

e-STORAGE

A subsidiary of Canadian Solar

SolBank3.0

User Manual

V2.1

CSI Energy Storage Co., Ltd.

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1 Preface

1.1 Document Purpose and Scope

The purpose of this document is to provide an overview of the processes and procedures required to operate the SolBank3.0 series Energy Storage System (ESS). The scope of this manual is limited to only those tasks applicable to operation of this product. Topics covered include, major component overview, operational safety hazards and precautions, modes of operation, pre- operation checklists, and startup and shutdown procedures.

This manual should be made available to all field personnel participating in the design, installation, operation, and maintenance of the SolBank3.0 series energy storage system. A copy of this User Manual should be available on-site at all times.

This manual is to be considered supplemental to project specific design and safety documentation. Please read and understand all aspects of this document prior to initiating SolBank3.0 series operation.

Should any questions arise, please contact E-STORAGE support:

- By email at support@csestorage.com

1.2 Applicable Models

This manual covers the following models only:

- CSI-SolBank-S-5016-2h-NA
- CSI-SolBank-S-5016-4h-NA
- CSI-SolBank-S-5016-2h-EU
- CSI-SolBank-S-5016-4h-EU
- CSI-SolBank-S-5016-2h-AUS
- CSI-SolBank-S-5016-4h-AUS
- CSI-SolBank-S-PL-5016-2h-NA
- CSI-SolBank-S-PL-5016-4h-NA
- CSI-SolBank-S-PL-5016-2h-EU
- CSI-SolBank-S-PL-5016-4h-EU
- CSI-SolBank-S-5016-2h-NA-LH
- CSI-SolBank-S-5016-4h-NA-LH
- CSI-SolBank-S-5016-2h-EU-LH
- CSI-SolBank-S-5016-4h-EU-LH
- CSI-SolBank-S-PL-5016-2h-EU-LH
- CSI-SolBank-S-PL-5016-4h-EU-LH

1.3 Reference Documents

The SolBank3.0 User Manual exists as part of library of product specific documents. Please consult

the following documents to ensure a comprehensive understanding of SolBank3.0 attributes.

- ***SolBank3.0 Installation Manual***
- ***SolBank3.0 User Manual***
- ***SolBank3.0 Safety Manual***
- ***SolBank3.0 Maintenance Manual***
- ***SolBank3.0 Commissioning Manual***
- ***SolBank3.0 Transportation Instruction Document***

1.4 Version Control

As part of e-STORAGE's continuous improvement process, e-STORAGE reserves the right to make technology and document changes. Please contact e-STORAGE support to verify this manual reflects the most recent release or to report omissions or inaccuracies.

Version	Description	Date of Issuance
SolBank3.0 User Manual_V1.0	Initial publication date	
SolBank3.0 User Manual_V1.1	Update the SolBank3.0 BOL energy from 5015 to 5016	2024.6.25
SolBank3.0 User Manual_V1.2	1.Update Applicable Models 2. Update Table 1 SolBank3.0 Standards Compliance 3.Add SolBank3.0's specifications with String PCS in Table 3 4. Delete model switch signage at Annex 1	2024.8.1
SolBank3.0 User Manual_V1.3	Add SolBank3.0's battery rack specification in "5 Key Component Overview- b) SolBank3.0 Battery System-Table 5.2"	2024.8.26
SolBank3.0 User Manual_V1.4	Add EMC Class A warning in "4.3 Operational Precautions"	2024.9.9
SolBank3.0 User Manual_V1.5	Add "Noise reduction mode" description in "5-d) SolBank 3.0 Liquid Cooling and Heating System-Table 7"	2024.10.25
SolBank3.0 User Manual_V1.6	1.Add "Black Start Mode" description in "6.3.6 Black Start Mode" 2.Modify smoke detectors set from "1.02-4/ft" to "3.5%" in Section 4.4 3. Modify heat detectors set from "57°C" to "85°C" in Section 4.4 4. Edit Table-2-NO.8 to Chiller 5.Add new Storage requirement in Section 10 (See Section10-b))	2024.12.5
SolBank3.0 User Manual_V1.7	1.Revise "Power Meter" description in "5-g) SolBank3.0 Power Meter" 2.Delete "6.3.6 Black start mode" 3.Add "Mirror Design" in "11	2025.3.20

	Annex" 4.Added applicable models in chapter 1.2	
SolBank3.0 User Manual_V1.7.1	1.Update "5-h) SolBank3.0 Fire Safety System" to cover AUS fire system	2025.3.28
SolBank3.0 User Manual_V1.8	1.Model designation updated to CSI-SolBank-S-PL-5016-xx-xx 2.Replace "SolBank3.0&SolBank3.0 PL" to "SolBank3.0 series" 3.Update "10-c)Storage Condition and figure11" 4.Update "3.3 system specification" 5.Update "1.5 Labls&Explanation" table	2025.4.24
SolBank3.0 User Manual_V1.9	1.Add floor drain specification in "5-a) SolBank series Enclosure" 2.Add Description of seismic resistance rating in "5-a) SolBank series Enclosure"	2025.6.6
SolBank3.0 User Manual_V1.9.1	1.Update description in "5-b) SolBank3.0 series Battery System	2025.7.2
SolBank3.0 User Manual_V2.0	1. Optimized "5-h) SolBank3.0 series Fire Safety System" table (NA version, heat detector will trigger ventilation) 2. Add "1.7- Software Update Notice" 3.Amend "3.3-Table3" Usable energy to Rated DC Capacity	2025.9.11
SolBank3.0 User Manual_V2.1	1. Revision 1.2 Scope of Application for the Manual 2. Add Lead-acid Maintenance Description in "10 Storage Condition"	2025.12.30

1.5 Document Safety Notices

Throughout this manual the below indicated labels are used to convey hazards associated with specific tasks and procedures. These safety notices do not represent all hazards present when performing a given task. Installers and operators of the "SolBank3.0 series" (referring to all application models mentioned in Section 1.2, unless specifically stated otherwise, this will not be reiterated in the following text) should adhere to industry safety best practices; site specific Environmental, Health and Safety plans; and local safety requirements and regulations. ***Only properly trained and qualified personnel should be permitted to complete the installation procedures identified in this manual.***

Labels	Explanation
--------	-------------

	CE mark of conformity.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury. Indicators are not used for property damage hazards unless personal injury risk appropriate to this level is also involved.
	Label the product as Combustible and explosive, and do not involve open flame.
	Electrical hazard sign, non-professional personnel do not approach. Professional personnel are required to perform maintenance and operation.
	Do not discard randomly
	Recycling equipment
	Consult instructions for use
	Noise source
	cTUVus certification

1.6 Product Certification and Compliance

The SolBank3.0 series is compliant with the standards, regulations, and requirements identified in Table 1.

Table 1: SolBank3.0 series Standards Compliance

Classification		Regions	Standards
System	Design regulations	ALL	NEC – National Electrical Code® IEEE C84.1 – Standard Preferred Voltage Ratings for Alternating-Current Electrical Systems IEEE 693 – Recommended Practice for Seismic Design of Substations IEEE 1584-2018 – Guide for Performing Arc-Flash Hazard Calculations NFPA 855 – Installation of Energy Storage Systems NFPA 70E® – Standard for Electrical Safety in the Workplace® NFPA 72 – National Fire Alarm and Signaling Code IEC62933-5-2 – Safety requirements for grid-integrated EES systems - Electrochemical-based systems AS3000 - Electrical installations “Wiring Rules”
	Product certification	NA	IEC 60529 – Degrees of protection provided by enclosure UL 60730-1 – Standard for safety: Automatic Electrical Controls – Part 1:General Requirements NFPA 69® – Standard on Explosion Prevention Systems NFPA 68® – Standard on Explosion Protection by Deflagration Venting UL9540A – Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems UL1973 – Standard for safety: Batteries For Use In Stationary And Motive Auxiliary Power Applications UL9540 – Standard For safety: Energy Storage Systems And Equipment UN38.3 – Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria
	Product certification	EU	IEC62619 – Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications

			IEC63056 – Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems IEC/EN 62477-1 – Safety requirements for power electronic converter systems and equipment - Part 1: General IEC/EN 61000 – Electromagnetic compatibility (EMC)
Fire Protection and Safety	Design regulation	NA	NFPA 2001 – Standard on Clean Agent Fire Extinguishing Systems NFPA 15 – Standard for Water Spray Fixed System for Fire Protection NFPA 2-2023 – Hydrogen technologies code
		EU	BS 5839-1 – Fire detection and fire alarm systems for buildings BS 7273 -1 – Code of practice for the operation of fire protection measures BS EN 54 Pt1- 21 – series for equipment BS EN 15004-1:-2019 – Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance. BS EN 15004-2:2020 – Fixed Firefighting Systems- Gas Extinguishing Systems FK-5-1-12 BS 6266:2011 – Fire protection for electronic equipment installations– Code of practice BS EN 12094-1:2003 – Fixed firefighting systems. Components for gas extinguishing systems Requirements and test methods for electrical automatic control and delay devices
		AUS	AS 4487-2013 – Condensed aerosol fire extinguishing systems – Requirements for system design, installation and commissioning and test methods for components AS 7240– Fire Detection and Alarm Systems AS1670 – Fire detection, warning, control and intercom systems – System design, installation and commissioning AS 1851-2012 – Routine service of fire protection systems and equipment

1.7 Software Update Notice

e-Storage reserves the right to release updates addressing critical SolBank software anomalies, system performance optimizations, cybersecurity vulnerabilities, or compliance requirements. These updates may include but are not limited to:

- 1) Firmware patches
- 2) Software version upgrades
- 3) Critical bug fixes
- 4) Stability and performance enhancements
- 5) Regulatory compliance modifications

To maintain the safe operation, performance, and reliability of the SolBank, it is mandatory that all software and firmware updates provided by e-Storage be installed in a timely manner.

