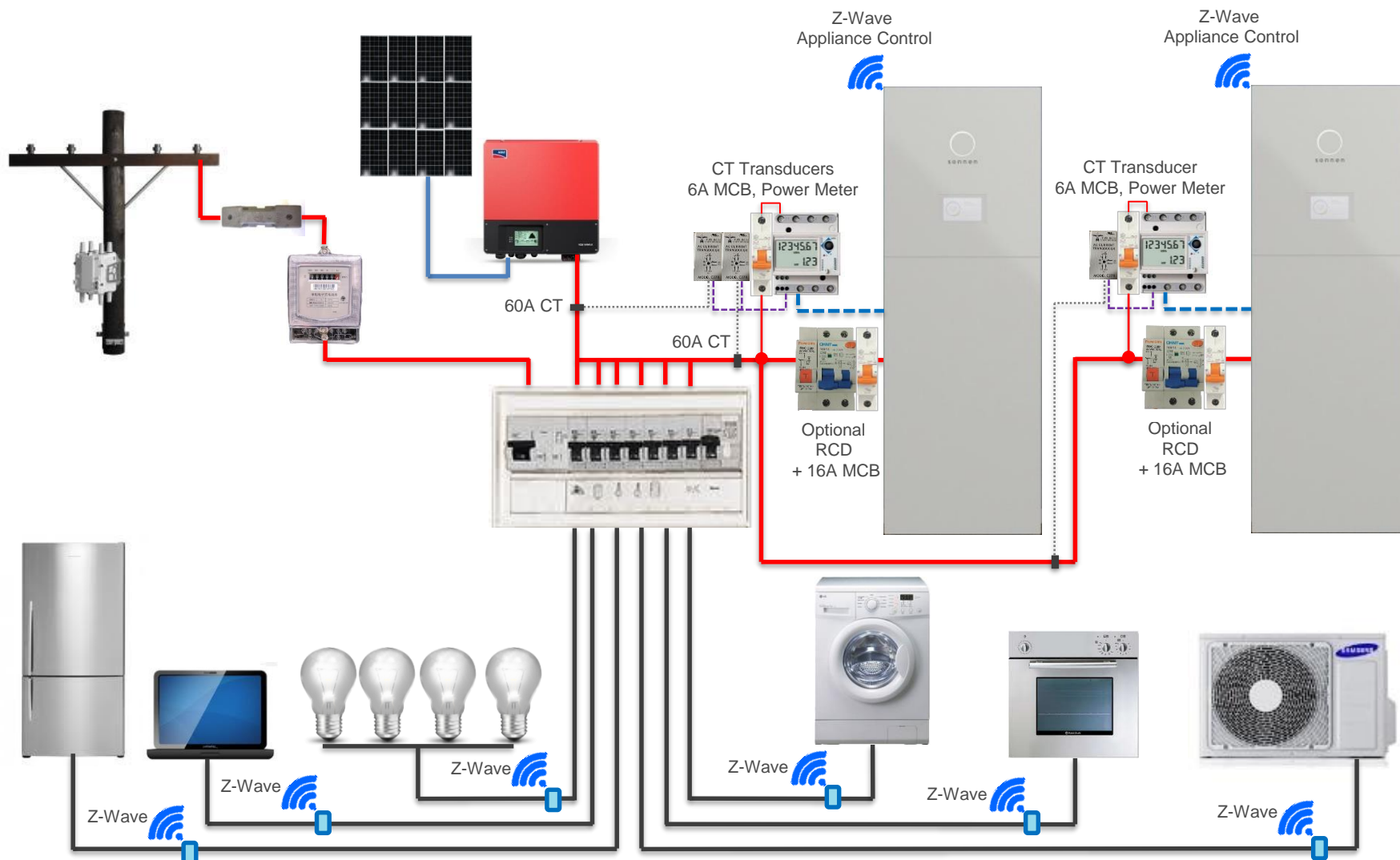
Sonnen – Domestic Installation Diagram

Single Phase – Retro Fit Gross Feed PV & New Nett Feed PV



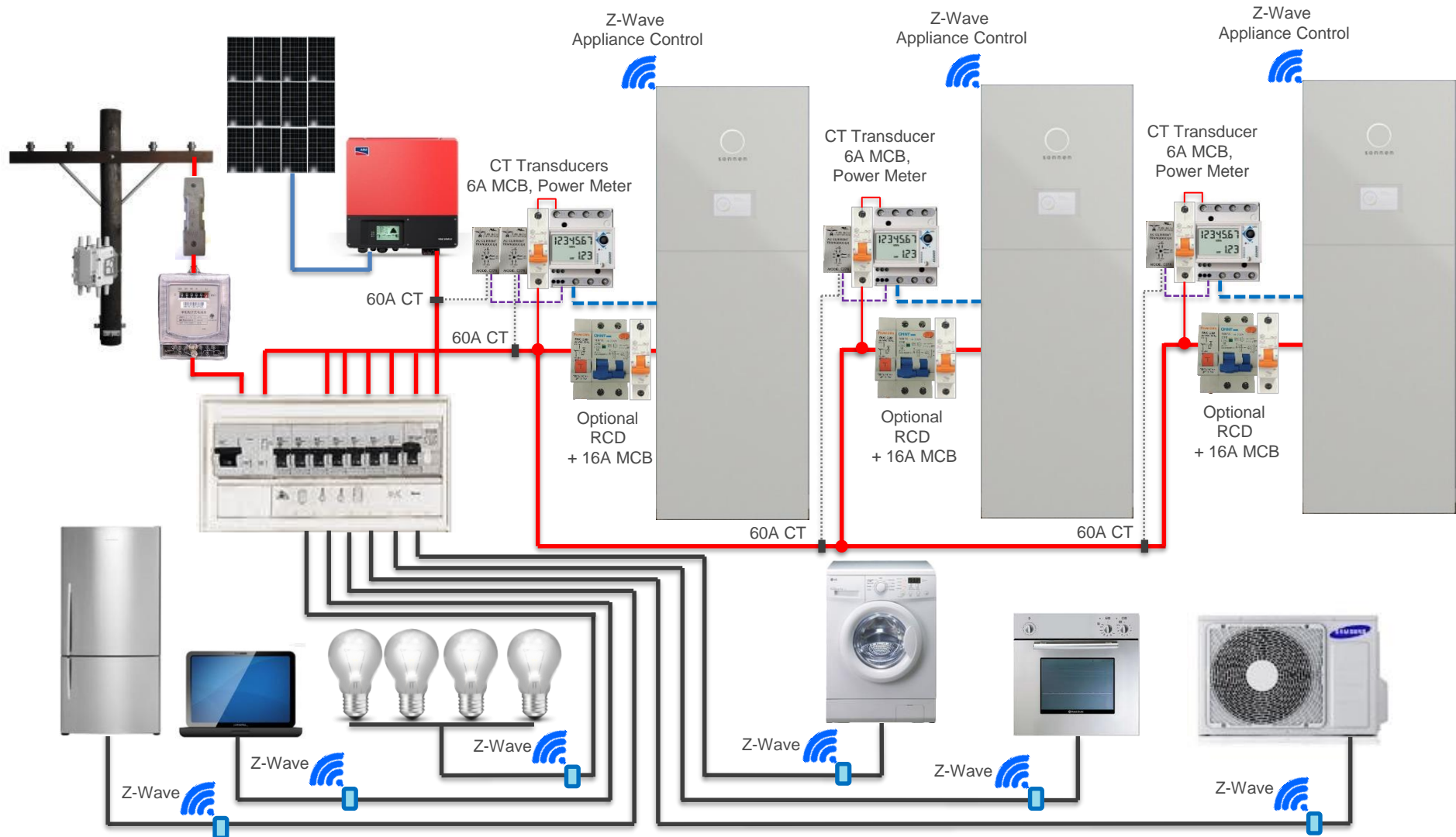
Sonnen – Domestic Installation Diagram

Dual Single Phase – New Net Feed PV



Sonnen – Domestic Installation Diagram

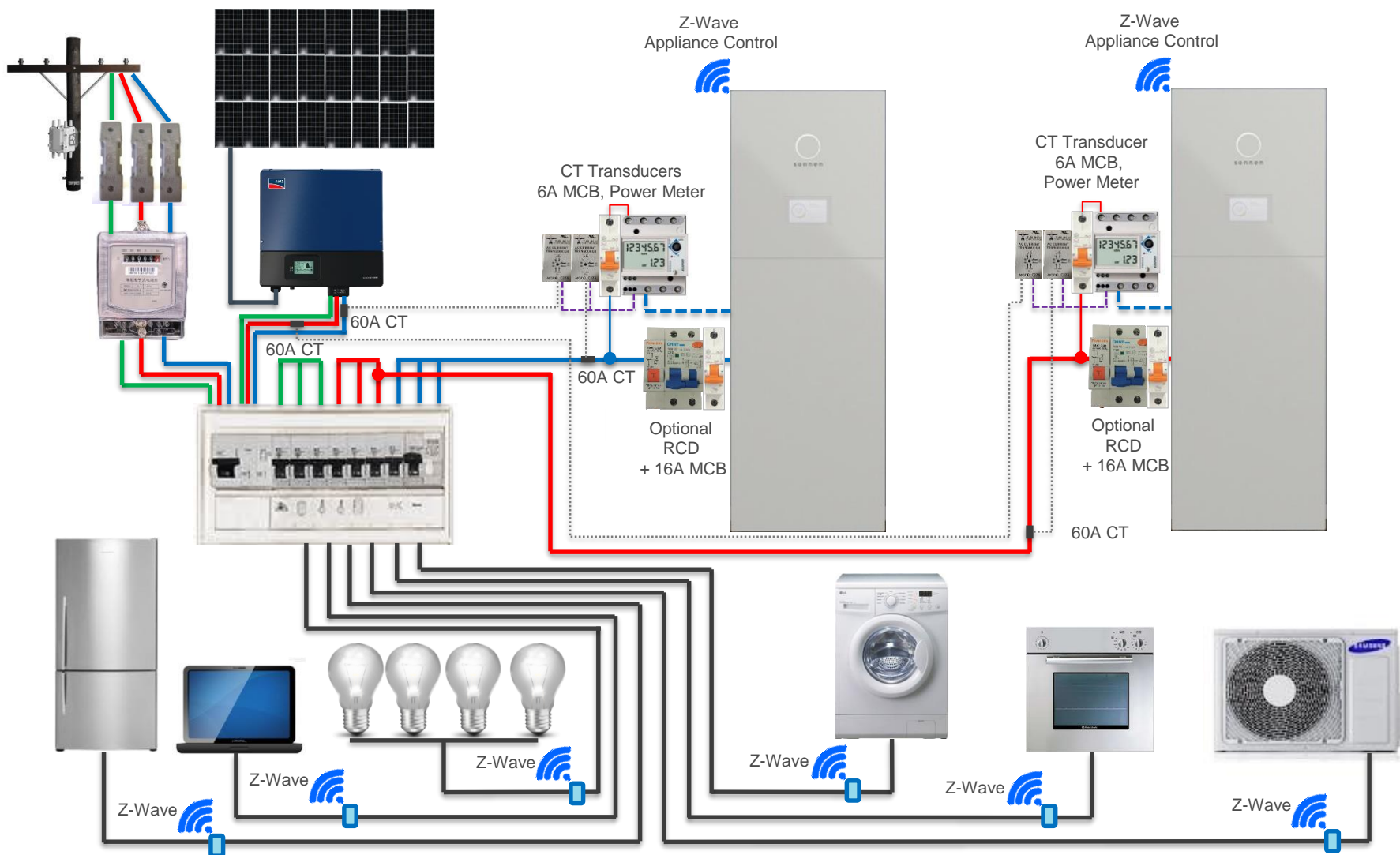
Tripple Single Phase – New Net Feed PV





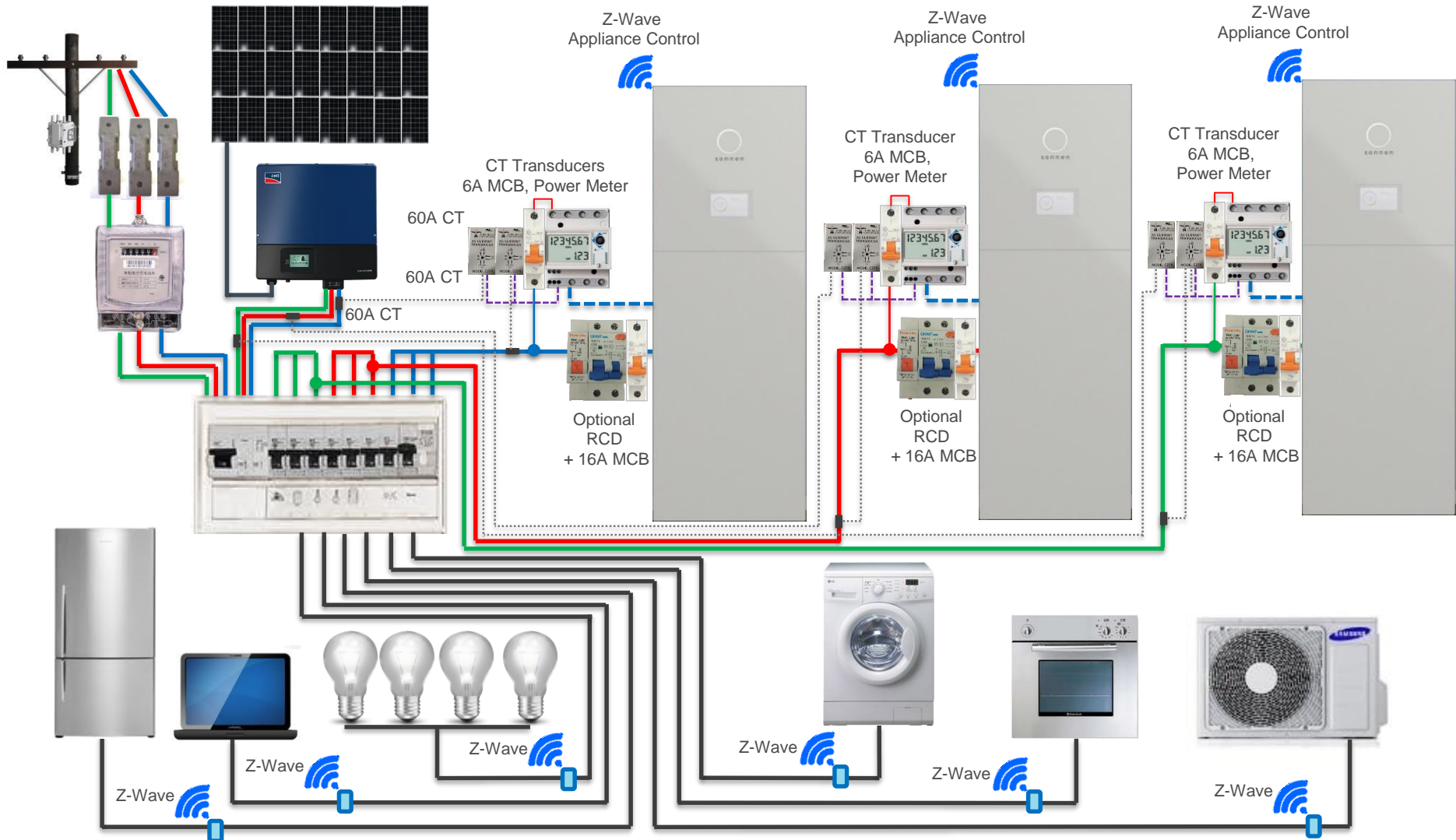
