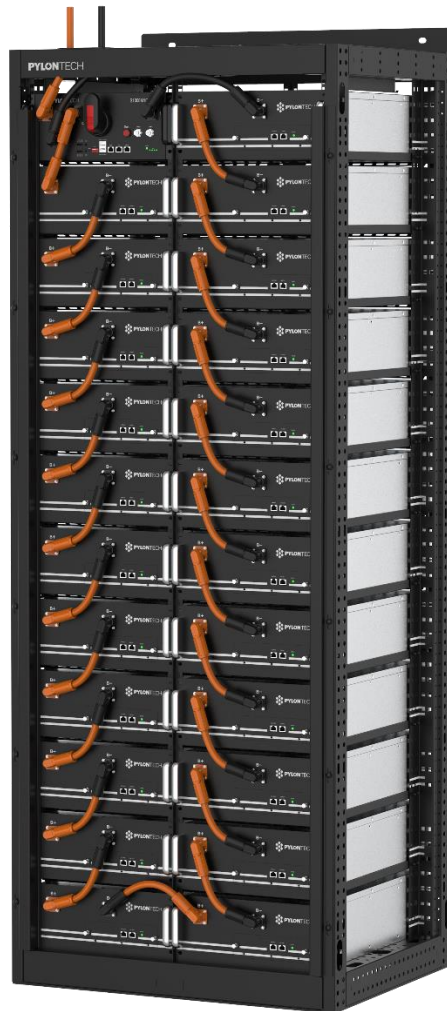




Manual

Battery Storage Kit

Indoor BSI 50-176/109-872



Note

This manual contains important safety instructions that must be observed when installing and maintaining the appliance.

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Storage of the Manual

The manual is part of the scope of delivery of the product and must be available at all times. The manual must always be included with the device, even if it is transferred to another user or to another area.

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Foreword

Structure of this Manual

Please read the manual carefully before installation, operation or maintenance. This manual contains important safety information and installation instructions that must be followed when installing and maintaining the appliance.

Scope of Application

This manual describes the installation, electrical connections, commissioning, maintenance and troubleshooting of the Indoor BSI series battery storage kit.

Keep this manual in a place where it is accessible at all times.

Target Group

This manual is intended for qualified electrical technicians who are responsible for the installation and commissioning of the Indoor BSI series battery storage kit with all the necessary components, as well as for the operator of the Indoor BSI series battery storage kit.

Symbols Used

This manual contains information on safe operation and uses symbols to ensure the safety of persons and property. Please read the instructions and explanations of the symbols in the manual completely before installing and commissioning the Indoor BSI series battery storage kit. If you have any questions, please contact Pramac Storage Systems GmbH immediately for advice and instructions.

DANGER

Danger indicates a warning which, if ignored, will lead directly to death or serious injury.

WARNING

Warning indicates an instruction which, if ignored, can lead directly to death or serious injury.

CAUTION

Caution indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTE

Note draws attention to potential risks which, if not avoided, can lead to device faults or damage to property.



REMARK

Remarks provide tips that are valuable for the optimal operation of the product.

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1 Basic Safety Information

1.1 General Safety Instructions for Handling the Indoor BSI Series Battery Storage Kit

DANGER

Read the safety instructions in this manual carefully, otherwise serious injury or death may result.



REMARK

If you have any questions or problems, read the following information and contact Pramac Storage Systems GmbH.

DANGER

Batteries supply electricity and can explode or become a fire hazard if short-circuited or incorrectly installed.

DANGER

Dangerous voltages are present at the battery terminals and cables. Contact with the cables and poles can result in serious injury or death.

WARNING

Please do not open or technically modify the battery module.

WARNING

Wear suitable personal protective equipment (PPE) such as rubber gloves, steel-toed safety shoes and safety goggles when working on the battery.

WARNING

Temperature ranges of the Indoor BSI series battery storage kit (assuming rel. humidity 5 ... 95 % non-condensing):

Operating temperature of battery rack:	+10 °C ... +40 °C
Operating temperature of inverter:	-25 °C ... +60 °C
Storage temperature:	-20 °C ... +60 °C

Only operate the BSI within the operating conditions described in the technical data in order to ensure proper operation in the long term.

CAUTION

Improper settings or maintenance can permanently damage the battery.

CAUTION








Incorrect inverter parameters lead to premature ageing of the battery.











NOTE

Please clarify the technical connection requirements with the responsible energy supply company and obtain approval before installation and commissioning.

1.2 Symbols










The following symbols and information can be found on the type plate of the battery storage kit:

	<p>See also the external checklists, data sheets and operating instructions for the individual main components.</p>
	<p>Danger! Warning!</p>
	<p>Caution, risk of electric shock!</p>
	<p>There is residual voltage in the inverter! Before opening the appliance, the operator should wait two minutes to ensure that the capacitor is completely discharged.</p>
	<p>Do not set up near flammable material!</p>
	<p>Caution, hot surface!</p>
	<p>Beware of hand injuries!</p>
	<p>The positive and negative poles must not be interchanged.</p>
	<p>Do not place near naked flames.</p>
	<p>Do not place in areas accessible to children and pets.</p>

	Earthing point
	LTE connection
	This indicates the permissible temperature range.
	Recycling label
	Symbol for the Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU)
	Mark for EU conformity (Conformité Européenne)
	Sign for UK conformity
	Safety certificate from TÜV Rheinland
	Safety certificate from TÜV Rheinland for the US and Canadian markets
	Positive pole / negative pole of the input voltage (DC)

1.3 Tools Required

Have the tools required for setting up, assembling and installing the battery storage kit ready.

	Side cutter		Cordless screwdriver with bit set
	Crimping pliers		Adjustable spanner
	Cable ties		1,500 VDC insulating socket spanner set
	Screwdriver set		Multimeter CAT III 1,000 V
	Cable lug crimping pliers	No image	Lift truck

NOTE

Observe the 5 safety rules and only use properly insulated tools to avoid accidental electric shocks or short circuits.

1.4 Protective Equipment

⚠ WARNING

It is recommended that you wear the following safety equipment when working with the battery storage kit.

	Voltage insulating gloves		Safety goggles		Safety shoes
---	---------------------------	---	----------------	---	--------------

⚠ WARNING

When installing and replacing battery modules and battery inverters during service and maintenance work, a second assisting person with suitable equipment must always be called in.

1.5 Installation Conditions

The Pramac battery storage kit Indoor (BSI) is a modular lithium battery storage system with battery inverter. The components are manufactured in accordance with the current state of the art and applicable product-specific standards.

The Pramac battery storage kit Indoor (BSI) is only approved for operation with the Pramac battery inverter PBI 50K-PC or PBI 88K-PC. Any other use must be agreed with the manufacturer and, if necessary, the local energy supplier.

CAUTION

- The battery storage kit Indoor may only be installed and operated indoors.
- The operating temperature range and the maximum permissible humidity can be found in the "Technical data".
- The battery storage kit Indoor must not be exposed to direct sunlight and must not be placed directly next to heat sources.
- The battery storage kit Indoor must not be exposed to a corrosive atmosphere.
- When installing the battery storage kit Indoor, ensure that the system is placed on a sufficiently dry, load-bearing, horizontal and level surface.
- The height of the installation site may not exceed 2,000 metres above sea level without the written approval of the manufacturer.
- In flood-prone areas, ensure that the battery storage kit Indoor is always installed in an elevated position and protected from contact with water.
- In accordance with the IEC 62619 standard, the battery storage kit Indoor must be installed in a fire-protected room. This room must be equipped with an independent fire alarm unit in accordance with local regulations and standards. It must also be ensured that the room is free of other fire loads. The room must be equipped with suitable fire doors of category T60. The fire protection requirements also apply to comparable openings in the room (e.g. windows).
- The room may only be entered by trained and instructed specialised personnel. The key must only be accessible to authorised persons. Any modifications to hardware and software are prohibited.

NOTE



- Intended use of the indoor battery storage kit also includes compliance with the information in this manual.

WARNING

The battery storage kit Indoor (BSI) is not to be used for the following purposes:

- Mobile use on land, in the air or on water
- For the use of medical devices
- As a UPS system
- Continuous operation with open doors

The battery modules must not be used in potentially explosive atmospheres or installed and operated in areas with high humidity.



REMARK

As a basis for planning air conditioning and ventilation systems, a maximum waste heat of 2.3 kW per PBI 88K-PC can be expected. A waste heat of 1.9 kW can be assumed for each battery rack.

NOTE

The power losses depend on the respective operating mode and the respective ambient temperatures.

CAUTION

The following points must also be taken into account:

- Store the battery modules in a dry place and within the temperature ranges specified in the data sheet.
- Do not open, pierce or drop the battery cells or modules.
- Do not expose the battery cells or modules to high temperatures.
- Do not throw the battery cells or modules into a fire.
- In the event of a fire, use a CO₂ fire extinguisher if the fire originates from the battery.
In the event of a fire in the vicinity of the battery, an ABC fire extinguisher must be used.
- In the event of an accident, keep your distance; do not open the CombinerRack doors.
- Do not use defective or damaged battery modules.

NOTE



The following regulations have been taken into account and must also be observed by the operator:

- Closed electrical operating areas in accordance with DIN VDE 0100-731
- DGUV Regulation 3 - Electrical installations and equipment
- DIN VDE 0105-100 - Safe operation of electrical installations
- State building regulations
- VDE-AR-E 2510-50 - Stationary battery energy storage systems with lithium batteries – Safety requirements
- VDE-AR-E 2510-2 - Stationary electrical energy storage systems intended for connection to the low voltage grid

1.6 Checklist BEFORE Commissioning

NOTE



- B2B Pre-Commissioning Checklist for BSI 50-176/109-872
- The checklist must be completed, signed and sent to info.pss@pramac.com before commissioning.

Please observe the requirements in accordance with the VDE-AR-E 2510-2 directive.

Extract from B2B Pre-Commissioning Checklist Battery Storage Kit Indoor (BSI):

ID	Requirement	Description	Comment	Tested
01	The system is installed in a closed operating room.	Only accessible to trained electrical personnel		<input type="checkbox"/>
02	The operating room fulfils the space requirements.	See installation instructions. Note battery rack height of 2.13 m		<input type="checkbox"/>
03	The operating room has free wall space for installing the battery inverter and other components.	Only for single-rack systems		<input type="checkbox"/>
04	The operating area is level, dry and accessible for lift trucks.			<input type="checkbox"/>
05	The operating room should have a dry and constant temperature of 18 ... 25 °C.	Suitable cooling/heating and dehumidification is required for rack systems		<input type="checkbox"/>
06	Single-rack battery storage kit: AC main supply 3P/PE is available at the connection point.	Connection bolt in the battery inverter: <ul style="list-style-type: none"> • L1 ... L3: 35 ... 120 mm²: M10 • PE: M8 		<input type="checkbox"/>
07	Multi-rack battery storage kit with CombinerRack: AC main supply 3P/PE is available at the connection point.	Connection terminals in the CombinerRack: <ul style="list-style-type: none"> • L1 ... L3: Max. 70 mm² • PE: Max. 70 mm² 		<input type="checkbox"/>
08	Free network access line (customer LAN) is available at the connection point.	Pramac Smart Energy Controller (PSEC) requires permanent internet access		<input type="checkbox"/>
09	Alternative: Router incl. data sim card available.	Router can be ordered as an optional accessory		<input type="checkbox"/>
10	An interface for integrating the meter data is available at the connection point.	Integration of the energy meter either via RS485 (2-wire) to the Link B connection of the PSEC or via Ethernet via switch.		<input type="checkbox"/>
11	Suitable current transformers for energy meters at the connection point are available.	No current transformers are included in the scope of delivery		<input type="checkbox"/>
12	Suitable earthing of the battery rack(s) is available in the operating room.			<input type="checkbox"/>

ID	Requirement	Description	Comment	Tested
13	Suitable mounting elements for rack and components on the floor and wall are available.	For mounting battery racks, battery inverters, etc.		<input type="checkbox"/>
14	A sub-distribution board for the installation of PSEC and 24 VDC network switch is available.	To install the necessary components of the single-rack battery storage kit		<input type="checkbox"/>
15	Check delivery for completeness.			<input type="checkbox"/>
16	Check compatibility with existing generation systems.			<input type="checkbox"/>
17	Provision of access authorisation for assembly personnel.	If necessary		<input type="checkbox"/>

2 Overview – Battery Storage Kit Indoor BSI Series

This chapter presents the individual components of the battery storage kit Indoor BSI series.

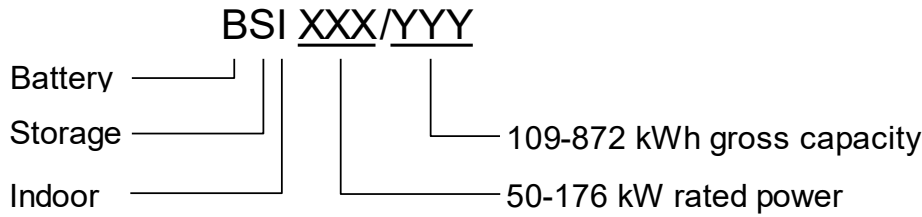


Figure 2-1: Product designation of the BSI series

2.1 Component Overview

Using the BSI 50/109 as an example:

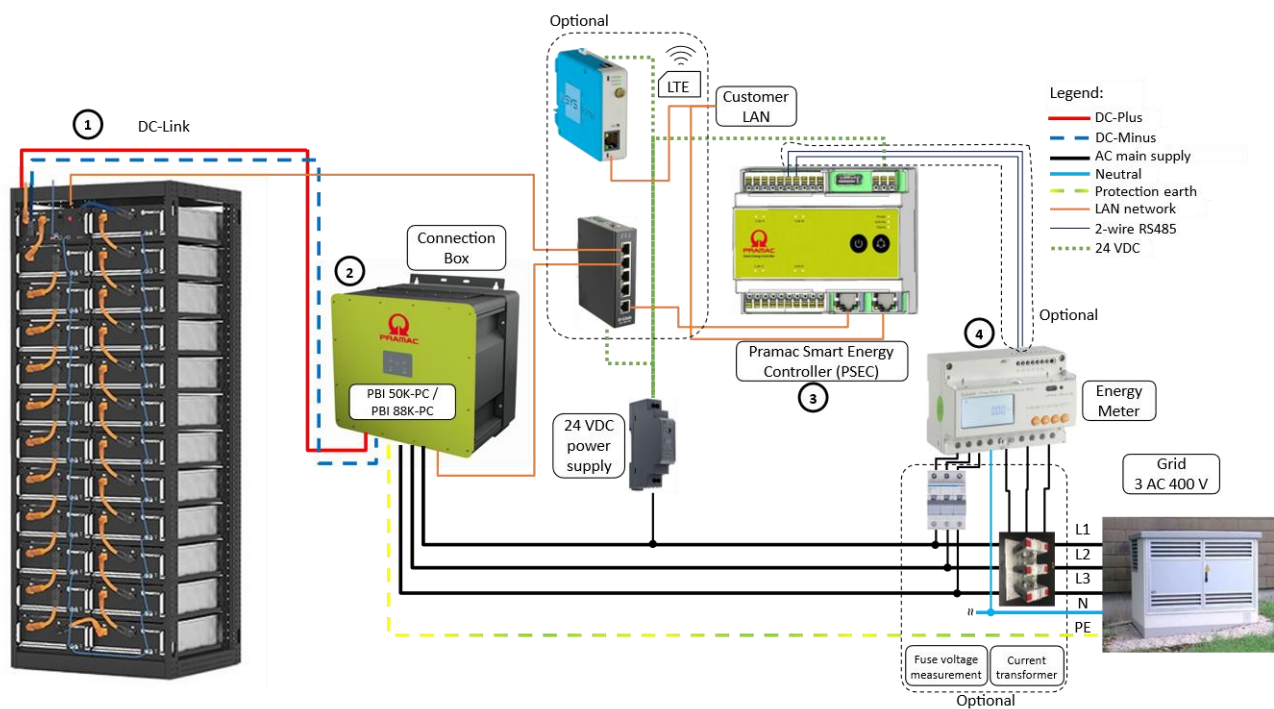


Figure 2-2: Overview of BSI 50/109 with main components

No.	Description	Consisting of
1	Powercube M1C Li-Ion battery storage kit with a rack capacity of 109 kWh from Pylontech	<ul style="list-style-type: none"> • 23× battery modules, each with a capacity of 4.74 kWh • 1× battery management system (BMS) • Mounting rack for attaching the BMS and modules • DC plus-minus cables for connecting the battery modules and BMS • Network cables for connecting the battery modules and BMS • Small parts
2	Battery inverter with either 50 kW or 88 kW output	<ul style="list-style-type: none"> • Battery inverter PBI 50K-PC (Art. No. 421P050.110) / Battery inverter PBI 88K-PC (Art. No. 421P100.110) • ConnectionBox (Art. No. 940P300.0000)
3	Pramac Smart Energy Controller (PSEC)	<ul style="list-style-type: none"> • Energy management system for mounting on top-hat rail
4	Energy meter without transformer for measurement at the grid connection point	<ul style="list-style-type: none"> • Type Acrel ADL3000-E/C • 3× 220/380 V / 3× 1(6) A 3P4L

In addition to an accessible mounting surface, the following components and installations must be provided by the customer in advance (see "Chapter 1.6 Checklist BEFORE Commissioning").

- AC supply line to the battery inverter incl. suitable fuse protection.
 - Please refer to "Chapter 3.2.6 AC Connection for ConnectionBox and AC network".
 - Local IT network or LTE router for internet connection of the EMS (PSEC) to the portal <https://portal.pramac.energy>.
- Suitable instrument transformers for correct integration of the energy meter, including fuse protection for voltage measurement.

2.1.1 Data Sheet

NOTE



- Data sheet: Battery storage kit Indoor BSI series

Table 2-1: Data sheet: Battery storage kit Indoor BSI series

TECHNICAL DATA – Battery storage kit Indoor BSI series							
		BSI 50-88/109	BSI 50-176/218	BSI 50-88/327	BSI 50-176/436	BSI 100-176/654	BSI 100-176/872
Gross capacity (kWh)		109	218	327	436	654	872
Net capacity (90 % DoD) (kWh)		98.1	196.2	294.3	392.4	588.6	784.8
Nominal voltage (VDC)		736					
Max. charging/discharging current (A)		148					
Cell type		Li-Ion (LFP) Pouch					
Cycles (90 % DoD 65 % SoH 0.5 C/0.5 C)		7,300 cycles					
Temperature range	Storage (°C)	-20 ... +60					
	Operating (°C)	+10 ... +40					
Humidity (RH, %)		5 ... 95, non-condensing					
Max. permissible operating/installation altitude (above sea level) (m)		2,000					
Weight	Battery rack, loaded (kg)	1×1,250	2×1,250	3×1,250	4×1,250	6×1,250	8×1,250
	Battery module (kg)	48					
Dimensions (W×D×H, mm)		1× (815×659× 2,130)	2× (815×659× 2,130)	3× (815×659× 2,130)	4× (815×659× 2,130)	6× (815×659× 2,130)	8× (815×659× 2,130)
Protection class		IP20					
Communication		RS485, Modbus (TCP/RTU)					
Certificates / Permits	Battery module	UN 38.3 / IEC 62619 / UL 1973 / UL 9540A / VDE 2510-50					
	Battery rack	CE / UN 38.3 / UN 3536 / IEC 62619 / IEC 63056 / UL 1973 / UL 9540A / VDE 2510-50 / EN IEC 61000-6-2:2019-02 / EN IEC 61000-6-4:2019-09					

Warranty	5-year product warranty * 10-year performance guarantee
<p>* The following table is based on:</p> <ul style="list-style-type: none"> • 90 % DoD and an operating temperature range between +10 °C and +40 °C in a maximum of 10 years or • The achievement of the defined cycles, whichever occurs first. 	

SOH % of nominal energy	≤ 0.5 C-rate	≤ 1 C-rate
≤ 3,650 cycles	75 %	70 %
≤ 5,475 cycles	70 %	65 %
≤ 7,300 cycles	65 %	60 %

Table 2-2: Data sheet: Battery inverter PBI 50K/88K

TECHNICAL DATA – Battery inverter PBI 50K/88K		
	PBI 50K-PC 421P050.110	PBI 88K-PC 421P100.110
Rated power (kW)	50	88
Maximum AC current (A)	128	
Maximum DC current (A)	87	155
DC operating range min. ... max. (V)	585 ... 1,000	
AC mains connection	3P, PE / TT, TN-C, TN-S	
Nominal voltage (VAC)	380/400/415	
Nominal frequency (Hz)	50	
THDi (%)	< 3	
AC power factor / range	1 / 0.3i ... 0.3 c	
Max. efficiency (%)	98.5	
Operating range (°C)	-25 ... +60	
Cooling	Intelligent active cooling	
Weight (inverter only) (kg)	69	
Topology	transformer less	
Communication	Sunspec (Modbus TCP/RTU)	
Noise emissions (dB(A))	< 70	
Certificates / Permits	EU directives	2014/30/EU / 2014/35/EU / 2014/53/EU / 2011/65/EU
	Device	IEC 62109-1 / IEC 62109-2 / IEC 62116 / IEC 61727 / IEC 62477-1 / IEC 61439-1 / IEC 61439-2
	EMC	EN 61000-6-2 / EN 61000-6-4 / EN 61000-3-12 / EN 61000-3-11
	Environment	IEC 60068-2-1 / -2-2 / -2-30 / -2-78 / -2-14 / -2-6 / -2-27 / -2-75
	Grid connection conditions	DIN VDE V 0126-1-1 / VDE AR-N 4105:2018 / VDE AR-N 4110:2018 / TOR Type A producer / UTE C 15-712-1 VFR 2019 / G 99 / EN 50549-1/-2

Table 2-3: Data sheet: CombinerRack

TECHNICAL DATA – CombinerRack	CombinerRack Single ZY000A00004	CombinerRack Dual ZY000A00005
Space for inverters	1	2
Space for Master BMS	1	2
± DC rack connection	4× (DC ±)	8× (DC ±)
AC connection terminal range (L1 ... L3/PE) (mm ²)	4× 35 ... 70	8× 35 ... 70
AC auxiliary power supply (L1/N/PE) (mm ²)	0.75 ... 2.5	
Protection class	IP20	
Weight (kg) without inverter	165	185
Dimensions (W×D×H, mm)	800×800×2,200	

Table 2-4: Data sheet: Energy meter

ACCESSORIES		Energy meter Acrel ADL3000-E * ZY000A00002
Voltage	Reference voltage (V)	3×380, 3×220/380
Current	Input current (A)	3×1(6) (passive current transformer), 3×10(80)
Power (%)		Active, reactive and apparent power, error ±0.5
Communication		RS485 (Modbus RTU)
Conductor cross-section voltage measurement min./max. (mm ²)		2.5/16
Mounting		Top-hat rail
Dimensions (W×D×H, mm)		126.5×88.2×69.5
* Current transformers and fuse protection for voltage measurement are not included in the scope of delivery		

Table 2-5: Data sheet: Pramac Smart Energy Controller (PSEC)

ACCESSORIES	Pramac Smart Energy Controller (PSEC) ZY000A00011 PSEC-DMXX
Supply voltage (VDC)	10 ... 24
Operating temperature range (°C)	-25 ... +60
Operating humidity range (RH, %)	5 ... 95 (non-condensing)
Communication	LAN Ethernet, RJ45, RS485 (Modbus RTU)
Mounting	Top-hat rail 6TE
Dimensions (W×D×H, mm)	106×63×90

3 Installation of the BSI Series

This chapter describes the installation of the Indoor BSI series battery storage kit.

NOTE



- The Powercube M1C battery rack is from the manufacturer Pylontech
- The battery inverters are from Pramac Storage Systems GmbH

3.1 Before Installation

Based on the installation requirements, check that there is sufficient space in order to be able to install the battery storage kit Indoor (BSI) correctly.

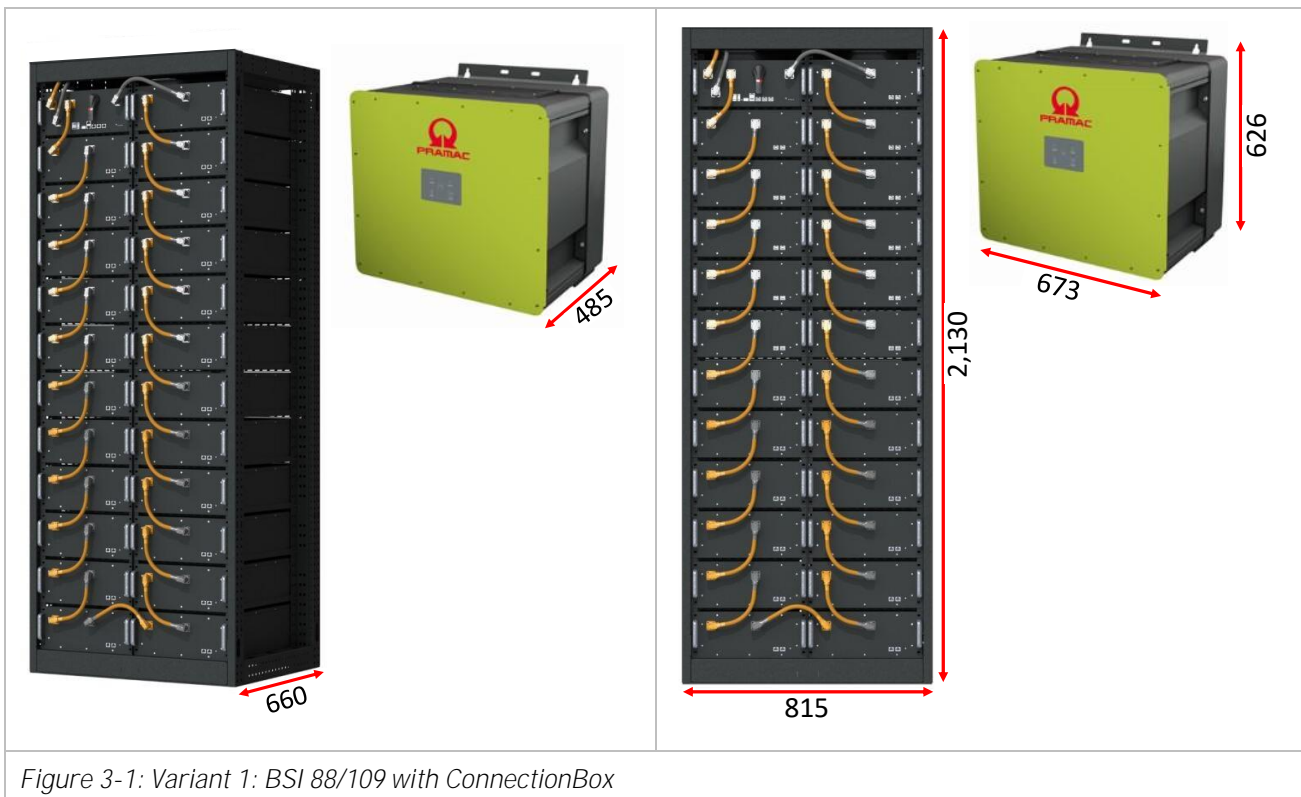
⚠ WARNING

The battery rack has protection class IP20. It must be installed in an area with restricted access.

⚠ WARNING

A single battery module weighs 48 kg. 2 to 3 people are recommended for installation without a lifting device.

