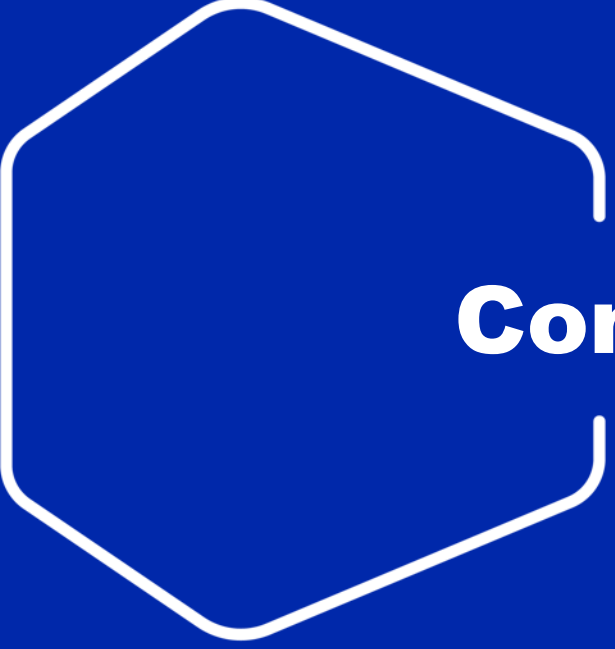


Interface of BESS Specification

Prepared By: Solution Center Team

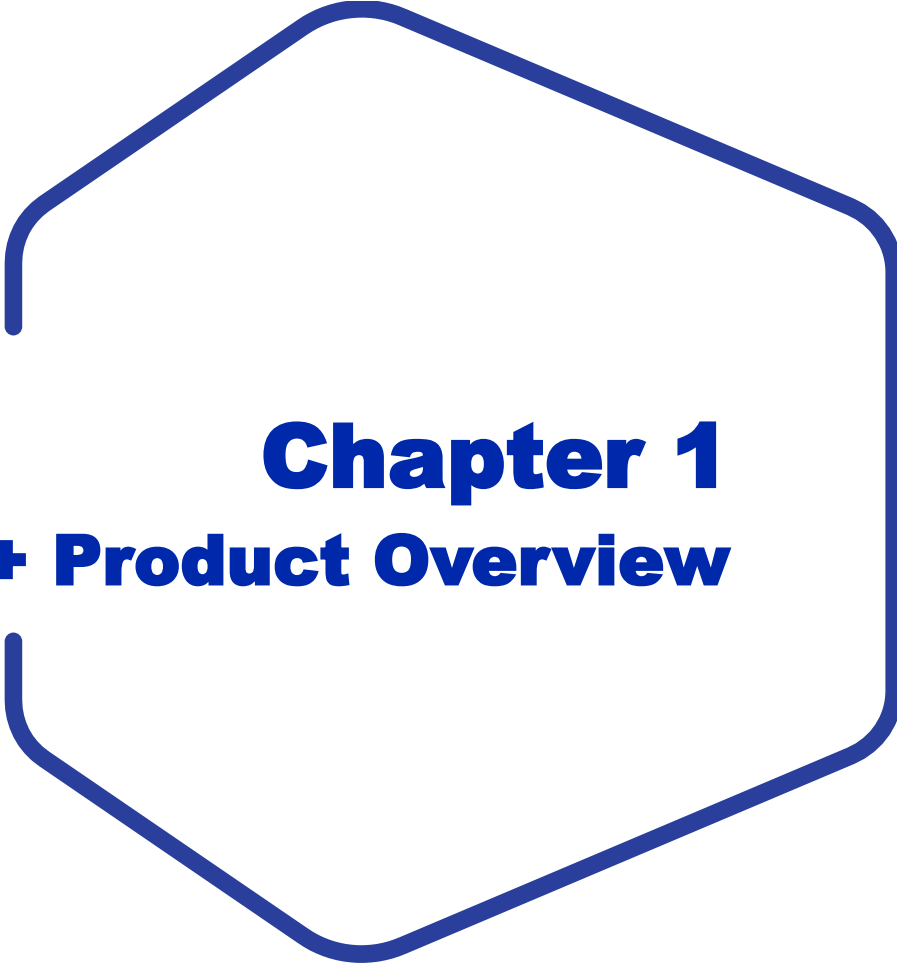
Change History

Version	Date	Description	Author	Reviewer
V1.0	2023/12/11	First version released.	Mike Hu Jiageng Xi	Hank Zhao Andy Lin Bertha Liu
V2.0	2024/02/28	The layout of aerosol is confirmed. Fire Suppression System – Control logic is changed.	Jiageng Xi	



Contents

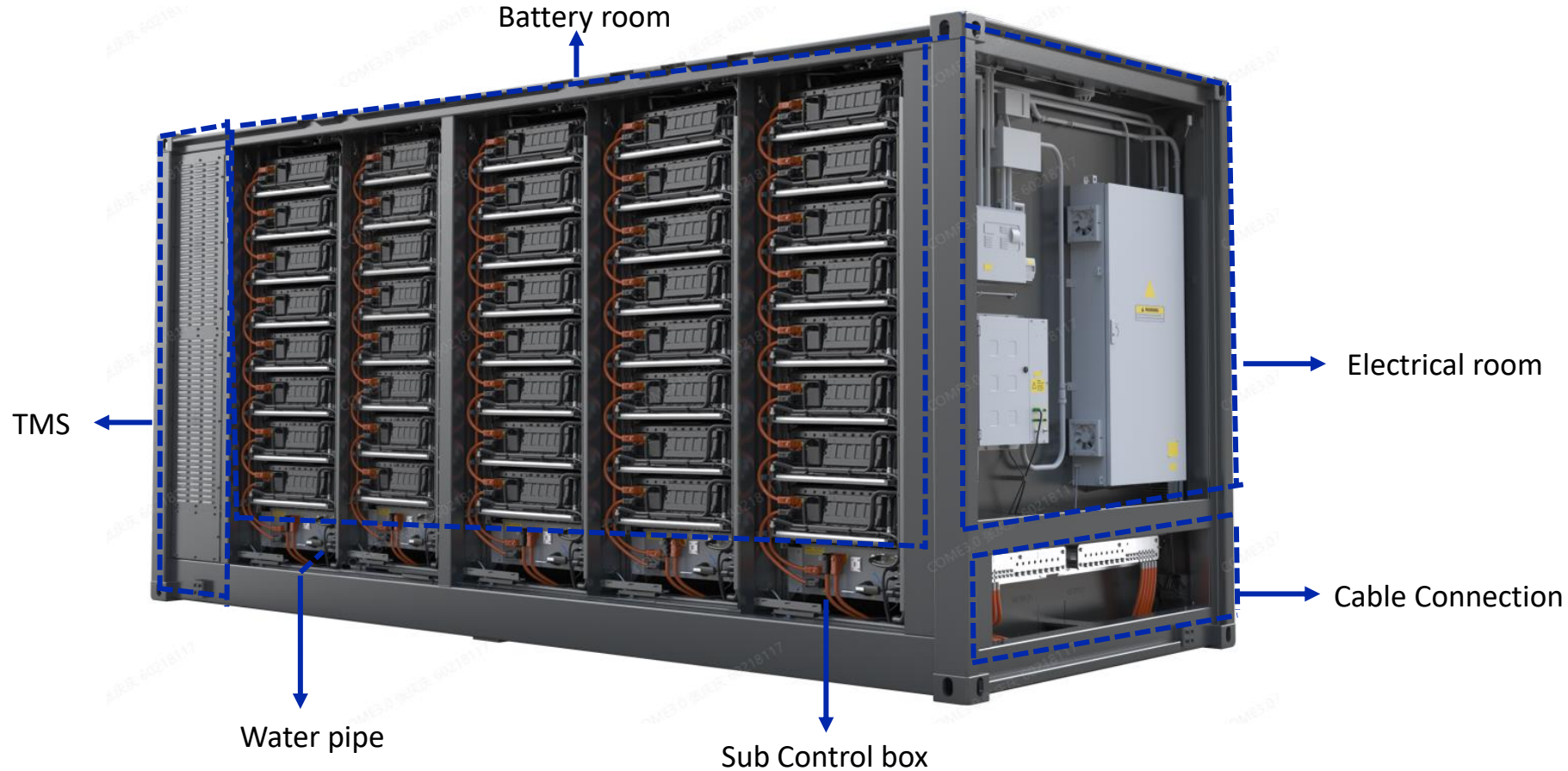
- 01 EnerC+ Product Overview
- 02 EnerC+ Installation Interface
- 03 System Match Interface
- 04 System architecture diagram
- 05 Fire Suppression System (FSS)
- 06 Thermal Management System (TMS)
- 07 Uninterruptible Power Supply (UPS)
- 08 System Application Interface



Chapter 1

Ener C+ Product Overview

EnerC+ Product Overview - Container



Standard 20-foot
container

Liquid-Cooling

High Integration

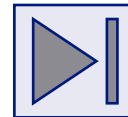
High Safety

Reliability

Long-Life

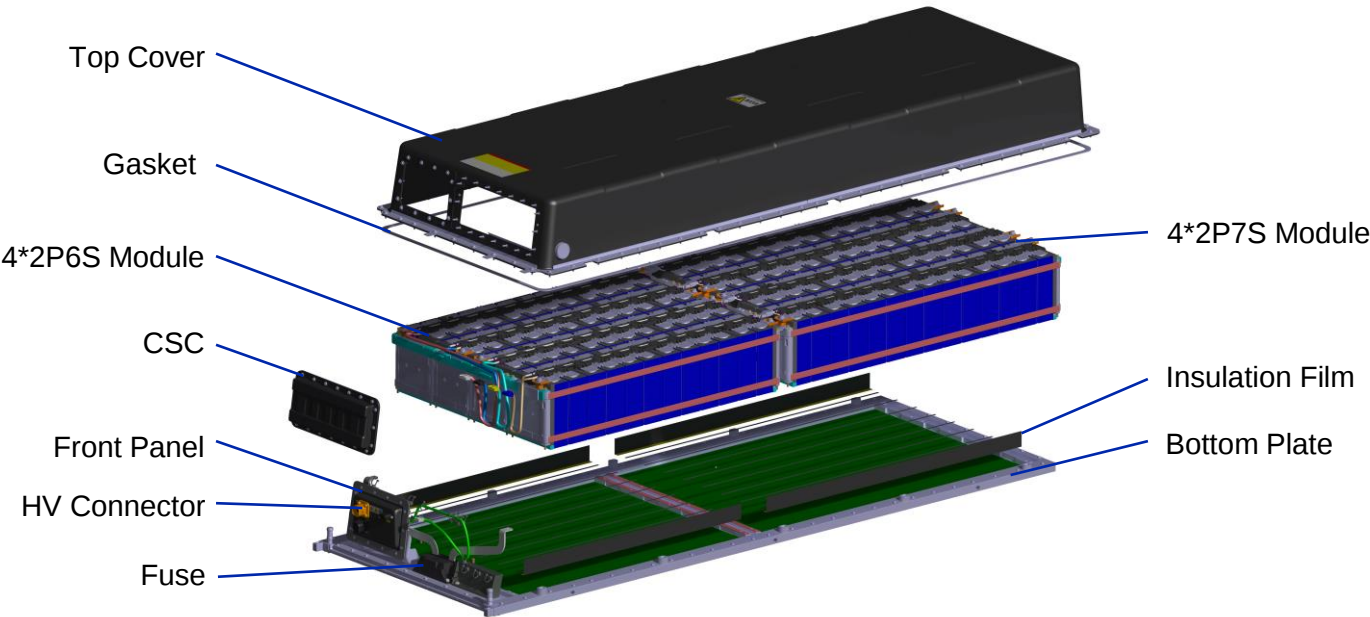
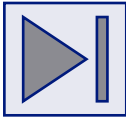
High Cost
Performance