Failure to install such updates within the specified deployment window may result in degraded system functionality and may void any related performance guarantees and product warranty resulting from non-compliance.

Data Handling and Compliance

All update-related diagnostics, communications, and telemetry data will be handled in accordance with applicable data protection laws, including but not limited to the General Data Protection Regulation (GDPR) in the European Union and other relevant market-specific data privacy regulations. Personal or system-identifiable data collected during update procedures will be processed solely for the purposes of service enablement, safety, and product support, and will not be shared with third parties without consent unless required by law.

2 Acronyms and Abbreviations

AC – Alternating Current

AHJ – Authority Having Jurisdiction

BMS – Battery Management System

BOL – Beginning of Life

DC – Direct Current

SolBank Controller – Local Energy Management System (Battery system)

EOR – Engineer of Record

ESS – Energy Storage System

COG – Center of Gravity

HVAC – Heating Ventilation Air Conditioning

IFC - Issued for Construction

LFP – Lithium Iron Phosphate

LOTO – Lock-Out-Tag-Out

NFPA – National Fire Protection Association

PCS – Power Conversion System

PPE – Personnel Protective Equipment

SPD – Surge Protection Device

UPS – Uninterruptible Power Supply

EPC – Engineering, Procurement, and Construction contractor

CapEx - Capital Expenditures

3 Introduction

3.1 Acknowledgement

Thank you for purchasing the containerized SolBank3.0 series system supplied by e-STORAGE. The SolBank3.0 series is an advanced modular battery energy storage system incorporating industry leading capabilities enabled by cutting-edge technologies and innovative design. High energy density, liquid cooled battery and power electronics, extended service life, and advanced safety features are just a few of the attributes that set the SolBank3.0 series apart from other ESS products.

The SolBank3.0 series is fully factory integrated and tested at E-STORAGE's facility, arriving on site with battery racks populated and sub systems installed. This high level of pre-integration results in rapid installation, reduced EPC CapEx, and improved system performance and reliability.

3.2 System Overview

The SolBank3.0 series System integrates all power electronics, controls, and safety features required to support the DC side of a battery energy storage system. An overview of the SolBank3.0 series layout and key features is shown in Figure 1 and further described in Table 2.

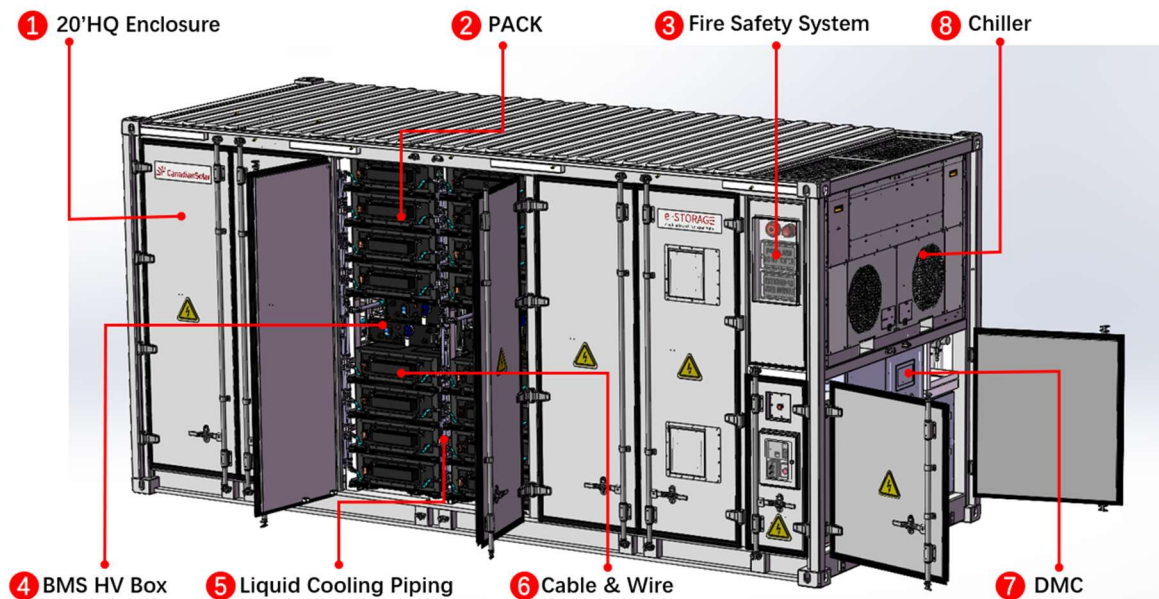


Figure 1: Layout and features of the SolBank3.0 series

Table 2: Key System Features

NO.	Name	Remarks
-----	------	---------

1	Standard Enclosure and Rack	All models of the SolBank3.0 series utilize a standard IP55 rated 20'ft HC container and battery rack design allowing for enhanced system modularity.
2	Pack	The SolBank3.0 series contains 48 Lithium Iron Phosphate (LFP) battery packs, each consisting of 104 series wired battery cells.
3	Fire Protection System	The SolBank3.0 series combines heat, smoke and gas detection with an explosion-proof ventilation system.
4	BMS Box	The SolBank3.0 series contains 12 BMS boxes. These are easily accessed for installation and maintenance within the middle line of the container. The BMS ensure optimal battery functionality and safety.
5	Liquid Cooling piping	The liquid-cooled piping connecting the p to the packs.
6	Cable & Wire	High-voltage connection and low-voltage communication power cable.
7	DMC	The Distribution Management and Control Cabinet (DMC) houses all aux power distribution equipment including 2-hour backup UPS; system communication, control, and monitoring hardware including network switch, and SolBank controller, and all required customer communication, signal, and aux power interfaces.
8	Chiller	The SolBank3.0 series's liquid cooling/heating system facilitates improved battery temperature management efficiency relative to traditional forced air systems. Each battery pack is liquid cooled, allowing for greater heat dissipation and uniform cell temperature management. During charge and discharge, cell temperature is maintained between 20°C - 35°C.

3.3 System Specifications

The SolBank3.0 series system has two models, as shown in Table 3 below. Each model has varying C-rate, power, and energy characteristics. Battery string size, nominal voltages, form factor, and physical dimensions remain consistent across all models. This manual applies only to model

Table 3: SolBank3.0 series Specifications.

SYSTEM MODEL NUMBER	e-STORAGE-SolBank3.0-S-5016-4h/CSI-SolBank-S-5016-4h/ CSI-SolBank-S-PL-5016-4h	e-STORAGE-SolBank3.0-S-5016-2h/CSI-SolBank-S-5016-2h/ CSI-SolBank-S-PL-5016-2h
Discharge Duration (hour)	4	2
Charge/Discharge P-rate	0.25P	0.5P
BOL Cell Energy (kWh)	5016	5016
Rated DC Capacity (kWh)	4800 (For String PCS) / 4800 (For Centralize PCS)	4800 (For String PCS) / 4700 (For Centralize PCS)
Operating DC Voltage Range (Vdc)	1164.8 ~ 1497.6	
Recommended Discharge Power (kW)	1200 (For String PCS) / 1200 (For Centralize PCS)	2400 (For String PCS) / 2350 (For Centralize PCS)
# of LFP Battery Rack	12	12
# of BMS	12	
Output Short-circuit Current (Icc)	110.12kA	

4 Operational Safety

4.1 Safety Requirements

The primary hazards associated operation of the SolBank3.0 series are indicated below and in Table 5 and discussed in detail within the SolBank3.0 series Safety Manual. Hazard warning signs and other signage are identified in Annex 1. The below hazard summary does not represent a complete list of hazards at an ESS site. User should reference product and site-specific safety documentation such as an Environmental Health and Safety (EH&S) plan or Emergency Response Plan (ERP) for further details.

4.1.1 Electrocution Hazard



Personnel will be exposed to voltages up to 1500 VDC from the SolBank3.0 series's battery packs. Battery packs cannot be de-energized. Low and medium voltage AC is also present – exposure levels will depend on site specific conditions. Risk of arc flash and electrocution is omnipresent at an ESS site. E-STORAGE encourages full compliance with the practices and procedures indicated in NFPA 70E including use of Personal Protective Equipment (PPE) sufficient to mitigate any hazards identified in a site-specific arc flash study. Emergency Response Personnel should rely on Standard Operating Procedures (SOP) for responding to incidents at electrical generating facilities.

4.1.2 Fire and Explosion Hazard



The SolBank3.0 series contains combustible fuels, ignition sources, and sufficient oxygen to result in propagation of fire. Fire and other sources of extreme heat, if not properly mitigated, can lead to battery cascading thermal runaway and the release of combustible gases. **These combustible gases, if present in sufficient density, pose a risk of explosion.** If a fire, or other indications of thermal runaway are present within the SolBank3.0 series or at the ESS site, first responders are advised to maintain a safe perimeter until it can be verified that entry into the ESS site is safe per the site specific Emergency Response Plan (ERP) and SOP.

4.1.3 Chemical Exposure Hazard



The SolBank3.0 series contains the following hazardous chemicals: LFP battery electrolyte, lead acid battery electrolyte, R513a refrigerant, and Ethylene Glycol coolant. **These chemicals can be hazardous to both human health and environment.** Please refer to the Safety Data Sheets (SDS) contained within the SolBank3.0 series Safety Manual for hazards and precautions specific to each chemical.

4.2 Emergency Shutdown

See Section 9.1 for emergency shutdown procedures.

4.3 Operational Precautions



Batteries cannot be deenergized. The shutdown sequences described below can only isolate batteries and associated dangerous voltage. Personnel must always exercise extreme caution and wear proper PPE.



Complete ESS Shutdown sequences will vary by site specific design. Always consult site specific schematics and manuals to ensure proper isolation of electrical equipment.



Lock-out-tag-out (LOTO) procedures should be implemented to prevent accidental energization of equipment.



All personnel operating the SolBank3.0 series shall be properly trained and qualified. Personnel shall read and understand all manuals and project documentation and adhere to the requirements and direction within.