Sonnen – Domestic Installation Diagram

Dual Single Phase on 3-Phase – New Net Feed PV



Sonnen – Domestic Installation Diagram

Tripple Single Phase on 3-Phase – New Net Feed PV

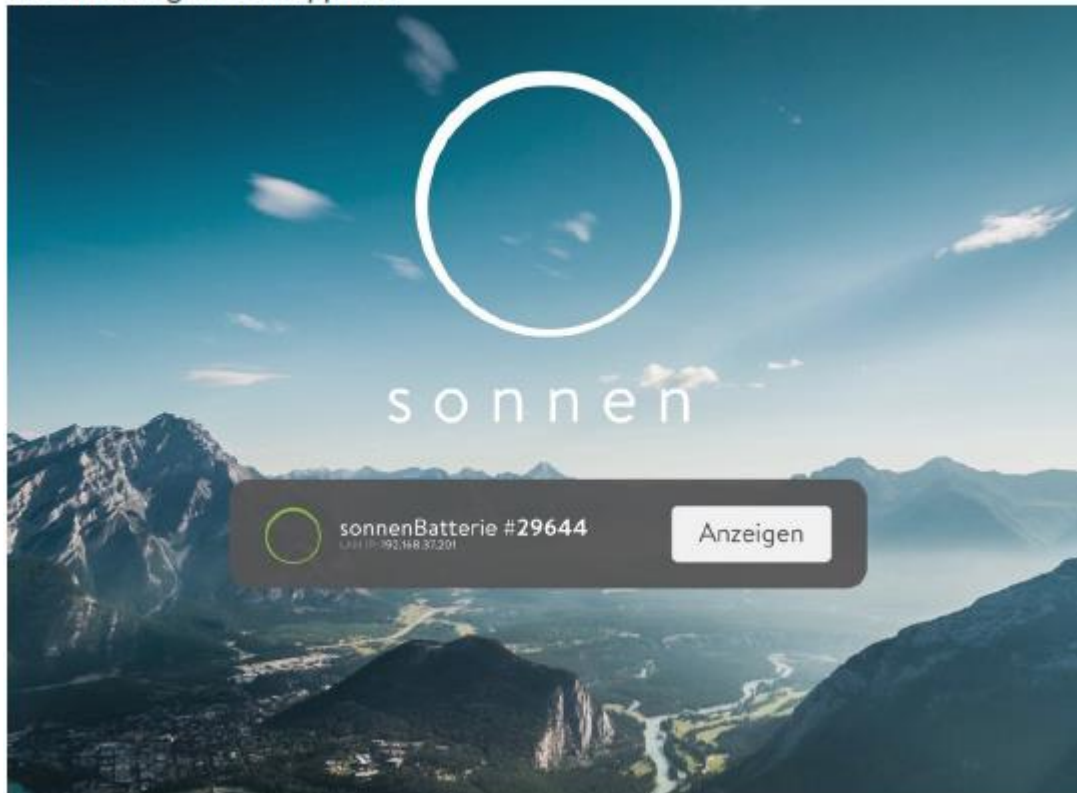


sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Establishing Connection



The following window appears:

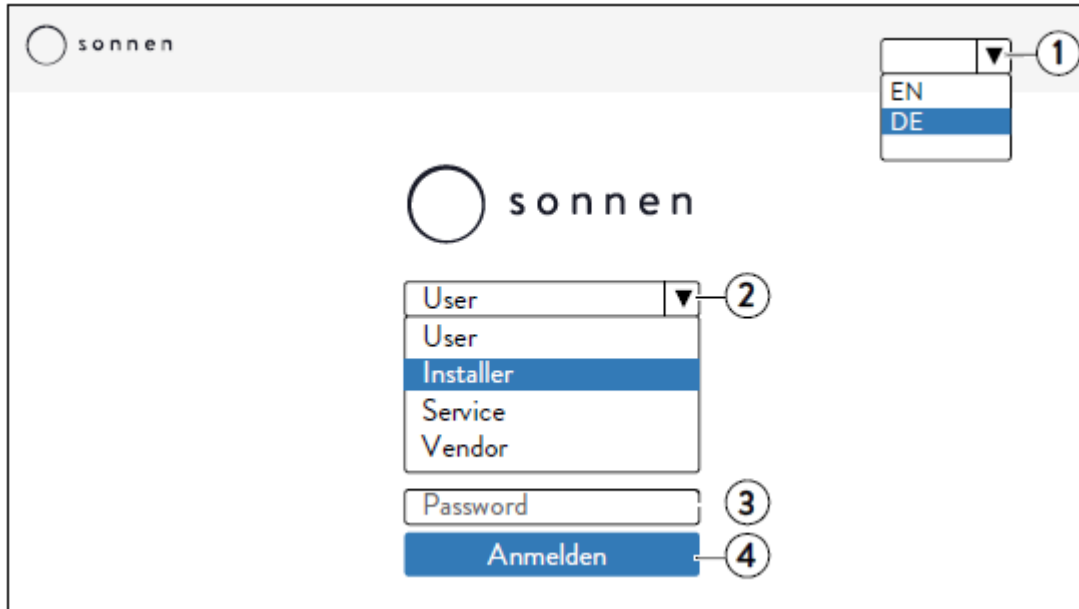


Start a browser (e.g. Firefox, Chrome, Safari, ...) on your laptop or pc.