EnerC+ Product Overview - Container



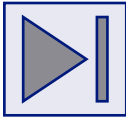
Item	Specification
Configuration	5P2P416S
Rated Energy	4073.47kWh
Cell Capacity	306Ah
Charging/Discharging Power	≤0.5P
End of Life (EOL)	SOH 65% or 20 years @EOL
Rated Voltage	1331.2V
Voltage Range	1040V to 1500V
Dimension(W* D* H)	2438*6058*2896 mm 8ft*20ft*9.5ft
Weight	~35t±1t
Operation Temperature Range	-25°C to 55°C
Storage Temperature	-30°C to 60°C
Application Altitude	≤2000m (No Derating)
Coolant	50% Ethylene glycol+50% DI water
IP Grade	IP55
Humidity	<95%, No condensing
Color	RAL 7042
Auxiliary power supply	Voltage Range: Aux 1: 380~480V (±10%), 3AC+N+PE,50/60Hz, Max: 37kW Aux 2: 230V (±10%, L+N),0.5kW
Noise Class	<93 dB(A); Distance:1.0m
Enclosure Coating	ISO 12944, C4 (C5 Optional)
Grounding	Grounding copper braid
Installation	Concrete: anchor bolt
Certification	UN38.3/UL1973 / UL9540A / IEC62619 / IEC62477-1 / IEC61000-6-2/IEC61000-6-4 /IEC62933-5-2/IEC63056/NFPA855

EnerC+ Product Overview - Battery Module



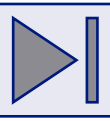
Item	Specification
Configuration	2P52S
Nominal Energy(kWh)	101.83
Rated Voltage(V)	166.4
Dimension (W* D* H)	830*2235*250 mm
Weight (kg)	660±5kg
Charging/Discharging Power	≤0.5P
IP Grade	IP67

EnerC+ Product Overview - Thermal Management System

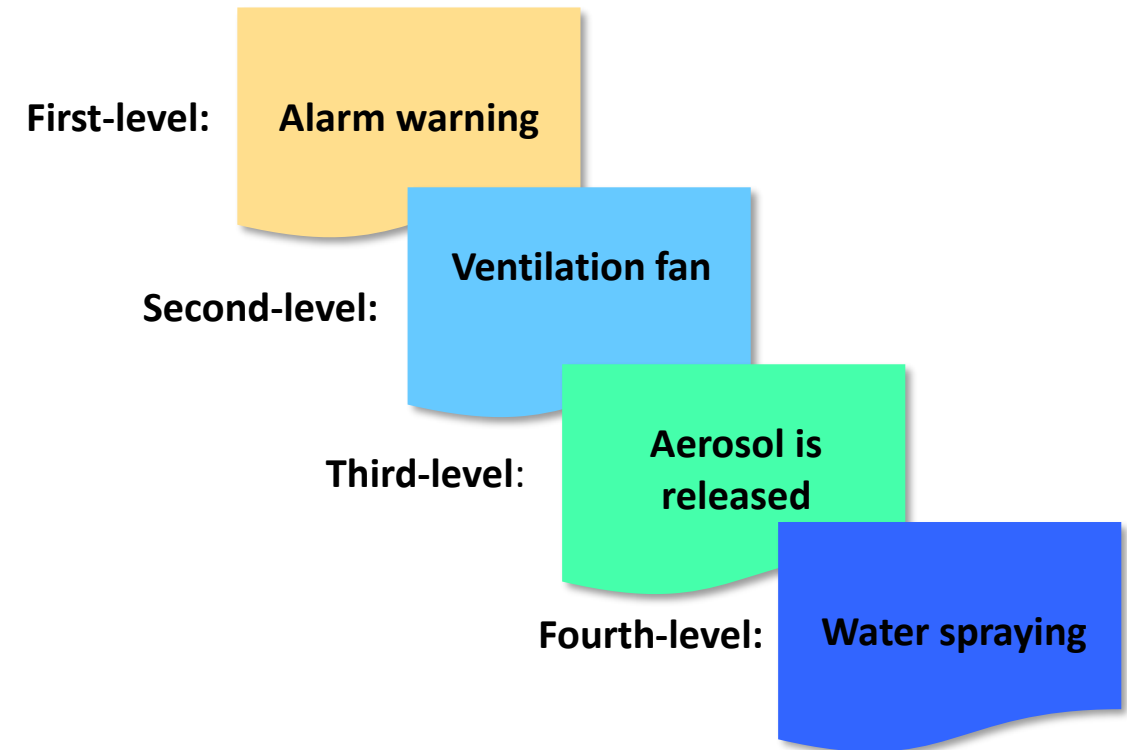


Item	Specification
IP Grade	IPX7
Dimension(W* D* H)	980*632*2400mm
Weight	≤400kg
Coolant flow	≥250 L/min @120kpa±10kpa
Coolant	water-glycol mixture with concentration≤50% and anti-freezing mixture (PH value: 6.0~9.0)
Refrigerant type	R134a (15kW 5000±50g/25kW 8300±50g)
CAN interface	CAN 2.0
Installation method	Retaining bolt installation
Material of Cooling Pipe	Nylon + Aluminum pipe
Power scope	36.7kW
Current scope	Heating: 31A, Cooling : 50.3A
Inrush Current	Starting impulse current≤65A(less than 5s)

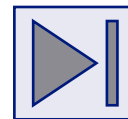
EnerC+ Product Overview - Fire Suppression System



- EnerC + provides a perfect set of fire suppression system solutions with detection, explosion control and fire extinguishing functions. The fire suppression control strategy is divided into four levels:
- The first-level: alarm warning
 - Second-level: ventilation fan to prevent deflagration
 - Third-level: aerosol is released to extinguish the initial fire
 - Fourth-level: water spraying to control the spread of fire

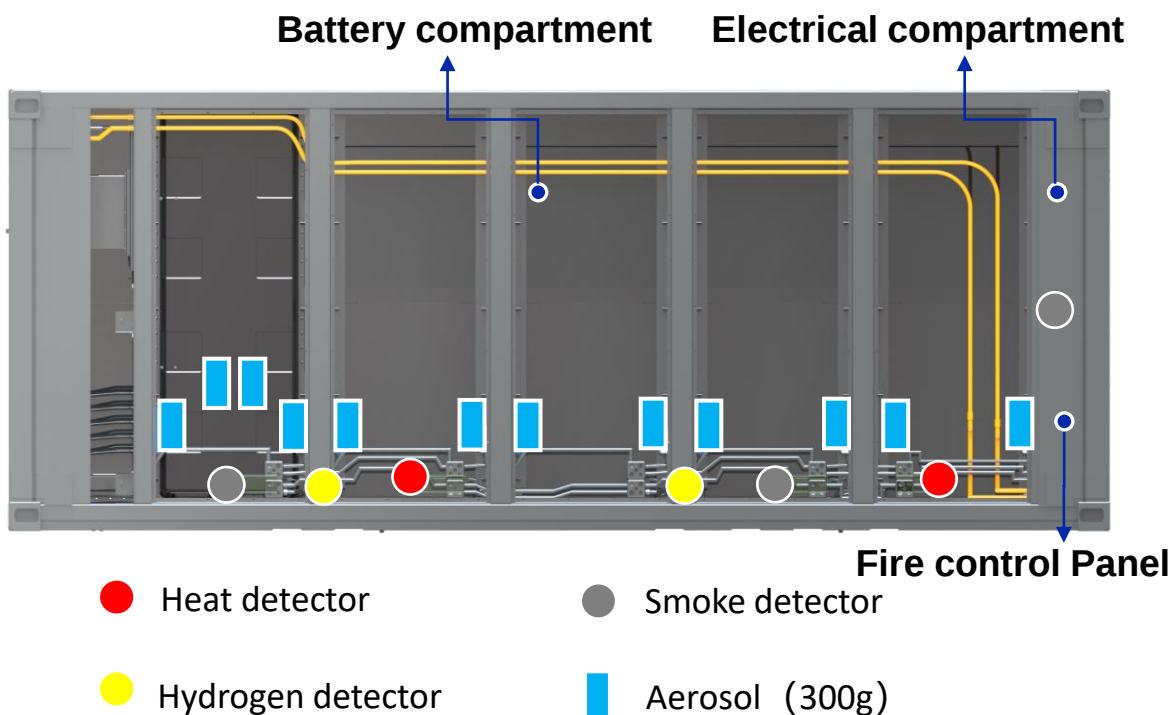


EnerC+ Product Overview - Fire Suppression System



➤ Detection system

- Equipped with different types of detectors, such as smoke detector, heat detector and hydrogen (H₂) detector
- All detection signals are received and processed by the fire control panel, and the hydrogen (H₂) detector is linked with the ventilation system.

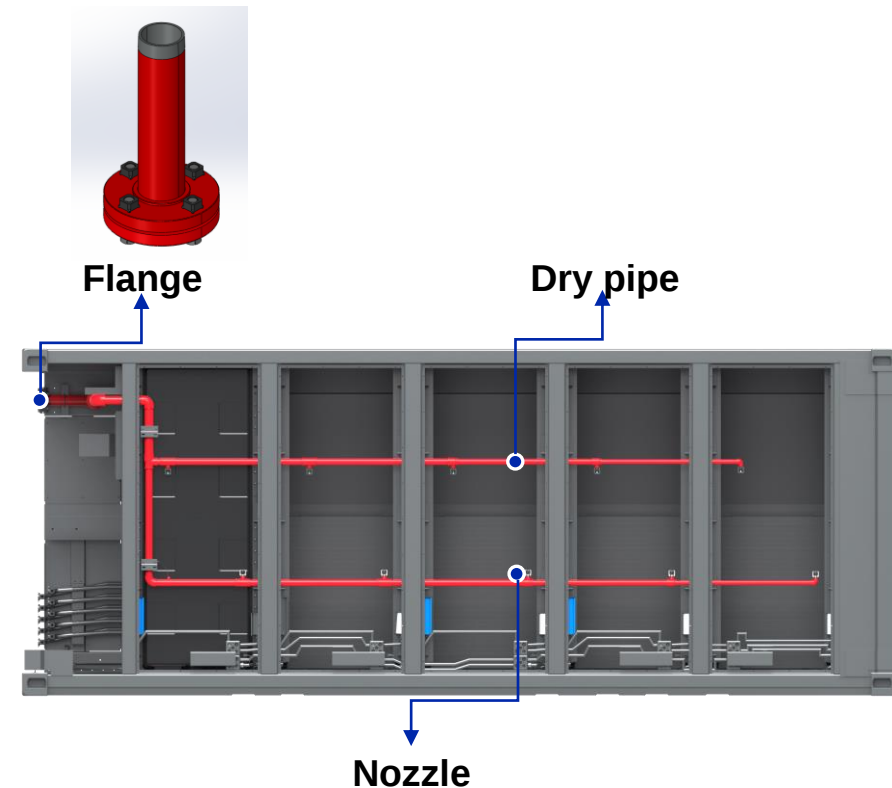


No	Type	Quantity	Configuration	Remarks
1	Heat detector	2	Standard	Detection of temperature, in the battery compartment
2	Smoke detector	2+1	Standard	Detection of smoke particles, two in the battery compartment, and one in the electrical compartment
3	Hydrogen detector	2	Standard	Detection of hydrogen, in the battery compartment
4	Fire control panel	1	Standard	Receive detector signals and control fire extinguishing system and explosion-proof fan, in the electrical compartment
5	Aerosol	12	Standard	When activated, the aerosol will be released