Shutting down thermal management and communication systems for extended periods may result in damage to equipment and inability to detect and communicate fault conditions.



Opening the BMS contactors under load may result in damage to SolBank3.0 series BMS. Only use the F-stop buttons in event of emergency.



Do not initiate SolBank3.0 series operation until system is fully commissioned and inspected by E-STORAGE field technicians, or until all required periodic maintenance is performed.

Only open doors during "appropriate weather" :

1) no rain;

2) wind speeds ≤ 18 mph;

3) The ambient temperature and humidity conditions meet the requirements of the shadow part of the figure below





Do not modify or alter the SolBank3.0 series without written permission from E-STORAGE



The Emission characteristics of the system make it suitable for use in industrial areas that means Class A electromagnetic environment. If it is used in a residential environment (Class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment

4.4 System Protection Features

The SolBank3.0 series incorporates numerous features designed to protect personnel and equipment from harm. See Table 4 for a summary of these features.

Table 4: SolBank3.0 series System Protection Features

FEATURE	DESCRIPTION
Smoke detection	2 smoke detectors located on the interior ceiling of the battery cabinet and 1 smoke detector located on the interior of the DMC, calibrated to an alarm sensitivity of 3.5%/ft
Heat detection	2 heat detectors located on the interior ceiling of the battery cabinet and 1 heat detector located on the interior of the DMC, calibrated to an alarm threshold of 85°C
H ₂ gas detection	2 H ₂ gas detectors located on the interior ceiling of the battery cabinet and calibrated to an alarm threshold of 10% LEL
Audible and visual alarms	One externally mounted alarm bell and one externally mounted siren and strobe combination alarm.
Water sprinkler system (optional)	Integrated water-based fire suppression system piping network and external dry-pipe or hose connection for water supply.
Lightning strike mitigation	2 units (6 pieces) Surge Protection Devices (SPD) located on the main DC bus, and auxiliary power bus.
Water and flood detection	Water detection located on the floor of the SolBank3.0 series.
Thermal runaway prevention	Sophisticated battery cell and pack design, advanced BMS functionality, and stable cell electrolyte chemistry combine to greatly reduce the probability of battery thermal runaway.
Overcurrent Protection	All SolBank3.0 series electrical circuits are protected by properly sized Overcurrent Protection Devices (OCPD)
Fast stop buttons	Two Fast stop (F-stop) buttons are located on both ends of each SolBank3.0 series. Activating an F-stop button will immediately disconnect all BMS DC contactors.
Access door limit switch alarms	The battery cabinet and DMC access doors contains interlocked switch that prevents operation of the SolBank3.0 series when any door is open.

5 Key Component Overview

a) SolBank3.0 series Enclosure

All models of the SolBank3.0 series utilize a standard IP-55 rated container and battery rack design allowing for enhanced system modularity without increased production and equipment costs. Container meets High Level under IEEE-693 and Zone 4 under GR-63-CORE. The enclosure and all components within are factory installed and commissioned, requiring only limited field integration upon arrival on-site. See the *SolBank3.0 series Installation Manual* for further details.

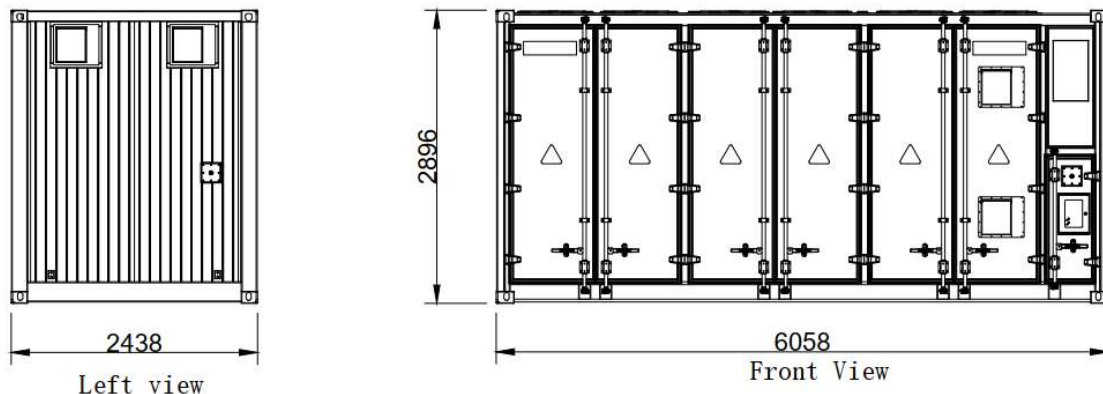
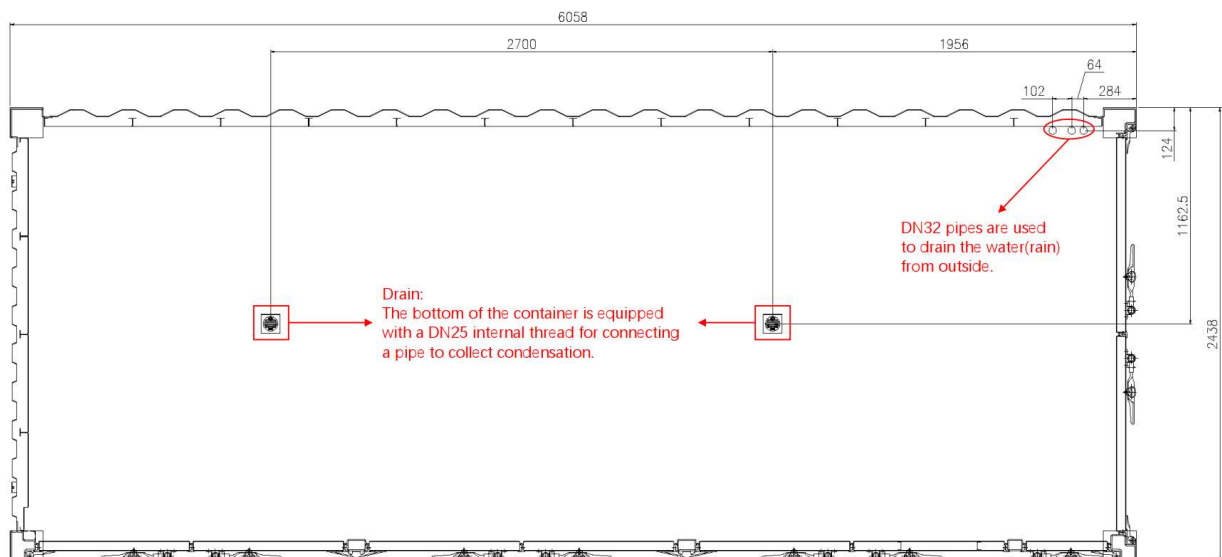


Figure 2: SolBank3.0 series Dimensions

The bottom of SolBank3.0 series containers is equipped with two floor drains use for connecting a pipe to collect condensation and three DN32 pipes use for drain the water from outside. When there is water inside SolBank, The water will go straight through the floor drain.



Top Section View of SolBank3.0

Figure 2.1: Drain design of SolBank3.0 series

b) SolBank3.0 series Battery System

The SolBank3.0 series contains 48 Lithium Iron Phosphate (LFP) battery packs, each consisting of 104 series wired battery cells. Each battery pack has a nominal voltage of 332.8VDC and is wired in series with three other battery packs to achieve a nominal string voltage of 1,331.2VDC. The battery pack housing is constructed from a material with a flame-resistant rating of 5VA.

The SolBank3.0 series contains 48 x 1P104S battery packs and 12 BMS. A typical battery string consists of 4*1P104S battery packs wired in series and connected to a single BMS as shown in Figure 3 such strings exist within each SolBank3.0 series. To ensure safe transport of the SolBank3.0 series, the battery packs have been electrically isolated by disconnecting several interconnection cables.

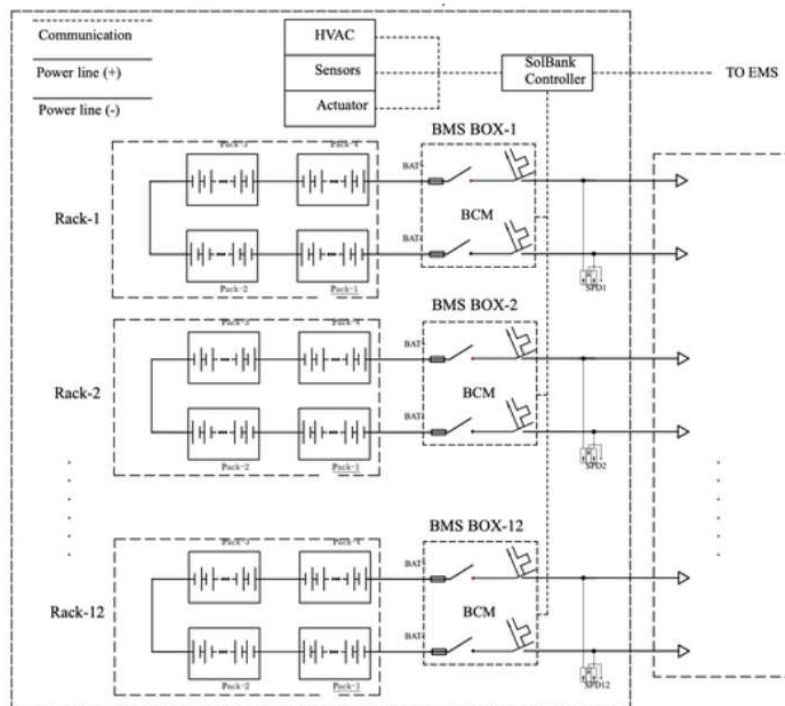


Figure 3: SolBank3.0 series battery string. 1 of 12 shown.

Other notable attributes of the battery pack include the liquid cooling connectors, positive and negative terminals connector. See Figure 4 for further details. The SolBank3.0 series will arrive on site with the battery packs installed and integrated to the extender permissible by shipping and transit regulations. Site installers will be required to land pre-terminated and secured inter-string cabling, and install maintenance switches. See the *SolBank3.0 series Installation Manual* for further guidance.

