.

PRODUCT SPECIFICATION

32.6kWh Lithium Ion Energy Storage System for UPS

1. Customer: Schneider Electric
2. Product Number: ELSU323-00001, ELSU323-00004
3. Received Marking

Division			
Signature			
Date	/ /	/ /	/ /

4. Date of Application (YYYY/MM/DD): 2018.01.11
5. Supplier: SAMSUNG SDI Co., Ltd.

Development			QA	
Issued	Checked	Approved	Checked	Approved

Customer Approval

The Request for approval Mass Production

Customer Approval

Revision History

Revision	Date	Description	Pages Changed
0.1	2016.07.01	First Release	
0.2	2016.08.04	SMPS Assembly Type B related information removed MODbus Protocol updated	19 21-23
0.3	2016.12.22	Dry contact connector corrected	24
0.4	2017.05.24	Added document number Notice on consecutive discharge updated	 14
0.5	2018.01.11	Added product number(ELSU323-00004) Added Rack Frame Model No.(SJ61-03305E) Changed storage humidity	 8,20 14

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Acronyms and Abbreviations

The following acronyms and abbreviations are used in this manual.

Table 1: Acronyms and Abbreviations

Abbreviations	Full Name
BMS	Battery Management System
ESS	Energy Storage System
OTP	Over Temperature Protection
OVP	Over Voltage Protection
SMPS	Switched Mode Power Supply
SOC	State Of Charge
SOH	State Of Health
UTP	Under Temperature Protection
UVP	Under Voltage Protection
UPS	Uninterruptible Power Supply

1. Product Overview

Customer: **Schneider Electric**

Model Number: ELSU323-00001, ELSU323-00004
Product Name: 32.6kWh Lithium Ion Energy Storage System for UPS
Supplier: Samsung SDI Co., Ltd.

1.1 Scope

This document details the safety and handling information, characteristics, requirements, installation instructions, operating guidelines, service, maintenance and warranty of 32.6kWh Lithium Ion Energy Storage System ("ESS" hereinafter) manufactured by Samsung SDI Co., Ltd. Intended for **Schneider Electric.** It is intended to provide certified personnel and users with information on safe handling, installation and usage of the specified product. Consult Samsung SDI, if some usages not described are expected.

This product is comprised of the following components.

Table 2: Component Information

Component	Model No.	Note
67Ah Cell	CM0630R0002A	
67Ah 8S1P Battery Module Type A	ELPM182-00001	
67Ah 8S1P Battery Module Type B	ELPM182-00002	
Switch Gear	ELPJ513-00001	UL
	ELPJ513-00002	CE
SMPS Assembly Type A	ELPD131-00001	With System BMS
Rack Side Door	SJ63-00110A	
Rack Frame	SJ61-03305A	UL
	SJ61-03305E	CE

2. Product Description

ESS consists of four major components: 67Ah 8S1P Battery Module (“Battery Module” hereinafter), Switchgear Assembly and SMPS Assembly. A single rack configuration of 32.6kWh ESS is comprised of one Switchgear Assembly and one SMPS Assembly and 17 Battery Modules.

Battery Module Type A(ELPM182-00001), Battery Module Type B(ELPM182-00002) are the most basic component and they contain the energy storing battery cells. There is one Module BMS inside each Battery Module. Module BMS checks the status of one Battery Module by measuring its voltage and temperature. It also communicates with Switchgear Assembly to send all measured voltage and temperature data, and received commands to control cell balancing.

Switchgear Assembly (ELPJ513-0000X) collects all information about the battery system and controls the battery system by switching the main power line and controls each Battery Module by cell balancing. Switchgear Assembly calculates the state-of-charge (SOC) and state-of-health (SOH) of the battery system.

SMPS Assembly Type A(ELPD131-00001) is comprised of system Battery Management System(BMS) and switched mode power supply(SMPS). SMPS Assembly supplies the power for BMS and communicates with Uninterruptible Power Supply (UPS).