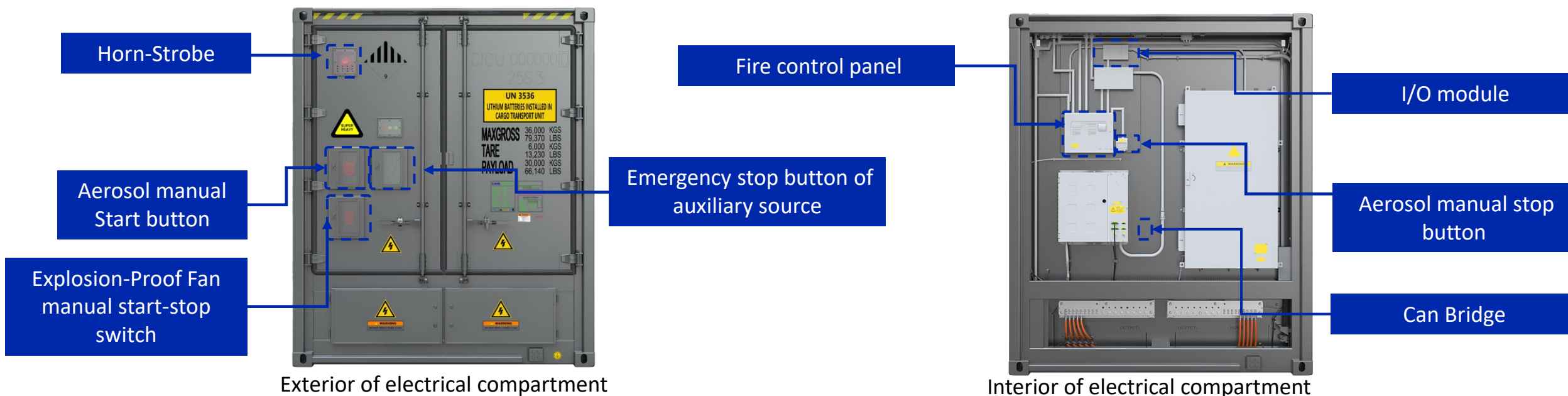
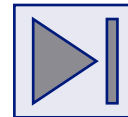
EnerC+ Product Overview - Fire Suppression System



- Ventilation fan system
 - When the combustible gas in the container accumulates, the ventilation fan system is started to prevent deflagration
 - ventilation fan system meets **NFPA69** standard
- Dry pipe system (**Optional**)
 - As the last line of defense, the dry pipe system can effectively control the spread of fire.
 - The dry pipe system meets NFPA855 standard
 - Pipe design fulfill ASTM, Color: RAL 3000 (Red).

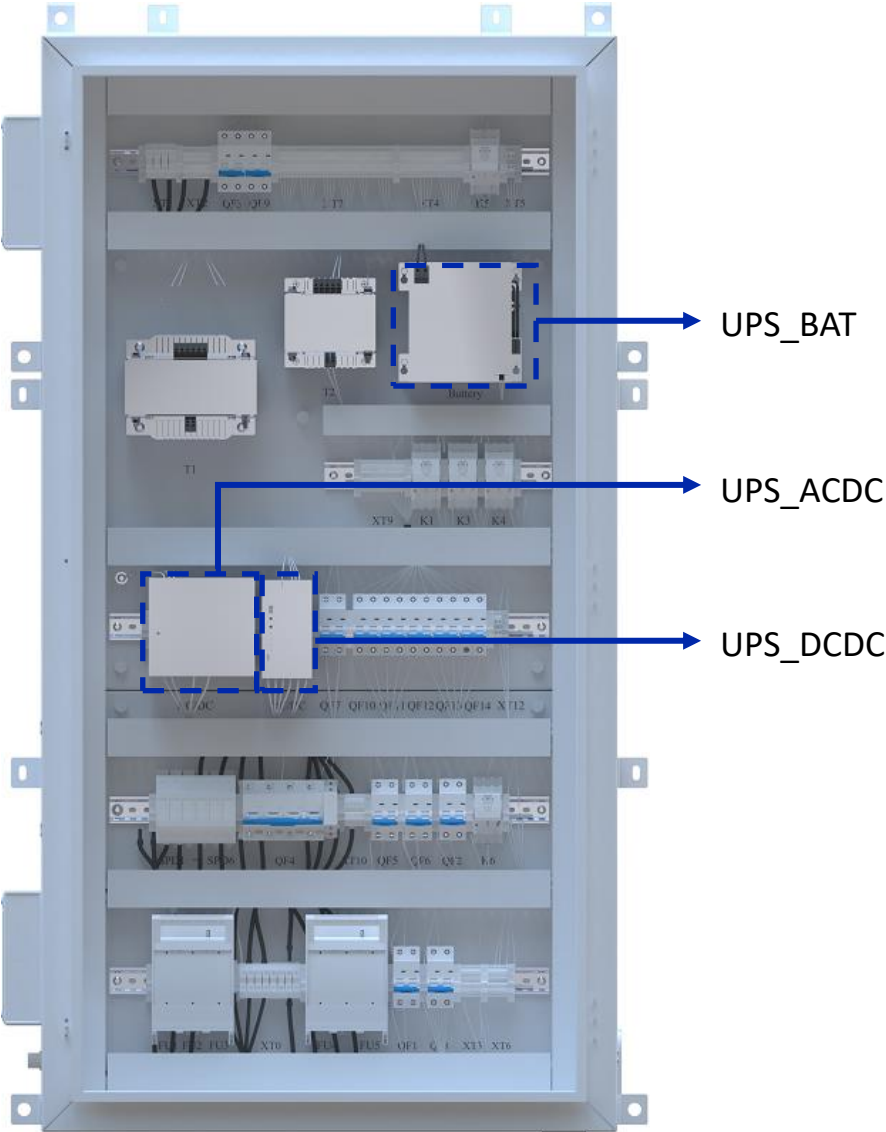
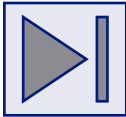


Ener C+ Product Overview - Fire Suppression System



No	Type	Quantity	Configuration	Remarks
1	Horn-Strobe	1	Standard	Alarm
2	Aerosol manual Start button	1	Standard	Release aerosol manually
3	Explosion-Proof Fan manual start-stop switch	1	Standard	Start and stop of explosion-proof fan controlled manually
4	Emergency stop button of auxiliary source	1	Standard	Manually cut off the auxiliary source
5	Fire control panel	1	Standard	Control the fire suppression system
6	Aerosol manual stop button	1	Standard	Manually shut down the Aerosol fire suppression system
7	I/O module	1	Standard	Address the container in fire suppression system
8	Can Bridge	1	Standard	Add CAN bus load nodes

EnerC+ Product Overview – UPS



UPS_AC/DC



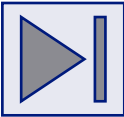
UPS_DC/DC



UPS_BAT

Item	UPS_AC/DC	UPS_DC/DC	UPS_BAT
Rated power	960W	960W	/
Nominal output current	40A	40A	50A (max)
Nominal output voltage	24V	24V	24V
Nominal capacity(C20)	/	/	7Ah@25°C

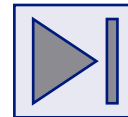
EnerC+ Product Overview - Scope of Supply



NO.	Category	Name	Material description	Notes
1	Container	EnerC+	Battery Container: Nameplate Capacity 4073.47kWh	



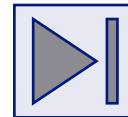
EnerC+ Product Overview - Scope of Supply



➤ The container contains the following parts:

NO.	Category	Description	QTY	Unit	Remarks
1	Battery Container	4073.47kWh, Color: RAL 7042	1	Pcs	-Each rack consists of 1.1~1.10
1.1	Battery Rack	LFP 306Ah, 2P416S, 0.5CP	5	Pcs	-Each rack consists of 1.1.1~1.1.2
1.1.1	Battery Module	LFP 306Ah, 2P52S, 0.5CP	8	Pcs	- CSC included - IP67
1.1.2	Sub Control Box	1500V Control box	5	Pcs	-Pre-charge circuit -Contactors included -250KA Fuses(250KA) included -SBMU installed inside - Current sensor
1.2	HV Cables	HV cables for battery main DC circuit and AUX. power supply	1	Set	All HV cables inside container provided by CATL -DC power cable -AUX. distribution cable
1.3	LV Cables	LV cables for communication and 24V power supply	1	Set	All LV cables inside container provided by CATL -Communication cable -24V DC cables

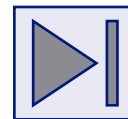
EnerC+ Product Overview - Scope of Supply



➤ The container contains the following parts:

NO.	Category	Description	QTY	Unit	Remarks
1.4	FSS Components	Components of Fire Suppression System	1	Set	-H2 detector *2 -Heat detector *2 -Smoke detector *3 -Aerosol *12 -Control Panel *1 -Dry pipe (Optional) *1 -Smoke exhaust ventilation fan *1
1.5	Thermal management system (TMS)	Liquid cooling Unit(Chiller)	1	Set	-Maximum 40kW per unit cooling capacity for 0.5CP system -Including compressor, heater, fan, and pump
1.6	Power supply distribution box	Distribution panel	1	Pcs	-Transformer -Circuit breaker -UPS -E-stop circuit -Circuit protection and power supply on-off control circuit -Type II SPD for AC Power supply

EnerC+ Product Overview - Scope of Supply



➤ The container contains the following parts:

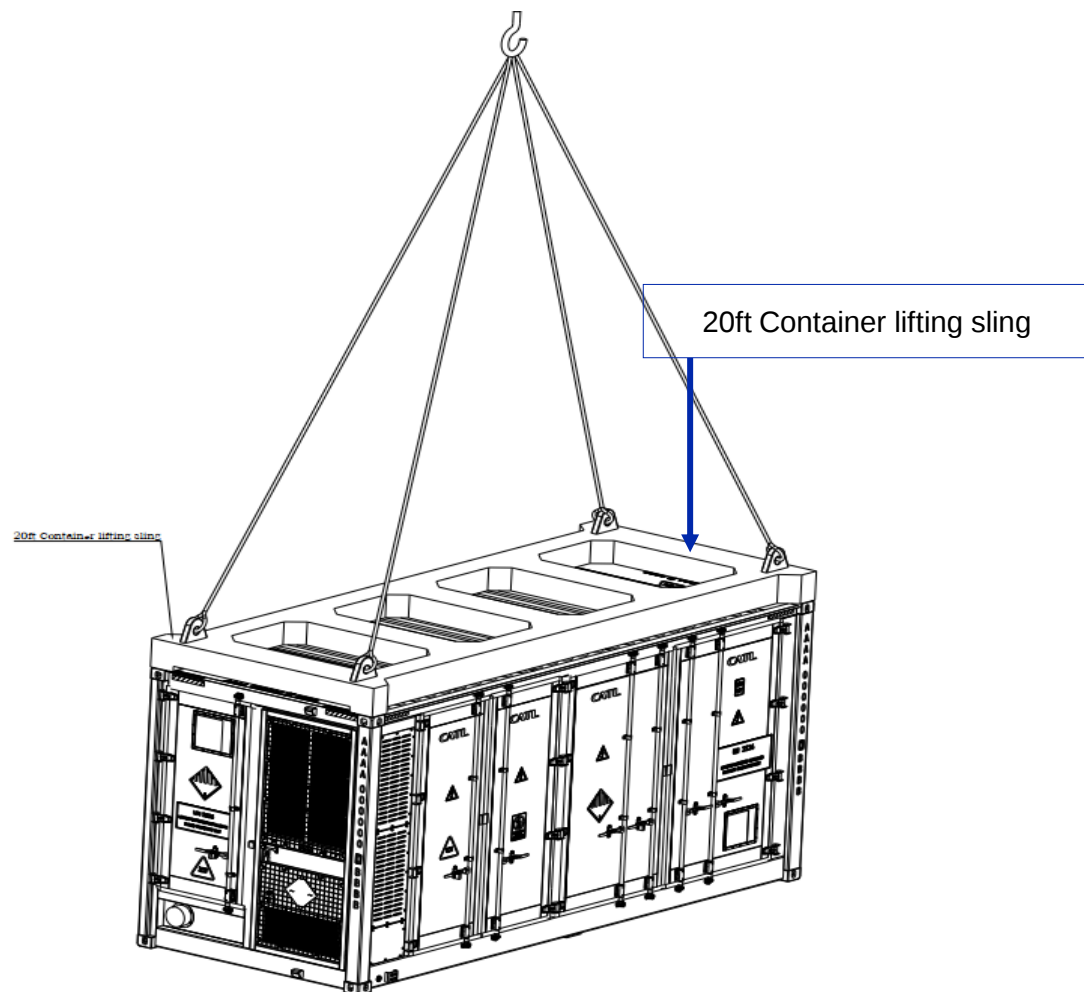
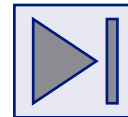
NO.	Category	Description	QTY	Unit	Remarks
1.7	Master control box	MBMU + ETH + Fiber + IMM	1	Set	- Fiber communication with BMS(ST port multiple mode) , support unmanaged Switch. (The external communication cable is not included) -ETH -MBMU -IMM
1.8	Accessory	Connector	1	Set	-Connectors for CAN cable connection between MBMU
1.9	DC HV Inlet Port	High voltage connection port	1	Pcs	-The positive and negative copper bar provide 8 x double M12 holes for connection
1.10	Auxiliary power supply wiring bar	Auxiliary power supply connection port	1	Pcs	-Auxiliary power supply inputs : 380-480V 3AC (±10%)+N+PE, 50Hz/60Hz; 230V AC (±10%)+N+PE, 50Hz/60Hz