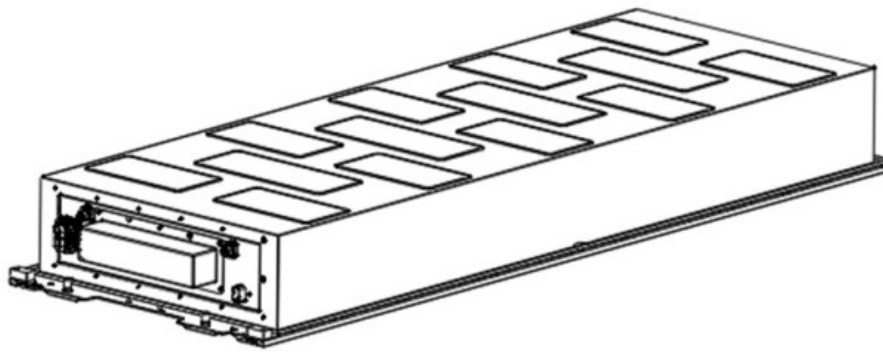


Figure 4: SolBank3.0 series battery pack

Table 5.1: SolBank3.0 series battery pack specifications

DIMENSIONS	
Height	248 ± 5mm
Width	790 ± 3mm
Length	2180 ± 5mm
Weight	670 ± 15kg
ELECTRICAL PARAMETERS	
Nominal Voltage	332.8 V
Nominal Capacity	314Ah
	104.5kWh
Charge Mode	CP
Charge Current	157A (Standard Continuous Charge Current@25°C)
	240A (Max. Continuous Charge Current@25°C, ≤30min)
Charge Cut-off Voltage	3.60V/Battery Cell
Discharge Mode	CP
Discharge Cut-off Voltage	2.80V/Battery Cell
Discharge Current	157A (Standard Continuous Discharge Current@25°C)
	240A (Max. Continuous Discharge Current @ 25°C, ≤60min)
OPERATING CONDITIONS	
Operating Temperature	0~+55°C
Storage Humidity	≤90%

Table 5.2: SolBank3.0 series battery rack specifications

GENERAL PARAMETERS	
Product Model	CSI-SolBank-R-418-2h-H CSI-SolBank-R-418-4h-H CSI-SolBank-R-418-2h-G CSI-SolBank-R-418-4h-G CSI-SolBank-R-418-2h-E CSI-SolBank-R-418-4h-E CSI-SolBank-R-418-2h-N CSI-SolBank-R-418-4h-N CSI-SolBank-R-418-2h-A CSI-SolBank-R-418-4h-A CSI-SolBank-R-PL-418-2h-H CSI-SolBank-R-PL-418-4h-H CSI-SolBank-R-PL-418-2h-G CSI-SolBank-R-PL-418-4h-G CSI-SolBank-R-PL-418-2h-E CSI-SolBank-R-PL-418-4h-E CSI-SolBank-R-PL-418-2h-N CSI-SolBank-R-PL-418-4h-N CSI-SolBank-R-PL-418-2h-A CSI-SolBank-R-PL-418-4h-A CSI-SolBank-R-PL-418-2h-X CSI-SolBank-R-PL-418-4h-X
Protection Grade	IP20
ELECTRICAL PARAMETERS	
Nominal Voltage	1331.2 V
Nominal Capacity	314Ah
	418kWh
Charge Mode	CP
Charge Current	240A (Max. Continuous Charge Current@25°C, ≤30min)
Charge Cut-off Voltage	3.60V/Battery Cell
Discharge Mode	CP
Discharge Cut-off Voltage	2.80V/Battery Cell
Discharge Current	240A (Max. Continuous Discharge Current @ 25°C, ≤60min)
OPERATING CONDITIONS	
Operating Temperature	0~+55°C
Storage Humidity	≤90%

c) SolBank3.0 series Battery Management System (BMS)

The SolBank3.0 series houses 12 rack-mounted, Battery Management Systems (BMS) (one for each string). These are easily accessed for installation and maintenance within the central User Interface Cabinet of the SolBank3.0 series. The BMS work in concert with SolBank3.0 series battery pack Battery Management Units (BMU) to ensure optimal battery functionality, lifespan, and safety by continuously monitoring battery parameters such as voltage, temperature, insulation, while also performing maintenance functions such as cell balancing. In the event the BMS detects a fault condition, or if an operational parameter exceeds an acceptable range, the BMS will isolate the

impacted battery string by opening integrated DC contactors. See Figure 5 for additional details.

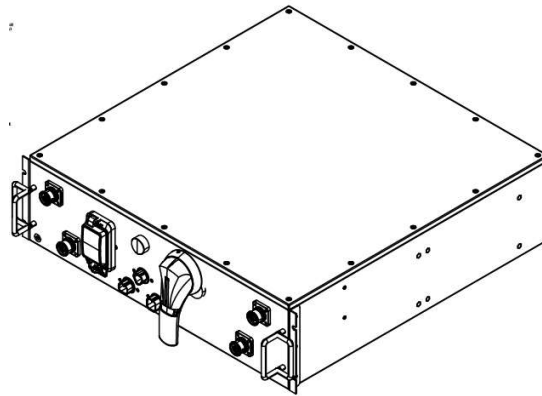


Figure 5: BMS plug receptacles and termination locations.

d) SolBank3.0 series Liquid Cooling and Heating System

The SolBank3.0 series integrates a liquid cooling and heating system which distributes a temperature regulated ethylene glycol solution throughout the SolBank3.0 series enclosure, efficiently dissipating heat from battery cells when charging and discharging, while also providing necessary cell heating during periods of cold weather. See Figure 6 for an overview of the coolant distribution system.

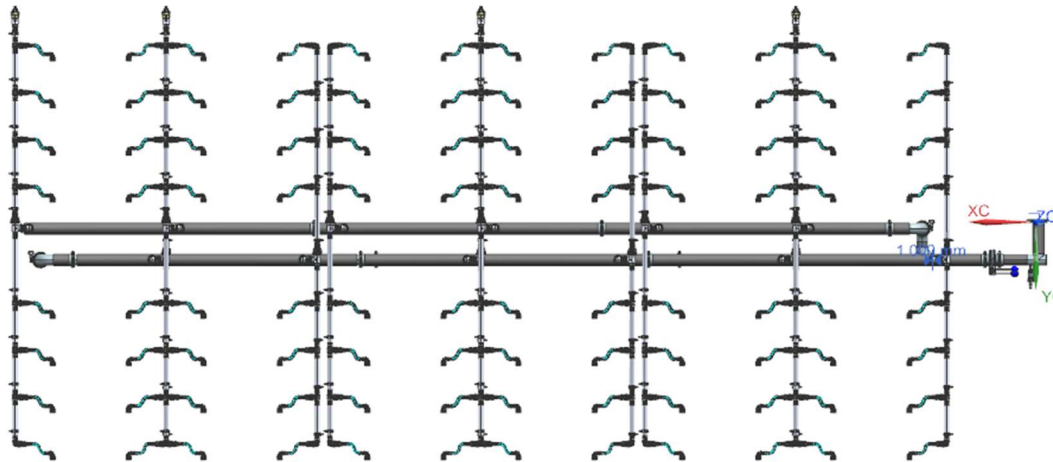


Figure 6: SolBank3.0 series liquid cooling system schematic (front view)

Temperature regulated coolant flows outbound from the coolant reservoir located within the HVAC cabinet to the 48 battery packs via the distribution lines shown in Figure 7. After passing through each required device, and absorbing heat (or releasing heat – heating mode), the coolant then flows back into the HVAC cabinet via the red piping, where it is cooled, if necessary, by a glycol/refrigerant heat exchanger. The SolBank3.0 series coolant system is factory charged. However, in the event damage or shipping limitations require field charging, please consult the *SolBank3.0 series Maintenance Manual*.

The SolBank3.0 series's HVAC system can be turned on by closing breaker within the Distribution and Control Cabinet. See Section 8 for system startup procedures. The SolBank3.0 series's HVAC system can be controlled and adjusted, if need be, via the HVAC Human Machine Interface (HMI)

located within the HVAC cabinet. Always consult E-STORAGE technical support before adjusting HVAC parameters or setpoints.

Table 6: Coolant System Specifications

ITEM	PARAMETER	REMARK
Cooling system medium	50/50 Ethylene Glycol and deionized water	
MSDS Ethelene Glycol	See <i>SolBank3.0 Safety Manual</i>	
Equipment cooled/heated	48 SolBank3.0 LFP battery packs	
# of Primary system valves	2 (supply and return). Located in HVAC bay	
# of Branch circuit valves	4 (2 distribution and 2 supply). Located throughout.	
Line pressure	1.2bar - 3.5bar	

Table 7: Chiller System Specifications

ITEM	PARAMETER	REMARK
Cooling Capacity	0.50P: 60 kW 0.25P: 25 kW	
Heating Capacity	0.25P & 0.50P: 16kW	
Operating Temperature Range	-30°C to 55°C (-22°F to 131°F)	
MSDS refrigerant	See <i>SolBank3.0 Safety Manual</i>	
Sound(<1M)	<75dBA*	<1M

*** Noise reduction mode for cooling system**

In some areas there may be a requirement for noise level, so the corresponding function of running the cooling system in noise reduction mode has been designed on SolBank 3.0.

The cooling system includes four gears of operation power. One gear is the normal mode which means the chiller works with full power. The other three gears are the noise reduction mode related to three levels of noise. The user could select the gear according to the project requirements. Please refer to “*SolBank3.0 Noise Test Report*” of the specific SolBank model for further information about the noise level and working condition matrix.