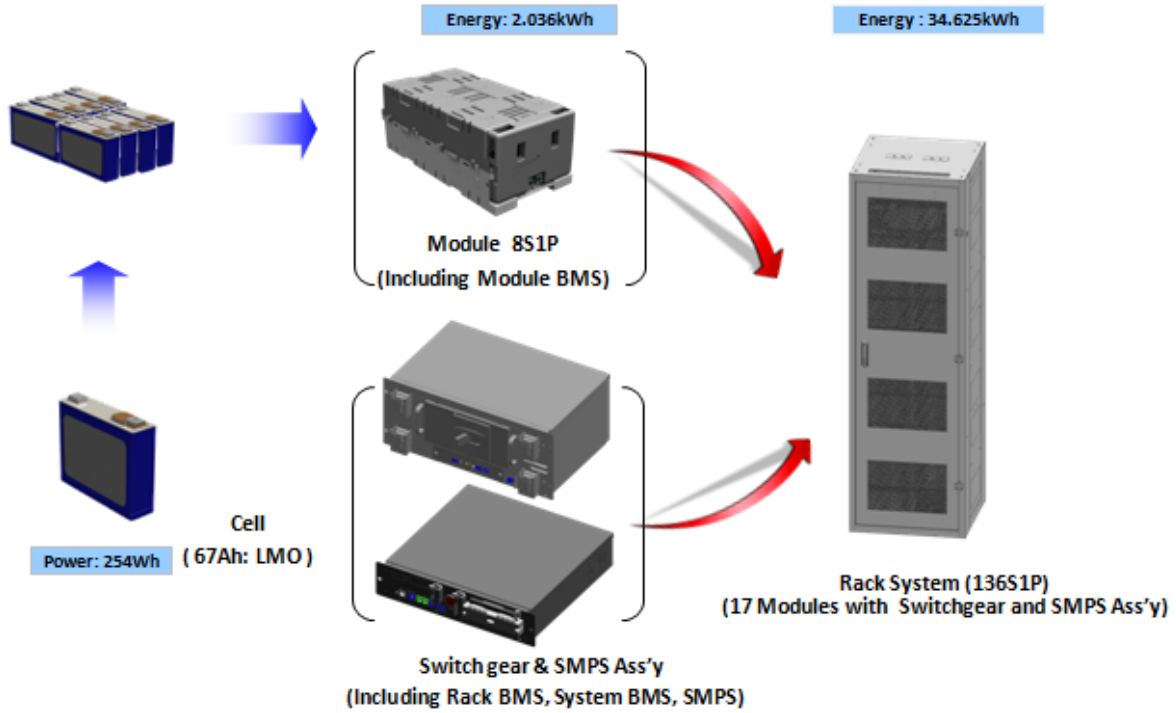


Figure 1: 32.6kWh Lithium Ion Energy Storage System

3. Safety Information and Handling

This Part details the safety information that personnel must fully understand and follow while transporting, storing, installing, operating or servicing the ESS. Before proceeding with unloading, unpacking, handling, installation and operation, read the following details.

3.1 Safety Symbols

Table 3: Safety Symbols

	**DANGER** 'DANGER' indicates a hazardous situation which will result in death or serious injury if not avoided.
	**WARNING** 'WARNING' indicates a hazardous situation which could result in death or serious injury if not avoided.
	**CAUTION** 'CAUTION' indicates a hazardous situation which could result in minor or moderate injury if not avoided.
	**NOTICE** 'NOTICE' indicates a hazardous situation which could result in property damage if not avoided.
	**Energy Storage Device** To help avoid burns or electric shock : - Service by qualified personnel only - Disconnect main power before maintenance - Turn off the Battery System before maintenance
	**Electric shock hazard** Do not remove cover or disassemble.
	**Explosive gas** **Do not expose to flame, incinerate, puncture, or impact**
	**Shield eyes** Wear safety goggles at ALL times. (Installation, maintenance, etc.)
	**Electrolyte hazard** Do not contact eyes, skin or clothing. If it happens, Flush with water and seek medical aid immediately.

	**Do not dispose in trash** Transport legally. Follow manufacturer's instructions for disposal. Please recycle Lithium ion battery. Do not discard.
	Qualified technicians use this manual for service and replacement.
	This symbol is attached to the position near the DC+, DC- and communication port. If the user wants to access to the points near this symbol, he has to be fully aware of the contents in this manual.
	This symbol is near to the point for grounding. Wire for grounding has to be connected to the point with this symbol.

3.2 General Safety Information

ESS provides a safe source of electrical energy when operated as intended and as designed. Potentially hazardous circumstances such as excessive heat or electrolyte mist may occur under improper operating conditions, damage, misuse and/or abuse. The following safety precautions and the warning messages described in this Part must be observed.

If any of the following precautions are not fully understood, or if you have any questions, contact Customer Support for guidance. The Safety Part may not include all regulations for your locale; personnel working with ESS must review applicable federal, state and local regulations as well as the industry standards regarding this product.

3.2.1 Protective Equipment

When working with ESS, the following personal protective equipment must be worn:

- High voltage rated rubber gloves
- Safety goggles or other eye protection

3.2.2 Organic Solvent Electrolyte

Cell components of ESS contain organic solvent-based electrolyte. Breach of individual cells may allow some electrolyte to be released from the cell. Direct contact with the liquid electrolyte can cause skin irritation.

If contact with the liquid electrolyte occurs, follow the suggestions below to minimize the chance of injury:

- Flush eyes immediately with cold running water for at least 15 minutes.
- Rinse skin immediately with water for at least 15 minutes.
- Remove clothing if soiled.
- Seek immediate medical attention.

3.2.3 Electrolyte Vent Product

The Lithium-Ion chemistry used in ESS contains an organic solvent-based electrolyte. If ESS is misused, damaged or abused, internal cell pressure may increase to excessive levels. Each cell within the ESS is equipped with a non-resettable vent so that if internal cell pressure increases, the cell's vent will activate releasing the electrolyte vent products. When operated as intended and designed, internal cell pressure remains stable and no electrolyte product venting occurs. Other structure (rack, enclosure e.g.) must not interfere gas vent.

Organic solvent electrolyte vent products are flammable. To avoid serious injury from the release and ignition of flammable products, the following guidelines must be observed:

- Operate the ESS under conditions only as specified in this manual.
- Keep sparks, flames and smoking materials away from the ESS.
- Do not incinerate, puncture or impact the ESS.
- Do not solder or weld to the ESS.

3.2.4 High Voltage Sources

DANGER: HIGH VOLTAGE – ELECTRIC SHOCK HAZARD. ESS does not include the enclosure. As all Battery Modules and wires are exposed, the probability of electric shock is high. ESS contains high voltage electric shock sources. Do NOT open any cover of Battery Module, Tray Switchgear Assembly and Tray BMS Assembly.

Exposure to high voltage can cause serious electrical burns, shock or death. To avoid high voltage electrical shock, follow the guidelines below:

- Do not work with high voltages unless you are qualified personnel.
- Personnel must fully understand the safety precautions associated with working on high voltage circuits.
- Personnel must fully understand the risk of working with batteries, and be prepared and equipped to take the necessary safety precautions.
- Necessary equipment, including but not limited to insulated tools, high voltage rated rubber gloves, rubber aprons, safety goggles, and face protection must be used.
- Ensure that the system is powered off and disconnected from outside circuits before servicing the unit.

3.2.5 Unloading and Unpacking

Carefully remove the plastic cover from the pallet. The packages are situated on a pallet on which it can be transported via forklift from location to location.