Chapter 2

Installation Interface

Installation Interface - Container Hoisting

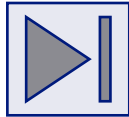


Preloaded weight	Cable Length	Cable quantity	Acceleration
$\leq 35t$	$> 6.3m$	4	$\leq 0.5g$

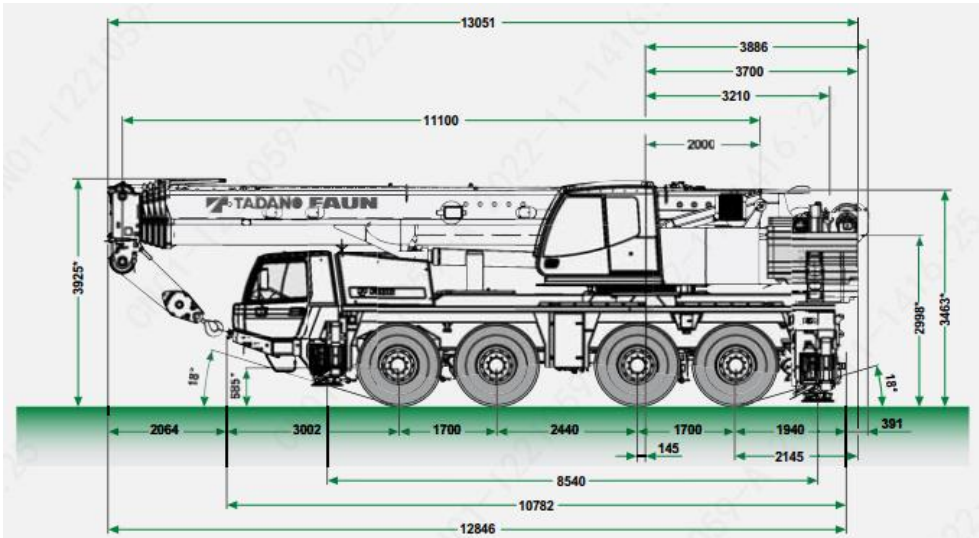
● Notes:

1. Container hoisting must be conducive to vertical hoisting of the top four corner pieces;
2. Using special spreader for container hoisting; The rated loading of container spreader is 61t;
3. Tilt angle during hoisting should be less than 5° ;
4. Hoisting acceleration $\leq 0.5g$;
5. The angle between hoisting rope and cabinet top $\geq 60^{\circ}$;
6. Hoisting in constant speed;
7. Handle with care to avoid impact ;
8. The follow equipment is just for reference.

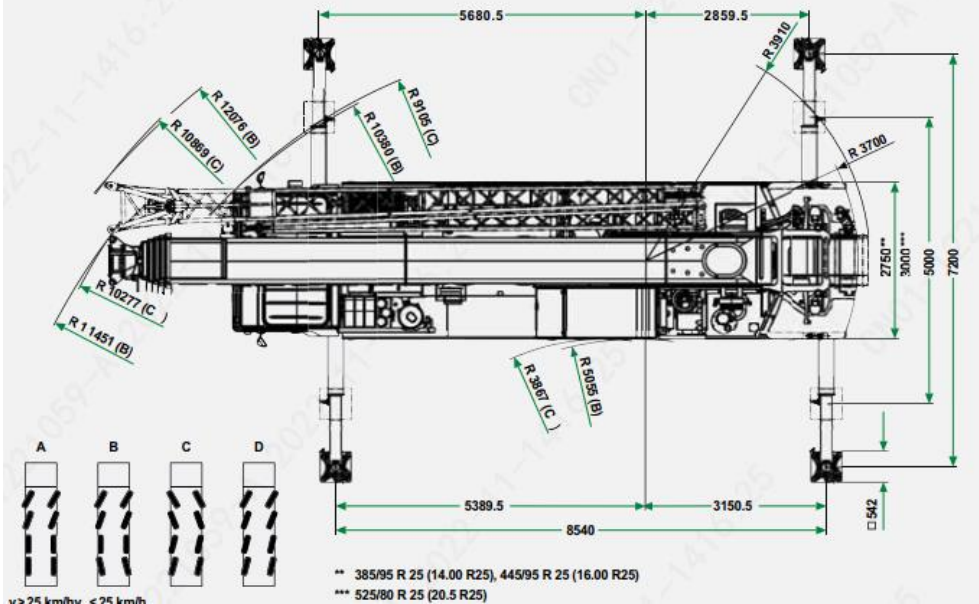
Installation Interface - Container Hoisting



Tadano ATF 90G-4



* - 100



Recommended hoisting equipment:

Type: Tadano ATF 90G-4

(For reference)

Weights



Axle	1	2	3	4	Total weight (t)
Tons	12	12	12	12	48*

* including 6.5t counterweight, 10/18m boom extension, hook block, swivel hook, tyres 445/95 R25 (16.0 R 25).

Lifting Capacity



Load (t)	No. of sheaves	No. of lines	Weight (kg)
100	9	19	1000
63*	9	11	650
40*	3	7	550
40	3	7	550
20	1	3	300
6	-	1	150

* ram's horn

Working Speeds

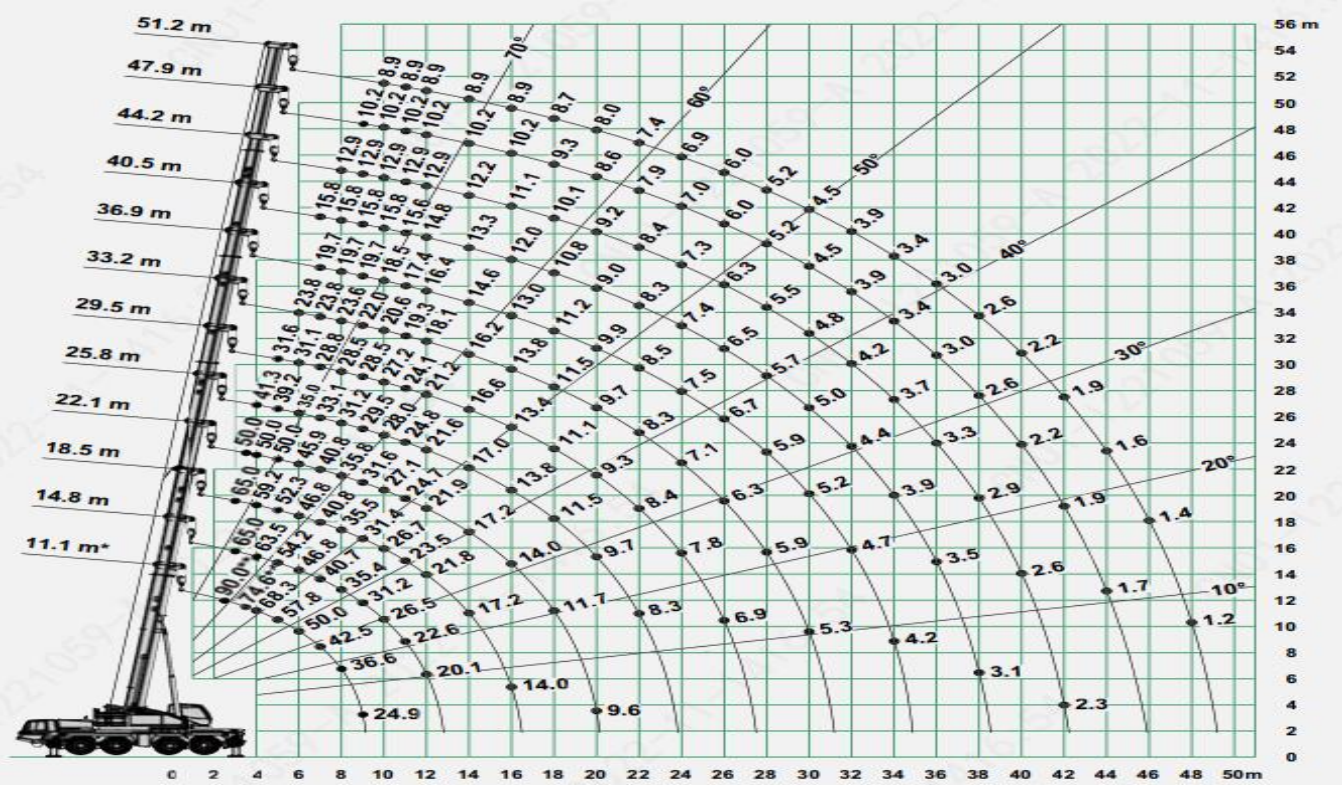
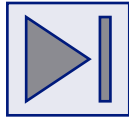


	1	2	3	4	5	6	7	8	9	10	11	12	R1	R2	
385/95 R25 (14.00 R 25)	3	4	5	7	9	11	15	19	24	31	40	51	4	5	70%
445/95 R25 (16.00 R 25)	4	5	6	8	10	12	16	21	27	34	43	56	4	5	62%
525/80 R25 (20.5 R 25)	6	8	10	13	16	21	28	36	46	59	75	85	7	8	



Drive	Infinitely variable	Rope diameter / length	Max. single line pull
0	0 - 115 m/min single line	18 mm / 230 m	55 kN
0	0 - 115 m/min single line	18 mm / 230 m	55 kN
0	0 - 2 min ⁻¹		
0	Approx. 35 seconds to reach from -1° to 82° boom angle		
0	Approx. 310 seconds for boom extension from 11.1 m - 51.2 m		