- » Enter the address finde-meine.sonnenbatterie.de in the address line of your browser.
- » Click the button Anzeigen.
- » The login page appears.

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Wizard



- | | |
|---|-------------------------|
| 1 | Language selection list |
| 2 | User selection list |
| 3 | Password entry box |
| 4 | Confirm button |

Running the commissioning wizard.

- » Select your preferred language from the language selection list (1).
- » Select the User Installer from the user selection list (2).
- » Enter Sonnen@Installer2016 in the password entry box (3).
- » Click the button (4) to confirm your entries. After that the commissioning wizard will start.
- » Run the commissioning wizard until it is fully completed.

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Requirements



STANDARDS
Australia

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Standards for Batteries in Buildings

AS 1170.4 Structural design actions - Earthquake actions in Australia
AS 1319 Safety signs for the occupational environment
AS 1926.1 Swimming pool safety - Safety barriers for swimming pools
AS 2676.1 Guide to the installation, maintenance, testing and replacement of secondary batteries in buildings – Vented cells
AS 2676. 2 Guide to the installation, maintenance, testing and replacement of secondary batteries in buildings – Sealed cells
AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS 3011.1 Electrical installations - Secondary batteries installed in buildings - Vented cells
AS 3011.2 Electrical installations - Secondary batteries installed in buildings - Sealed cells
AS 4086.2 Secondary batteries for use with stand-alone power systems - Installation and maintenance
AS/NZS 4509.1 Stand-alone power systems - Safety and installation
AS/NZS 4509.2 Stand-alone power systems – System design
AS/NZS 4777.1 Grid connection of energy systems via inverters – Installation requirements
AS/NZS 4777.2 Grid connection of energy systems via inverters – Inverter requirements
AS/NZS 4777.3 Grid connection of energy systems via inverters – Grid protection requirements
AS/NZS 5000.1 Electric cables - Polymeric insulated - For working voltages up to and including 0.6/1 (1.2) kV
AS/NZS 5000.2 Electric cables - Polymeric insulated - For working voltages up to and including 450/750 V
AS 60950.1 Information technology equipment - Safety - General requirements
AS 62040.1.1 Uninterruptible power systems (UPS) - General and safety requirements for UPS used in operator access areas
AS 62040.1.2 Uninterruptible power systems (UPS) - General and safety requirements for UPS used in restricted access locations
NZS 4219 Seismic performance of engineering systems in buildings
IEC 62109-1 Safety Of Power Converters For Use In Photovoltaic Power Systems - Part 1: General Requirements
IEC 62109-2 Safety Of Power Converters For Use In Photovoltaic Power Systems - Part 2: Particular Requirements For Inverters

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Standards for Batteries in Buildings

AS 2676

- » Covers the testing, commissioning, maintenance and repair of battery banks in buildings. This standard applies to lead-acid cells and to alkaline cells (e.g. nickel-cadmium), and consists of two parts: Part 1 for vented cells, Part 2 for sealed cells

AS 3011

- » Covers the layout, arrangement and installation requirements for battery systems in buildings. It includes systems greater than 115V DC. This standard also applies to lead-acid cells and to alkaline cells, and consists of two parts for vented and sealed batteries, as per AS 2676.

AS 4086

- » Covers battery bank layout, installation, commissioning, and maintenance – but it is defined for ELV battery installations only (<115V DC), and written specifically for off-grid (stand-alone) power systems.

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Standards for Batteries in Buildings

AS/NZS 4509

- » Sets out safety, installation and design of stand-alone power systems used for the supply of extra-low (ELV) and/or low voltage (LV) electric power to an electrical installation. This standard generally applies to lead-acid installations, and consists of two parts.

AS 3011

- » Covers is called up under the Wiring Rules (AS/NZS3000) as an ‘informative reference’ (guidance only); and AS 4086 is referred to by AS/NZS 4509 for the installation of off-grid systems. None of these standards are currently called up by regulations for GCBS electrical installations.

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Standards for Batteries in Buildings

Decisive Voltage Classification (DVC)

- » Under fault conditions, DVC-A circuits are permitted to have voltages up to the DVC-B limits for a maximum of 0.2s.

Decisive Voltage Classification (DVC)	Limits of Working Voltage V		
	AC Voltage U_{ACL} r.m.s.	AC Voltage U_{ACPL} peak	DC Voltage U_{DCL} mean
A	≤ 25 (16)	≤ 35.4 (22.6)	≤ 60 (35)
B	50 (33)	71 (46.7)	120 (70)
C	50 (>33)	>71 (>46.7)	>120 (>70)

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Requirements

Main Battery Isolation Point,

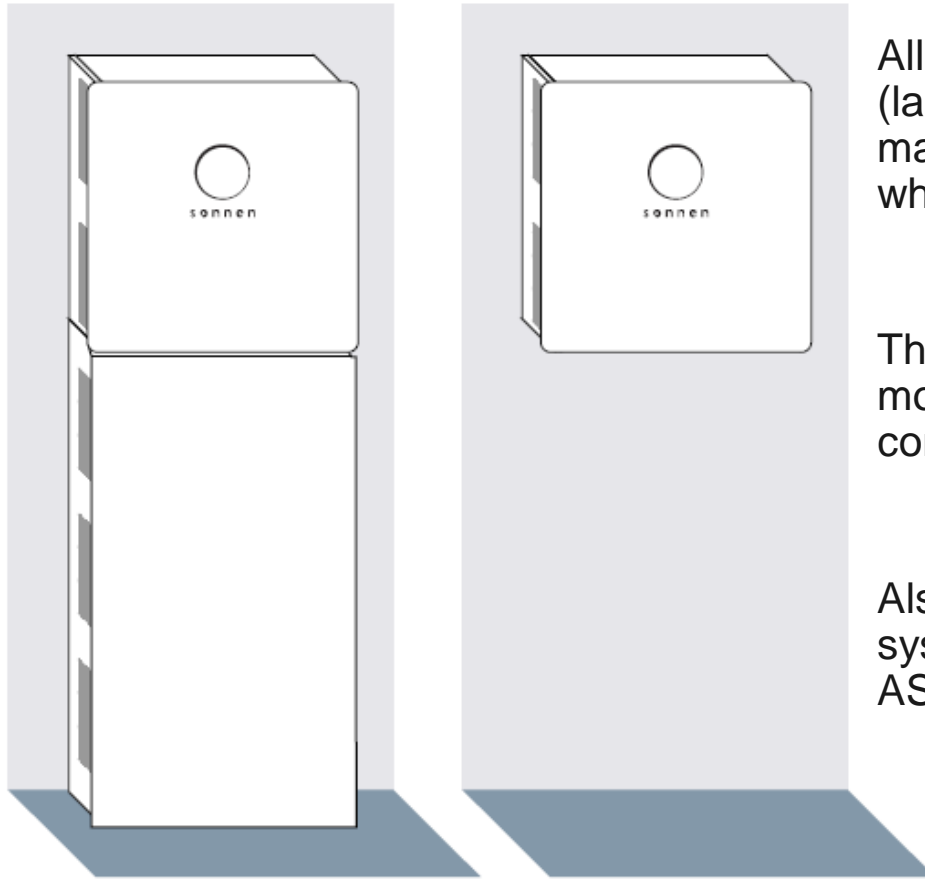
- » The battery bank shall be capable of being readily isolated from the power system. Battery isolation equipment should be mounted outside the battery enclosure.





sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements



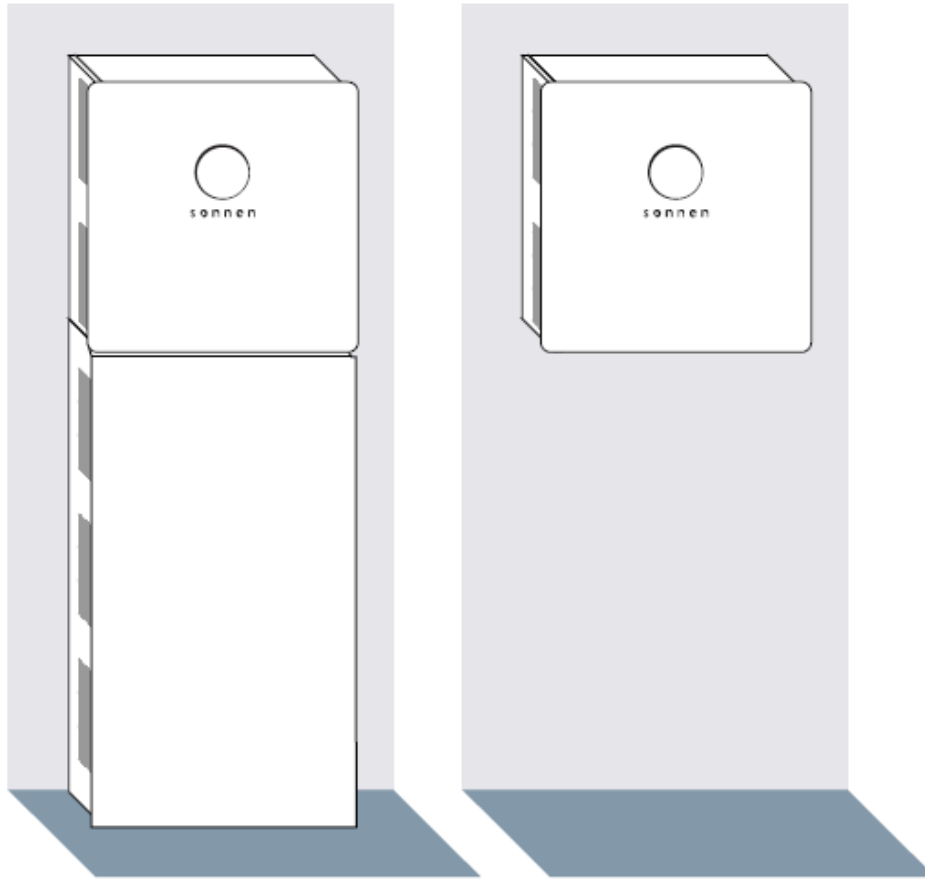
All electrical equipment shall be marked (labelled) according to the requirements for marking to local standards and regulations when applicable.