A damaged box or rattles during transport may indicate rough handling. Make a descriptive notation on the delivery receipt before signing. If damage is found, request an inspection by the carrier and file a damage claim. Pay particular attention to a damaged crate or staining from electrolyte or other fluids. Delay in notifying carrier may result in the loss of reimbursement for damages.

3.2.6 Storage

Follow the guidelines below when storing the Battery Modules.

- The battery module box should be upright as in Fig. 1 below. Do not stack or place upside down when storing the battery module box.

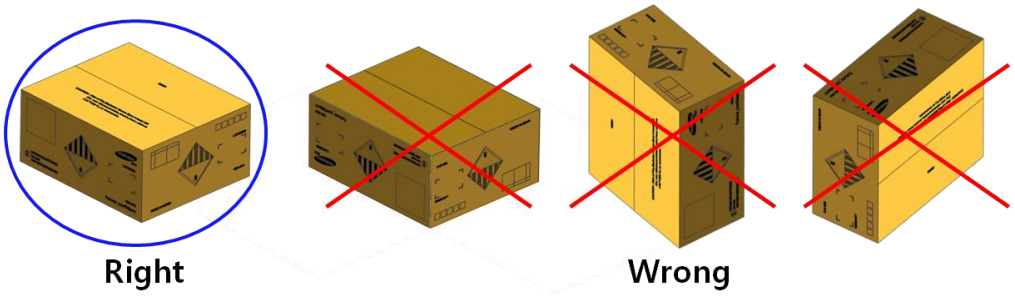


Figure 2: Storage Guide

- Do not stack more than five Battery Module boxes.
- Storage temperature must be in the range of 0 to 40°C.
- Storage humidity must be less than 60% RH under no condensing.
- Capacity degradation will occur depending on storage time.

To minimize capacity degradation, storage temperature of less than 10°C and 3.630V per cell is recommended.

3.3 General Handling Information

Follow the guidelines below when handling the ESS.

- Do not short circuit the positive (+) and negative (-) terminals with metallic object intentionally.
- Do not remove insulation cap on the terminals. If insulation cap is removed, avoid contacting between the metals and the battery terminals. Do not damage the screw thread.
- Do not use seriously scarred or deformed battery. Dispose them immediately according to proper regulations.
- Do not damage sheath of cable and connectors.

4. Specification and Characteristics

Table 4: General Specification

No.	Item		Specification	Remarks
1	Dimension [mm, (inch)]	Switchgear	583 x 235 x 411, (22.95 x 9.25 x 16.18)	
		Battery Module	414 x 216 x163, (16.30 x 8.50 x 6.42)	
		SMPS Assembly	397 x 338 x 86, (15.63 x 13.31 x 3.39)	
		Rack Frame	650 x 2,055 x 600, (25.59 x 80.91 x 23.62)	
2	Weight [kg,(lb)]	Switchgear	About 18, (39.68)	
		Battery Module	About 17, (37.48)	
		SMPS Assembly	About 5, (11.02)	Type A
		Rack Frame	About 190, (418.87)	
3	Minimum Capacity		67Ah	1/3C (22A) charge and discharge@R.T
4	Number of Module		16	
5	Nominal Capacity		32.6kWh	1/3C@R.T
6	Nominal Voltage[1]		486.4V DC	3.8V/cell
7	Maximum Voltage[1]		537.6V DC	4.2V/cell
8	Discharging Method		Constant Power	
	End of Discharge Voltage[1]		384V DC	3.0V/cell
	Standard Discharging Current		22.3A	1/3C@R.T
	Maximum Continuous Discharge Power		173kW	
	Maximum Discharging Current		600A	1 second pulse
9	Charging Method		Floating	
	Floating Charging Voltage		537.6V DC	4.2V/cell
	Standard Charging Current		22.3A	1/3C
	Maximum Charging Current		250	2 second pulse
10	Recommended Operation Temperature		23±5°C	
11	Storage Temperature		0 ~ 40°C	
12	Storage Humidity		Less than 90% RH	No condensing
13	Storage Period[2]		Less than 6 months	
14	Communication (Internal)		Differential UART, 2 Mbps	Switchgear Assembly – Battery Module
15	Communication (External)1		RS485	UPS – SMPS Assembly
	Communication (External)2		TCP/IP	UPS – SMPS Assembly
	Communication (External)3		Dry contact	UPS – SMPS Assembly

[1] **Specified voltage must be satisfied in all load and charging conditions.**

[2] The Capacity degradation will occur depending on storage time.

- To minimize capacity degradation, storage temperature of less than 10°C and 3.630V per cell is recommended.

NOTICE

Notice: After a full discharge at maximum continuous discharge power, cool the battery for at least 12 hours before another discharge in order to avoid over-temperature protection. Immediate recharging is allowed with standard charging current. For optimal performance, wait until the battery temperature returns to at least ±3°C within the room temperature.

5. Block Diagram and Configuration

A single rack system consists of 1 Switchgear, 1 SMPS Assembly and 17 Battery Modules.
Refer to Figure 3 General system configuration block diagram.