The dimensions of the Indoor BSI series battery storage kit are shown below in 3 variants:



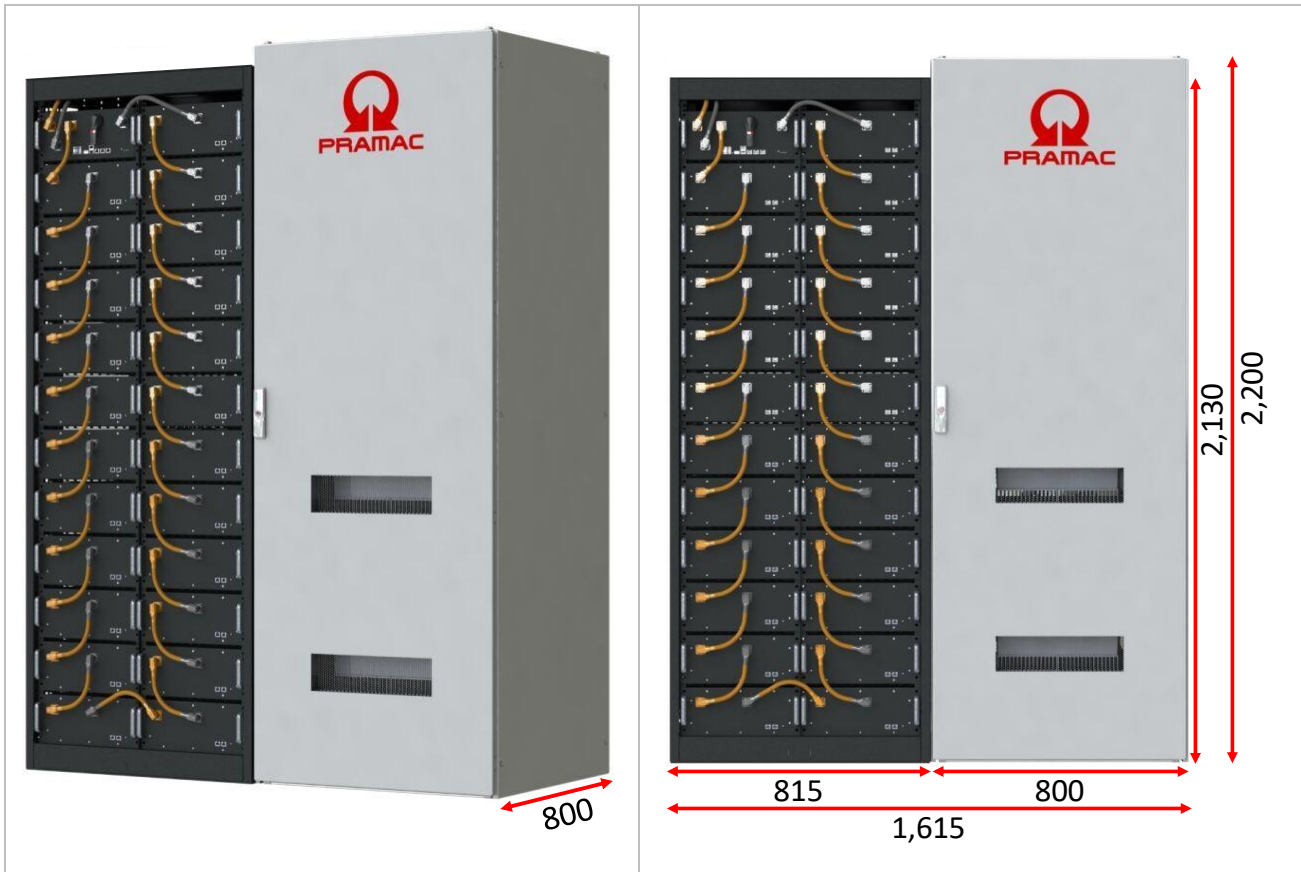


Figure 3-2: Variant 2: BSI 88/109 with CombinerRack

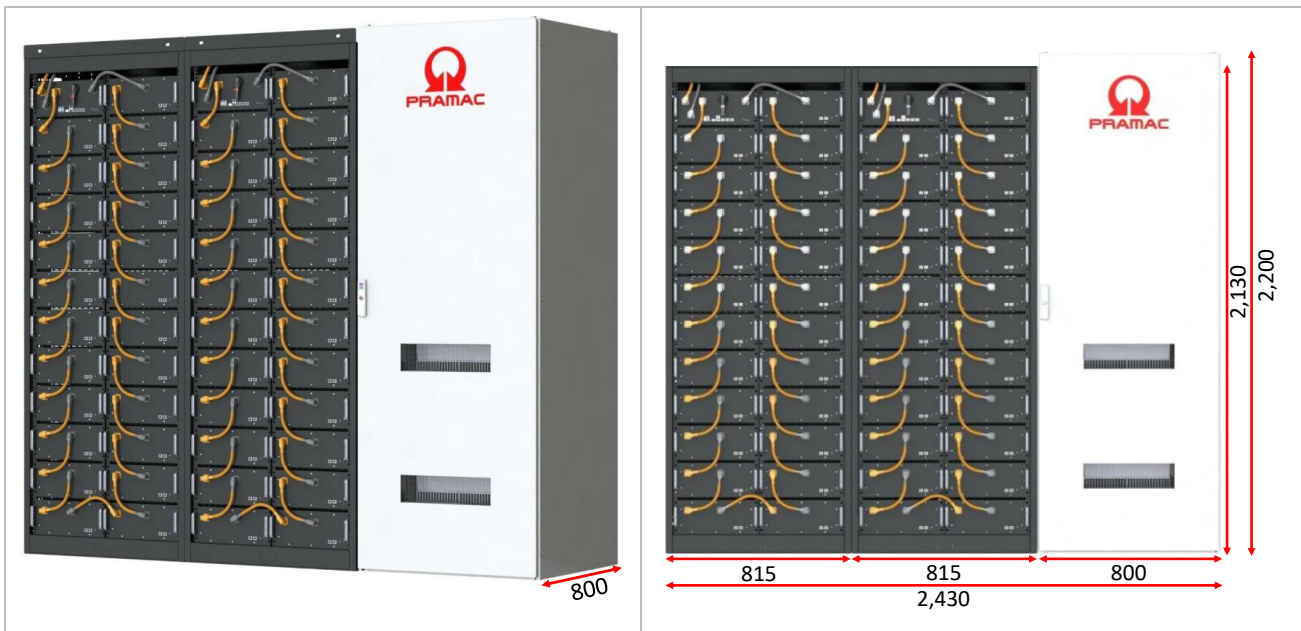


Figure 3-3: Variant 3: BSI 88/218

NOTE

For optimum installation of the battery modules, we recommend a minimum distance of 150 mm from the battery rack to the left or right wall.

3.1.1 Inspection of the Delivery before Installation

The individual components of the battery storage kit are delivered separately on pallets and are packaged accordingly.

1. Check packaging for damage.

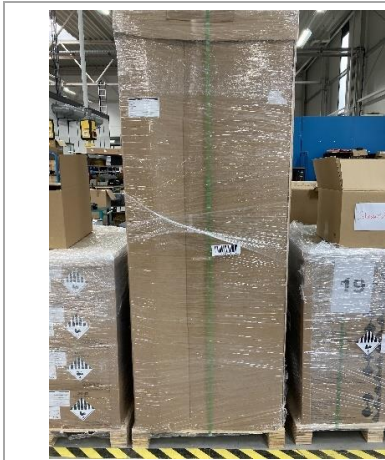


Figure 3-4:
Empty battery rack



Figure 3-5:
Battery modules



Figure 3-6:
Battery management system (BMS)



Figure 3-7:
ConnectionBox 50K/88K



Figure 3-8:
Battery inverter 50K/88K-PC



Figure 3-9:
PSEC energy management system



Figure 3-10:
Energy meter Acrel ADL3000



Figure 3-11:
DC cable and screws included



Figure 3-12:
Switch/Router

NOTE

If damage is detected, DO NOT unpack the components and contact your supplier immediately.
The individual appliances shown are not exhaustive. Depending on the product variant, additional devices and packaging may also be included, e.g. CombinerRack.

3.2 Mounting and Connecting the Components

This chapter describes the installation of the individual components of the battery storage kit.

3.2.1 Mounting the Battery Rack

Unpack the empty battery rack and move it to the planned installation location.

The battery rack can be attached to the floor/base with 4 screws.

It is also possible to attach the battery rack to the wall using a mounting rail supplied at the head end.

There are 2 slotted holes with a diameter of 15 mm in the mounting rail for this purpose.

Sketch of the holes in the battery rack (unit: mm):

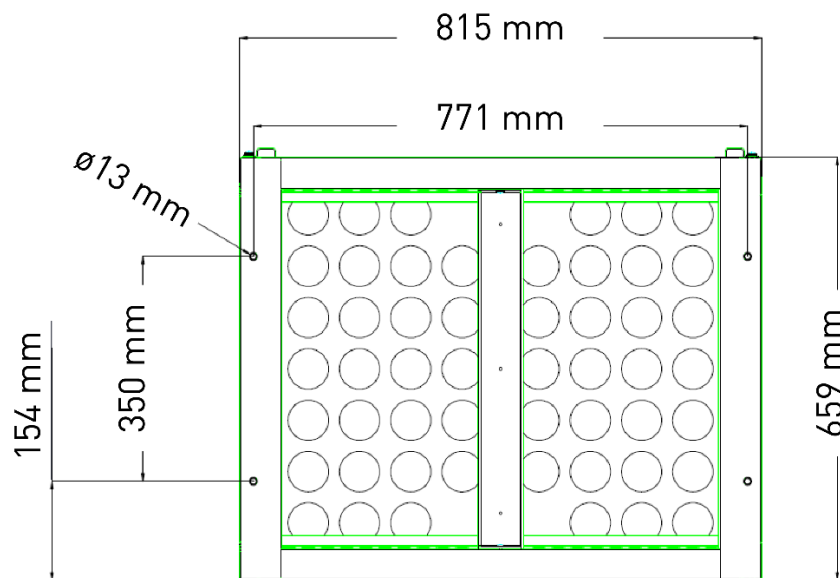


Figure 3-13: Dimension sheet for perforated plate of battery rack

NOTE

The battery rack is earthed at the base of the rack housing. See "Chapter 3.2.11 Earthing the Components".



REMARK

Applicable national regulations must be observed!

3.2.2 Installation of the BMS and Battery Modules

Install the battery management system and all battery modules in the rack:

1. Remove the module brackets on the left and right side of the rack.



Figure 3-14: Removal of module brackets on rack

NOTE

After installing the BMS and all battery modules, the module bracket must be refitted for safety reasons.

2. Remove the cage nuts from the accessory pack and install them in the empty battery rack. The position of the cage nuts must match the mounting holes of the BMS and the battery modules.
3. Insert the battery module into the corresponding compartment as far as it will go.
4. Install the BMS and all battery modules according to "Figure 3-16: Connecting the battery modules". To do this, remove 4 screws at a time from the accessory pack and fasten them to the previously inserted cage nuts. Ensure a maximum torque of 13 Nm.

3.2.3 Connecting the Battery Modules

⚠ DANGER

The battery storage kit is a high-voltage direct current system. It must be ensured that the earthing of the rack is stable and reliable.

⚠ DANGER

All plugs and sockets of the DC connection cables must be orange to orange and black to black. Failure to do so may result in injury.

⚠ DANGER

The DC disconnect switch on the rack BMS must be opened before any maintenance or repair.

⚠ DANGER

Do not bridge the +pole (DC) / -pole (DC) of a battery module.
Danger of short circuits!

⚠ WARNING



Be careful of hand injuries (crushing injuries) when inserting the battery modules into the rack!

⚠ CAUTION

- The DC disconnect switch of the BMS must be open (position: OFF).
- Connect the DC cabling (cables E and F [see "Figure 3-16: Connecting the battery modules"]) first to the ConnectionBox of the battery inverter; and only then to the BMS of the battery rack.

Detailed view of a battery module:

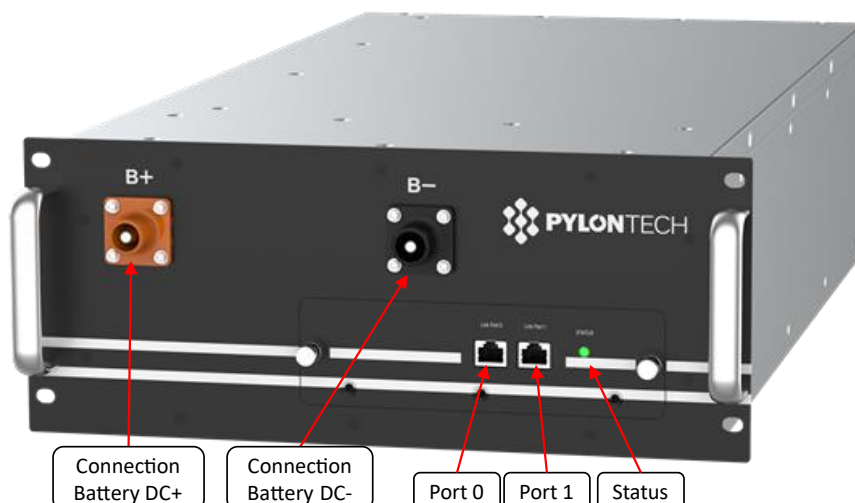


Figure 3-15: Front panel of battery module

1. Remove the rubber grommets from the plus and minus poles and set aside. The grommets are required as protection against contact in the event of a complaint/return. Please keep them in a safe place!
2. DC± wiring of the battery rack: Connect the battery modules to each other from B- (black) to B+ (orange) using the power cable orange ↔ black. The power cables engage audibly when pressed into the plus/minus pole. The cables can be removed again by releasing the lock on the respective plug.

DC connection of the battery modules

The DC cables of the battery modules and the BMS are connected as follows:

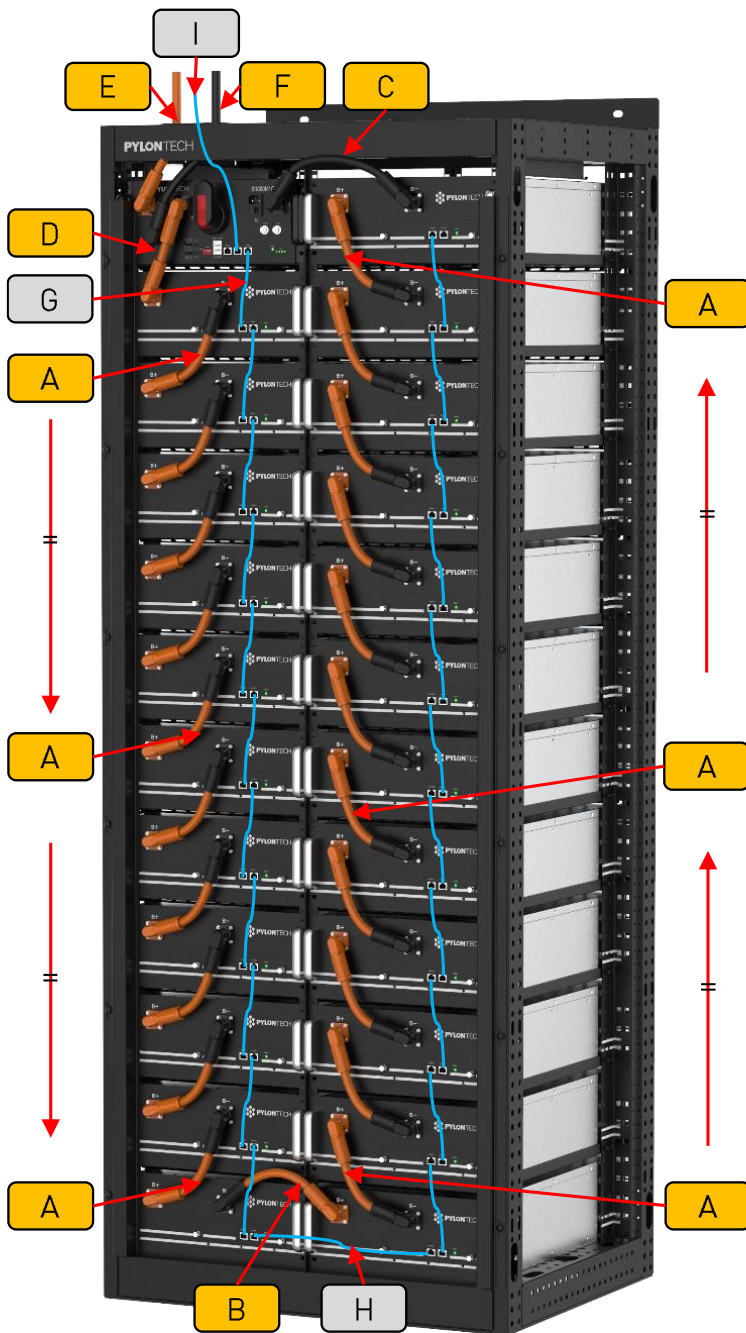
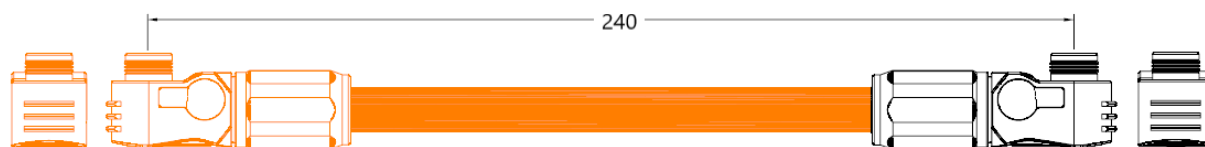