To turn on the noise reduction mode, write the modified function in the EMS software, and send the corresponding commands through the EMS. Please refer to “*SolBank 3.0 CSI BMS Modbus communication protocol-To EMS&BCI*” for the detailed software description.

e) SolBank3.0 series DC Junction Box

The SolBank3.0 series’s DC Junction box contains all primary DC busbar, fusing, Surge Protection Devices (SPD), and power monitoring required to safely exchange power between the SolBank3.0 series and the Power Conversion System (PCS).

All field wiring, to include system ground, primary DC cables, and communication cables enter the base of the DC Junction Box. See the *SolBank3.0 Installation Manual* for further details.

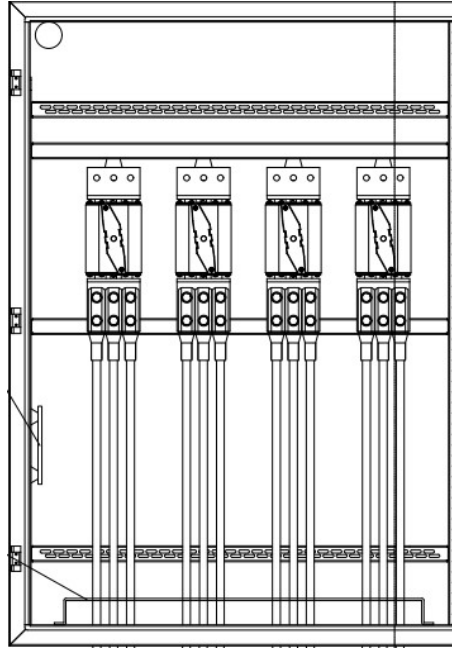
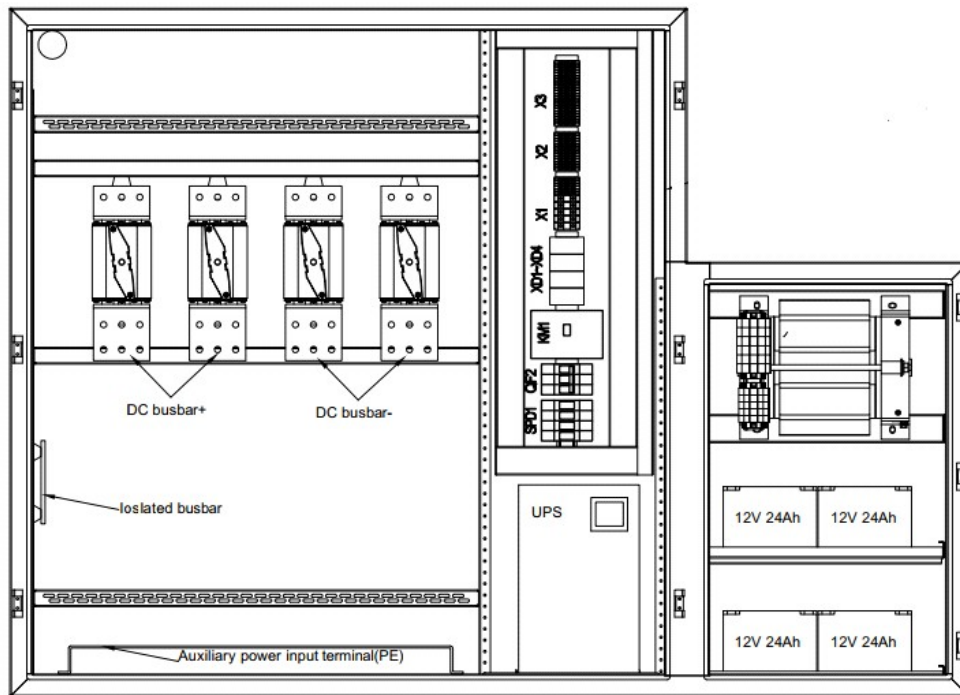


Figure 7: Location of power cable foundation exit

f) SolBank3.0 series Distribution and Control Cabinet

The Distribution and Control Cabinet houses all aux power distribution equipment including 2-hour backup UPS; system communication, control, and monitoring hardware including network switch, and Energy Management Control Unit (SolBank3.0 Controller). It also includes all required customer communication, signal, and aux power interfaces.



No.	Interface	Remarks
UPS	UPS	Used for auxiliary power supply in equipment
XD1 ~ XD4	Auxiliary power input terminal	L1/L2/L3/N
XD5	Auxiliary power input terminal	PE
KM1	Power meter	

Figure 8: Distribution and Control Cabinet

The Distribution and Control Cabinet is the primary user interface required for SolBank3.0 series startup and shutdown procedures. See Section 8, Section 9, and Table 10 for additional details.

Table 8: Auxiliary Power Overcurrent Protection Device (OCPD) index
(0.5P&0.25P)

PROTECTIVE DEVICE	CIRCUIT DESCRIPTION	VOLTAGE	AMPS	Remarks
	Supplies aux power system POWER	480Vac(US)	63A	
Breakers of Cooling system	Supplies Liquid HVAC system	480Vac(US)	63A	

Breakers of SPD	Supplies Surge Protection Device switch	480Vac(US)	32A	
Breaker of Fire Safety System	Supplies fire safety system	277Vac(US)	6A	
Breaker of Fan in DMC	DMC Fan power supply	277Vac(US)	6A	
Breaker of UPS	Supplies UPS input	277Vac(US)	16A	
Breakers of BMS boxes	Supplies 1~12#BMS BOX	277Vac(US)	10A	
Breaker of 24V AC/DC module	Supplies AC/DC (24VDC)	277Vac(US)	6A	
Breaker Fan in Container	Container Fan power supply	277Vac(US)	6A	

g) SolBank3.0 series Power Meter

The Power Meter of SolBank3.0 series is located in the DMC aux Cabinet, and its primary function is to measure the energy consumption of the 400V/480V auxiliary power supply, as shown by KM1 in Figure 8.

h) SolBank3.0 series Fire Safety System

The SolBank3.0 series incorporates heat and smoke detection. The below alarm sequence will be programmed into the SolBank3.0 series. Refer to *Fire Safety System Flow Chart* for more information.

- Level 1 Smoke/Heat Alarm: If a single detector (heat or smoke) is triggered, the fire alarm control panel will receive the signal and the exterior mounted alarm bell will activate, notifying on-site personnel of a potential fire within the SolBank3.0 series. Simultaneously, the SolBank3.0 series will communicate the alarm condition to the site EMS. Charging and discharging are not allowed.
- Level 2 Smoke/Heat Alarm: If both heat and smoke detectors are triggered, the fire alarm control panel will receive the signal and the exterior mounted alarm siren and visible strobe will activate, notifying on-site personnel that both elevated heat and smoke exist within the SolBank3.0 series. Simultaneously, the SolBank3.0 series will communicate the alarm condition to the site EMS. All BMS DC contactors will open and auxiliary power will be disconnected from the SolBank. The SolBank will continue to operate critical loads by UPS backup power.
- Level 1 Gas Alarm: If a single gas detector detects > 10% LEL, the fire alarm control panel will receive the signal and the exterior mounted alarm bell and exterior mounted alarm siren and visible strobe will activate, notifying on-site personnel that elevated gas levels exist within the . Simultaneously, the SolBank 3.0 will activate the ventilation system to purge the SolBank3.0 series of any gases. The SolBank3.0 series will communicate the alarm condition to the site EMS, and charging and discharging are not allowed.
- Level 2 Gas Alarm: In addition to the Level 1 gas alarm actions, all BMS DC contactors will open and auxiliary power will be disconnected from the SolBank. The SolBank will continue to operate critical loads by UPS backup power.

Table 9.1: The control logic of fire alarms (NA version)

Combustible gas level 1 alarm	Combustible gas level 2 alarm	Smoke detector alarm	Heat detector alarm	ventilation Fan	Alarm Bell	Horn-Strobe (fire)	Horn-Strobe (gas)	Aerosol Based Fire Suppression (Optional)	Running status of the energy storage system
x	x	x	x	Close	Close	Close	Close	Close	No fire alarm, the system runs normally
√	x	x	x	Open	Open	Close	Open	Close	Combustible level 1 alarm, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	x	x	Open	Open	Close	Open	Close	Combustible level 2 alarm, the system does not charge and discharge, auxiliary AC switch and DC contactor are disconnected
x	x	√	x	Close	Open	Close	Close	Close	Fire alarm level 1, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	x	√	x	Open	Open	Close	Open	Close	Combustible, fire alarm level 1, the system is prohibited to charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	√	x	Open	Open	Close	Open	Close	Combustible alarm level 2, fire alarm level 1, the system is forbidden to charge and discharge, auxiliary AC switch and DC contactor are disconnected
x	x	x	√	Open	Open	Close	Close	Close	Fire alarm level 1, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	x	x	√	Open	Open	Close	Open	Close	Combustible, fire alarm level 1, the system is prohibited to charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	x	√	Open	Open	Close	Open	Close	Combustible alarm level 2, fire alarm level 1, the system is forbidden to charge and discharge, auxiliary AC switch and DC contactor are disconnected

x	x	√	√	Open	Open	Open	Close	Open	Fire alarm level 2, the system does not charge and discharge, auxiliary AC switch and DC contactor are disconnected
√	x	√	√	Open	Open	Open	Open	Open	Combustible level 1, fire level 2 alarm, the system forbid charging and discharging, auxiliary AC switch and DC contactor are disconnected
√	√	√	√	Open	Open	Open	Open	Open	Combustible level 2, fire level 2 alarm, the system forbid charging and discharging, auxiliary AC switch and DC contactor are disconnected

Table 9.2: The control logic of fire alarms (EU version)