The labelling for battery storage system is more extensive than a standard grid connected solar system.

Also additional labels will be required for ESS system that are not currently covered by AS4777, AS5033 or AS4509.

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements



SHUTDOWN PROCEDURE

Step 1:

Switch of main AC switch labelled 'ESS Main Switch' located in main switch board of premises.

Step 2:

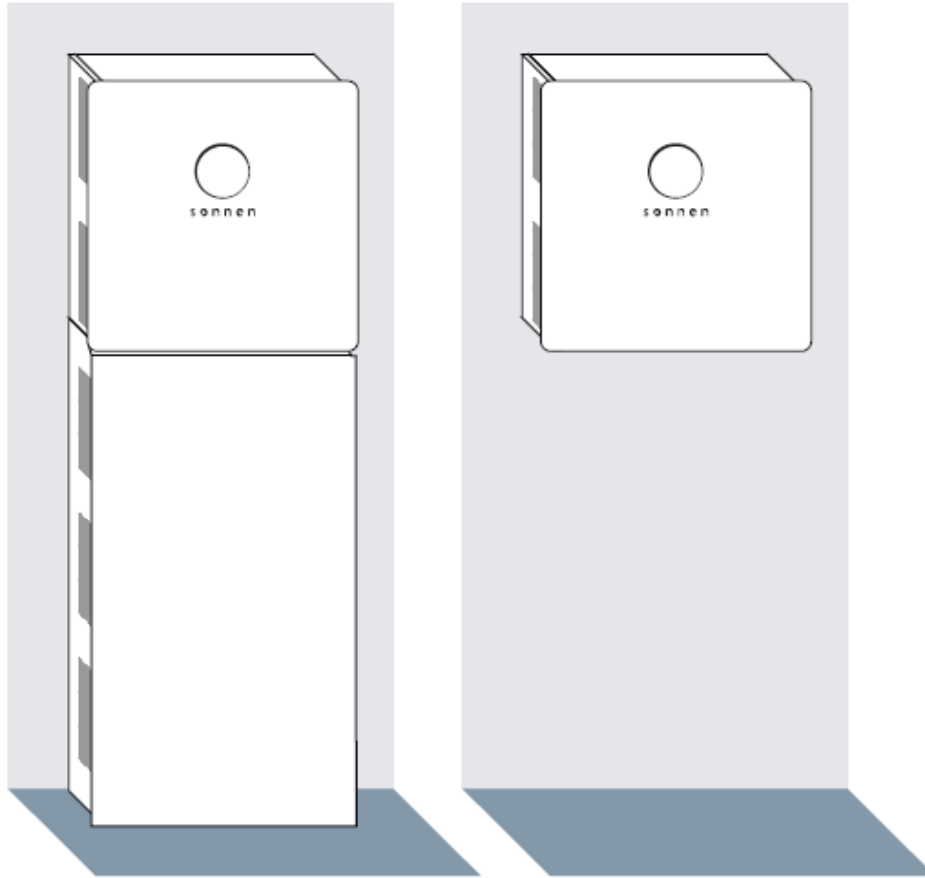
Remove switch cover of sonnen unit located on the top right hand side of unit.

Step 3:

Switch off the main sonnen isolator / on/off switch labelled F1.

sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements



sonnenBatterie eco 8.2 – Single Phase

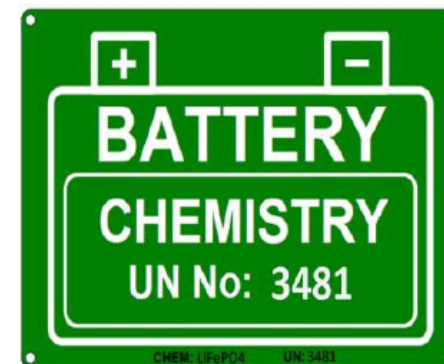
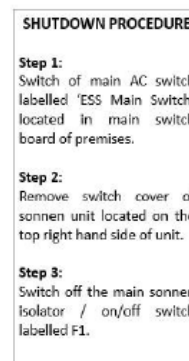
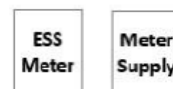
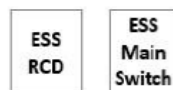
Installation Commissioning – Labelling Guide

TN001 – Australian Labelling Guide

In accordance with Australian Standards, the Clean Energy Council installation guidelines as well as DNSP's throughout Australia the installation of a sonnen unit also requires various labelling and notices to be positioned within the installation location as explained within the tech note.

Labels Supplied

AU-LB-001	Shutdown Procedure
AU-LB-002	Battery Chemistry Designation
AU-LB-003	ESS RCD
AU-LB-004	ESS Main Switch
AU-LB-005	ESS Meter
AU-LB-006	Meter Supply



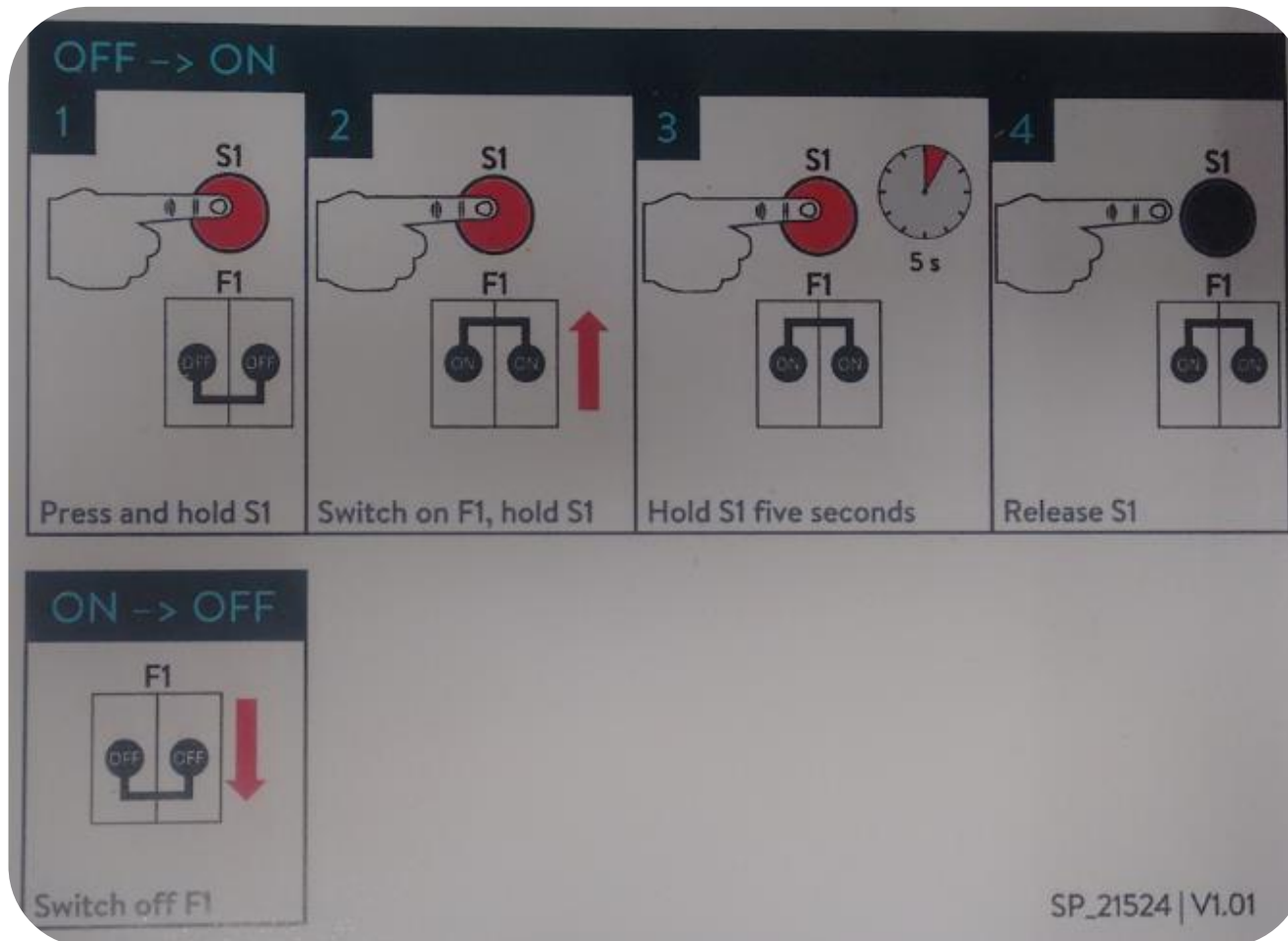
sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – Labelling Guide