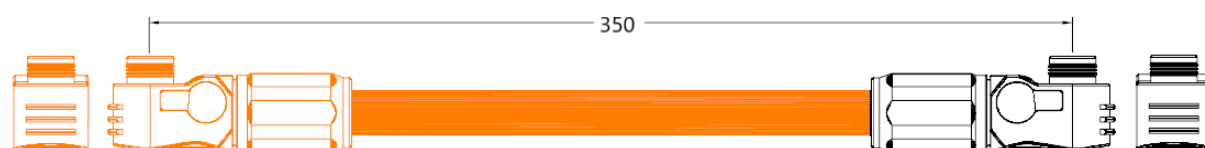
Figure 3-16: Connecting the battery modules

ID	Components	Description	Unit	Quantity
A	Connection cable	Orange/0.24 m/1/0AWG/ Connection 1× orange & 1× black	Pcs.	23



The DC connection between the left and right module racks is established with a slightly longer power cable:

ID	Components	Description	Unit	Quantity
B	Connection cable (battery module left and right rack serial connection)	Orange/0.35 m/1/0AWG/ Connection 1× orange & 1× black	Pcs.	1



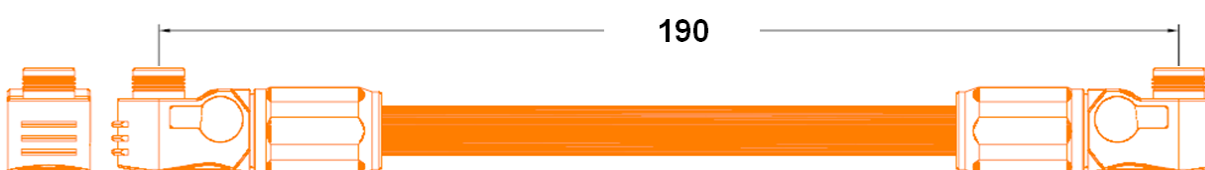
The DC connection B- from the last battery module to B- on the BMS is established using a slightly longer power cable (black ↔ black):

ID	Components	Description	Unit	Quantity
C	Connection cable	Black/0.32 m/1/0AWG/ Connection 2× black	Pcs.	1



The DC connection B+ from the BMS to the B+ of the first battery module is made using a short power cable (orange ↔ orange):

ID	Components	Description	Unit	Quantity
D	Connection cable	Orange/0.19 m/1/0AWG/ Connection 2× orange	Pcs.	1



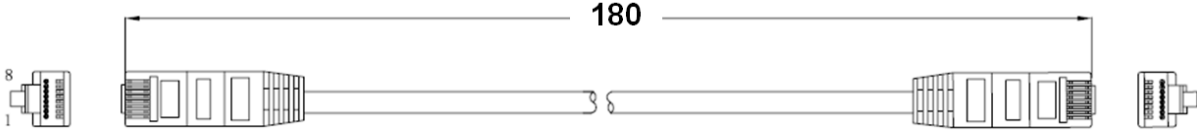
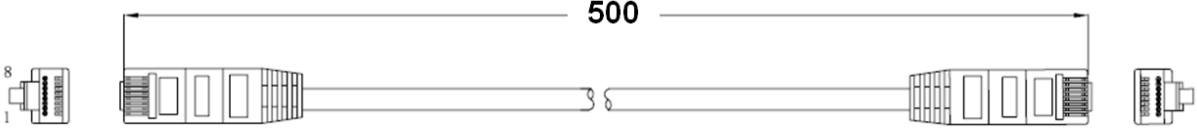
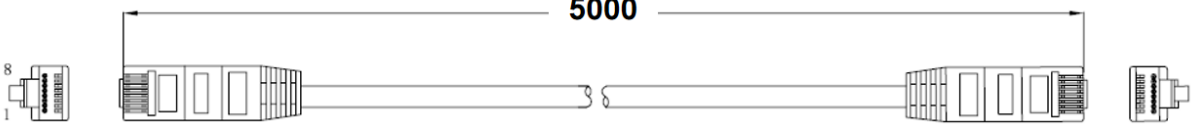
Network connection of the battery modules

⚠ CAUTION

Incorrect connection of the communication cables will cause the battery storage kit to fail.

See "Figure 3-16: Connecting the battery modules" (G, H, I):

Connection from battery module to battery module:

ID	Components	Description	Unit	Quantity
G	Battery cascade communication cable (0.18 m)	Black/0.18 m/8 cores (twisted pair CAT5 cable)/RJ45	Pcs.	23
				
Connection from left rack half to right rack half:				
H	Battery cascade communication cable (0.5 m)	Black/0.5 m/8 cores (twisted pair CAT5 cable)/RJ45	Pcs.	1
				
Connection from BMS to switch/router (single rack) or BMS to (M-)BMS (multi-rack):				
I	External battery communication cable (direct)	Black/5.0 m/8 cores (twisted pair CAT5 cable)/RJ45	Pcs.	1
				

3.2.4 Mounting the ConnectionBox 50K/88K

NOTE



- Operating instructions for Pramac battery inverter PBI 50K/88K

A ConnectionBox (Art. No. 940P300.100) is required for the single-rack version (e.g. BSI 50/109). The ConnectionBox is mounted on the wall with 4 fastening screws.

The multi-rack version (e.g. BSI 88/218) does not require a ConnectionBox, as the battery inverter is inserted horizontally into the CombinerRack.

1. Mark the drill holes using the following drawing:

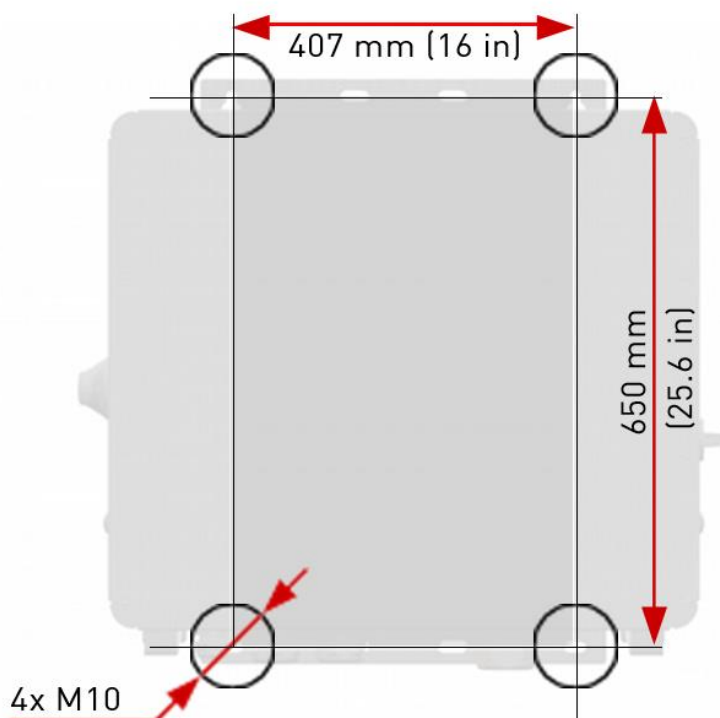


Figure 3-17: Drill hole template

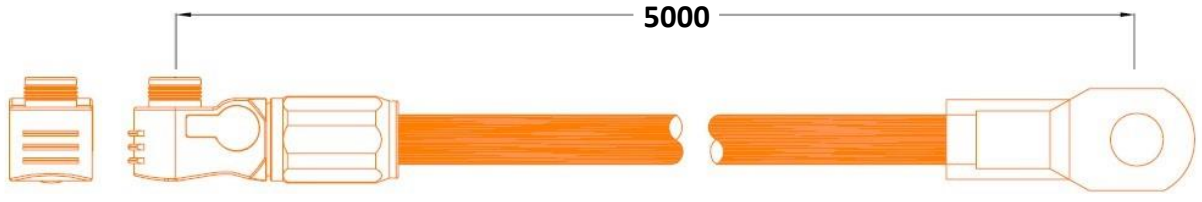
2. Drill holes and insert dowels.
3. Screw the screws (minimum diameter 8 mm) into the upper dowels at a distance of 8 mm from the mounting surface.
4. Hook the ConnectionBox into the two upper screws and press it against the wall.
5. Screw the bottom screws into the dowels.
6. Tighten all screws.

3.2.5 DC Connection, BMS and ConnectionBox

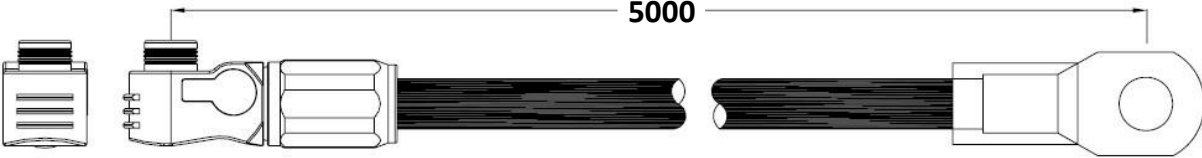
See "Figure 3-16: Connecting the battery modules" (E, F):

The DC connection between the BMS and ConnectionBox is established using the DC plus/DC minus cables supplied:

ID	Components	Description	Unit	Quantity
E	+DC connection cable	Orange/5.0 m/1/0AWG/ Phoenix terminal/50-8 terminal	Pcs.	1



ID	Components	Description	Unit	Quantity
F	-DC connection cable	Black/5.0 m/1/0AWG/ Phoenix terminal/50-8 terminal	Pcs.	1



NOTE

The cable lugs still need to be adapted on the customer side. The cable lugs are supplied ex works with a cross-section of 50 mm² and an M8 hole. To be able to connect the DC power cables in the ConnectionBox, the cable lug must be re-crimped to 50 mm² with an M10 hole!

The DC power connection to the BMS is made at the "DC+ supply line" and "DC- supply line" connections as shown in the following diagram.

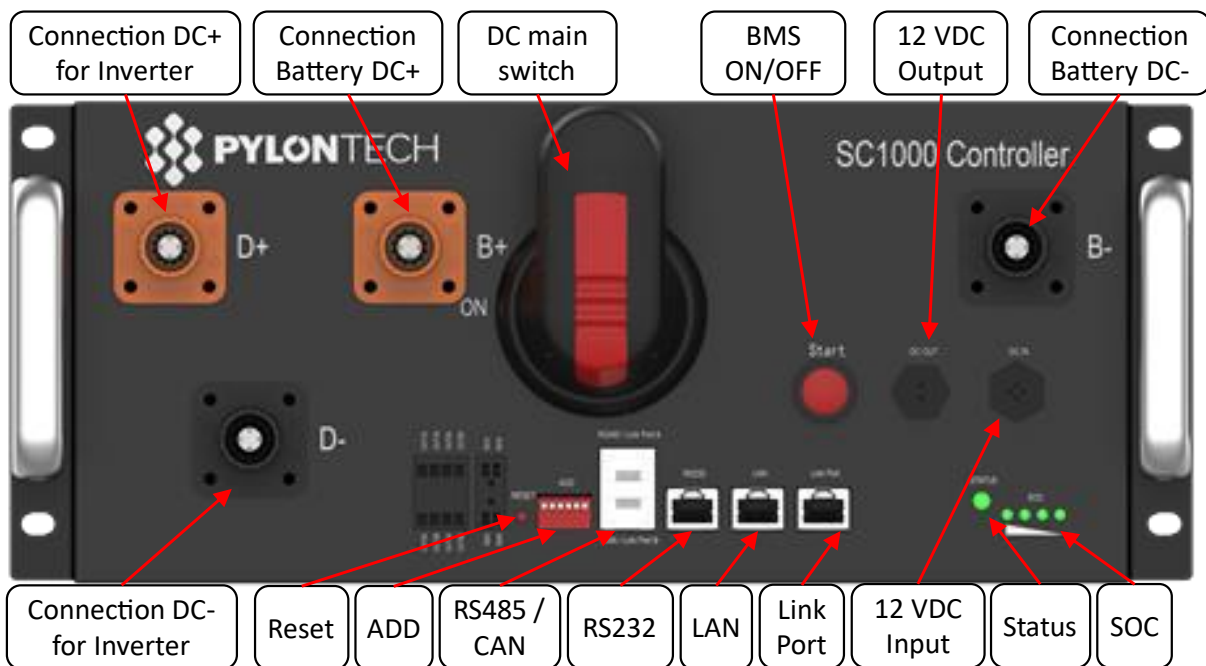


Figure 3-18: BMS - Communication and power connections

The DC power cables are connected to the DC bolts provided in the ConnectionBox.
Observe the torque of 14 ... 31 Nm on the M10 DC bolts!



REMARK

The cable routing must only be specified and designed by a qualified electrician!

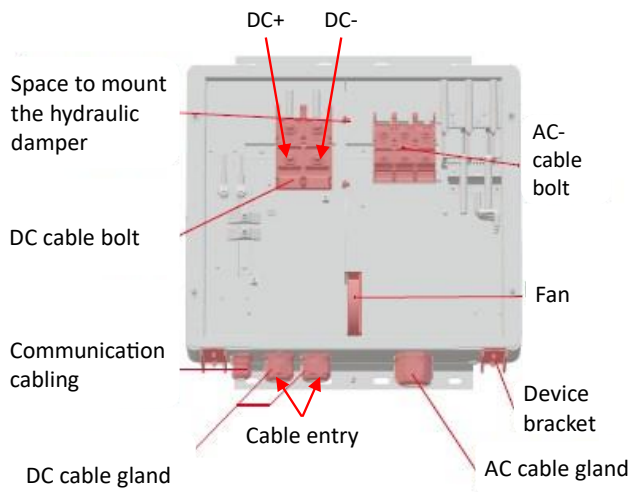


Figure 3-19: DC connection for ConnectionBox

NOTE



- Operating instructions for Pramac battery inverter PBI 50K/88K

3.2.6 AC Connection for ConnectionBox and AC network

The AC mains connection of the battery inverter and ConnectionBox combination must be provided by the customer and must be laid and fitted with fuses in accordance with the local conditions.