Combustible gas level 1 alarm	Combustible gas level 2 alarm	Smoke detector alarm	Heat detector alarm	Ventilation Fan	Alarm Bell	Horn-Strobe (fire)	Horn-Strobe (gas)	Aerosol Based Fire Suppression	Running status of the energy storage system
x	x	x	x	Close	Close	Close	Close	Close	No fire alarm, the system runs normally
√	x	x	x	Open	Open	Close	Open	Close	Combustible level 1 alarm, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	x	x	Open	Open	Close	Open	Close	Combustible level 2 alarm, the system does not charge and discharge, auxiliary AC switch and DC contactor are disconnected
x	x	√	x	Close	Open	Close	Close	Close	Fire alarm level 1, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	x	√	x	Open	Open	Close	Open	Close	Combustible, fire alarm level 1, the system is prohibited to charge and discharge, auxiliary AC switch and DC contactor are closed

√	√	√	×	Open	Open	Close	Open	Close	Combustible alarm level 2, fire alarm level 1, the system is forbidden to charge and discharge, auxiliary AC switch and DC contactor are disconnected
×	×	×	√	Close	Open	Close	Close	Close	Fire alarm level 1, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	×	×	√	Open	Open	Close	Open	Close	Combustible, fire alarm level 1, the system is prohibited to charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	×	√	Open	Open	Close	Open	Close	Combustible alarm level 2, fire alarm level 1, the system is forbidden to charge and discharge, auxiliary AC switch and DC contactor are disconnected
×	×	√	√	Close	Open	Open	Close	Open	Fire alarm level 2, the system does not charge and discharge, auxiliary AC switch and DC contactor are disconnected
√	×	√	√	Open	Open	Open	Open	Close	Combustible level 1, fire level 2 alarm, the system forbid charging and discharging, auxiliary AC switch and DC contactor are disconnected
√	√	√	√	Open	Open	Open	Open	Close	Combustible level 2, fire level 2 alarm, the system forbid charging and discharging, auxiliary AC switch and DC contactor are disconnected

Table 9.3: The control logic of fire alarms (AUS version)

Combustible gas level 1 alarm	Combustible gas level 2 alarm	Smoke detector alarm	Heat detector alarm	ventilation Fan	Horn-Strobe (fire)	Horn-Strobe (release)	Horn-Strobe (gas)	Aerosol Based Fire Suppression	Running status of the energy storage system
×	×	×	×	Close	Close	Close	Close	Close	No fire alarm, the system runs normally
√	×	×	×	Open	Close	Close	Open	Close	Combustible level 1 alarm, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	×	×	Open	Close	Close	Open	Close	Combustible level 2 alarm, the system does not charge and discharge, auxiliary AC switch and DC contactor are disconnected
×	×	√	×	Close	Close	Close	Close	Close	Fire alarm level 1, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed
√	×	√	×	Open	Close	Close	Open	Close	Combustible, fire alarm level 1, the system is prohibited to charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	√	×	Open	Close	Close	Open	Close	Combustible alarm level 2, fire alarm level 1, the system is forbidden to charge and discharge, auxiliary AC switch and DC contactor are disconnected
×	×	×	√	Close	Close	Close	Close	Close	Fire alarm level 1, the system does not charge and discharge, auxiliary AC switch and DC contactor are closed

√	×	×	√	Open	Close	Close	Open	Close	Combustible, fire alarm level 1, the system is prohibited to charge and discharge, auxiliary AC switch and DC contactor are closed
√	√	×	√	Open	Close	Close	Open	Close	Combustible alarm level 2, fire alarm level 1, the system is forbidden to charge and discharge, auxiliary AC switch and DC contactor are disconnected
×	×	√	√	Close	Open	Open	Close	Open	Fire alarm level 2, the system does not charge and discharge, auxiliary AC switch and DC contactor are disconnected
√	×	√	√	Open	Open	Close	Open	Close	Combustible level 1, fire level 2 alarm, the system forbid charging and discharging, auxiliary AC switch and DC contactor are disconnected
√	√	√	√	Open	Open	Close	Open	Close	Combustible level 2, fire level 2 alarm, the system forbid charging and discharging, auxiliary AC switch and DC contactor are disconnected

If any alarm is triggered, do not open any of the SolBank3.0 series access doors – explosive gases may be present. If safe to do so, stop the system via F-stop, evacuate the site, and notify emergency response authorities. See Section 9a and the *SolBank3.0 Safety Manual* for additional details.

6 Controls and Communication

a) ESS Network Design

The typical ESS network design is built upon a hierarchical control and communication structure. System dispatch commands are often sent to a site EMS controller from remotely located ESS fleet controllers, cloud-based EMS interfaces, or Automatic Generation Control (AGC) dispatchers. These commands get passed down to the PCS and BMS via the SolBank3.0 series. Conversely, system status and alarms are communicated back to the EMS and remote operations personnel from the SolBank3.0 series and other devices. See Figure 9 for an example network block diagram.

The SolBank3.0 series communicates with other equipment within the ESS via multiple communication protocols. Chief among them are Modbus TCP, Modbus RTU, and CANbus. Please reference the *Auxiliary Distribution and Communication Schematic* contained in Annex 2 for further details.

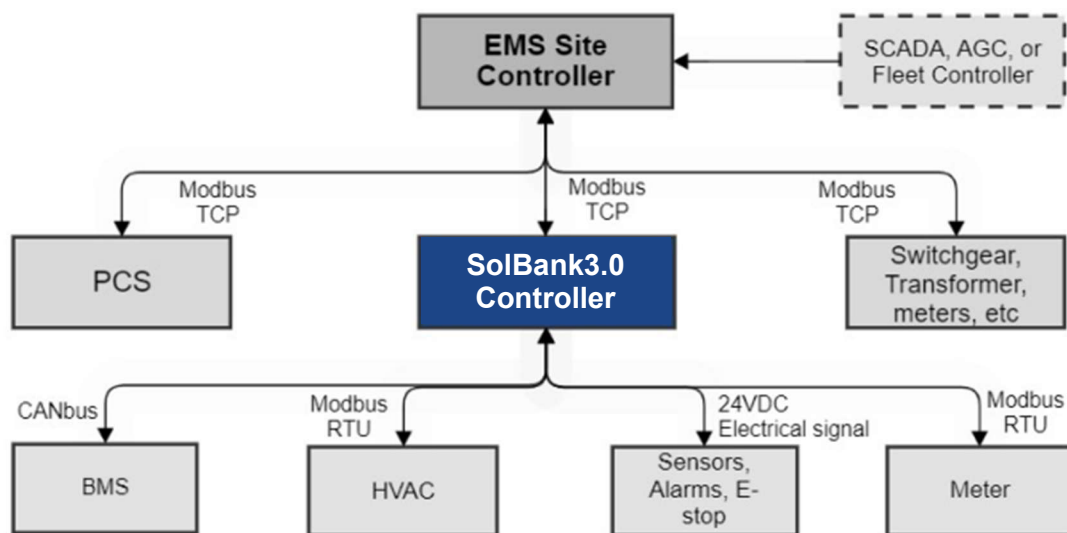


Figure 9: Example ESS communication network with a single SolBank3.0 series. Site specific network design may vary.

b) Communication Data

Please reference the *SolBank3.0 series Communication Protocol* contained in Annex 3 for a mapping of control points.

c) Modes of Operation

The SolBank3.0 series can be placed into the operational modes indicated in Table 12. Further indicated below is the status of key system components and switching devices when in a given mode, in addition to a brief summary of each mode of operation.

For system startup and shutdown procedures, please see Section 8 and Section 9 respectively.

Table 10: SolBank3.0 series modes of operation.

MODE	MAIN DC DISCONNECT STATUS	BMS CONTACTOR STATUS	LOCAL/ REMOTE KEYED SWITCH	ON/OFF KEYED SWITCH	ENABLED LOCALLY OR REMOTELY
Operation Mode	Closed	Closed	Remote	On	Remotely
Idle Mode	Closed	Open	Remote	On	Remotely
Eco Mode	Closed	Open	Remote/Local	On/Off	Remotely
Failure Mode	Closed	Open	Remote	On	Automatic
Debug Mode	Open/Closed	Open/Closed	Local	Off	Locally

6.3.1 Operation Mode

When in Operation Mode, the SolBank3.0 series can charge and discharge energy from its battery bank in response to commands from the site EMS. To transition into Operating Mode, a “Run” command must be received from the site EMS to do so. Each BMS will in-turn close their internal DC contactors and energize the SolBank3.0 series’s main DC bus. To enter Operation Mode, 1 or more BMS must successfully respond the “Run” command. When Operation Mode is exited (i.e. “Stop” command is sent), all BMS contactors will open and the main DC bus will de-energize.

6.3.2 Idle Mode

When in Idle Mode, the system is in a state ready to receive a “run” command from the EMS. All manually operated disconnects are closed, and the BMS DC contactors are open. The main DC bus will not be energized. The SolBank3.0 series will enter Idle Mode when a “Stop” command is issued by the BMS or after resolution of a system fault (i.e. Failure Mode is exited).

6.3.3 Eco Mode

When the SolBank3.0 series is placed in Eco Mode, a load shedding scheme is automatically implemented by the SolBank3.0 series’s EMCU, shutting down specific auxiliary loads to conserve energy. Specifically, disconnecting the BMS box power and system fans power. Communication and control systems, Detectors and alarms, and HVAC systems will remain operational. Eco Mode can be enabled remotely by the EMS only when the SolBank3.0 series is in Idle Mode. Additionally, when the external auxiliary power supply is lost, the SolBank3.0 series will also enter Eco Mode. However, in this event, HVAC systems will power off, and all critical loads will be supported by the UPS.

Note, when in Eco mode, relay will momentarily close once per 24-hour period to obtain BMS system status data (cell temperature, voltage, etc). Upon completion of data upload, relay will reopen.

6.3.4 Failure Mode

The SolBank3.0 series will automatically enter Failure Mode when all 12 of the string BMS fail to respond to a “Run” command from the site EMS. In this state, the BMS DC contactors will remain open. If 1 or more string BMS returns to operational readiness, the system will automatically transition to Idle Mode.

6.3.5 Debug Mode

Debug Mode is enabled locally when a need arises to modify BMS software parameters or investigate system faults. Debug Mode should only be enabled by qualified E-STORAGE technicians. When the Debug Mode is enabled, remote operation of the SolBank3.0 series is prevented.