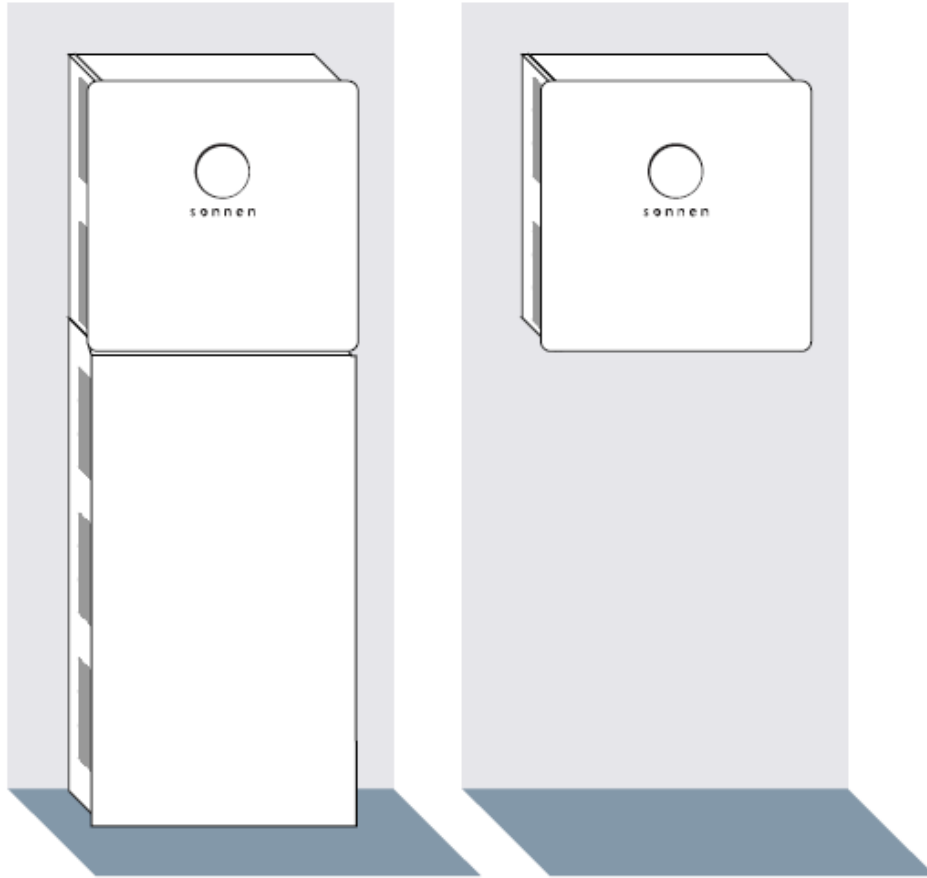
sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements



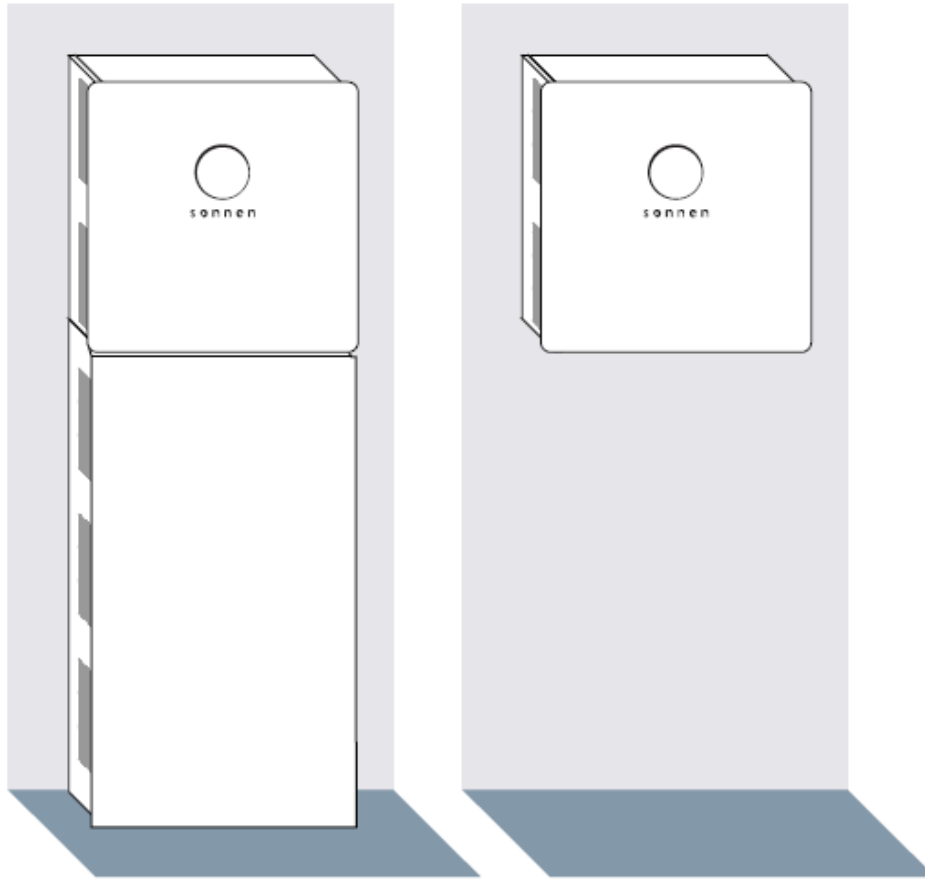
sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements



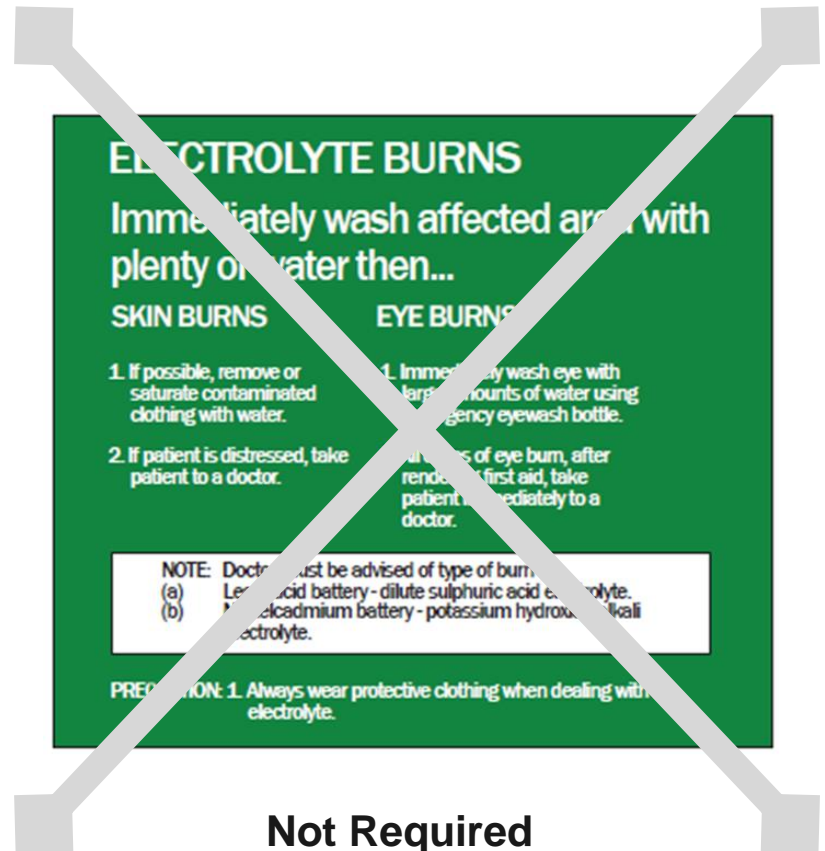
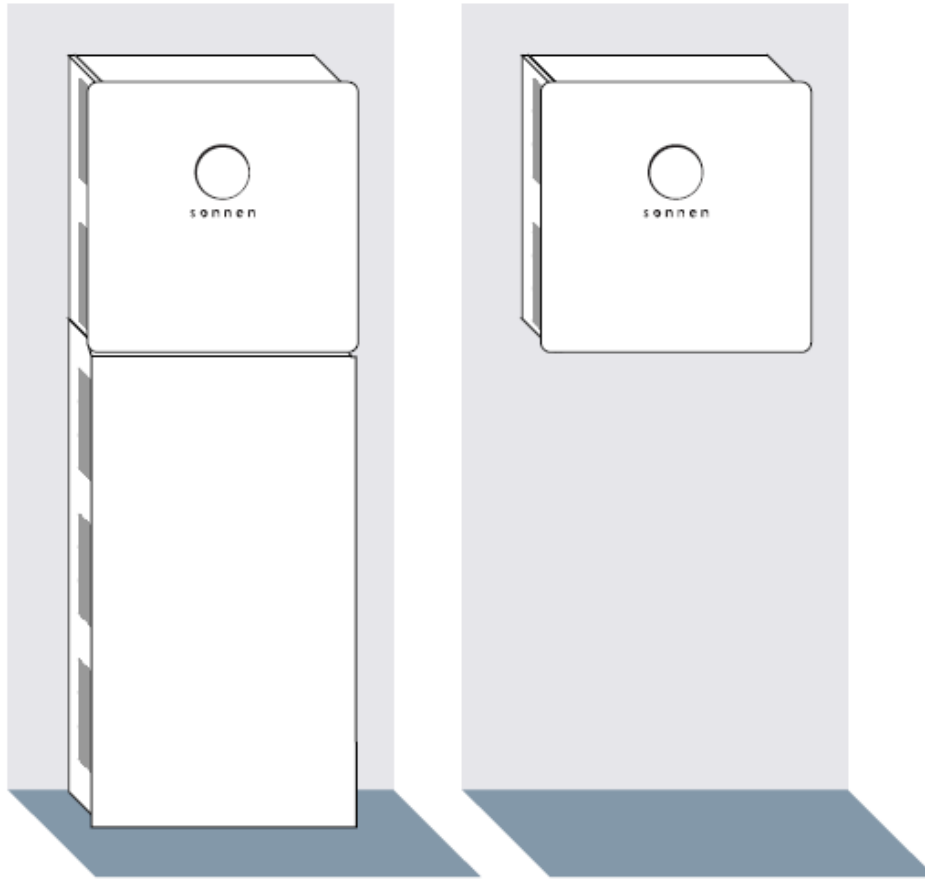
sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements



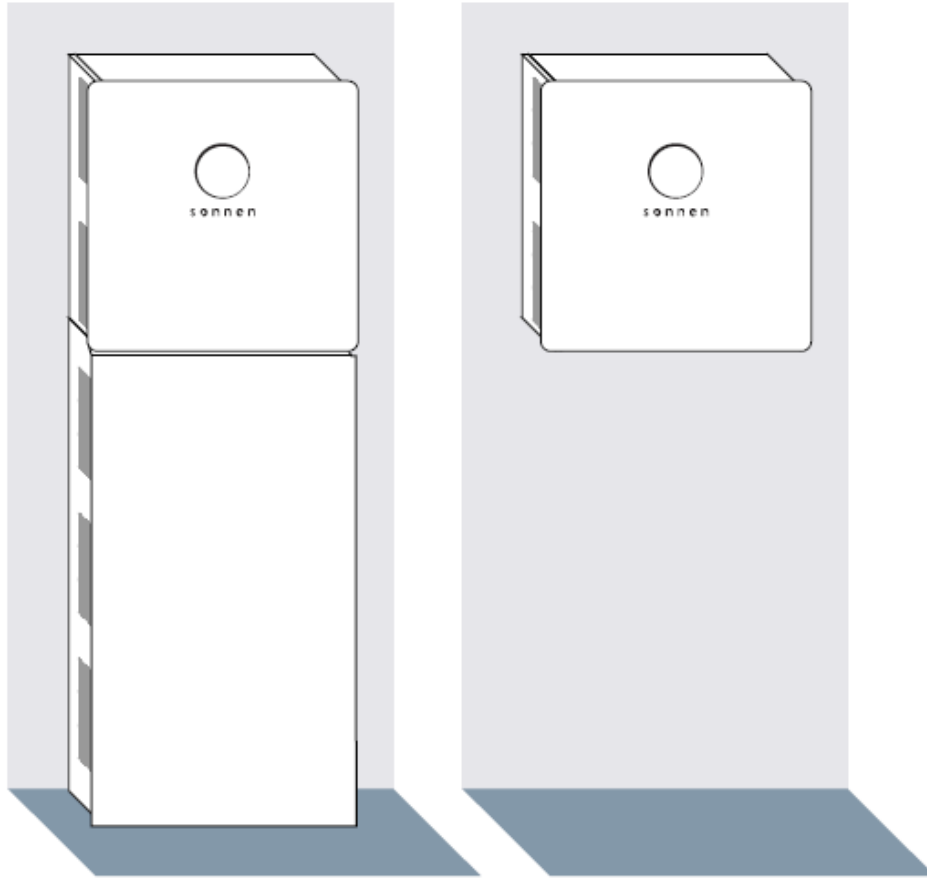
sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements



sonnenBatterie eco 8.2 – Single Phase

Installation Commissioning – AS/NZS Labelling Requirements

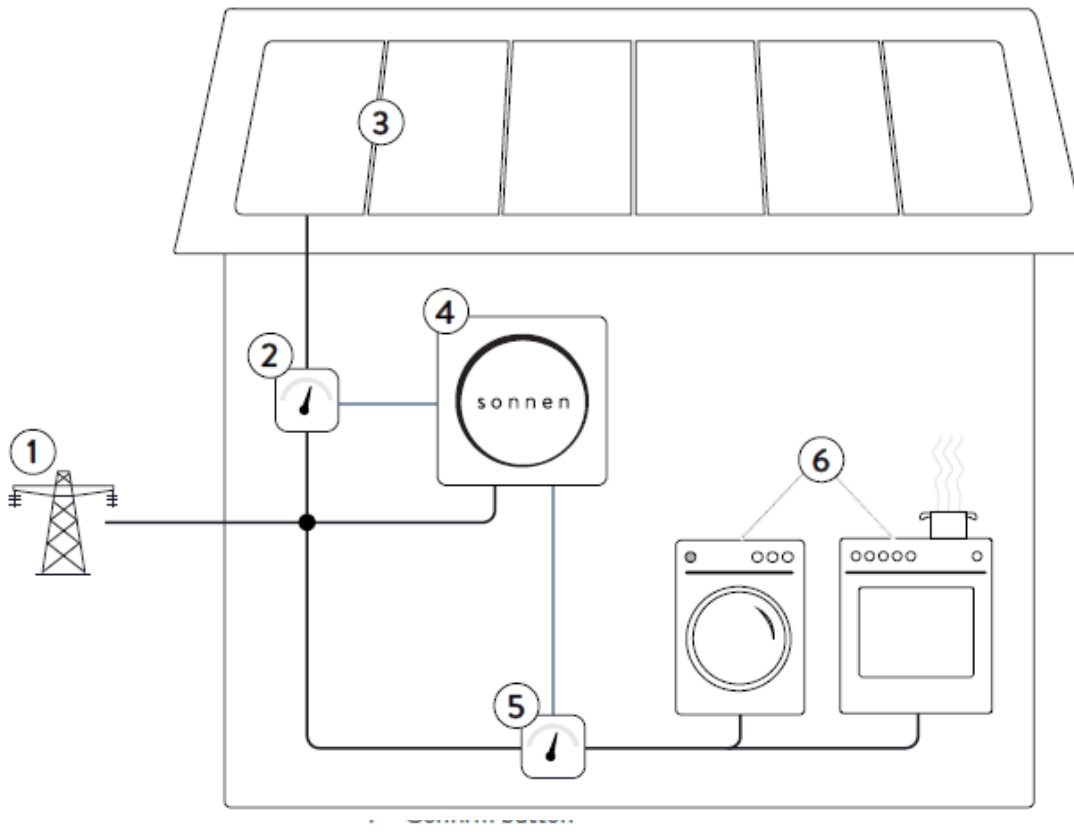




sonnen Apps, Monitoring & Energy Control

Sonnen – System Monitoring

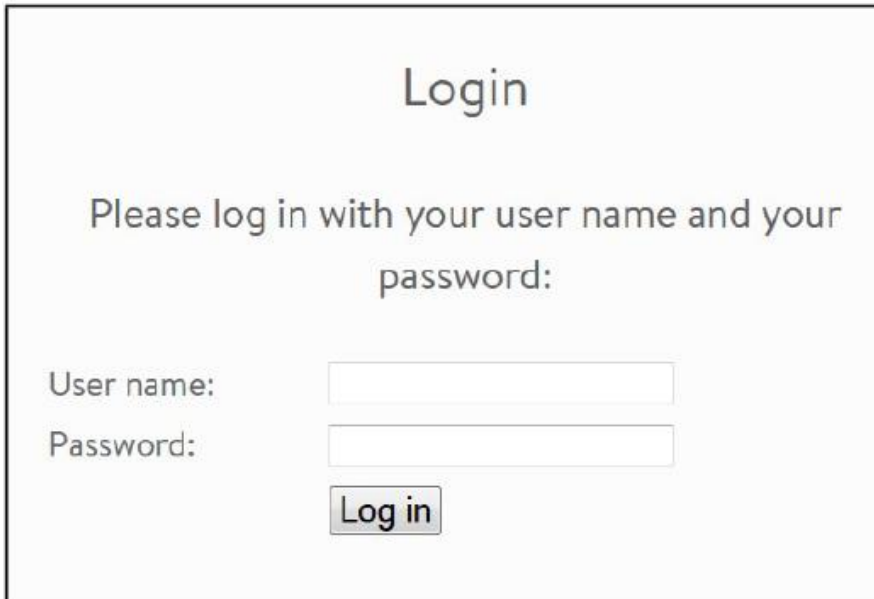
Basic overview of installation



1. Grid electrical mains
2. Measurement of generation
3. PV system
4. Storage system
5. Measurement of consumption
6. Loads in the building (e.g. washing machine, cook top, lights, refrigerator, etc.)

Sonnen – System Monitoring

End User Online Monitoring – Login Procedure



The image shows a login form for the Sonnen system monitoring portal. The form is titled "Login" and contains the following elements:

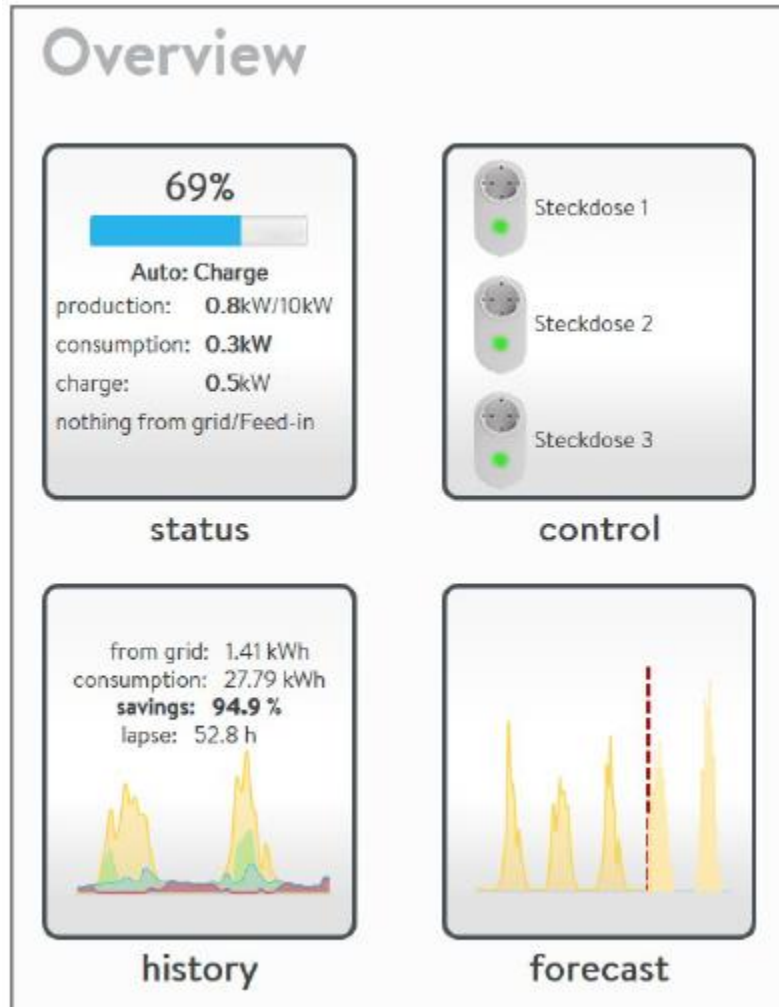
- A heading "Login" in a large, bold font.
- A prompt: "Please log in with your user name and your password:"
- A label "User name:" followed by a text input field.
- A label "Password:" followed by a text input field.
- A "Log in" button located below the password field.

Logging into the internet portal.

- » To log into the internet portal, enter the following web address into the browser:
- » <https://my.sonnen-batterie.com>
- » The login window shown opens:
- » Enter your access data, which was provided as part of the scope of delivery.
- » Click on the Log in button.