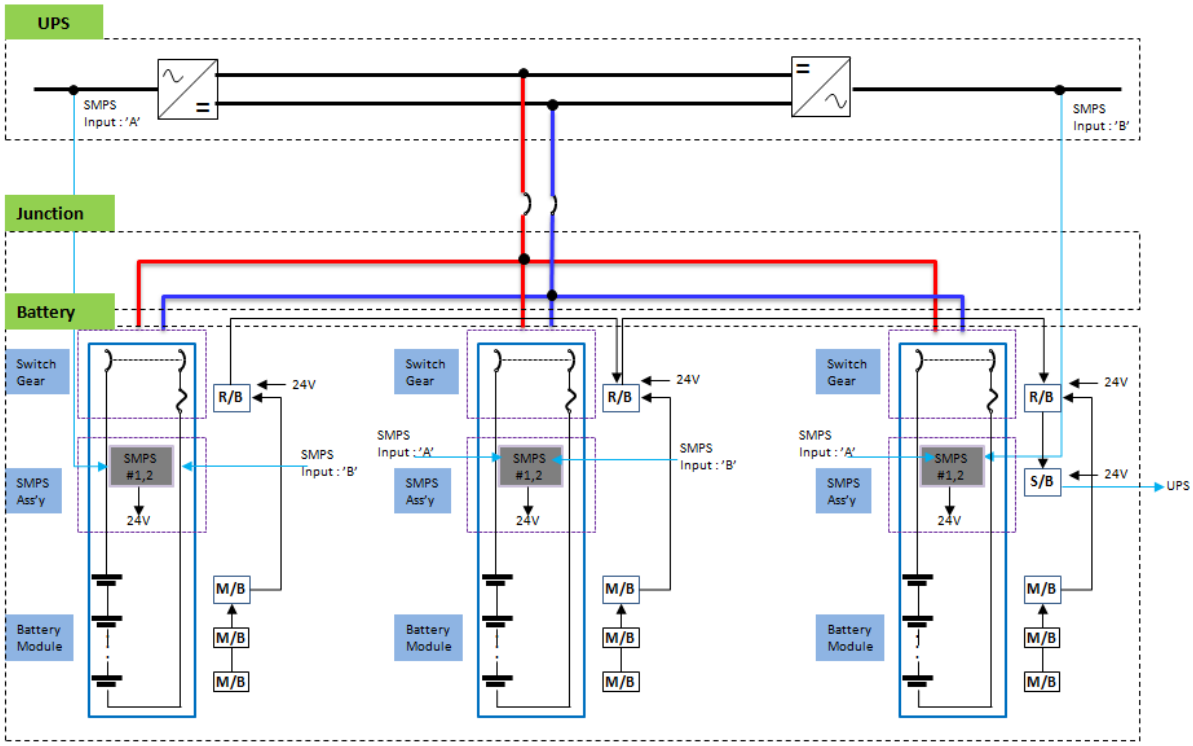


Figure 3: General System Block Diagram

6. Detail Product Description

6.1 Battery Module

Type A: (ELPM182-00001)
Type B: (ELPM182-00002)

There are two types of 8S1P Battery Module. Model number for each type is classified by the position of polarity. Type A's plus(+) terminal is on the right side in front view. Type B is on the left

- Nominal capacity: 67 Ah
- Nominal voltage: 30.40 V
- Weight: 17 kg (37.48 lb.)
- Dimension (L x W x H): 414.00 mm x 216.00 mm x 163.00 mm (16.30 in x 8.50 in x 6.42 in)

The following shows the front and rear views of a module assembly:

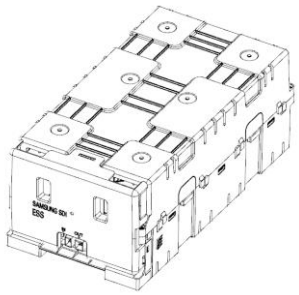
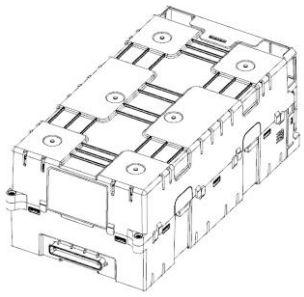
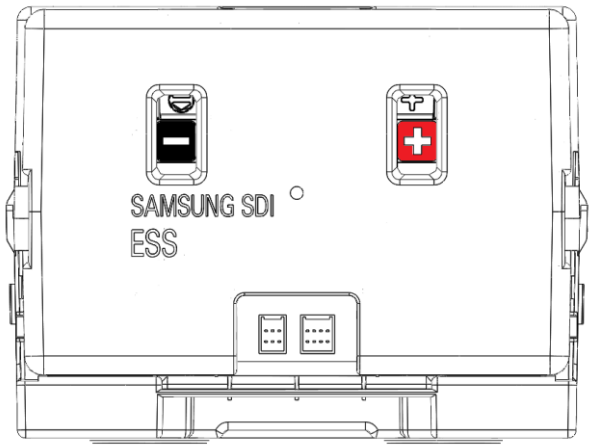
Battery Module A type (Isometric Front/Rear)	Battery Module Type A (Front)
 	

Figure 4 : Battery Module Type A

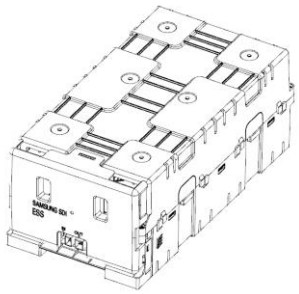
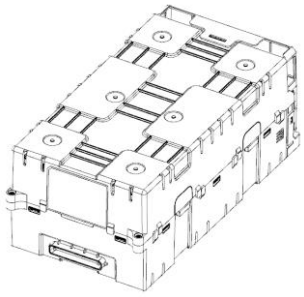
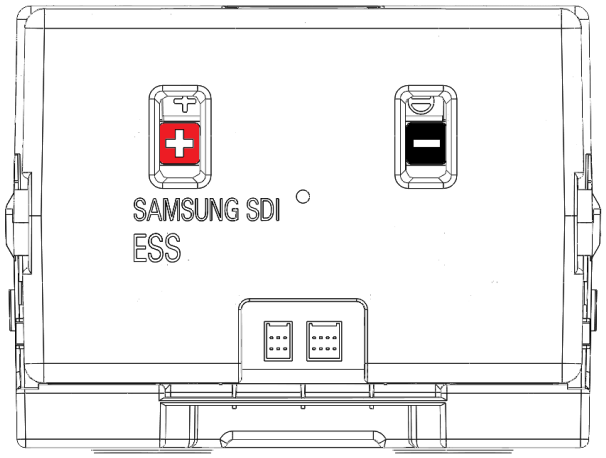
Battery Module Type B (Isometric Front/Rear)	Battery Module Type B (Front)
 	

Figure 5 : Battery Module Type B

6.2 Switchgear Assembly (ELPJ513-0000X)

The Switchgear assembly consists of protection devices and a rack BMS. The key component of protection devices are as follows

- Fuse: 500A
- MCCB UL/CE: 600A
- Switchgear Weight: 18 kg (39.68 lb.)
- Switchgear Dimension (L x W x H): 583.00 mm x 235.00 mm x 411.00 mm (22.95 in x 9.25 in x 16.18 in)

The following shows the Switchgear assembly and Rack BMS.