The connection is made in the ConnectionBox to the AC bolts L1 ... L3.

Ensure a clockwise rotating field.

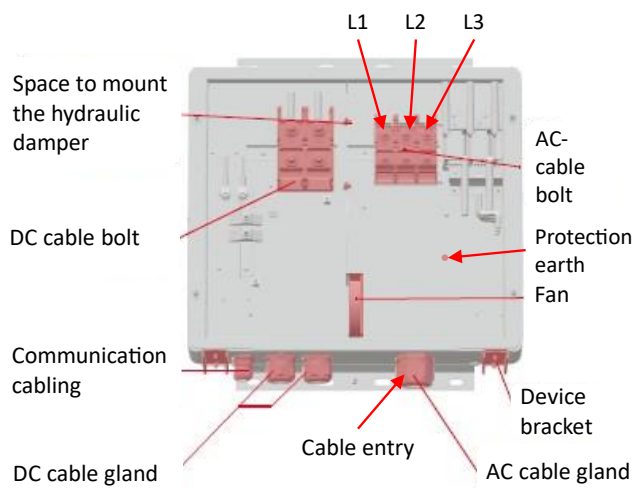


Figure 3-20: AC connection of ConnectionBox

NOTE



- Operating instructions for Pramac battery inverter PBI 50K/88K

3.2.7 Mounting the Inverter (PowerUnit)

Before attaching the PowerUnit, ensure that the environment is dry.

1. Carefully unpack the PowerUnit and check that the connector contacts on the rear are undamaged.
2. Lift the PowerUnit with 2 to 3 people, each with one hand on the handle and one hand on the top of the PowerUnit.
3. Carefully insert the PowerUnit into the device holder of the ConnectionBox.

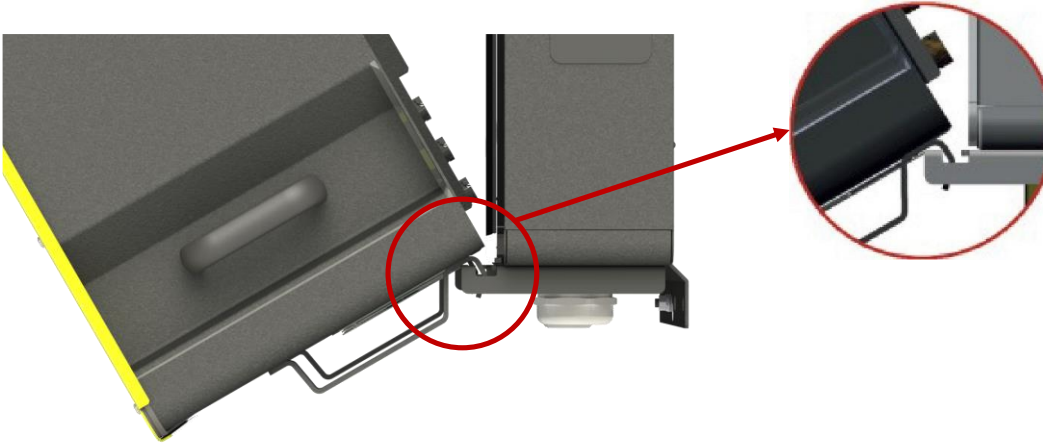


Figure 3-21: Hang PowerUnit/ConnectionBox in place

4. Person 1 holds the PowerUnit.
5. Person 2 hangs the hydraulic cylinders into the slot of the ConnectionBox.



Figure 3-22: Hanging hydraulic rod in ConnectionBox

CAUTION

The electrical system is disconnected in accordance with the 5 safety rules.
DC switch on the rack BMS is switched off. AC fuses of the AC supply line are disconnected.

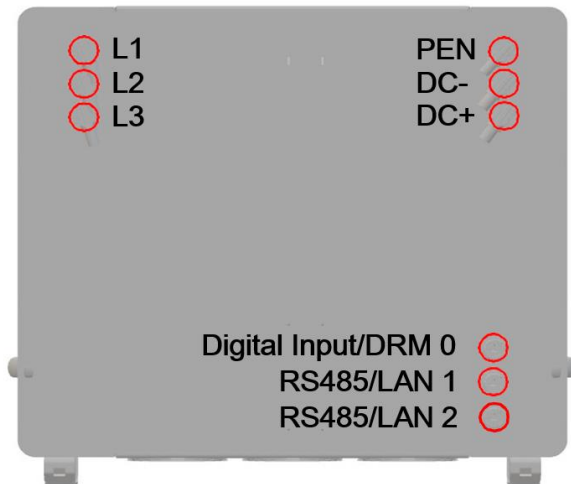


Figure 3-23: Connection area of the inverter: L1-3, PEN, DC±, digital input and RS485/LAN 1-2

1. Press the plug lock and insert the plug into the connection socket until you hear it click into place.
2. Connect the protective earth conductor (PE, green/yellow).
3. Connect the AC and DC cables to the ConnectionBox according to the labels (DC-, DC+, L1, L2 and L3).
4. Connect the Ethernet cable of the ConnectionBox adapter board (X6) to the digital input of the PowerUnit (Digital Input/DRM 0).
5. Check that the plug connectors are firmly seated.
6. Carefully press the PowerUnit into place and hold it firmly.
Make sure that the cables are not pinched or damaged when closing it.
7. Hand-tighten the M8 screws.
Tighten all four M8 screws crosswise with a tightening torque of 20 Nm.

NOTE



- Operating instructions for Pramac battery inverter PBI 50K/88K

3.2.8 Pramac Smart Energy Controller (PSEC) Connection

In the product variant without CombinerRack, the energy management system (PSEC) must be installed in a corresponding sub-distribution board provided by the customer and supplied with 24 VDC.

NOTE

Installation may only be carried out by a trained electrician.

In the product variant with CombinerRack, the energy management system (PSEC) and the 24 VDC supply are already pre-installed.

The controller has 4 plug-in card slots, which were selected specifically for the product.

The PSEC-DMXX equipment variant shown here has a plug-in card with 4× digital IO and a plug-in card with RS485 bus.

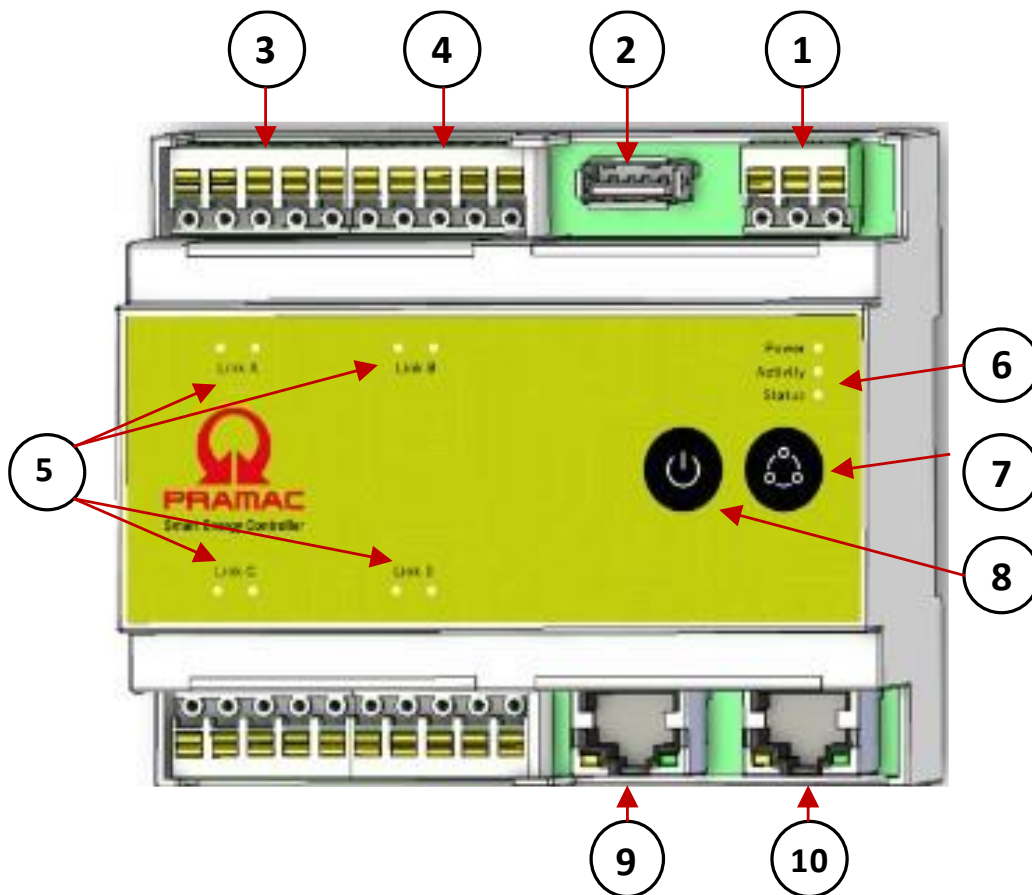


Figure 3-24: Overview: PSEC

No.	Description	No.	Description
1	10 ... 24 VDC power supply	6	Status display: Power / Activity / Status
2	USB-A 2.0	7	Confirm button
3	Link Port A → 4× Digital IO	8	ON/OFF button
4	Link Port B → Modbus RTU (RS485)	9	LAN1 - internal network
5	Status LED Link Port A / B / C / D	10	LAN2 - external customer network with Internet connection

3.2.9 Energy Meter Connection via RS485

The energy meter is preferentially connected to the grid connection point of the battery storage kit. The energy meter can be mounted and installed on a standard top-hat rail in a switch cabinet.



REMARK

The scope of delivery of the energy meter does not include a current measuring transformer. These can be ordered as an option. The operating instructions are enclosed. It describes the menu navigation and the setting of the transmission ratio.

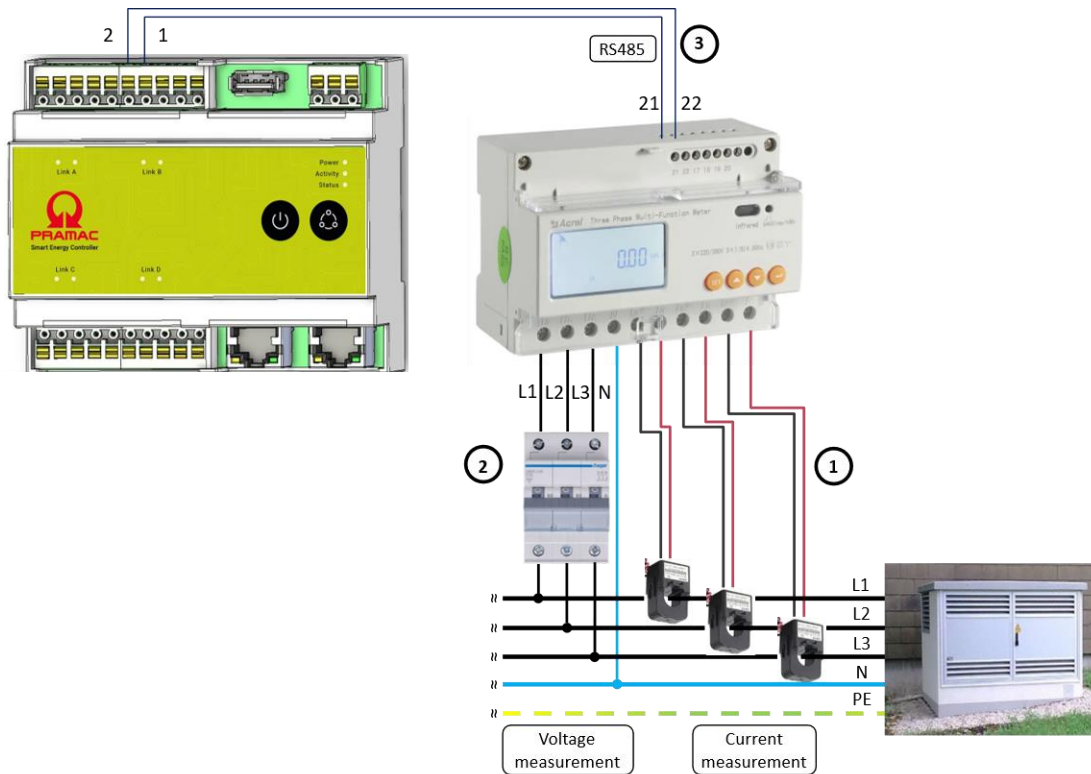


Figure 3-25: Connection of energy meter via RS485

No.	Description
1	A transformer is required for each phase for current measurement. It must be ensured that the direction of the current arrow is uniform and follows the direction of the arrow from the mains connection to the consumer.
2	The voltage measurement must be fused separately, see "Figure 3-25: Connection of energy meter via RS485". For this purpose, the customer must install a 3-pole circuit breaker or a 3-pole thermal fuse in the sub-distribution board in which the energy meter is also installed.
3	Connect the RS485 bus to terminals 21 and 22 on the energy meter.

The RS485 cable is fed through the same rubber grommet as the network cable on the customer side. The energy meter is connected to Link Port B (terminals 1 and 2) on the energy management system (PSEC).

NOTE

- It is important that transformer 1 is connected with phase L1 to Ua (Ia, Ia* and terminal 1) and analogously L2 and L3, and that the direction of rotation for L1, L2, L3 is maintained.
- Only use shielded and twisted cables for Ethernet cabling. We recommend bus cables or network cables of type CAT6/CAT7.
- The fuse is not included in the scope of delivery. The dimensioning of the fuse protection and the conductor cross-sections must be designed by the customer.
- Observe the direction of the counting flow:
Install the PV meter and grid meter in the correct counting direction: Supply + / Feed-in -.

3.2.10 Energy Meter Connection via RJ45

An energy meter is also integrated via Ethernet at the grid connection point to which the battery storage kit is connected (see "Figure 3-26: Connecting energy meter via Ethernet").



REMARK

The scope of delivery of the energy meter does not include a current measuring transformer. These can be ordered as an option. The operating instructions are enclosed. It describes the menu navigation and the setting of the transmission ratio.