Installation Interface - Container Hoisting



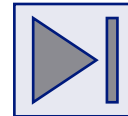
Other parameters of example crane

	11.1m*	11.1m	14.8m	18.5m	22.1m	25.8m	29.5m	33.2m	36.9m	40.5m	44.2m	47.9m	51.2m
2.5	90**												
3	81.6**	76.1**	65	65									
3.5	74.6**	70.1	65	63.2	50								
4	68.3	64.2	63.5	59.2	50	41.3							
4.5	62.6	59.1	58.7	55.6	50	40.9							
5	57.8	54.6	54.2	52.3	50	39.2	31.6						
6	50	47.3	46.8	46.8	45.9	35	31.1	23.8					
7	42.5	41.2	40.7	40.8	40.8	33.1	28.8	23.8	19.7	15.8			
8	36.6	35.4	35.4	35.5	35.8	31.2	28.5	23.6	19.7	15.8	12.9		
9	24.9	24	31.2	31.4	31.6	29.5	28.5	22	19.7	15.8	12.9	10.2	
10			26.5	26.7	21.7	28	27.2	20.6	18.5	15.8	12.9	10.2	8.9
11			22.6	23.5	24.7	24.8	24.1	19.3	17.4	15.6	12.9	10.2	8.9
12			20.1	21.8	21.9	21.6	21.2	18.1	16.4	14.8	12.9	10.2	8.9
14				17.2	1.72	17	16.6	16.2	14.6	13.3	12.2	10.2	8.9
16				14	14	13.8	13.4	13.8	13	12	11.1	10.2	8.9
18					11.7	11.5	11.1	11.5	11.2	10.8	10.1	9.3	8.7
20					9.6	9.7	9.3	9.7	9.9	9	9.2	8.6	8
22						8.3	8.4	8.3	8.5	8.3	8.4	7.9	7.4
24							7.8	7.1	7.5	7.4	7.3	7	6.9
26								6.9	6.3	6.7	6.5	6.3	6
28									5.9	5.9	5.7	5.5	5.2
30										5.3	5.2	5	4.8
32											4.7	4.4	4.2
34												4.2	3.9
36													3.5
38													
40													
42													
44													
46													
48													

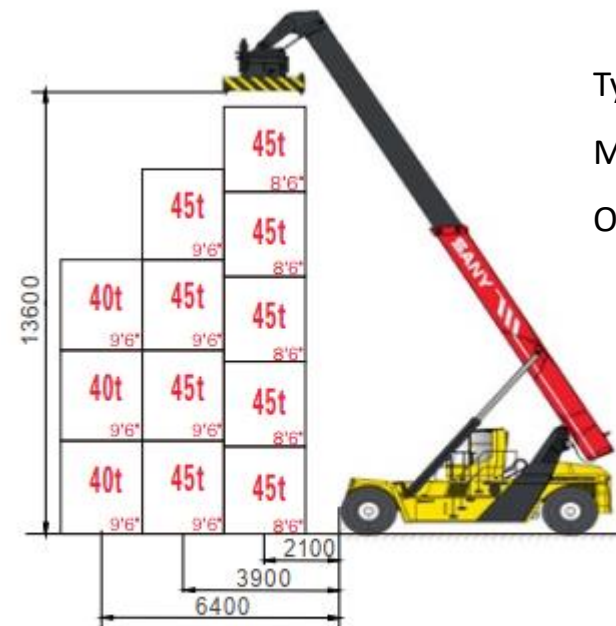
Lifting capacity according to lifting height

Note: Please consider the operating space of hoisting and transferring equipment in site layout.

Installation Interface – Container Transferring



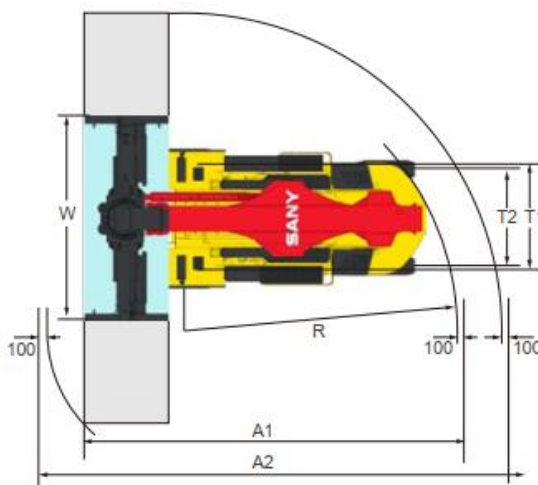
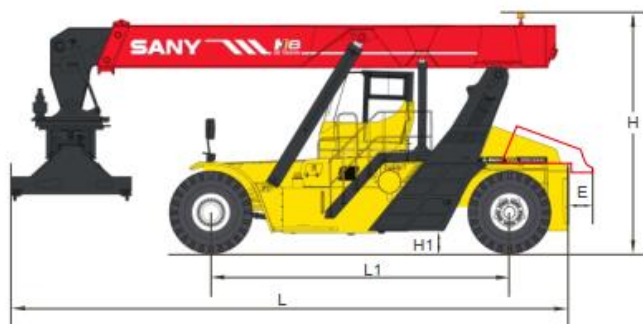
SDJ450: SANY classic spreader
 Rated capacity: 45t
 Application: ISO 20'/40'/45' Containers



Type: SRSC4545H
 Max Load: 45t
 Overall Weight: 103t

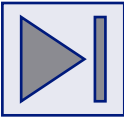
SRSC4545H SERIES OVERWEIGHT
 CONTAINER REACH STACKER

L: 13270mm H1: 420mm
 L1: 8000mm H: 5230mm

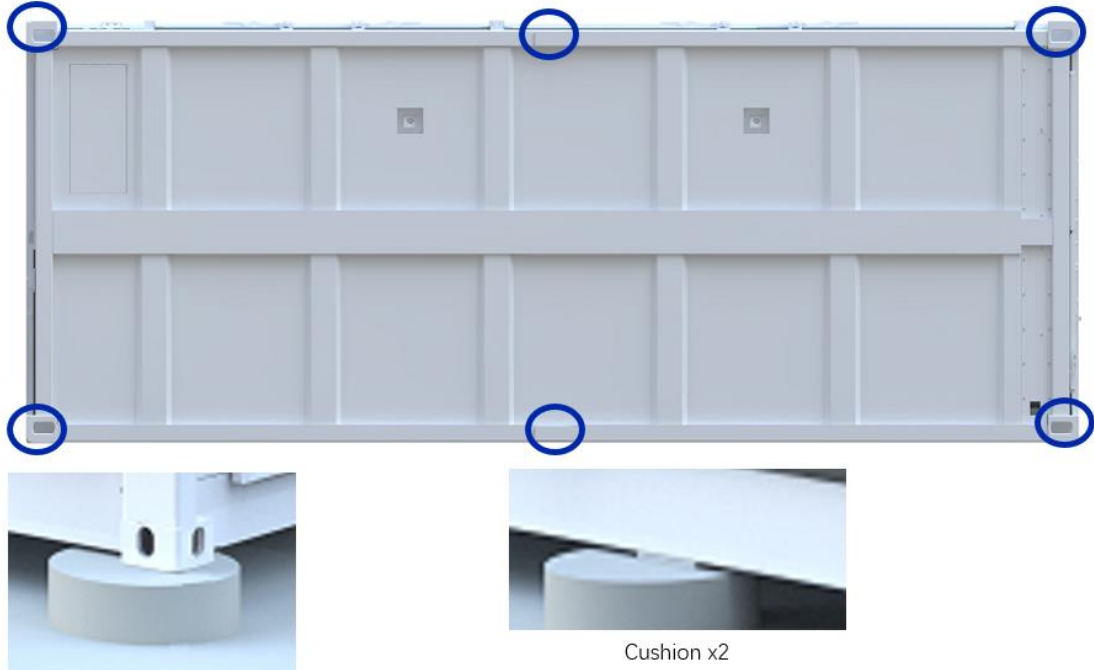


- Notes:
1. The above equipment is just for reference;
 2. Tilt angle during Transferring should be less than 5°;
 3. Hoisting acceleration $\leq 0.5g$;
 4. Hoisting in constant speed;
 5. Handle with care to avoid impact.

Installation Interface - Container Installation Requirements



- Grounding of the container:
 1. M12 bolt, required torque is 85N.m.
 2. Wire size $\geq 3 \times 150\text{mm}^2$ (material: cooper).
 3. The two grounding points are A and B, which can be selected according to the needs on site.



- Fixed with bolts welded (4 places)
- Container bottom fitting x4 (compliance with ISO 1161)

Ground type	Condition requirements	Note
Concrete floor	The ground needs to be able to bear a load of 35 tons	Ground should fulfill: ◆ Level deviation $\leq \pm 10\text{mm}$ ◆ Flatness deviation $\leq \pm 4\text{mm}/2\text{m}$
Plain land surface		

Installation Interface - Container Installation Requirements



Option 1 is recommended:

- Fix the bottom foot of the container:
 1. M16 bolt, required torque is 150~200N.m.
 2. Multi-point fixation, please refer to the Installation manual.
 3. Avoid surface paint peeling due to friction with the ground during anchor installation.



Option 1 :
Concrete Foundation:
Anchor **Bolt** Installation

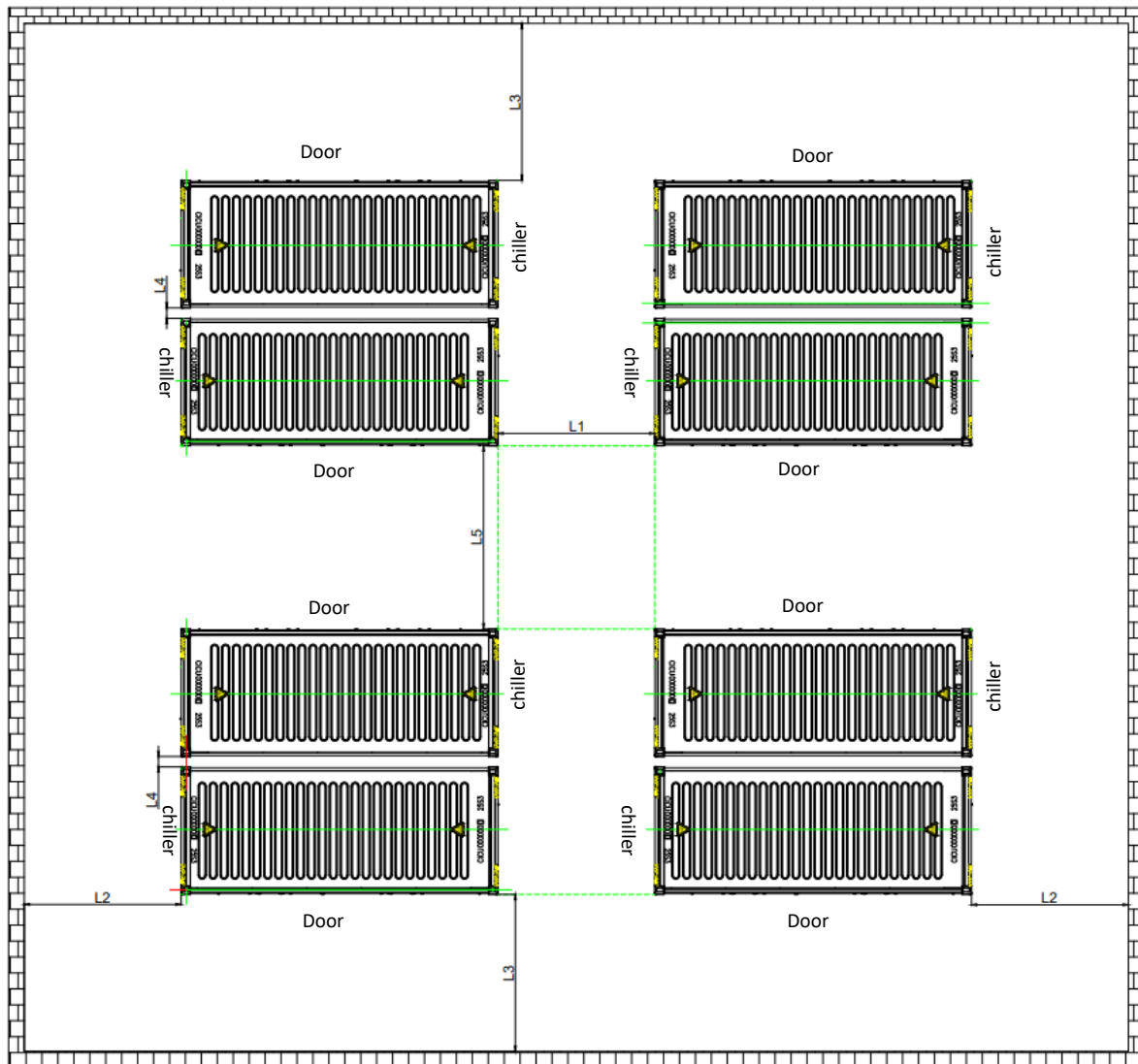
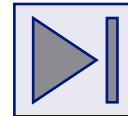


Option 2 :
Welding installation: The container bottom frame is **welded** to the embedded steel plate



Option 3 :
Twist lock installation:
The four bottom corners of the container can be fixed with the foundation through the container twist lock

Installation Interface - Containers Installation Layout



Case 1

To avoid the hot air interaction for two containers , and to maintain the container, the minimum distance must be followed :

L1 : 3.0m

L2 : 3.0m

L3 : 3.00m (Recommend 3.5m)

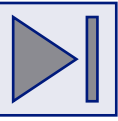
L4 : 0.90m (C5 or above) , 0.20m (C4 or below)

L5 : 3.00m (Recommend 3.5m)

Note that back-to-back two containers have opposite Wiring direction and need to control the length of the high-voltage cable to the PCS.