7 Pre-Operation Checklist

Prior to initiating SolBank3.0 series operation, please ensure the following items are addressed. Note, the below pre-operation checklist may not represent a complete list of all items requiring inspection or completion prior to operating the SolBank3.0 series or the ESS within which it is installed. The following is provided for general advisement only.

a) Safety Checklist

- ☐ All on-site personnel have proper PPE as dictated by the project specific EHS plan, and safety codes and regulations
- ☐ Task specific safety training and orientation has been completed as required
- ☐ All personnel are properly trained and qualified to operate the SolBank3.0 series
- ☐ The site is clean, orderly and all hazards have been mitigated to the extent possible and required by law
- ☐ All enclosures containing electrical or chemical hazards are secured to prevent access during operation
- ☐ The site is secured to prevent access by unqualified personnel
- ☐ All safety placards and arc flash labels are installed and clearly visible

b) Operational Readiness Checklist

- ☐ The SolBank3.0 series has been fully commissioned and deemed ready for service by E-STORAGE personnel
- ☐ All required routine SolBank3.0 series maintenance and inspections have been performed per the SolBank3.0 Maintenance Manual
- ☐ All other ESS BOP equipment required for safe and reliable operation of the SolBank3.0 series has been fully commissioned and deemed ready for service by appropriately qualified commissioning personnel and AHJ.
- ☐ All required ESS BOP routine maintenance and inspections have been performed per OEM recommendations and requirements.
- ☐ Remote operations personnel have been notified of pending operation as required

c) Functional Checklist

- ☐ Site auxiliary power is energized, and all ESS BOP equipment aux power systems are on and ready for service
- ☐ Site communications are active and site ESS EMS HMI (local and remote) are free of system alarms. Note: this may be an iterative check, performed as system components are powered up.
- ☐ All manually operated up-stream switching devices, external to the SolBank3.0 series are closed as required. Utility side of PCS AC disconnect should be energized. Remotely operated AC switching devices which are part of startup sequence may remain open in

necessary.

8 Initial System Startup

The following steps describe the initial startup sequence of the SolBank3.0 series. Typically, this process should be used as part of or after i) initial system commissioning, ii) maintenance activities requiring full system shutdown and component isolation, or iii) periods of extended system storage.

- Step 1: Ensure completion of the Pre-Operation Checklists contained in Section 7.
- Step 2: Power on the circuit breaker of BMS boxes 1-12.
- Step 3: Power on the circuit breakers of SPD. Before powering up, measure the voltage value at the input separately with a multimeter.
- Step 4: Power on the circuit breaker of chiller and close the AC relay. The thermal management system will turn on automatically. At the same time, pay attention to the coolant level and whether the chiller is operating normally.
- Step 5: Power on the circuit breaker of Transformer
- Step 6: Power on the circuit breaker of Fire Safety System.
- Step 7: Power on the circuit breaker of Fan in DMC.
- Step 8: Power on the circuit breaker of UPS.
- Step 9: Power on the circuit breaker of BMS boxes in DMC.
- Step 10: Power on the circuit breaker of 24V AC/DC module.
- Step 11: Power on the control supply switch.
- Step 12: Power on the circuit breaker Fan in Container

For detailed power-on operation procedures, please refer to the *SolBank3.0 Commissioning Manual*.

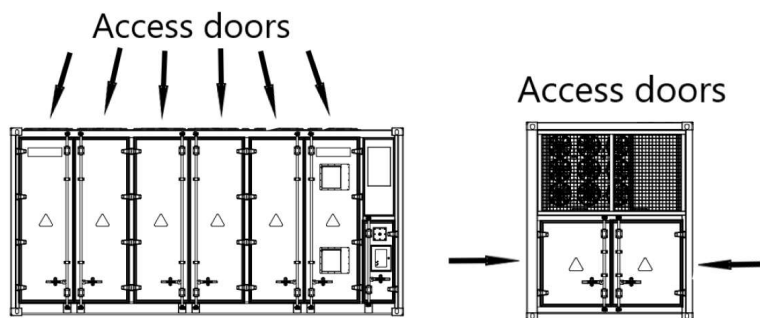


Figure 10: for door location

9 System Shutdown

9.1 Emergency System Shutdown

In the event of an emergency on-site, the SolBank3.0 series can be shut down locally or remotely. A system shutdown will result in electrical isolation of the battery strings and cessation of battery charging or discharging. A system shutdown will not de-energize the battery bank, nor will it

guarantee that a fault or thermal runaway event has been stopped. Do not approach or open the SolBank3.0 series until deemed safe to do so by an individual qualified to direct such decision. Procedures for the safe shutdown of the site and isolation from the grid should be dictated within the project-specific ERP.

9.1.1 Local Emergency Shutdown

If safe to approach the SolBank3.0 series, as defined by the project Emergency Response Plan, SOPs, Emergency Incident Commander, or other qualified on-site personnel, the F-stop button located on the either end of the SolBank3.0 series can be pushed. When the F-stop is pushed, the SolBank3.0 series BMSs will disconnect all battery strings from the main system bus, thereby stopping all charging and discharging. Simultaneously, the plant PCS will shut down if properly configured to do so. When multiple SolBank3.0 series exist on a single site, their F-stop circuits can be interconnected, resulting in total system shutdown when a single F-stop button is triggered.

Pressing the F-stop while charging and discharging places considerable stress on the system and ideally should be executed during no-load conditions. Only use the F-stop to stop the system during an emergency. Before restarting the system, the F-stop must be pulled out to its original position.

If indications of a fire within the SolBank3.0 series exists, such as smoke emanating from the SolBank3.0 series, or activation of the fire alarm strobe, it is recommended to immediately evacuate the area and maintain a safe perimeter. System shut down should be attempted remotely as described in Section 9.1.2. Do not open the SolBank3.0 series access doors. See the *SolBank3.0 Safety Manual* for further details.

9.1.2 Remote Emergency Shutdown

During normal operation, the SolBank3.0 series will be under the control of a site Energy Management System (EMS) or Local Plant Controller (LPC). The EMS or LPC in turn will communicate with, and be controlled by, an offsite fleet controller, SCADA operations center, or other third-party dispatch and monitoring entity. SolBank3.0 series alarms will be forwarded to such remote operations, and in turn, remote operations personnel can attempt to shut down the SolBank3.0 series (and/or the PCS connected to it) by sending a “Stop” command if determined to be necessary.

On-site personnel witnessing an emergency should not assume automated alarms have reached the LPC or EMS or that they have been passed onto remote operations. Such personnel are advised to first call 911, and then contact remote operations directly in addition to other key stakeholders identified in the ERP.

9.2 Partial System Shutdown

The following sequence describes the steps required to transition the SolBank3.0 series from normal operation to a state of safe isolation from the primary interconnection circuit. At the

conclusion of this process, the auxiliary power system will remain energized in support of SolBank3.0 series thermal management, safety, and communication systems. This process should typically be used when there exists a need to perform maintenance or inspections on the PCS or upstream devices.

- Step 1: Suspend operation of the SolBank3.0 series by sending a “Stop” command through site EMS and confirm (through local or remote HMI) the PCS has opened automatic AC and DC disconnects through remote or local HMI.
- Step 2: Prevent subsequent startup of the SolBank3.0 series by turning the keyed switch on the external side of the SolBank3.0 series to “Off.”
- Step 3: Open the access door to the User Interface Cabinet.
- Step 4: Verify absence of voltage on the main DC bus as indicated by the SolBank3.0 series Power Meter.
- Step 5: Prevent remote control of the SolBank3.0 series by turning the keyed switch on the Distribution and Control Cabinet to “local.”
- Step 6: Open the SolBank3.0 series’s main DC disconnect, thereby isolating the SolBank3.0 series’s DC bus from the PCS and upstream devices.
- Step 7: Perform LOTO as necessary.
- Step 8: Close and secure access door to User Interface Cabinet.

9.3 Full System Shutdown

The following sequence describes the steps required to transition the SolBank3.0 series from normal operation to a state of complete system shutdown. At the conclusion of this process, all primary SolBank3.0 series components will be deenergized to the extent possible through normal user interfaces. This process should typically be used when there exists a need to perform comprehensive maintenance on the SolBank3.0 series.

- Step 1: Suspend operation of the SolBank3.0 series by sending a “Stop” command through site EMS and confirm (through local or remote HMI) the PCS has opened automatic AC and DC disconnects.
- Step 2: Prevent subsequent startup of the SolBank3.0 series by turning the keyed switch on the external side of the SolBank3.0 series to “System Stop.”
- Step 3: Open the access door to the User Interface Cabinet.
- Step 4: Prevent remote control of the SolBank3.0 series by turning the keyed switch on the Distribution and Control Cabinet to “local.”
- Step 5: Open the SolBank3.0 series’s main DC disconnect, thereby isolating the SolBank3.0 series’s DC bus from the PCS and upstream devices.
- Step 6: Disconnect each battery string from the main SolBank3.0 series DC bus by manually opening the 12 DC disconnects located on the front of each BMS. Note, DC contactors will be open at this stage.
- Step 7: Turn off all 12 BMS via the power switch located in the upper left of each device.
- Step 8: Open all auxiliary breakers, disconnecting all grid supplied auxiliary power from the

SolBank3.0 series.

- Step 9: Turn off the SolBank3.0 series's Uninterruptable Power Supply (UPS). Caution, communication and fire safety equipment will power down. UPS should not be turned off unless necessary to do so for maintenance purposes.
- Step 10: Perform LOTO as required.
- Step 11: Close and secure User Interface Cabinet access door.

Note that the battery pack cannot be powered off. However, the battery pack voltage can be reduced by isolating the battery cells by unplugging the battery pack power connector. See the SolBank3.0 Maintenance Manual for details.