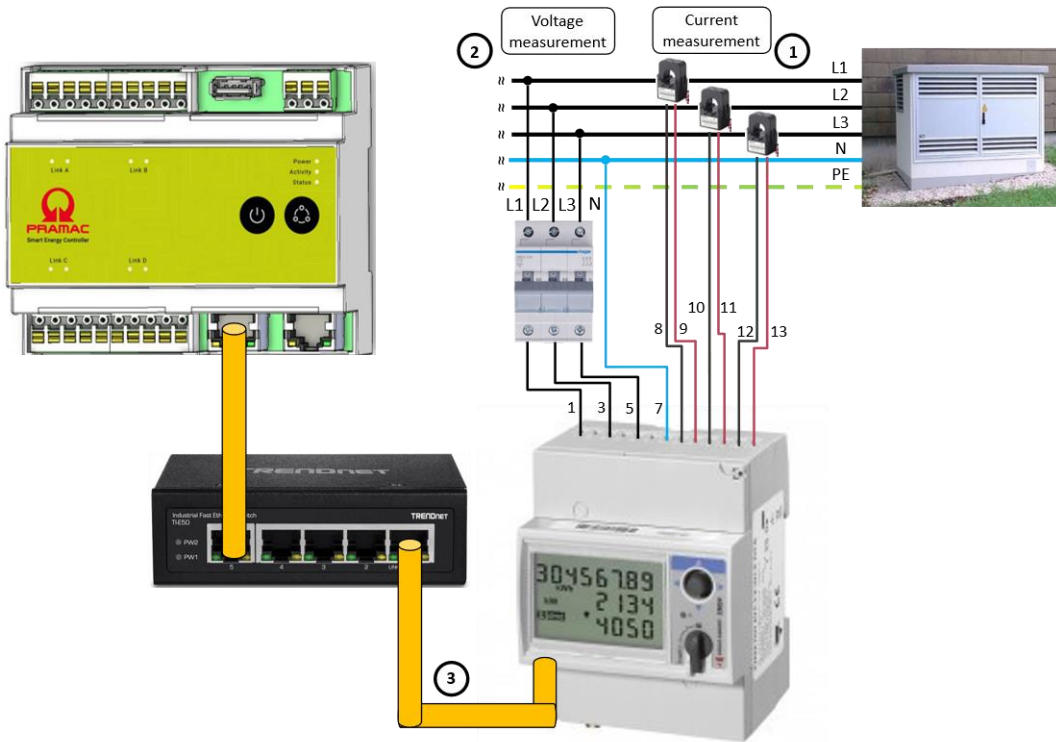


Figure 3-26: Connecting energy meter via Ethernet

No.	Description
1	A transformer is required for each phase for current measurement. It must be ensured that the direction of the current arrow is uniform and follows the direction of the arrow from the mains connection to the consumer.
2	The voltage measurement must be fused separately, see "Figure 3-26: Connecting energy meter via Ethernet". For this purpose, the customer must install a 3-pole circuit breaker or a 3-pole thermal fuse in the sub-distribution board in which the energy meter is also installed.
3	Ethernet connection from energy meter to switch.

NOTE

- It is important that transformer 1 is connected with phase L1 to I1 (1 and 2) and analogously L2 to I2 (3 and 4), L3 to I3 (5 and 6), and that the direction of rotation for L1, L2, L3 is maintained.
- Only use shielded and twisted cables for Ethernet cabling. We recommend network cables of type CAT6/CAT7.
- The fuse is not included in the scope of delivery. The dimensioning of the fuse protection and the conductor cross-sections must be designed by the customer.
- Observe the direction of the counting flow:
Install the PV meter and grid meter in the correct counting direction: Supply + / Feed-in -.

The electrical connection of the battery storage kit is now complete.

3.2.11 Earthing the Components

Earthing of battery rack

The battery rack is earthed at the base of the rack housing. M8 bolts are already integrated in the housing cut-outs in the base for connection.

The earthing cable should be made of copper with a yellow-green colour. The earthing cable must have a cross-section of $\geq 6\text{AWG} = 16\text{ mm}^2$.

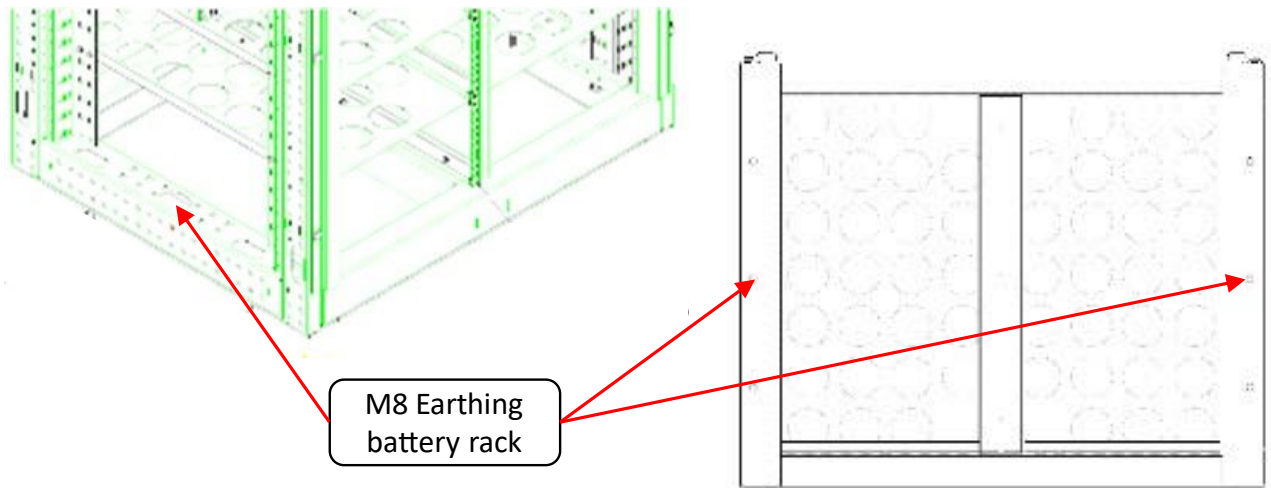


Figure 3-27: Earthing of battery rack

NOTE



- Operating instructions for PowerCube M1C Rack

1. Connect the individual earthing cables to an equipotential bonding bar. This must be provided by the customer.
2. For multiple battery racks in parallel: Loop the earthing from battery rack to battery rack.

Earthing of ConnectionBox

The battery inverter is earthed via the ConnectionBox. The ConnectionBox has an M8 bolt available for potential equalisation. Refer to the figure below.

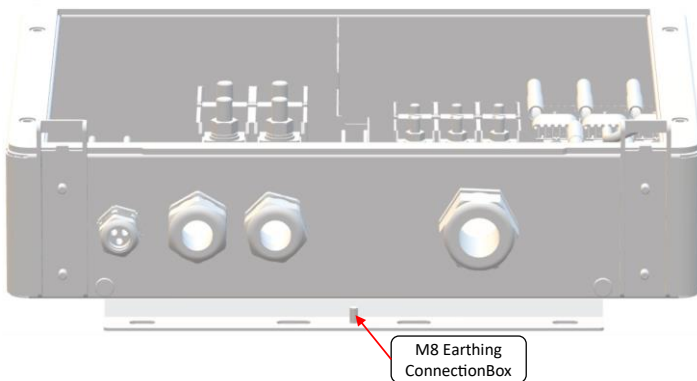


Figure 3-28: Earthing of ConnectionBox

NOTE

The protective conductor connection in the ConnectionBox is sufficient, i.e. the battery inverter no longer needs to be earthed separately.

NOTE



- Operating instructions for Pramac battery inverter PBI 50K/88K



REMARK

Only to be observed with a single battery rack:

Connect the individual earthing cables to an equipotential bonding bar (to be provided by the customer).

3.2.12 Network Connections

All main components such as the battery rack, battery inverter and Pramac Smart Energy Controller (PSEC) in both the single and multi-rack versions require a network connection. All these components are located in the internal network and should be collected on a switch.

In the multi-rack variant (e.g. BSI 88/218), the BMS of the battery racks are connected to each other serially via CAN bus and the first/last one is connected to the master BMS (MBMS), which requires a network connection. The network connection in the multi-rack version is described in "Chapter 5.3.1 CAN bus connections".

A network connection can either be provided by the customer's system administrator or ordered as an optional component from Pramac Storage Systems GmbH in the form of a router and switch. The router must be equipped with a SIM card to connect all components to the Internet.

The battery rack has the IP address 192.168.1.100 by default. The PSEC and the battery inverters are always set to DHCP in the factory settings.



REMARK

All components must be in the same network circuit. The battery inverter must be assigned a fixed IP address in the course of the commissioning.

For more information on setting up the network, see "Chapter 4 Commissioning and Switching On for the First Time".

4 Commissioning and Switching On for the First Time

4.1 Before Switching On for the First Time

1. Check whether the topic "B2B Pre-Commissioning Checklist: Battery Storage Kit Indoor (BSI)" has been fully completed.
Only then can you start commissioning the battery storage kit.

NOTE



- Checklist BEFORE commissioning

2. Provide laptop and network cable.
The PBI Connect software should be installed on the laptop so that settings for the battery inverter can be configured if necessary.

All further configuration steps can be carried out via the Pramac portal.

4.2 Switching On and Configuration

When switching on for the first time, the following sequence can be followed:

4.2.1 Switch on the 24 VDC Supply for PSEC, Router/Switch

In the single and multi-rack versions, an auxiliary power supply (230 V/16 A) must be provided by the customer.

The 24 VDC supply is switched on via the corresponding circuit breaker.

If a switch or router is also included in the scope of delivery, the 24 VDC supply must be branched off from the power supply unit so that the PSEC and optional router/switch are supplied with 24 VDC.

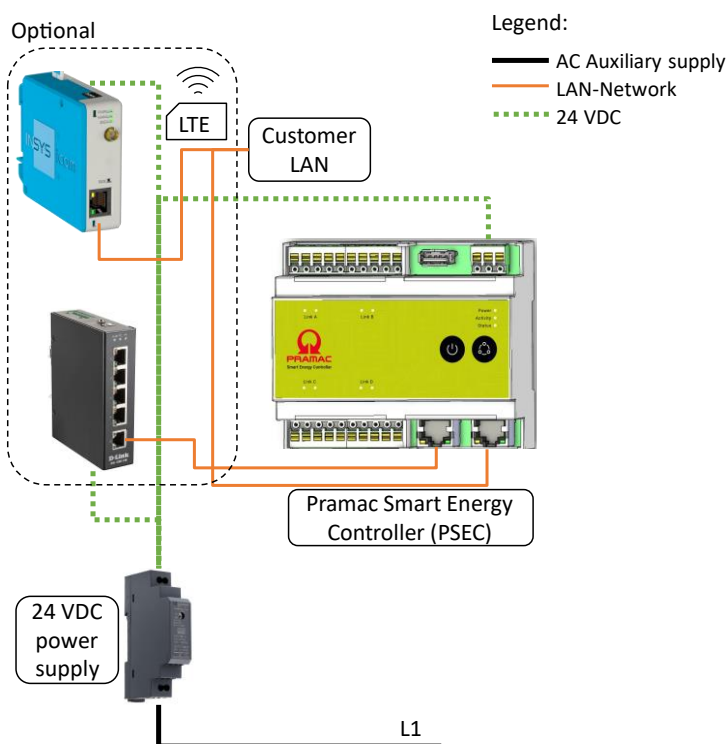


Figure 4-1: Overview of 24 VDC supply

4.2.2 Configuration of the Battery Inverter

The battery inverter is switched on by inserting the fuses in the customer's AC sub-distribution board. When activated, the battery inverter performs the following steps:

- Internal tests (e.g. relay test).
- Checks the connection conditions for the AC grid and the battery storage system.

The inverter will not yet switch to operating mode as the DC disconnect switch of the battery rack is still open and the network configuration has not yet been completed.

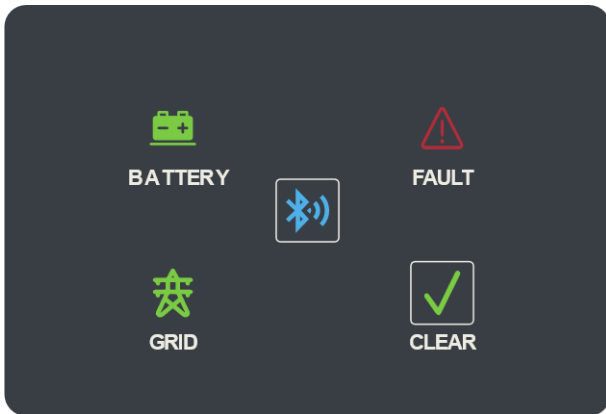


Figure 4-2: Display of battery inverter

The network configuration of the inverter can be performed using the PBI Connect app via Bluetooth or via a laptop with the PBI Connect PC software.

Download the PBI Connect app via Google Play or the iOS App Store.

PBI Connect can be downloaded from www.pramac-storage-systems.com.

4.2.3 Configuration via Bluetooth

All the necessary settings can be configured using the PBI Connect mobile app for iOS or Android platforms.

To do so, proceed as follows:

1. Install PBI Connect on the mobile device.
2. GPS and Bluetooth must be active and authorisations for the app must be set.
3. Press the Bluetooth button on the inverter display.
 - The Bluetooth button LED flashes blue.
 - The inverter is automatically paired and displayed in the PBI Connect app.

When the inverter is started for the first time, the initial setup screen with the following settings is displayed in PBI Connect:

- Country of installation (DE/AT/CH etc.)
- Network policy (if more than one for the selected country) (VDE AR-N 4105/4110/TOR Type A producers, etc.)
- Nominal mains voltage
- Date and time

Optional settings:

- Limitation of continuous power
- Signal for remote switch-off
- Network settings for RS485

4.2.4 Configuration via Ethernet

The PBI Connect PC software can be used to carry out firmware updates and set country-specific inverter parameters. The connection between the PC and the inverter can be established via Ethernet.

FUNCTIONS
Firmware update
Export of inverter data
Feed-in conditions; voltage and frequency
Ramp-up time in the event of a mains fault
Monitoring the mean value voltage
Monitoring the phase conductor voltage
Frequency-dependent power reduction
Monitoring the instantaneous voltage (quick switch-off)
Monitoring the instantaneous frequency
Provision of reactive power ($\cos \varphi$)
Switch-on times
K-factor (Fault Ride Through)

4.2.5 Configuration of the Energy Meter

The energy meter is configured via RS485 or via Ethernet and can be read in the respective manual.

NOTE

The respective transformer ratio must still be set.

C_t is calculated as follows:
$$C_t = \frac{\text{Transformer}_{\text{maximum current}}}{\text{Transformer}_{\text{rated current 5 A}}}$$

4.2.6 Switching On the Battery Rack

NOTE

Before switching on the battery rack, check that both the DC power cabling and the network cabling are correct.

NOTE

Multi-rack variant

Before switching on the DC disconnect switches of the rack BMS, check that the MBMS is switched off.