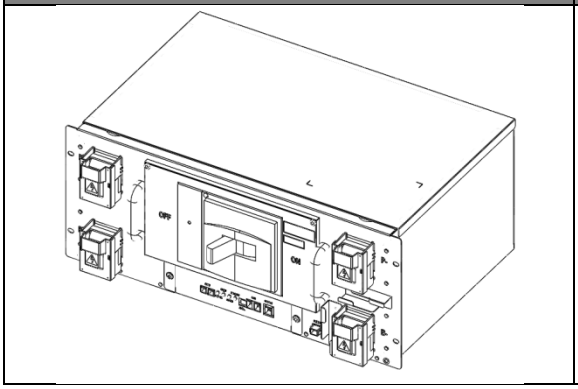
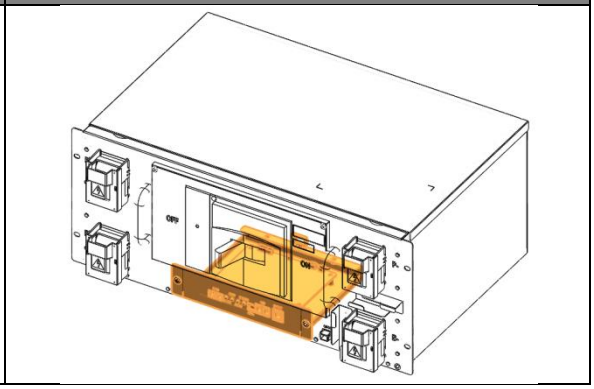
Front Switchgear Assembly	Front Switchgear Rack BMS Assembly Detail
	

Figure 6: Front Views of the Switchgear Assembly

The switchgear provides an extra auxiliary breaker switch that can be externally used for the building monitoring system.

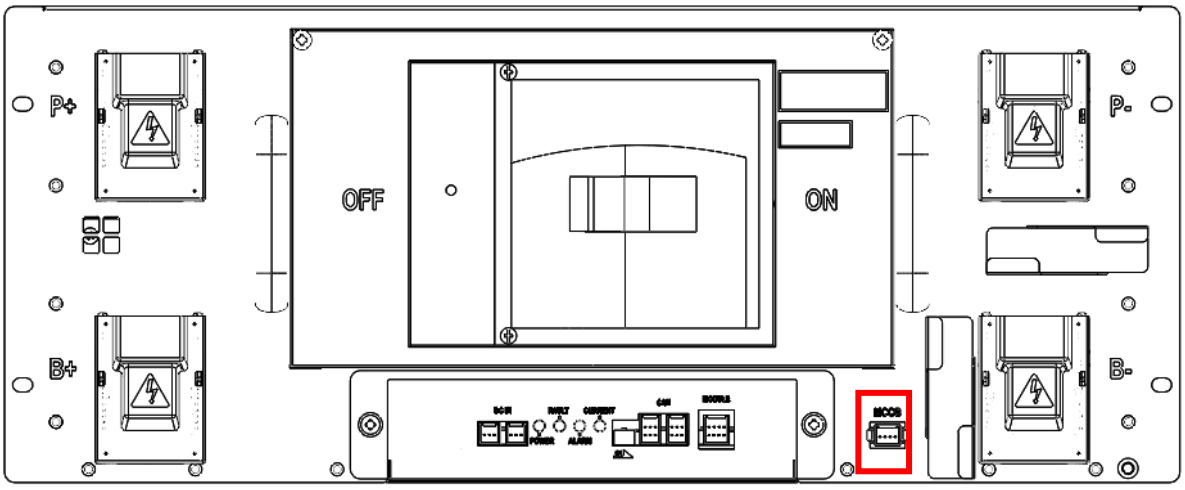


Figure 7: Extra Auxiliary Breaker Switch

6.3 SMPS Assembly (ELPD131-00001)

The system BMS assembly provides data to the external systems (i.e. building management system, UPS, etc.) while controlling and monitoring all connected Rack BMS's.

Weight: 5kg (11.02 lb.)

- Dimension (L x W x H): 397.00 mm x 338.00 mm x 86.00 mm (15.63 in x 13.31 in x 3.39 in)

Below are views of the front of the SMPS Assembly.

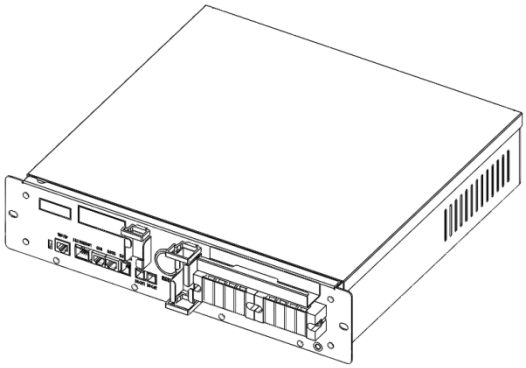
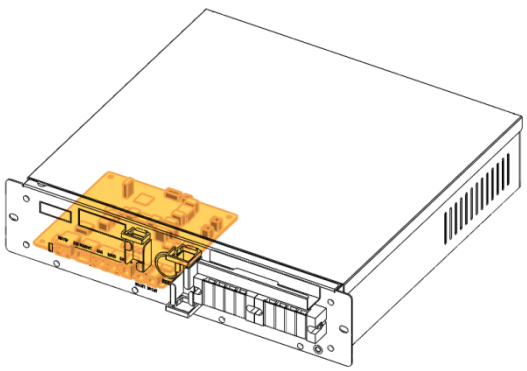
SMPS Assembly (Isometric Front)	Front SMPS Assembly Type A System BMS Detail
	