10 Storage Condition

- a) **"Storage Condition"** means when there is no Auxiliary Power available for a SolBank3.0 series for more than two (2) days during Warranty Period.
- b) If our customers use SolBank for charging and discharging on a daily basis, the battery will not remain in a state of less than 2% or greater than 99% SOC for an extended period. However, in case customers need to store SolBank for a longer duration due to special circumstances, the following SOC recommendations apply:
 - 1) For a storage period of up to 1 week: It won't have a significant impact on the battery's life to leave it at 0% or 99% SOC during this time.
 - 2) For a storage period exceeding 1 week but not exceeding 6 months: We recommend adjusting the SOC to around 30% before storing SolBank.
 - 3) In the case of anticipated storage without operation for more than 6 months: We recommend adjusting the SOC to approximately 50%.
- c) During the Storage Condition, SolBank shall be kept within an ambient temperature range of -30°C and 45°C, with further restrictions on a cumulative period of 736 hours during which the temperature exceeds 35°C, and a separate cumulative period of 736 hours during which ambient temperature drops below -20°C

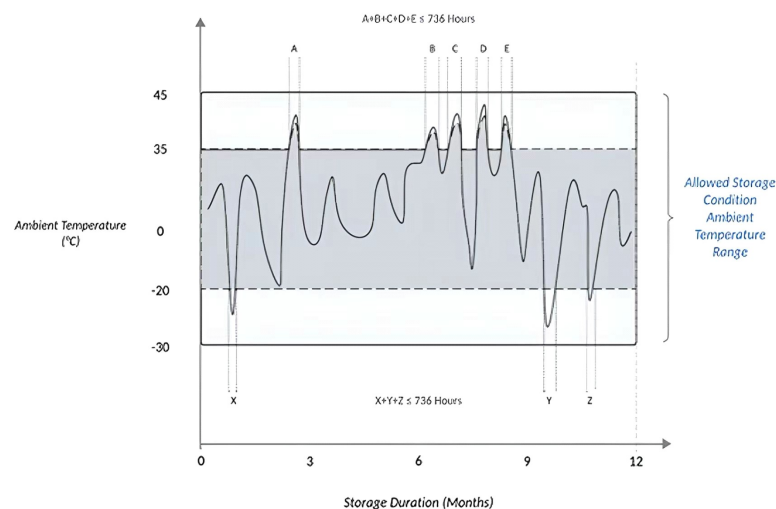


Figure 11 - Storage Condition Temperature Limitations

d) For ambient temperature records during Storage Condition:

Temperature readings will be taken from, in order of preference:

- A thermometer in the shade external to the unit, or
- the onsite weather station, or
- the nearest publicly available weather station.

e) Charge method of Lead-acid battery:

- Connect the lead-acid battery of UPS and FACP to each device.
- Connect the main auxiliary power of Solbank system.
- Switch on QF4 and QF6 and make sure UPS and FACP are being powered
- Keep the UPS and FACP powered for 48 hours.

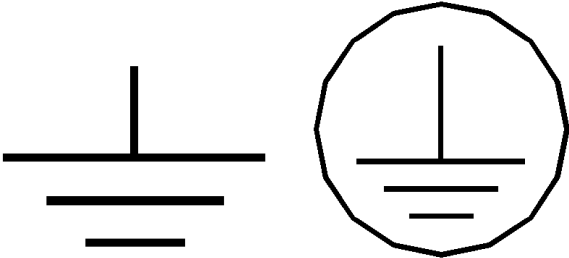
Note: 1) During the debugging and maintenance phases, if the mains power for the fire protection system is disconnected for an extended period, the fire protection power supply should be turned off to prevent over-discharge of the fire protection battery.

2) For further maintenance work, please referred to *"SolBank3.0 Maintenance Manual"*

11 Annex

a) Annex 1: SolBank3.0 series Signage

Safety Signs	Location	Quantity
	Located on the front of each access door	1
	Located on the front of each access door	1
	Located on the front of each access door	1

	Located adjacent to each F-stop button	2
	Located on the SolBank3.0 series primary field-ground point	4

b) Annex 2: SolBank3.0 series Design Package

Please reference the project specific SolBank3.0 series structural and electrical design package provided by e-STORAGE.

c) Annex 3: SolBank3.0 series Communication Protocol

Please reference the SolBank3.0 series communication protocol and project specific points mapping provided by e-STORAGE.

d) Annex 4: SolBank3.0 series Mirror Design

The Mirror Design for SolBank3.0 series , specific changes are described as follows:

11.4.1 Container and Fire Safety System Layout Changes

- ① The Container is design as a whole mirror , the container fan changed from near the back to near the door side, as figure 12 shown

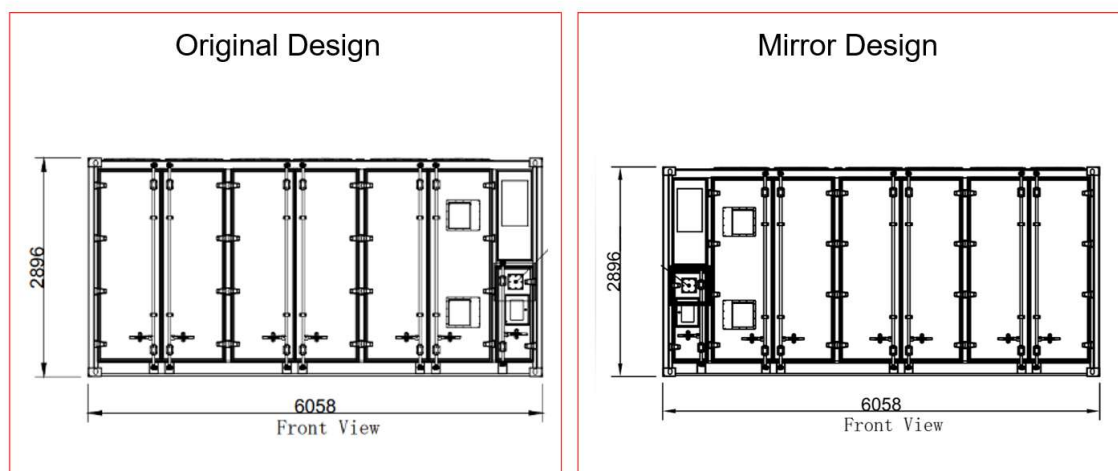




Figure 12 –The container and container fan mirror design

②The electrical and fire safety system device inside SolBank3.0 series are mirrored accordingly, but there is no change in device used

11.4.2 Liquid Cooling and Heating system changes

①Chiller mirror design (shown as figure 13), the supplier to re-provide certification(product materials, key device, performance, functionality without change)

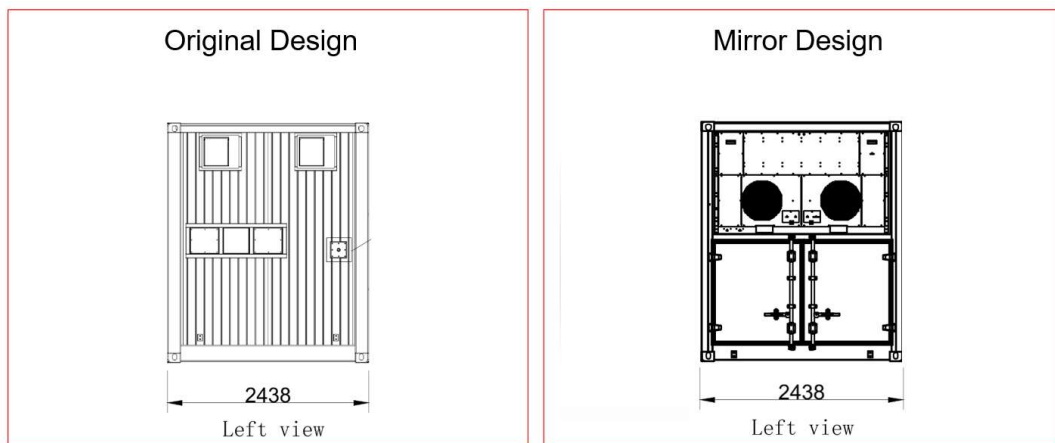


Figure 13 –The chiller mirror design

②Liquid cooling piping mirror design (shown as figure 14) (product materials, key device, performance, functionality without change)

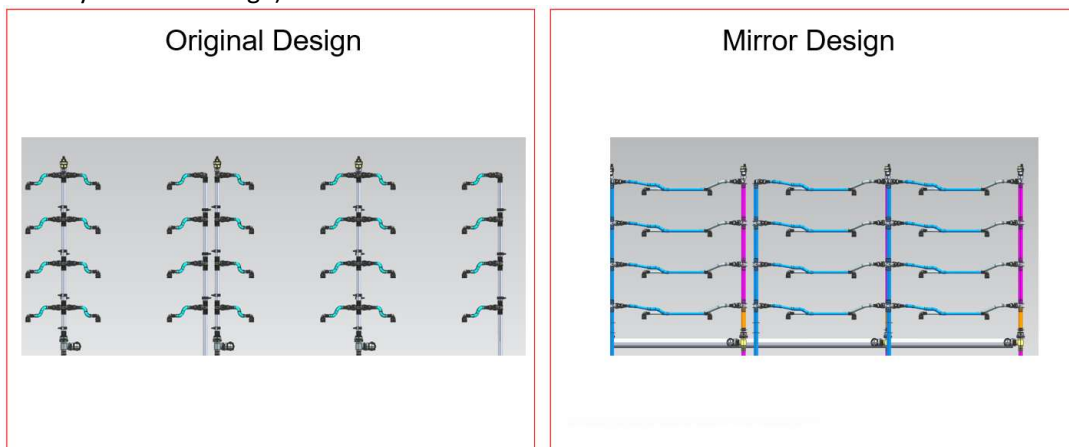


Figure 14 –The liquid cooling piping mirror design

③No change in dehumidifier and 600W air conditioner

11.4.3 Cable Length Changes

DC cable length will be more, no change in communication cable