1. Switch on the battery rack by turning the DC disconnect switch to the "ON" position.
2. Press the red start button for approx. 5 seconds until the buzzer sounds. See "Figure 4-3: Front side of battery rack" below.

- 1. Turn on the "Isolating Switch":



- 2. Press the "Start Button":



Figure 4-3: Front side of battery rack

The BMS automatically carries out a self-test.

If the BMS and all battery modules are functioning normally, each STATUS LED lights up green, i.e. the self-test was successful. The self-test is completed within 5 seconds.

If the STATUS LED lights up red after 30 seconds, a communication error may have occurred. In this case, check the communication connection on the BMS and switch/router.

Table 4-1: Explanation of LED display

STATUS – Battery	Protection / Alarm / Normal	STATUS (green)	STATUS (red)	Capacity (SOC)				Description
		●	●	●	●	●	●	
Switched off		Off	Off	Off	Off	Off	Off	Completely switched off
Sleep	Normal	Flashing 2 ¹⁾	Off	Off	Off	Off	Off	Displays sleep mode to save energy.
Idle	Normal	On	Off	Off	Off	Off	Off	Displays the energy saving mode.
	Alarm	On	Off	Off	Off	Off	Off	Indicates that the battery voltage or temperature is high or low.
	Protection	Off	On	Off	Off	Off	Off	Indicates that the battery voltage or temperature is too high or too low.
Charge	Normal	On	Off	The highest capacity indicator LED flashes (Flashing 2 ¹⁾), the others are permanently lit				The highest capacity indicator LED flashes (Flashing 2 ¹⁾), the others are lit
	Alarm	On	Off					
	Protection	Off	On	Off	Off	Off	Off	Stop charging process, STATUS (red) lights up
Discharge	Normal	Flashing 2 ¹⁾	Off	Indication of capacity (%)				Capacity display in 25 % increments
	Alarm	Flashing 2 ¹⁾	Off					
	Protection	Off	On	Off	Off	Off	Off	Stop discharge, STATUS (red) lights up
Malfunction	Switch-on fault	Off	Flashing 4 ²⁾	Off	Off	Off	Off	Charge/discharge stop, STATUS (red) lights up
	Other malfunction	Off	On	Off	Off	Off	Off	
	STL error	Off	Flashing 2 ¹⁾	Flashing 2 ¹⁾				MCU self-test problem

NOTE

Flashing types

¹⁾ Flashing 2: 0.50 s On | 0.50 s Off

²⁾ Flashing 4: 1.00 s On | 1.00 s Off

4.2.7 Commissioning the Pramac Smart Energy Controller (PSEC)

The PSEC has local monitoring. This can be accessed via a LAN (Ethernet) connection to port "LAN 1" (OT network).

The initial credentials are: admin/admin.

The address for access via browser is: "http://192.168.42.1" or "http://energy.controller".

1. Connection with laptop to internal network LAN 1 (via switch).
2. Enter the IP address of the PSEC in the web browser and confirm with "ENTER".

NOTE



- All further steps for commissioning the PSEC can be found in the online manual.



REMARK

Use the link: https://docs.pramac.energy/en/installation_guide or the following QR code to view the next steps.



Figure 4-4: QR code for registration

4.3 Switching Off the Battery Storage Kit Indoor (BSI Series)

⚠ WARNING



Only switch the battery storage kit on again after it has been switched off for at least 2 minutes to ensure that the internal capacitors are fully discharged.

Only then can the product be put back into operation.

1. Check battery storage kit for current charging or discharging mode. Otherwise, the battery storage kit is in standby mode and the AC and DC currents are 0 A.
2. Switch off the AC fuse of the battery inverter on the customer side.
3. Switch off the battery storage kit by turning the DC disconnect switch on the BMS to the "OFF" position.
4. If necessary, disconnect the fuse of the AC auxiliary power supply – especially the 24 V supply.
5. Switch off the master BMS at the ON/OFF switch.
(Only for battery racks connected in parallel)



Figure 4-5: Master BMS for multi-rack variant

⚠ WARNING

Do not turn off the DC disconnect switch during normal operation. This can cause high currents in other battery strings.

5 Parallel Connection of Additional Battery Racks

The following chapter describes the parallel connection of up to 4 battery racks, each with a gross capacity of 109 kWh, to an 88K battery inverter with an output of 88 kW. Additional components are required to enable parallel connection.

5.1 Overview of Variants

It is possible to operate up to 4 battery racks on one 50K/88K battery inverter. The CombinerRack Single is required for this. An additional 50K/88K battery inverter can be installed with the CombinerRack Dual. Up to 4 more battery racks can be connected to this.

This results in the following product variants:

ID	Description	C-rate	Required components
1	BSI 50/109	0.45	1× rack, 1× inverter, 1× ConnectionBox, 1× PSEC
2	BSI 50/218	0.23	2× rack, 1× inverter, 1× CombinerRack Single, 1× PSEC
3	BSI 50/327	0.15	3× rack, 1× inverter, 1× CombinerRack Single, 1× PSEC
4	BSI 50/436	0.11	4× rack, 1× inverter, 1× CombinerRack Single, 1× PSEC
5	BSI 88/109	0.80	1× rack, 1× inverter, 1× ConnectionBox, 1× PSEC
6	BSI 88/218	0.40	2× rack, 1× inverter, 1× CombinerRack Single, 1× PSEC
7	BSI 88/327	0.27	3× rack, 1× inverter, 1× CombinerRack Single, 1× PSEC
8	BSI 88/436	0.20	4× rack, 1× inverter, 1× CombinerRack Single, 1× PSEC
9	BSI 100/218	0.46	2× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC
10	BSI 100/436	0.23	4× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC
11	BSI 100/654	0.15	6× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC
12	BSI 100/872	0.11	8× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC
13	BSI 176/218	0.80	2× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC
14	BSI 176/436	0.40	4× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC
15	BSI 176/654	0.27	6× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC
16	BSI 176/872	0.20	8× rack, 2× inverter, 1× CombinerRack Dual, 1× PSEC

The following components are included in the battery storage kits with > 1 battery rack:

- 2 ... 4× battery racks incl. battery modules, power cables and small parts
- 1× CombinerRack Single (ZY000A00004) incl. power supply units, switch, master BMS, PSEC, terminals, etc.
- Alternative: 1× CombinerRack Dual (ZY000A00005) incl. power supply units, switch, 2× master BMS, 1× PSEC, terminals, etc.
- 1 / 2× battery inverter PBI 50K (421P050.110) / PBI 88K (421P100.110)
- 1× energy meter from Acrel (without transformer)

A router or the current measuring transformers are optionally available. If you are interested, please contact the sales department of Pramac Storage Systems GmbH.

5.2 Overview of Multi-Rack Variant

The following illustration shows the individual connections of the components using the product variant BSI 88/327 as an example.

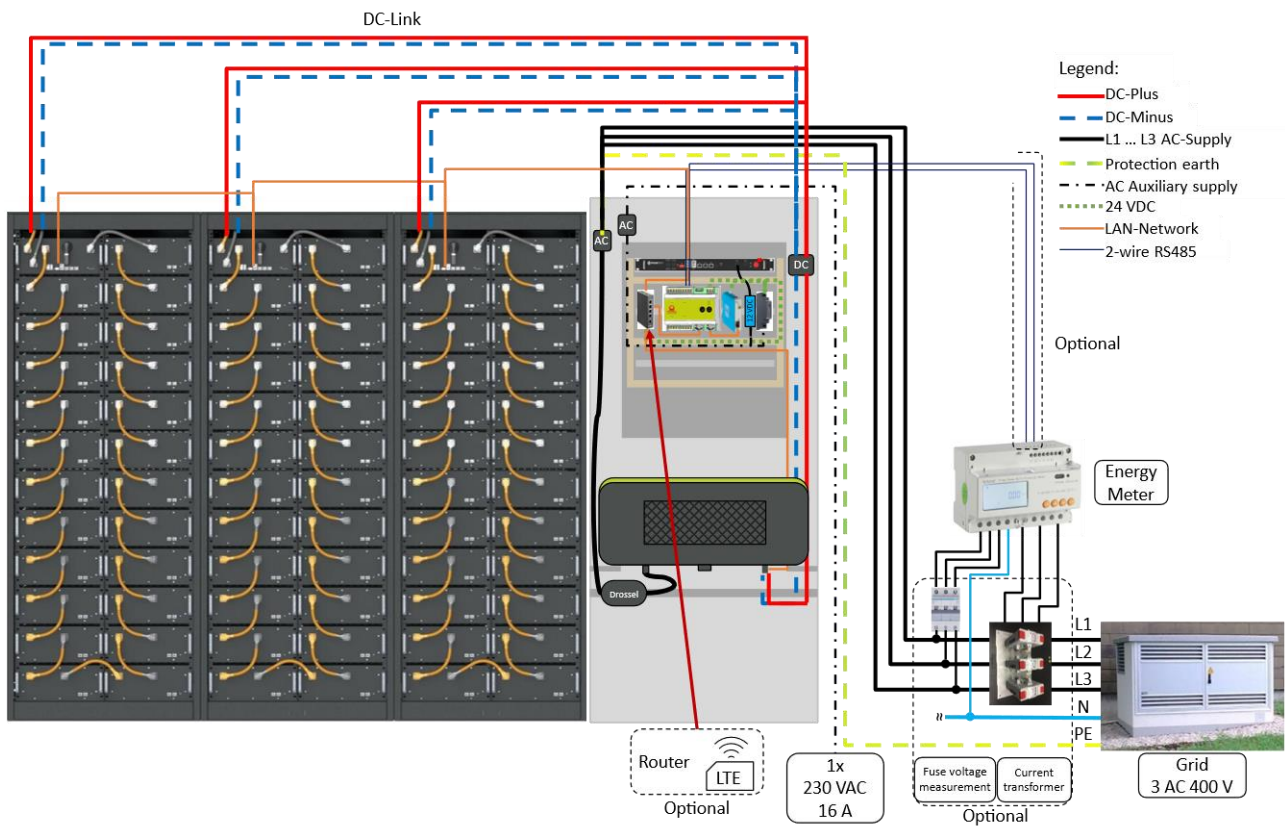


Figure 5-1: Example: Multi-rack variant with 3 racks

5.3 Layout and Installation of CombinerRack

The CombinerRack is supplied without a battery inverter and should be set up in the immediate vicinity of the battery racks. The CombinerRack does not have a base and may only be installed inside buildings. As with the battery racks, the CombinerRack can also be positioned on the wall without any clearance.

See "Chapter 1.5 Installation Conditions" and the "B2B Pre-Commissioning Checklist".

Once the CombinerRack has been set up, the PBI 50K/88K battery inverter can be placed on the guide rails provided.



REMARK

The battery inverter is installed horizontally; the connections of the inverter point downwards. The head side of the inverter points towards the door. The control panel of the inverter faces upwards and can be read upside down from the door.

1. Position the inverter and push it back as far as it will go.
The white limiters serve to prevent the inverter from being pushed too far back.
2. Plug in the prepared AC and DC plugs on the underside of the battery inverter.
The AC plugs are routed from the AC terminal strip to the inverter via the built-in choke.
The DC terminals are routed from the DC terminal strip directly to the inverter.

NOTE

Ensure a clockwise rotating field.

3. Connect the pre-installed Ethernet cable from the switch to the inverter on LAN 1.

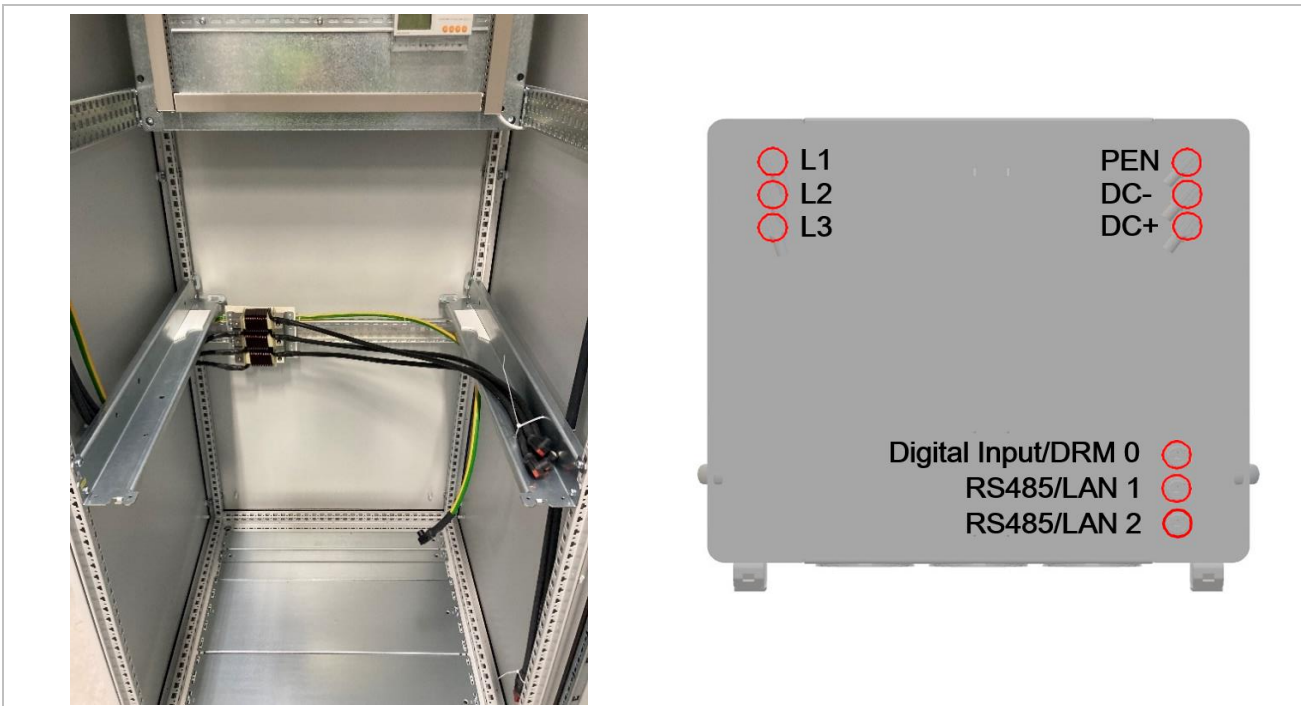


Figure 5-2: View of CombinerRack

4. Connect the DC power cable of the individual battery racks to the DC terminal strip provided.

By default, one DC+ and DC- power cable measuring 5 m in length is supplied with each battery rack. This ensures the installation and assembly of up to 4 racks directly next to each other.

⚠ CAUTION

The DC power cables must not be shortened!