Sonnen – System Monitoring

End User Online Monitoring – Overview Page

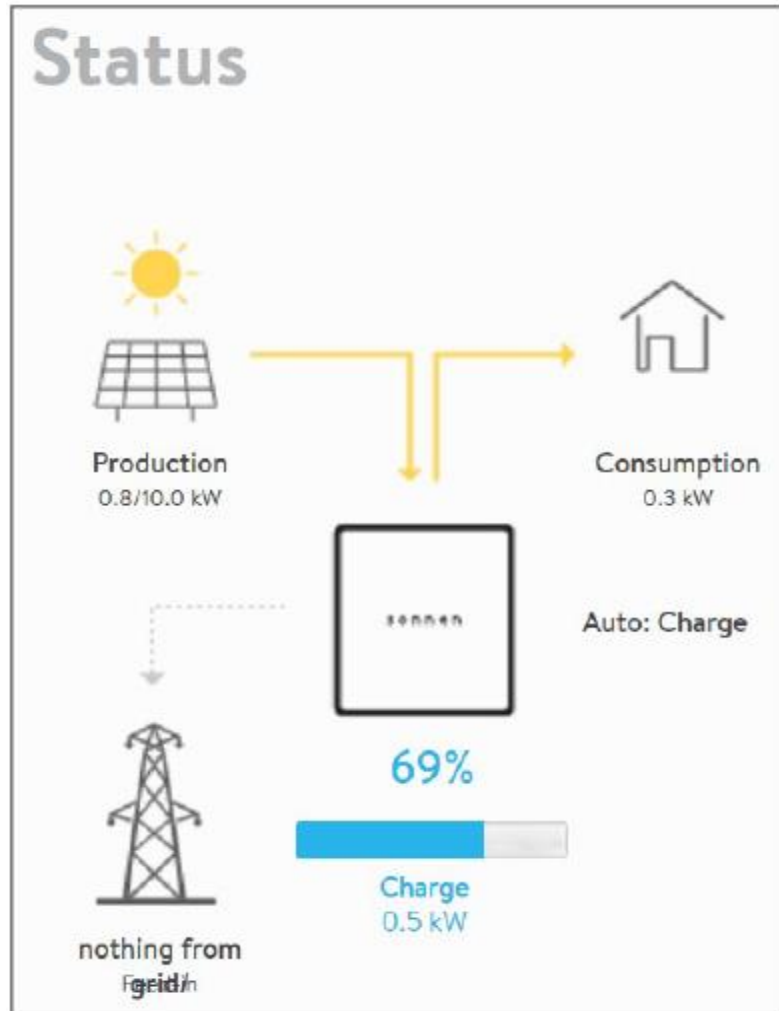


The overview page shows a summary of all of the information which can be seen on the portal.

» You can click on the Status, Control, Graph and Forecast buttons in order to open the specific page.

Sonnen – System Monitoring

End User Online Monitoring – Status Page

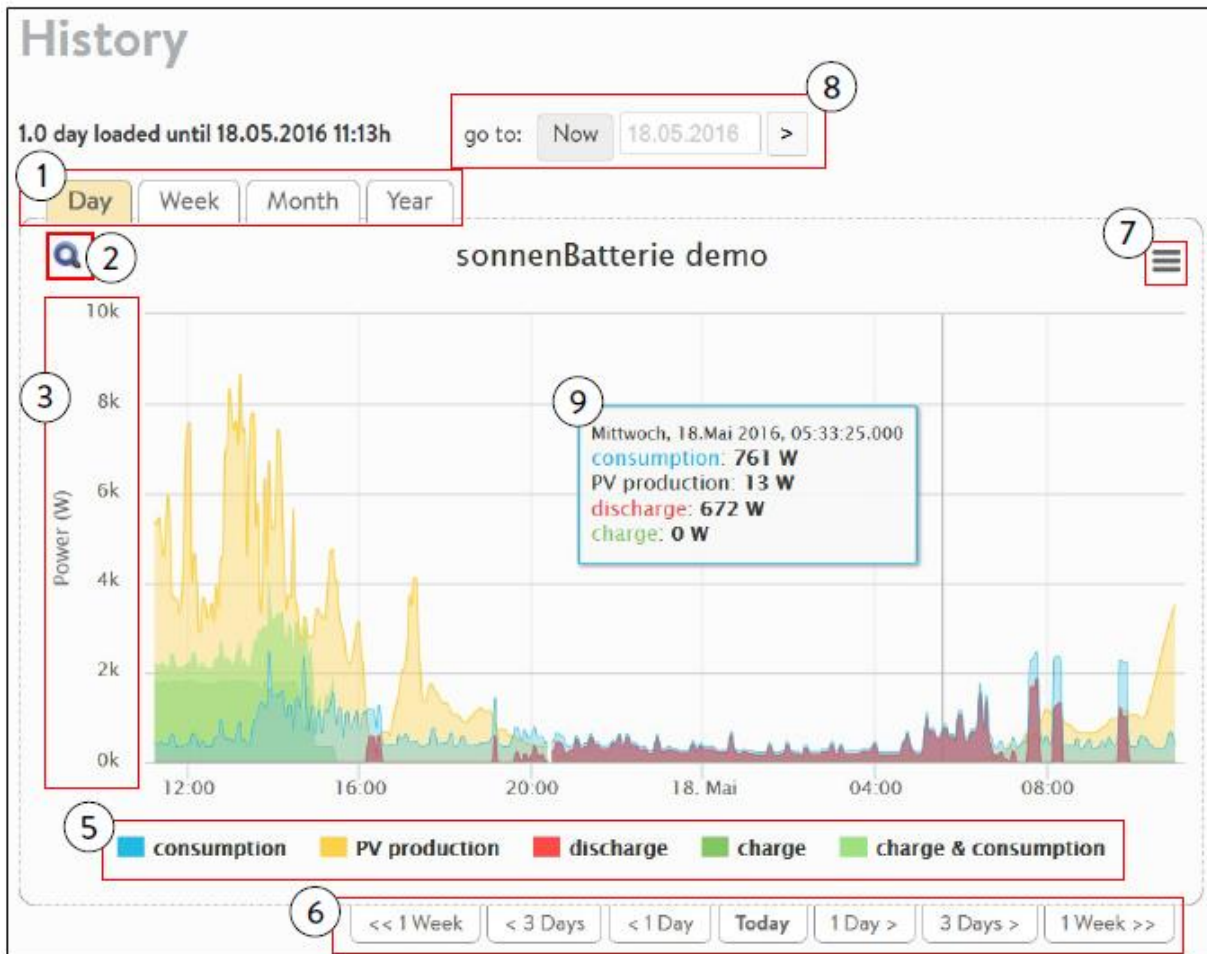


The status page (shown in the figure on the right) shows the following current measured values:

- » Current generation
- » Current consumption
- » Current usage/current feed-in
- » Current charging status.

Sonnen – System Monitoring

End User Online Monitoring – Graph Page

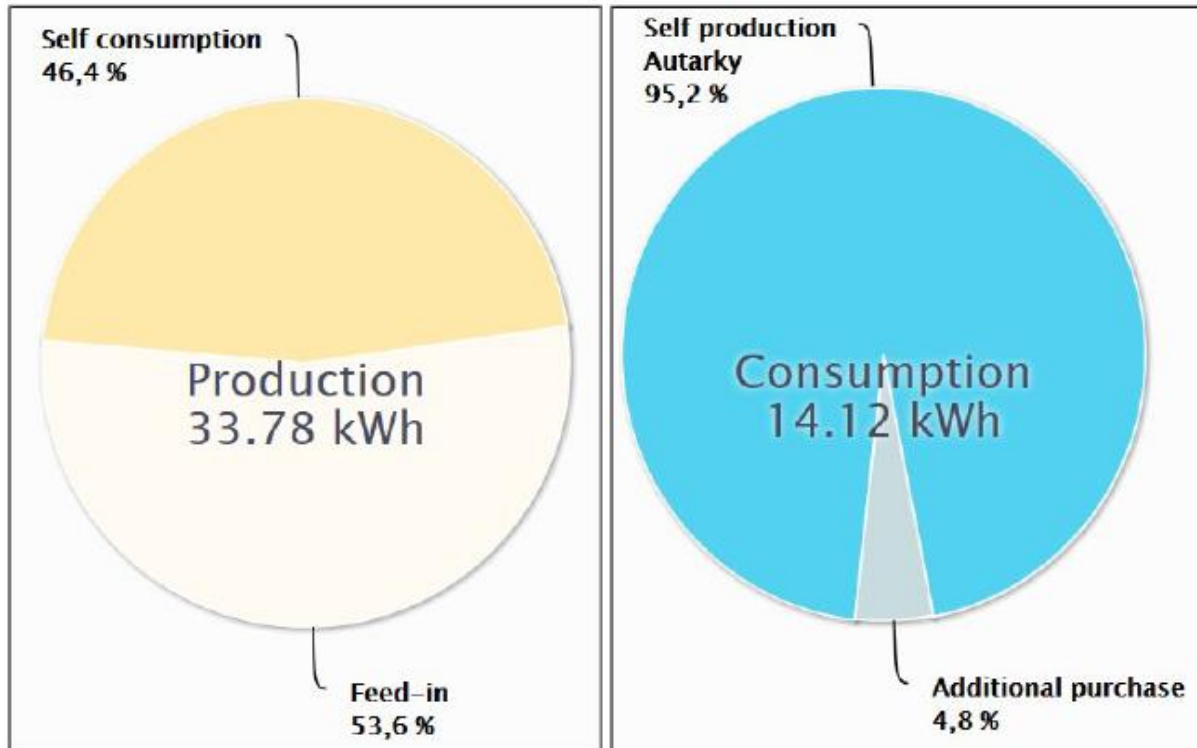


The power graph presents the different energy flows in relation to time:

1. Day, week, month or year
2. Activates / deactivate full-screen mode.
3. Power in watts (kW).
4. Time is on the x-axis.
5. Energy legend.
6. Navigate to previous or later timeframes.
7. Printing shown graph.
8. Select a date.
9. Cursor over the graph shows the exact values of the energy.