Note: The distance here refers to the road width, mainly considering the pass ability of maintenance tools. (Excluding mounting base dimensions)

Installation Interface - Containers Installation Layout



Case 2

To avoid the hot air interaction for two containers , and to maintain the container, the minimum distance must be followed :

L1 : 3.00m (Recommend 3.5m)

L2 : 3.00m

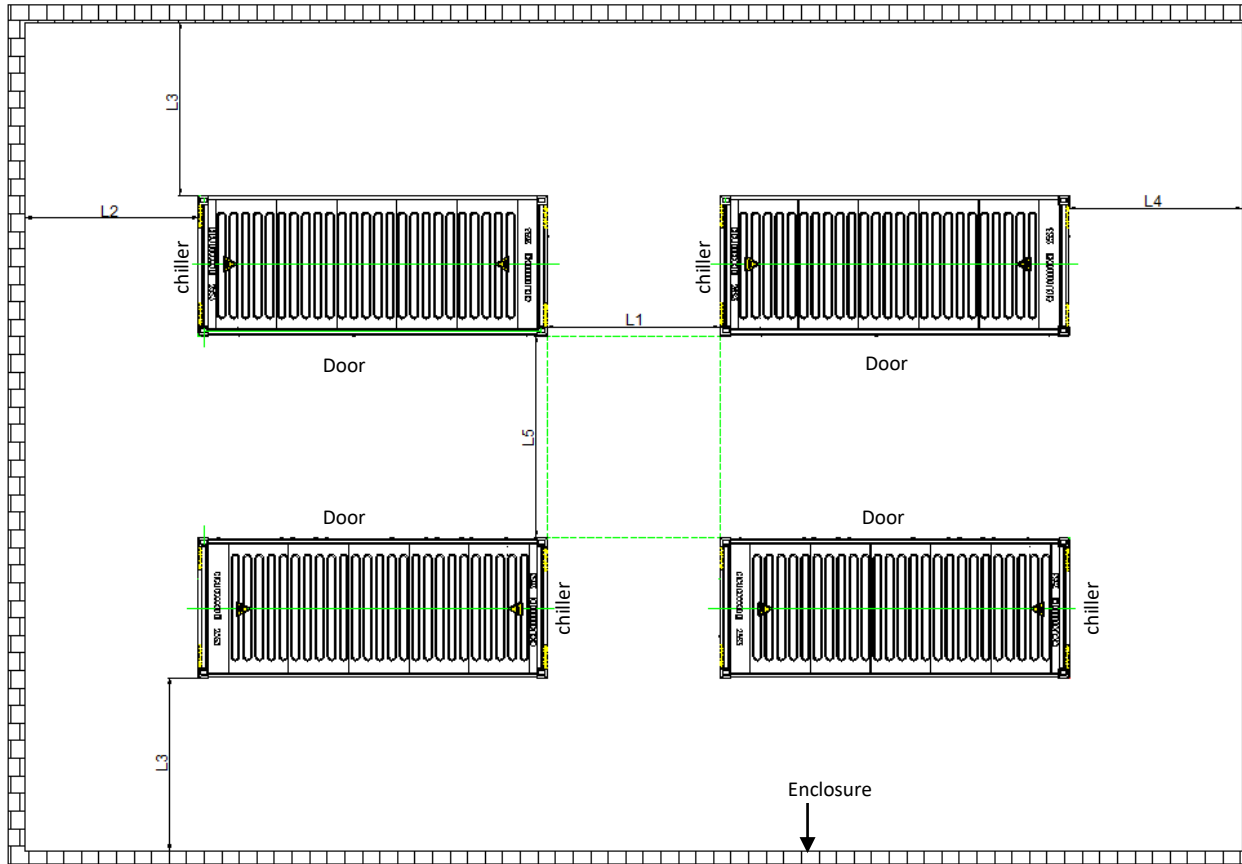
L3 : 3.00m (Recommend 3.5m)

L4: 1.10m (Recommend 1.5m)

L5 : 3.00m (Recommend 3.5m)

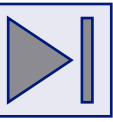
Note: Orientation of chiller unit and door in the drawing.

Note: The distance here refers to the road width, mainly considering the pass ability of maintenance tools. (Excluding mounting base dimensions)



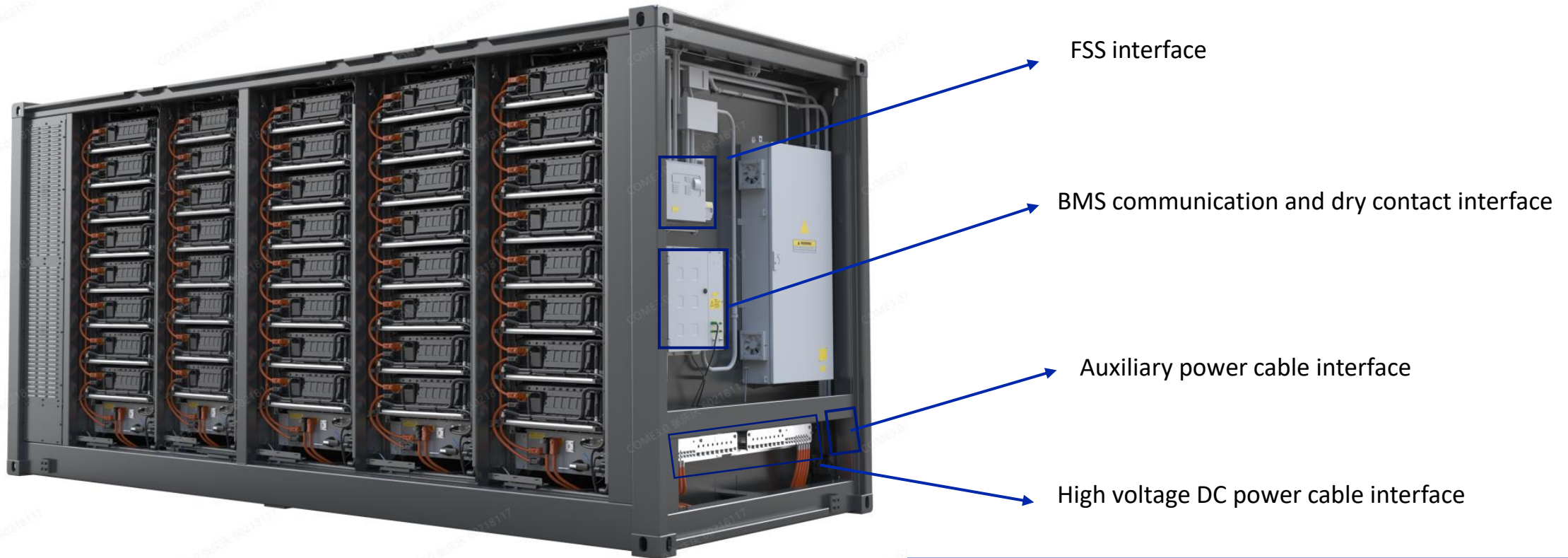
Top view

Installation Interface – Containers Cable Connection

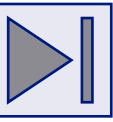


➤ EnerC+ Container cable connection Interface consists of

- A. High voltage DC power cable interface
- B. Auxiliary power cable interface
- C. BMS communication (Fiber) and dry contact interface
- D. FSS communication interface and dry contact interface

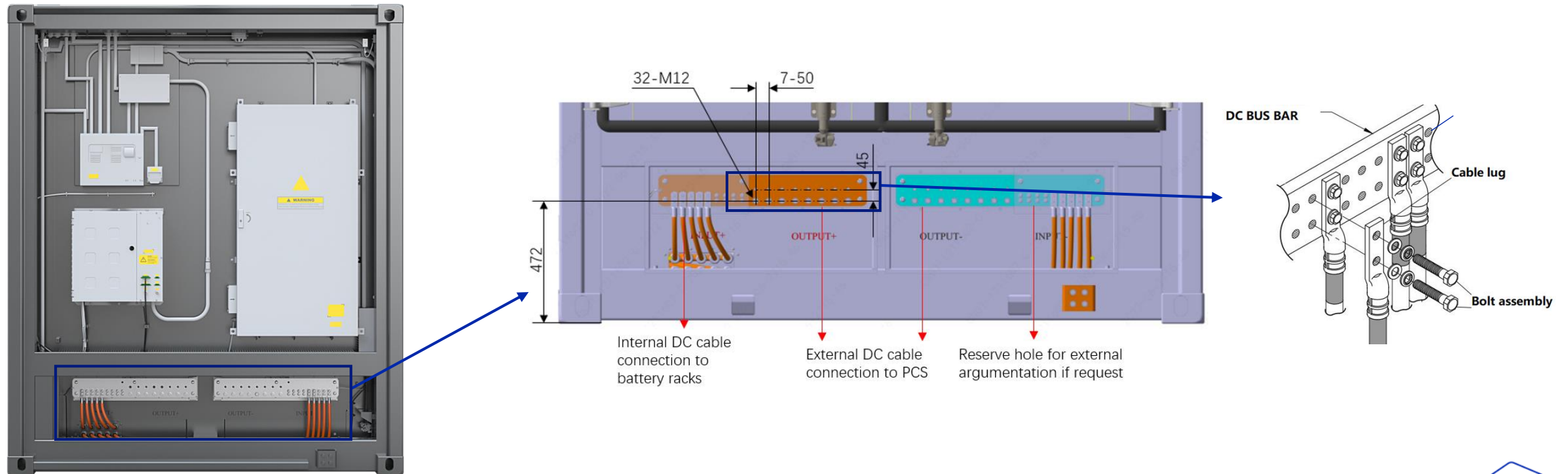


Installation Interface – Containers Cable Connection

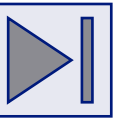


➤ A. High voltage DC power cable connection

- ① The DC power cable connection of the battery container is located in the busbar of the electrical room. The positive and negative copper bar provide **8 x double M12** holes for connection, Locking torque requirement: 50NM.
- ② The connecting cables should meet the following service requirements: rated voltage is **1500V DC**.