SMPS Assembly with System BMS	

Figure 8: Front and Rear view of the SMPS Assembly

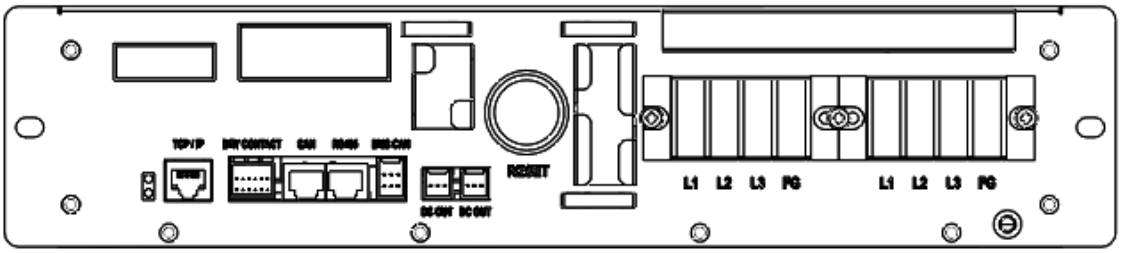


Figure 9: Front View of SMPS Assembly

SMPS Assemble provides RS485, TCP/IP and Dry contact.

6.4 Rack Frame (SJ61-03305X)

The Rack Frame is used to mount modules, switchgear and SMPS assembly. It facilitates grounding of the installed components.
(Grounding cable/bus bar for the rack frame is necessary for the switchgear and SMPS assembly as they are grounded to the rack frame when installed. However, it is required to prepare the ground cable in order to ground the rack frame to the earth.)

- Weight: 190 kg (418.87 lbs)
- Dimension (L x W x H): 650.00 mm x 600.00 mm x 2055.00 mm (25.59 in x 23.62 in x 80.91 in)

The following shows the front and rear of rack frame:

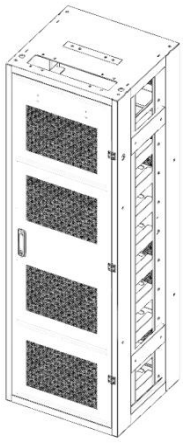
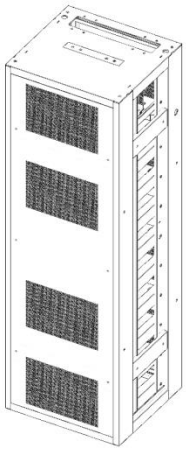
Rack Frame (Isometric Front)	Rack Frame (Isometric Rear)
	

Figure 10: Rack Frames (Front/Rear View)

7. Communication Protocol

7.1 MODBus protocol

Table 5: MODBus 485 communication Specification (ESS to UPS)

No.	Item	Specification	Remarks
1	Baud Rate	19200bps	-
2	RTU ID	0x27	-
3	Format	1 start bit, 8 data bit, Even parity, 1 stop bit	-

Table 6: MODBus TCP/IP communication Specification (ESS to UPS)

No.	Item	Specification	Remarks
1	Speed	10/100 Mbps	-
2	Port Number	502 or 602	-

Table 7: ESS to UPS MODBus Command List & Details

Function Code	Address	Description	Byte#	Bit#	Value	Data type	Endian	Factor	Unit
0x04	0x0000	MODBus Protocol Version	Byte0	Bit 0~7	Minor Version				
			Byte1	Bit 0~7	Major Version				
0x04	0x0001	System Voltage	Byte0~1	Bit 0~7	Average	Unsigned 8 bit	Big Endian	0.1	V
0x04	0x0002	System Current	Byte0~1	Bit 0~7	Summation	signed 8 bit	Big Endian	1	A
0x04	0x0003	System SOC	Byte0~1	Bit 0~7	Average	Unsigned 8 bit	Big Endian	0.1	%
0x04	0x0004	System SOH	Byte0~1	Bit 0~7	Minimum	Unsigned 8 bit	Big Endian	0.1	%
0x04	0x0005	Reserved							
0x04	0x0006	Maximum Cell Voltage of System	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	1	mV
0x04	0x0007	Minimum Cell Voltage of System	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	1	mV
0x04	0x0008	Max Cell Temperature of System	Byte0~1	Bit 0~7	-	signed 8 bit	Big Endian	0.01	℃
0x04	0x0009	Min Cell Temperature of System	Byte0~1	Bit 0~7	-	signed 8 bit	Big Endian	0.01	℃
0x04	0x000A	Protection Status#1 of System	Btyte0	Bit6~7	Reserved				
				Bit5	Discharge Over Current Protection level4				
				Bit4	Discharge Over Current Protection level3				
				Bit3	Discharge Over Current Protection level2				
				Bit2	Charge Over Current Protection level2				
				Bit0~1	Reserved				
			Byte0	Bit 0~7	Reserved				
0x04	0x000B	Protection Status#2 of System	Byte0	Bit0~7	Reserved				