Sonnen – System Monitoring

End User Online Monitoring – Pie Charts



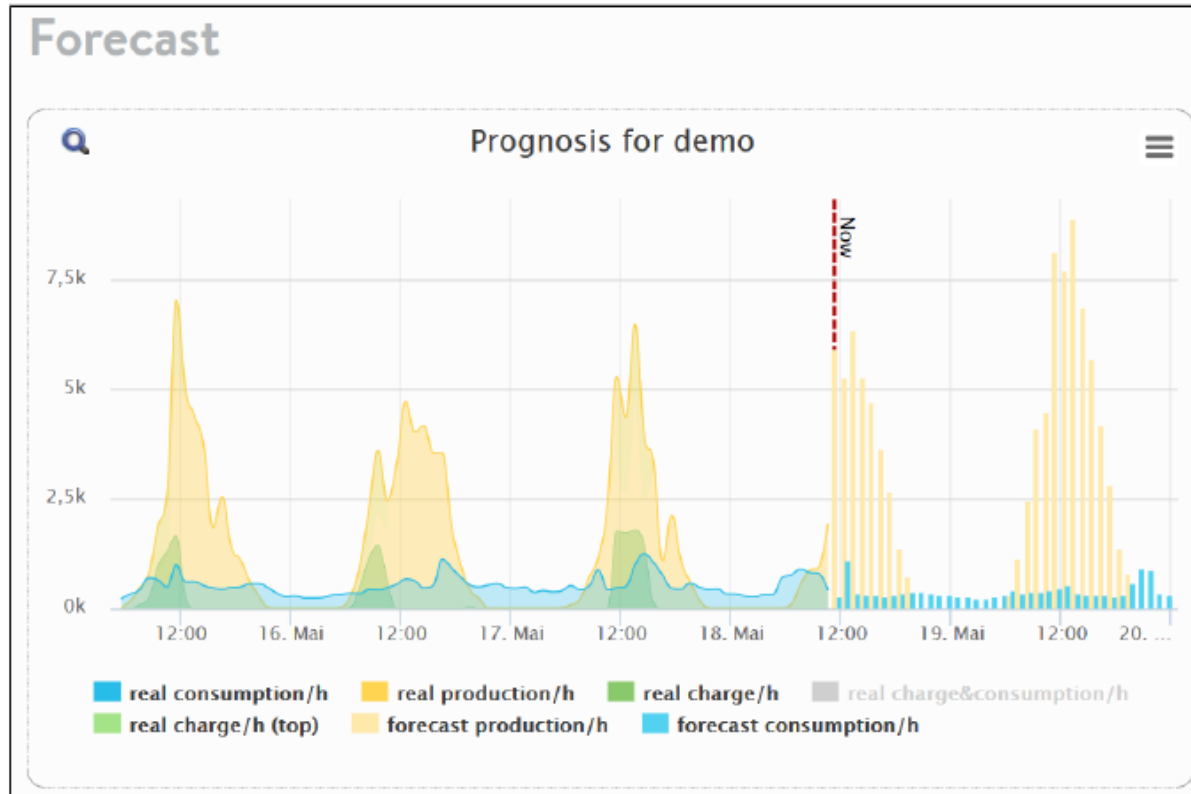
Two pie charts are shown below the power graph.

The pie charts always refer to the timeframe shown in the power graph.

- » Production
- » Consumption

Sonnen – System Predictive Control

End User Online Monitoring – Forecasting Page



The storage system is able to forecast consumption in the near future (blue) based

on previous consumption trends. Accessing weather data can also produce a generation forecast (yellow).

Sonnen – Apps, Monitoring & Energy Control

Smart Phone App



sonnen

sonnen GmbH Productivity

The intuitive sonnenApp communicates with the sonnenBatterie and informs the user with a button-click about all current values.

The sonnenApp shows clearly how much energy the user has produced, consumed or has stored in the sonnenBatterie.

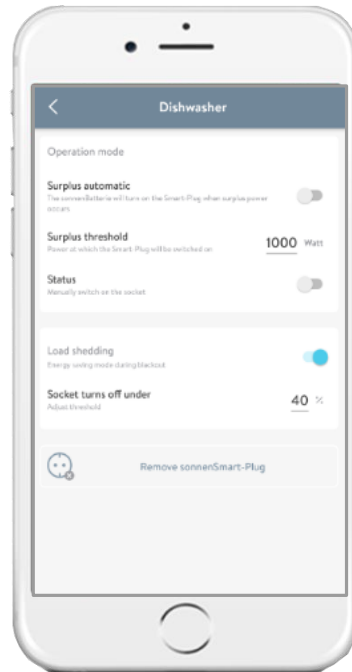
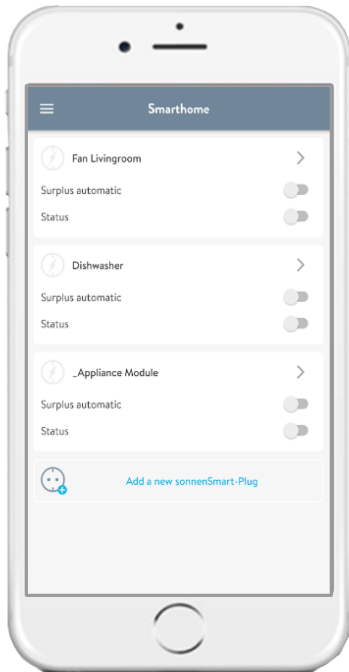
With the sonnenApp the user can directly control individual electrical appliances via intelligent radio sockets, the sonnenSmart-plugs, will receive detailed data on the consumption of certain devices, as they measure the actual power of the device.

The sockets are controlled either manually or automatically. This means: When surplus power production of the PV system on particularly sunny days, the coupled devices will be providing automatically with power. For example, you can start your washing machine comfortably on your way. So you increase effectively your own consumption and still consume even more electricity



Sonnen – Apps, Monitoring & Energy Control

Smart Phone App



Sonnen – Apps, Monitoring & Energy Control

Smart Phone App

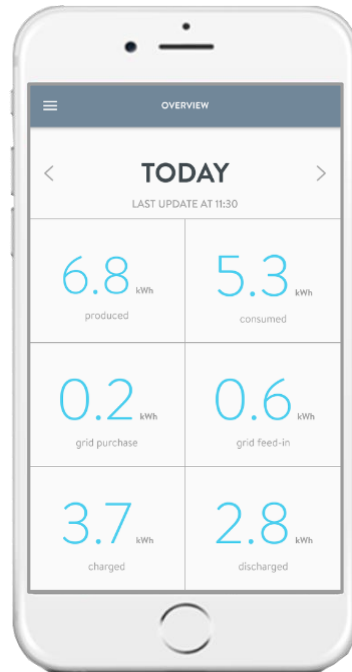


Z-Wave is a wireless technology that lets smart devices talk to one another. Household products, like lights, door locks and thermostats are made “smart” when Z-Wave connectivity is added inside the product’s design.

- » Over 325 manufacturers, including some of the biggest names in consumer electronics and smart home, it is easier to say what Z-Wave does not work with
- » Z-Wave has another level of security which uses AES128 encryption .
- » Z-Wave is a highly 'scalable' technology - meaning it can control anywhere from one device all the way up to 232 devices with just one network.

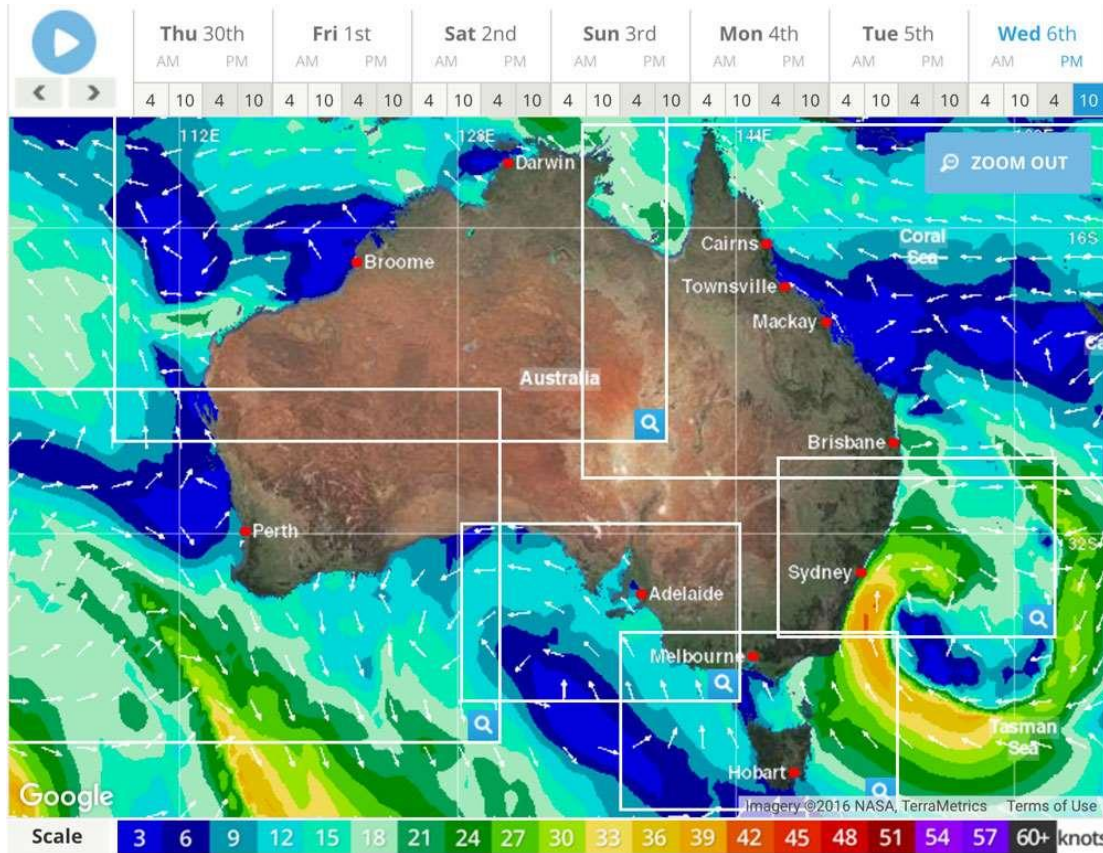
Sonnen – Apps, Monitoring & Energy Control

Smart Phone App



Sonnen – Weather Data

Intelligent Predictive Algorithm



Using the weather to update the predictive algorithm and manage energy effectively.

» Sonnen smart controls, via the self-learning algorithm and data from the weather bureau can identify the best time to start charging and/or discharging batteries as well as even with no- one at home, activate appliances.



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