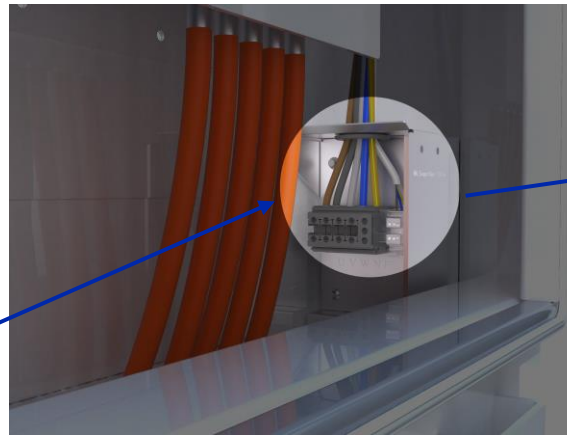
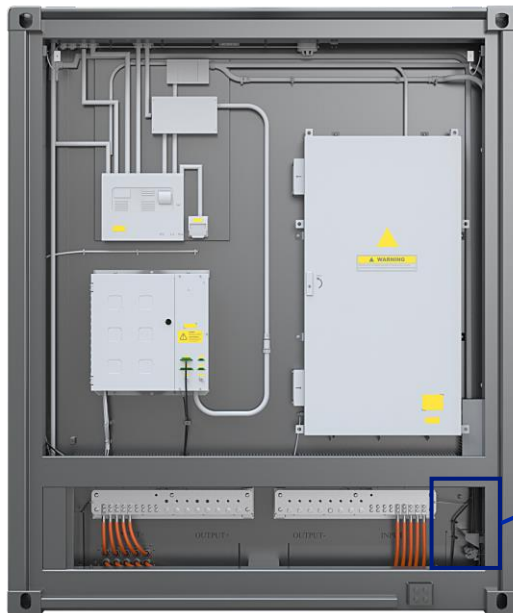


Installation Interface – Containers Cable Connection

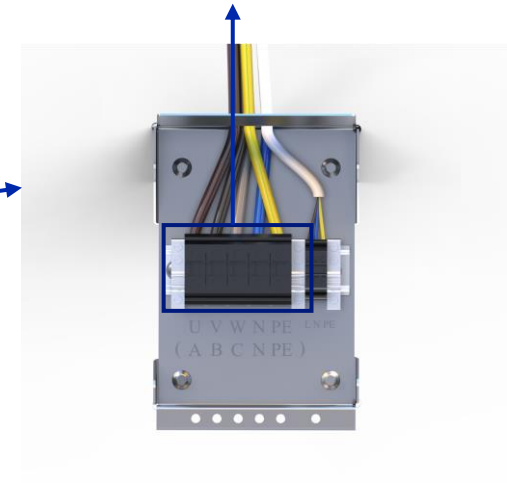


➤ B. Auxiliary power 1 cable connection (AC 380~480V)

- ① The auxiliary power 1 cable connection can be accessed at the bottom of electrical room.
- ② The connection requirements of auxiliary power supply (**3AC+N+PE**):
 - a) The **AC 380~480V 50/60Hz** power supply can be connected to the XT1 terminals.
 - b) Be sure the U/V/W/N/PE (**A/B/C/N/PE**) terminals connection sequence correctly.
 - c) Use flexible or hard wires with cold-pressed tube terminals.
 - d) **25mm² for single wire** is recommended, **the torque is 3.2 ~ 3.7 Nm**.



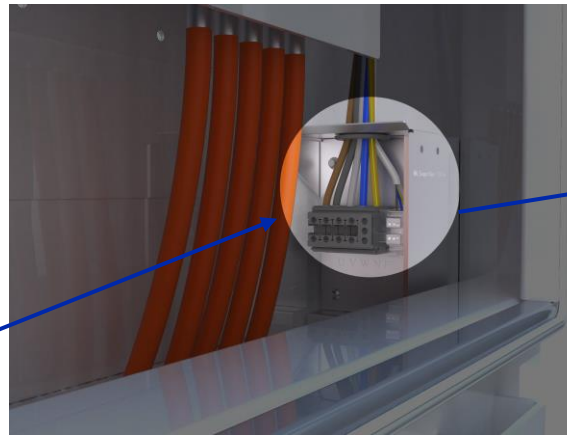
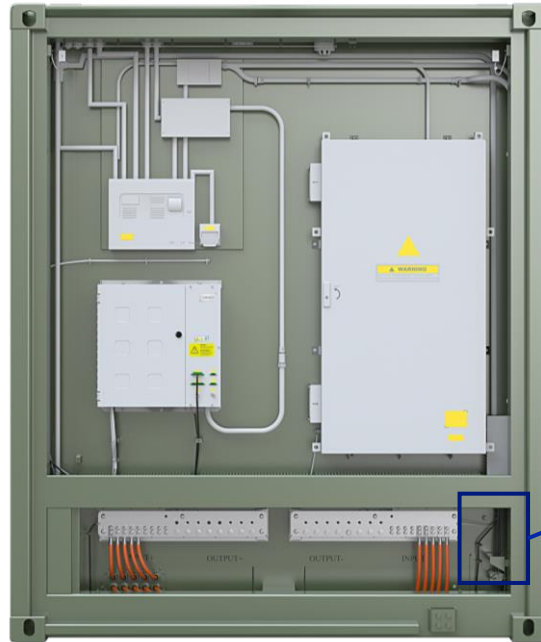
XT1 Terminals



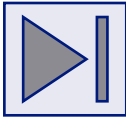
Installation Interface - Containers Cable Connection

➤ B. Auxiliary power 2 cable connection (UPS power AC230V)

- ① The UPS power AC230V cable connection can be accessed at the bottom of electrical room.
- ② The connection requirements of auxiliary power 2 supply (**L+N+PE**):
 - a) The **AC 230V 50/60Hz** power supply can be connected to the terminals.
 - b) Be sure the **L/N/PE** terminals connection sequence correctly.
 - c) Use flexible or hard wires with cold-pressed tube terminals.
 - d) **Continuous current 5A (AC 230V). 2.5mm² for single wire** is recommended, the torque is **0.6 ~ 0.8 Nm**.



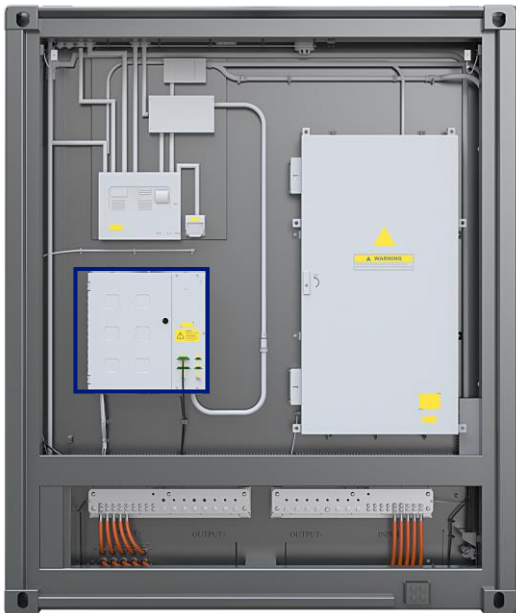
Installation Interface – Containers Cable Connection



➤ C. BMS communication (Fiber) and dry contact interface

Low voltage interface is located in M-Control Box.

- ① JX1 is CAN bus.
- ② JX2 is 485 bus.
- ③ JX3 is for debug.
- ④ JX4 is internal communication port
- ⑤ JX5 is Emergency dry contact.
- ⑥ JX6 is for parallel containers communication



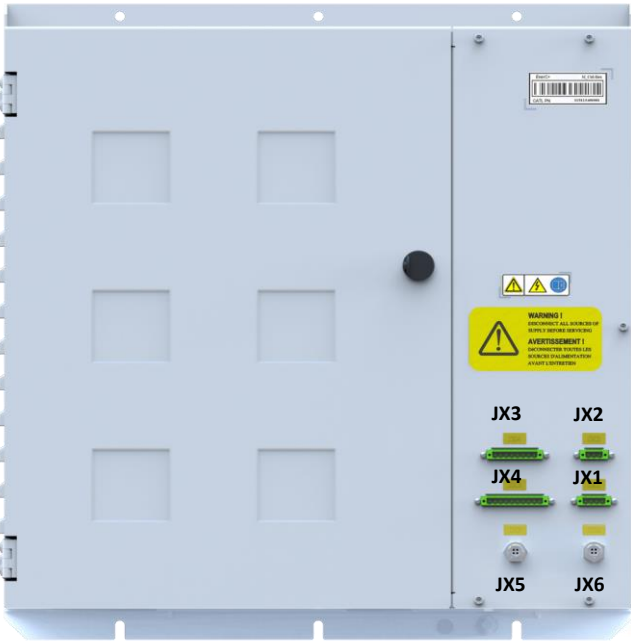
No.	Connector	Definition	Connector information	Remark
1	JX1-1	A-CAN-H	A-CAN Bus	Communicate with PCS through CAN port
2	JX1-2	A-CAN-L		
3	JX1-3	GND_ACAN		
4	JX1-4	Reserve		
5	JX2-1	RS485A	485 Bus	Communication with PCS through 485 port
6	JX2-2	RS485B		
7	JX2-3	GND		
8	JX3-1	D-CAN-H	Internal CAN bus for debug	Debug
9	JX3-2	D-CAN-L		
10	JX3-3	A-CAN-H		
11	JX3-4	A-CAN-L		
12	JX3-5	M-CAN-H		
13	JX3-6	M-CAN-L		
14	JX3-7...10	Reserve		

Installation Interface – Containers Cable Connection

➤ C. BMS communication (Fiber) and dry contact interface

Low voltage interface is located in M-Control Box.

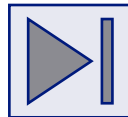
- ① JX1 is CAN bus.
- ② JX2 is 485 bus.
- ③ JX3 is for debug.
- ④ JX4 is internal communication port
- ⑤ JX5 is Emergency dry contact.
- ⑥ JX6 is for parallel containers communication



No.	Connector	Definition	Connector information	Remark
1	JX4-1	IMM__MCAN_H		
2	JX4-2	IMM__MCAN_L		
3	JX4-3	SBMU_Code_Out		
4	JX4-4~8	Reserve		
5	JX5-1	E_Stop_to_PCS+	Emergency dry contact	Emergency dry contact to PCS.
6	JX5-2	E_Stop_to_PCS-		
7	JX5-3	E_Stop_to_BMS+		Emergency dry contact to BMS
8	JX5-4	E_Stop_to_BMS-		
9	JX6-1	MCAN_H	M-CAN bus	M-CAN bus for parallel containers communication
10	JX6-2	MCAN_L		
11	JX6-3	MCAN_GND		
12	JX6-4	Reserved		
13	JX6-5	24V+_CAN bridge	CAN bridge bus	CAN bridge power supply
14	JX6-6	24V-_CAN bridge		CAN bridge power supply
15	JX6-7	Reserved		
16	JX6-8	Reserved		



Installation Interface – Containers Cable Connection



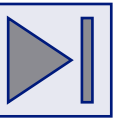
No.	Connector	Definition	Name	Remark	Connector information	Externa hardness requirement
1	JX1-1	A-CAN-H	A-CAN Bus	Communicate with PCS through CAN port	Plug receptacle : V80451530070G Plug: TJ0451520270G Manufacturer: Amphenol	Twisted pair and shielded wire
2	JX1-2	A-CAN-L				
3	JX1-3	GND_ACAN				
4	JX1-4	Reserve				
5	JX2-1	RS485A	485 Bus	Communication with PCS through 485 port	Plug receptacle: V80351530070G Plug: TJ0351520270G Manufacturer: Amphenol	Twisted pair and shielded wire
6	JX2-2	RS485B				
7	JX2-3	GND				
8	JX3-1	D-CAN-H	Debug	Internal CAN bus for debug	Plug receptacle: V81051530070G Plug: TJ1051520270G Manufacturer: Amphenol	Twisted pair and shielded wire
9	JX3-2	D-CAN-L				
10	JX3-3	A-CAN-H				
11	JX3-4	A-CAN-L				
12	JX3-5	M-CAN-H				
13	JX3-6	M-CAN-L				
14	JX3-7...10	Reserve				