Function Code	Address	Description	Byte#	Bit#	Value	Data type	Endian	Factor	Unit
			Byte1	Bit3~7	Reserved				
				Bit2	SW Sensor Failure - MCCB				
				Bit1	SW Failure - MCCB				
				Bit0	Reserved				
0x04	0x000C	Reserved							
0x04	0x000D	Protection Status#3 of System	Byte0	Bit0	Under Temperature Protection				
				Bit1	Over Temperature Protection				
				Bit2	Under Voltage Protection - Cell				
				Bit3	Over Voltage Protection - Cell				
				Bit4	Voltage Imbalance				
				Bit5	Temperature imbalance				
				Bit6	Communication Failure (Module ↔ Rack)				
				Bit7	Communication Failure (Rack ↔ System)				
			Byte1	Bit0	Over Current Protection (Charge Level1)				
				Bit1	Over Current Protection (Discharge Level1)				
				Bit2	Under Voltage Protection - Rack				
				Bit3	Over Voltage Protection - Rack				
				Bit4	Voltage Sensing Error				
				Bit5	Current Sensing Error				
				Bit6	Fuse Failure				
				Bit7	Reserved				
0x04	0x000E	Protection Status#4 of System	Byte0	Bit0	Reserved				
				Bit1	Emergency Stop (Dry Contact input)				
				Bit2	Over Current Protection (Charge Level2)				
				Bit3	Over Current Protection (Discharge Level2)				
				Bit4	Over Current Protection (Discharge Level3)				
				Bit5	Over Current Protection (Discharge Level4)				

Function Code	Address	Description	Byte#	Bit#	Value	Data type	Endian	Factor	Unit
				Bit6~7	Reserved				
			Byte1	Bit0~7	Reserved				
0x04	0x000F	Protection Status#5 of System	Byte0	Bit0~7	Reserved				
			Byte1	Bit0	Reserved				
				Bit1	SW Failure - MCCB SW				
				Bit2	Sensor Failure - MCCB				
				Bit3~7	Reserved				
0x04	0x001A	Rack Status of System	Byte0	Bit0~7	Total Rack Count				
			Byte1	Bit0~7	Number of Rack in service				
0x04	0x0028※	Rack #1 Voltage	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	0.1	V
0x04	0x002D※	Rack #1 Current	Byte0~1	Bit 0~7	-	signed 8 bit	Big Endian	0.1	A
0x04	0x0032※	Rack #1 SOC	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	0.1	%
0x04	0x0033※	Rack #1 SOH	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	0.1	%
0x04	0x0040※	Rack #1 Maximum Voltage	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	1	mV
0x04	0x0044※	Rack #1 Average Voltage	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	1	mV
0x04	0x0047※	Rack #1 Minimum Voltage	Byte0~1	Bit 0~7	-	Unsigned 8 bit	Big Endian	1	mV
0x04	0x0049※	Rack #1 Maximum Cell Temperature	Byte0~1	Bit 0~7	-	signed 8 bit	Big Endian	0.01	℃
0x04	0x004D※	Rack #1 Average Cell Temperature	Byte0~1	Bit 0~7	-	signed 8 bit	Big Endian	0.01	℃
0x04	0x0050※	Rack #1 Minimum Cell Temperature	Byte0~1	Bit 0~7	-	signed 8 bit	Big Endian	0.01	℃
0x04	0x0055	Rack #1 MCCB on	Byte 0	Bit 0	Rack MCCB status				

※ In order to get the information of next Rack, add 0x3C to the Rack Address.

7.2 Dry Contact

The Dry contact shows the various condition of the battery.
And if it obtains the urgent signal from UPS, then block the charge and discharge of the battery.

Table 8: Dry Contact Connector Description

Item	Part Name	Description
Connector	S12B-J11DK-GWXR	JST
Harness Housing	J11DF-12V-KX	JST
Harness Terminal	SF1F-21T-P0.6	AWG 18~22
Pin No.	**Pin Name**	**Function**
B1	Major Common	Over-Voltage Protection Under-Voltage Protection Over-Temperature Protection Over-Current Protection
A1	Major Normal Close	
B2	Major Normal Open	
A2	Minor Common	Voltage Imbalance Error Voltage Sensing Error Under Temperature protection Temperature Imbalance Error
B3	Minor Normal Close	
A3	Minor Normal Open	
B4	Charge Common	Charge Stop Set Condition 1. Overvoltage alarm(4.25V/Cell) 2. SOC 100% Charge Stop Release Condition 1. SOC < 97% or Discharge Current >|3A|
A4	Charge Normal Close	
B5	Charge Normal Open	
A5	Reserved	
B6	Input	Set Condition: UPS closes B6, A6 contacts for more than 3 second. Action : Battery MCCB Trip
A6	GND	

Table 9: Dry Contact Operation

Battery Status	MAJOR			MINOR			CHARGE STOP		
	B1	A1	B2	A2	B3	A3	B4	A4	B5
Normal Status	COM	Open	Close	COM	Open	Close	COM	Open	Close
Major Protection	COM	Close	Open	COM	Open	Close	COM	Open	Close
Minor Protection	COM	Open	Close	COM	Close	Open	COM	Open	Close
Charge Stop	COM	Open	Close	COM	Open	Close	COM	Close	Open
BMS Power Off	COM	Close	Open	COM	Close	Open	COM	Close	Open