If the installation layout differs, e.g. the racks are spaced further apart or the racks are distributed in the room, the customer must provide a DC power cable of the required length and cross-section.



REMARK

Make sure that the cable lengths of all battery racks are the same.

The DC terminal strip is labelled with DC+ and DC-. Each DC terminal block is fitted with jumpers.

5. Feed the DC power cable through the corresponding cut-out on the CombinerRack.



Figure 5-3: DC terminals on CombinerRack

6. Connect the AC power supply cable to the AC terminal strip. The AC terminal strip is labelled with L1/L2/L3 and PE. Supply cables with a maximum of 70 mm² can be connected. Feed the supply cable through the corresponding cut-out on the CombinerRack.

NOTE

Ensure a clockwise rotating field.



Figure 5-4: AC terminals on CombinerRack

The auxiliary AC power supply (230 VAC/16 A) is connected in the CombinerRack on the mounting plate. A terminal strip is already pre-installed for this purpose. The AC auxiliary voltage supplies the 12 VDC and 24 VDC power supply units.



Figure 5-5: View of mounting plate

5.3.1 Master BMS

The master BMS (MBMS) is required for battery storage kits > 1 battery rack. The MBMS is already pre-installed in the CombinerRack. Power is supplied via the 12 VDC power supply unit.

Communication between MBMS and BMS takes place via CAN bus.

Up to 2× MBMS can be installed and connected in the CombinerRack. A second MBMS is only required in conjunction with a second battery inverter.

NOTE



- Operating instructions for Pylontech PowerCube M1C

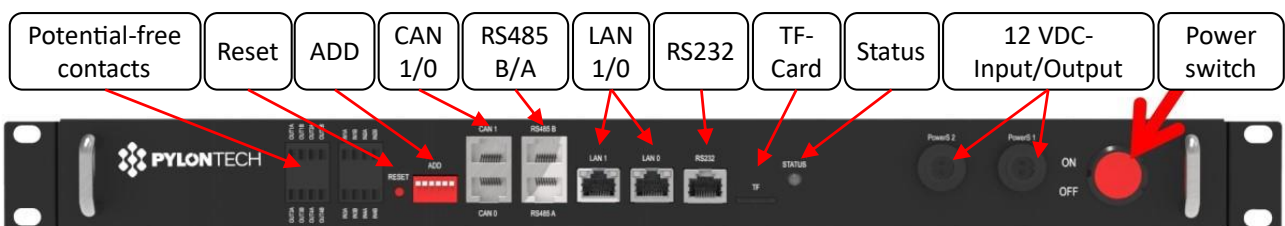


Figure 5-6: Overview of MBMS

CAN bus connections

The communication connection between the MBMS and the individual rack BMS (number of battery racks ≤ 6) is established via CAN. The CAN connection is made from the MBMS-CAN 0 connection to port A of the first battery rack. The connection to further battery racks is made from port B of the first battery rack to port A of the following battery rack. Port B is left free on the last battery rack connected in parallel.

NOTE

The first battery rack should be installed close to the MBMS.

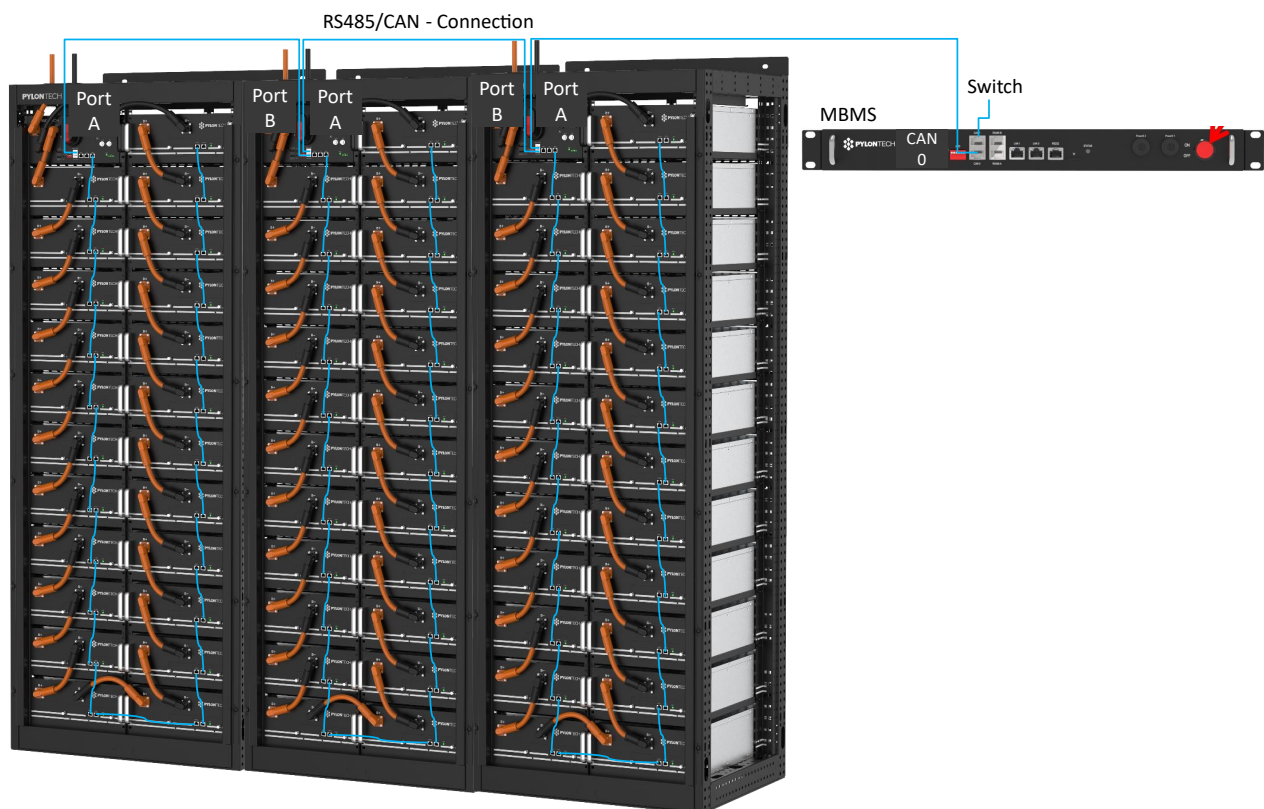


Figure 5-7: Example: Overview of CAN bus connection

Dip switch (ADD)

In the multi-rack version, the communication address must be set manually using the 6-bit dip switches. Depending on the number of battery racks, the dip switch settings must be made on the individual battery management systems as well as on the MBMS.



Figure 5-8: Example: Dip switch on BMS Rack 1

Number of racks	MBMS	BMS Rack 1	BMS Rack 2	BMS Rack 3	BMS Rack 4
2	↓↓↓↓↓↑↑	↑↓↓↓↓↓	↓↑↓↓↓↑	X	X
3	↓↓↓↓↓↑↑	↑↓↓↓↓↓	↓↑↓↓↓	↑↑↓↓↓↑	X
4	↓↓↓↓↓↑↑	↑↓↓↓↓↓	↓↑↓↓↓	↑↑↓↓↓	↓↓↑↓↓↑

Position	Meaning	Position	Meaning
Down	OFF = ↓	Bit 1 to bit 5	Address
Up	ON = ↑	Bit 6	Switches a 120 Ω resistor (terminating resistor)

NOTE

In the last BMS of the battery racks connected in parallel, bit 6 must be set to Up (ON = ↑).



Figure 5-9: Dip switch on MBMS

NOTE

The dip switch of the MBMS is set to "↓↓↓↓↓↑↑". The last 2 bits are terminating resistors.

5.4 Switching On the Multi-Rack Variant

Procedure when switching on for the first time:

1. Switch on the PBI 50K/88K battery inverter.
2. Ensure that the MBMS is switched off.
3. Switch on all BMSes as follows:
Switch on the first BMS of the first battery string.
4. The second BMS must be put into operation after the first battery string has successfully completed the self-test.
5. Repeat the process from the first BMS to the last BMS one after the other.
6. Switch on MBMS (see "Figure 5-6: Overview of MBMS").

Start procedure:

The BMS automatically carries out a self-test.

If the BMS and all battery modules are functioning normally, each STATUS LED lights up green, i.e. the self-test was successful. The self-test is completed within 5 seconds.

As the MBMS is initially switched off, the BMS cannot receive any communication from the MBMS. The STATUS LED lights up red continuously until communication with the MBMS has been established. This does not mean that there is a fault, but that this battery string is functioning normally.

7. After switching on the MBMS, check whether the STATUS LED lights up green.

The power relays of the individual rack BMSes switch on approx. 30 seconds after the MBMS has been switched on. The STATUS LEDs of the individual BMSes light up green.

NOTE

If the MBMS cannot establish communication with other BMSs, the system cannot work normally. If this happens, check the CAN communication connection as described in "Figure 5-7: Example: Overview of CAN bus connection".

The multi-rack version of the PSEC is set up in the same way as the single-rack version (see "Chapter 4.2.7 Commissioning the Pramac Smart Energy Controller (PSEC)").

6 Maintenance Information

Due to the influence of ambient temperature, humidity, dust and vibration, the devices in the battery storage kit age and wear out, which can lead to potential failures in the battery storage kit. Regular maintenance is therefore necessary to ensure normal operation over the entire service life. All measures and methods that help to ensure that the battery storage kit remains in good operating condition fall within the scope of maintenance work.

HINWEIS



- See the BSI maintenance checklist and BSI maintenance instructions.

6.1 Maintenance of Battery Storage Kit

The following table lists the recommended maintenance work and routine intervals.

Table 6-1: Maintenance of battery storage kit

TASKS	DETAILS	INTERVAL
Operating status and environment of the battery storage kit	<ul style="list-style-type: none"> • Visual inspection of the system. • Check the BSI for abnormal operating noises. • Check the battery and inverter area as well as the components for damage, moisture and deposits. Clean with compressed air if necessary. 	1/a
Check the electrical connections / terminal and cable connections	Visual inspection of the power connections, connectors and device terminals.	1/a
Combiner-Rack (single / dual)	Check the inside for dust deposits, dirt and moisture.	1/a
ConnectionBox	If installed outdoors, check for water ingress from outside.	or As required

6.2 Battery Inverter Maintenance for PBI 50K-PC and PBI 88K-PC

The following table lists the maintenance measures to be carried out and intervals for the battery inverter.

Table 6-2: Maintenance of battery inverter PBI 50K/88K

TASKS	DETAILS	INTERVAL
Inverter fan	Check the inverter fan for function and conspicuously loud operating noises.	1/a or As required
Heat sink	Visual inspection of the heat sink and cleaning with compressed air if necessary.	1/a or As required
Air outlet plate	Visual inspection: If heavily soiled, clean with compressed air or replace.	1/a or As required
Check the electrical connections / terminal and cable connections	Visual inspection of the cable connections and terminals.	1/a

7 Dismantling and Recycling

7.1 Dismantling

The battery storage kit is dismantled as described below:

1. Switch off the battery storage kits
(see "Chapter 4.3 Switching Off the Battery Storage Kit Indoor (BSI Series)").

CAUTION



There is residual voltage in the inverter! Before opening the appliance, the operator should wait 2 minutes to ensure that the capacitor is completely discharged.

2. Disconnect and remove the DC+/- power cable.
3. Unplug and remove the communication cable from the battery modules/racks.
4. Unplug and remove the communication cable from the PSEC / switch / router.
5. Dismantle and remove the energy meter incl. transformer at the grid transfer point.
6. Dismantle the AC and DC supply in the ConnectionBox of the battery inverter.
 - For multi-rack variant: Dismantle the AC and DC supply in the CombinerRack.
7. Pull the BMS and battery modules out of the battery rack and pack them properly.

NOTE

Defective or critical battery modules must be handled in accordance with the regulations.

8. Unplug the inverter and dismantle and pack the ConnectionBox
 - For multi-rack variant: Unplug the inverter and pull it out of the CombinerRack. Then pack both.
9. Dismantle the battery rack(s) and combiner rack.
 - Loosen the earthing connection on the housing.
 - The battery rack and CombinerRack can now be transported.

7.2 Recycling

Recycling battery racks

Damaged batteries can leak electrolyte or produce flammable gas. If a damaged battery needs to be recycled, the local recycling regulations (i.e. Regulation (EC) No. 1013/2006 of the European Union) must be complied with.

Recycling battery inverter

NOTE



The packaging and the replaced parts are to be disposed of in accordance with the regulations of the country in which the product is installed.

The PBI 50K-PC / 88K-PC battery inverter must not be disposed of with normal household waste.

■ Pramac Storage Systems GmbH offers its customers a free return service for the professional disposal of old appliances at its company headquarters in 72793 Pfullingen.

The PBI 50K-PC / 88K-PC battery inverter is RoHS-compliant. For a full return, please contact our customer service at service.pss@pramac.com.

Registration according to ElektroG

By law, every manufacturer and distributor of electrical appliances is obliged to register and maintain a corresponding WEEE number.

This reads: DE 17567286

8 Quality Assurance

WARRANTY

The current warranty terms can be downloaded from the website www.pramac-storage-systems.com.

Disclaimer

If a fault occurs with the battery storage kit during the warranty period, please contact your installer or supplier. In the event of faults for which the manufacturer is responsible, Pramac Storage Systems GmbH will provide a replacement or repair free of charge within the warranty period.

Any defect caused by the following circumstances is not covered by the manufacturer's warranty. The dealers or distributors are responsible and authorised by Pramac Storage Systems GmbH for the following investigation:

- Product modified, design changed or parts replaced that have not been authorised by Pramac Storage Systems GmbH.
- Modifications or repair attempts and deletion of the serial number or seals by a technician who is not employed by Pramac Storage Systems GmbH.
- Failure to observe the user manual, the installation instructions and the maintenance instructions, improper use or misuse of the device.
- Non-compliance with local safety regulations (e.g. VDE standards in Germany).
- The product was stored improperly and damaged during storage by the dealer or the end user.
- Transport damage (including paint scratches caused by movement inside the packaging during transport). A claim must be submitted directly to the insurance company as soon as the packaging has been unloaded and such damage has been detected.
- The system is operated outside the specified temperature window or the system is insufficiently ventilated.
- The maintenance procedures relating to the product were not followed as specified.
- Damage caused by external factors or force majeure (violent or stormy weather, lightning, overvoltage, fire, etc.).

9 Technical Support

If you have followed the troubleshooting procedure and have not been able to solve your problem, you can contact the Pramac Storage Systems GmbH service team as follows:

Germany: +49 (0) 7121-159-77-0

Website: www.pramac-storage-systems.com

Download data sheets, manuals, certificates, firmware update files, etc. here.

E-mail: info.pss@pramac.com



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