8. Protection Control

Table 10: Protection and failure modes of ESS

No	Items	Level	SET Condition	Time (Sec)	MCCB	Release Condition	Time (Sec)	MCCB
1	Over Voltage Protection - Cell	Major	Max Cell ≥ 4.28V	5	OFF	Max Cell < 4.25V & Reset	5	ON
2	Under Voltage Protection - Cell	Major	Min Cell ≤ 2.5V	3	OFF	Min Cell > 2.70V& Reset	3	ON
3	Over Voltage Protection - Rack	Major	Rack Voltage ≥ 547.84V	5	OFF	Rack Voltage < 544V & Reset	5	ON
4	Under Voltage Protection - Rack	Major	Rack Voltage ≤ 320	3	OFF	Rack Voltage > 345.6V & Reset	3	ON
5	Voltage Imbalance	Minor	Max Cell ≥ 3.50V & Δ Vcell ≥ 300mV	5	ON	Max Cell ≥ 3.50V & Δ Vcell < 50mV & Reset	5	ON
6	Voltage Sensing Error	Minor	|Rack V - Cell Sum V| ≥38.4V	10	ON	|Rack V - Cell Sum V| < 19.2V & Reset	3	ON
7	Over Temperature Protection	Major	Max Temp ≥ 75℃	3	OFF	Max Temp < 65℃ & Reset	3	ON
8	Under Temperature Protection	Minor	Min Temp ≤ 0℃	3	ON	Min Temp > 5℃ & Reset	3	ON
9	Temperature imbalance	Minor	Max Cell T - Min Cell T ≥ 40℃	30	ON	Max Cell T - Min Cell T < 20℃ & Reset	3	ON
10	Over Current Protection (Charge)	Major	Level2 Current ≥ 250A	2	OFF	|Current| < 10A & Reset	3	ON
		Major	Level1 Current ≥ 200A	60	OFF	|Current| < 10A & Reset	3	ON
11	Over Current Protection (Discharge)	Major	Lvel4 |Current| ≥ 600A	1	OFF	|Current| < 10A & Reset	3	ON
		Major	Level3 |Current| ≥ 540A	10	OFF	|Current| < 10A & Reset	3	ON
		Major	Level2 |Current| ≥ 495A	30	OFF	|Current| & Reset	3	ON
		Major	Level1 |Current| ≥ 470A	60	OFF	|Current| & Reset	3	ON
12	Communication Failure (Module ↔ Rack)	Minor	No Communication	30	ON	Re Communication & Reset	-	ON
13	Communication Failure (Rack ↔ System)	Minor	No Communication	30	ON	Re Communication & Reset	-	ON
14	SW Failure - MCCB	Minor	MCCB OFF & |Current| ≥ 2.4A	3	ON	(MCCB OFF & (|Current| < 2.4A) & Reset	-	ON
15	SW Sensor Failure - MCCB	Minor	MCCB contact ON = MCCB Trip ON	3	ON	(MCCB contact ≠ MCCB Trip) & Reset	-	ON
16	Current Sensing Error	Minor	No communication with Current IC	3	ON	Re communication with Current IC	-	ON
17	Fuse Failure	Minor	Fuse Blown	10	ON	Fuse ON & Reset	-	ON

9. LED Indication

LED indicator in front of the Switchgear Assembly shows the status of the battery.

9.1 Battery Status Display
The LED shows several battery conditions.

Table 11: LED Indicator

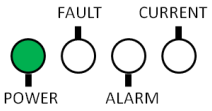
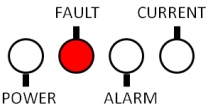
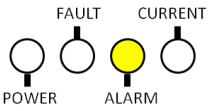
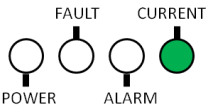
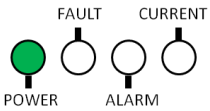
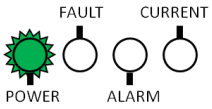
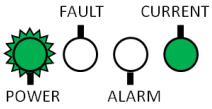
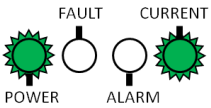
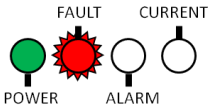
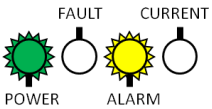
Items	POWER(Green)	FAULT(Red)	ALARM(Yellow)	CURRENT(Green)
Location				
Status	On : MCCB Off Off : Power Off Blink : MCCB On	On : N/A Off : Power Off Blink : Major Protection	On : N/A Off : Power Off Blink : Minor Protection	On : Discharge Off : Idle Blink : Charge

Table 12: Indicated Codes

LED Status	Battery Status	Remarks
 POWER steady	Normal status	MCCB Off
 POWER blinking	Normal status	MCCB On
 POWER blinking CURRENT steady	Normal Status	Discharge
 POWER blinking CURRENT blinking	Normal Status	Charge
 POWER steady FAULT blinking	Major Protection MCCB tripped	Over-Voltage Protection Under-Voltage Protection Over-Temperature Protection Over-Current Protection
 POWER blinking ALARM blinking	Minor Protection MCCB on	Voltage Imbalance Error Voltage Sensing Error Under Temperature Protection Temperature Imbalance Error

10. Evaluation

This part lists all regulation and safety tests conducted by Samsung SDI or a third-party organization. Refer to additional report for more information on test specification.

Table 13: List of Standards and Regulations

No.	Regulation	Tested Product	Result
1	UL1642	Cell	OK
2	UN38.3	Cell, 8S1P Module	OK
3	UL1973, UL991, UL1998	8S1P Module, System	OK
4	CE(EN 61000-6-2:2005, EN 61000-6-4:2007+A1:2011)	Rack	OK

※ Other evaluations are based on customer requirements or Samsung SDI's ESS standards.

11. Packaging and Shipment

ESS is packaged in groups of each component. Refer to additional specification document on packaging and shipment details.

12. Service, Maintenance and Warranty

12.1 Service

There are no user serviceable parts in the Battery Module, Switchgear and SMPS Assembly. Written authorization from Samsung SDI is required to open the Battery Module, Switchgear and SMPS assembly or perform any maintenance thereon. For service inquiries and questions please contact Samsung SDI.

12.2 Maintenance

ESS is designed to be free of maintenance when the recommended operating parameters are followed.

12.3 Warranty

Do not disassemble the Battery Modules, Switchgear and SMPS Assembly as doing so presents a safety hazard and will void the warranty. Contact Samsung SDI for more information. Refer to the purchase agreement for warranty details.

Contact Information

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