Installation Interface – Containers Cable Connection



No.	Connector	Definition	Name	Remark	Connector information	External hardness requirement
15	JX4-1	IMM__MCAN_H				
16	JX4-2	IMM__MCAN_L				
17	JX4-3	SBMU_Code_Out				
18	JX4-4~8	Reserve				
19	JX5-1	E_Stop_to_PCS+	Emergency dry contact	Emergency dry contact to PCS.	Plug receptacle: PT07A-8-4PW(E)(005) Plug: T06E-8-4SW(005) Manufacturer: Amphenol	Twisted pair and shielded wire
20	JX5-2	E_Stop_to_PCS-				
21	JX5-3	E_Stop_to_BMS+				
22	JX5-4	E_Stop_to_BMS-				
23	JX6-1	MCAN_H	M-CAN bus	M-CAN bus for parallel containers communication.	Plug receptacle: PT07A-8-4PX(E)(005) Plug: PT06E-8-4SX(005) Manufacturer: Amphenol	Twisted pair and shielded wire
24	JX6-2	MCAN_L				
25	JX6-3	MCAN_GND				
26	JX6-4	Reserved				
27	JX6-5	24V+_CAN bridge	CAN bridge connection	CAN bridge power supply	Plug receptacle: 360241-00356 Plug: 360242-00753 Manufacturer: JONHON	Single core cable
28	JX6-6	24V-_CAN bridge		CAN bridge power supply		Single core cable
29	JX6-7	Reserved				

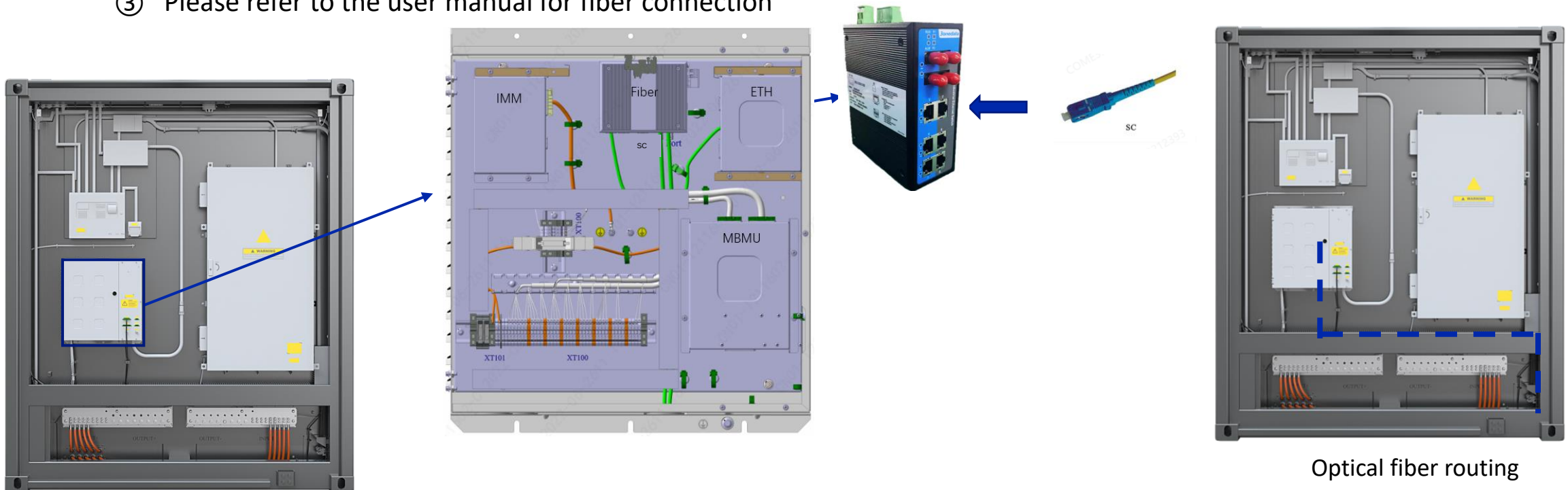
Installation Interface – Containers Cable Connection



➤ C. Optical fiber interface

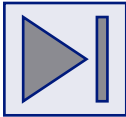
- **Optical fiber interface** is located in M-Control Box.

- ① For Optical fiber connection, the Optical fiber conversion module is included in master control box, which can convert TCP/IP to fiber signal, and **the single mode** SC port is used.
- ② Fiber communication with BMS(SC port single mode) , support unmanaged Switch.
- ③ Please refer to the user manual for fiber connection



Optical fiber routing

Installation Interface - Containers Cable Connection



➤ D. FSS dry contact interface

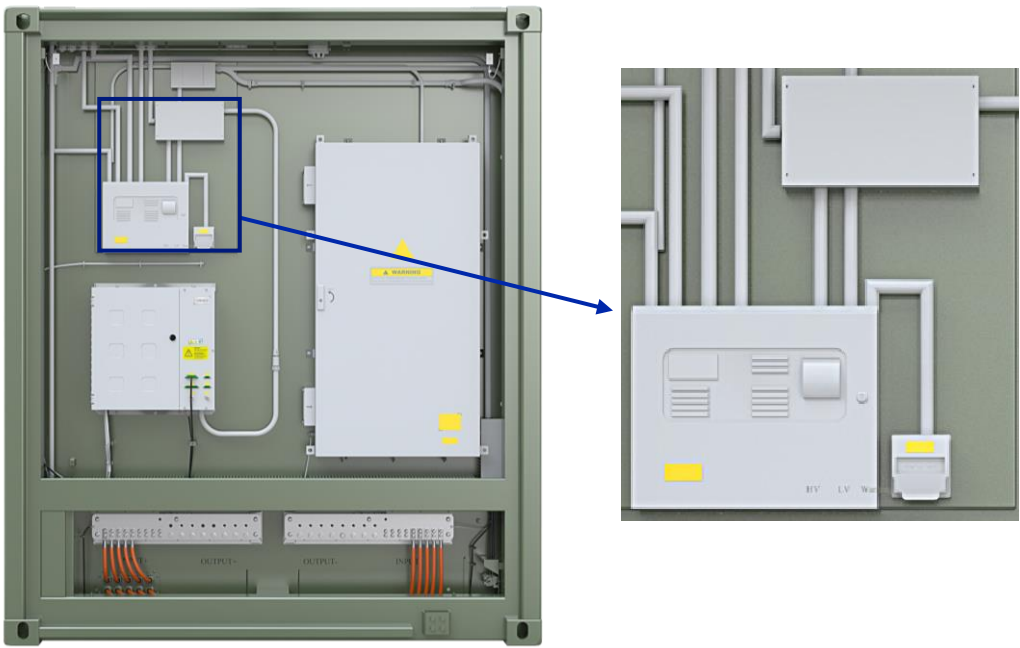
- There are three dry contact interfaces in FSS.
 - Fault Signal
 - Level 1 Alarm Signal
 - Level 2 Alarm Signal
- The three dry contact are connected to IO module.
- The IO module is placed in FSS.
- The IO module is connected to client FSS.

➤ FSS dry contact

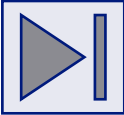
Pin	Function	Dry contact Status	External FSS or EMS Action
FSS Fault Signal+ and FSS Fault Signal-	To indicate the fault of FSS in battery container.	Close	No action
		Open	Check the detail fault information on the FSS.
FSS Level 1 Alarm+ and FSS Level 1 Alarm-	To indicate that any one heat or smoke detector is in alarm.	Close	No action
		Open	Cut off PCS power by EMS and check the detail fault information on the FSS.
FSS Level 2 Alarm+ and FSS Level 2 Alarm-	To indicate that both one heat detector and one smoke detector are in alarm or two heat detectors are in alarm.	Close	No action
		Open	Cut off PCS power by EMS and check the detail fault information on the FSS.

➤ FSS IO module

Connector	Pin Definition	Remark	External hardness requirement
FDnet/C-NET In	FDnet/C-NET_In+	Connections for FDnet/C-NET detector line	Twisted pair and shielded wire
	FDnet/C-NET_In-		
FDnet/C-NET Out	FDnet/C-NET_Out+		
	FDnet/C-NET_Out-		

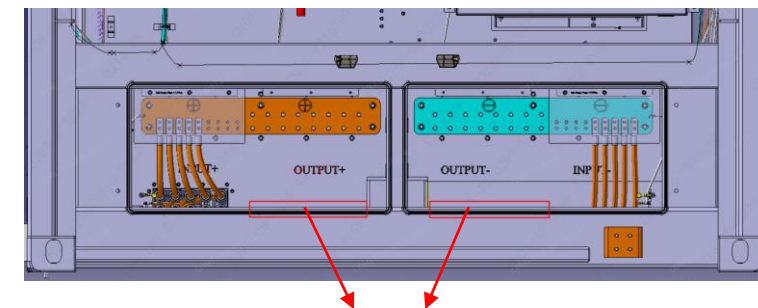
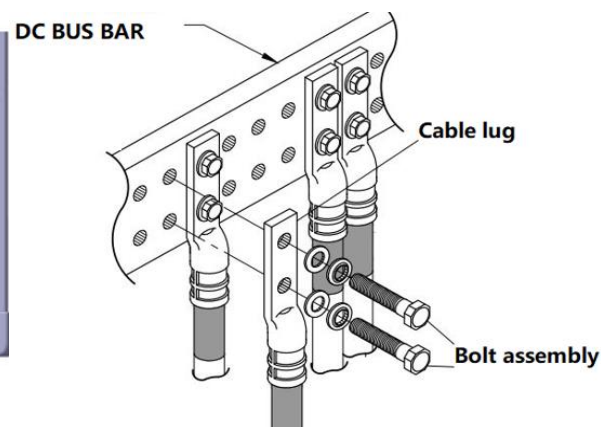
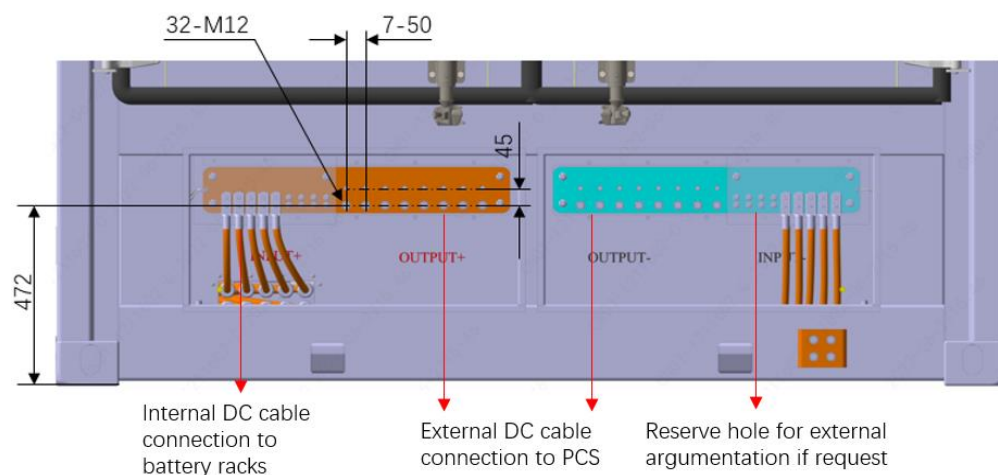
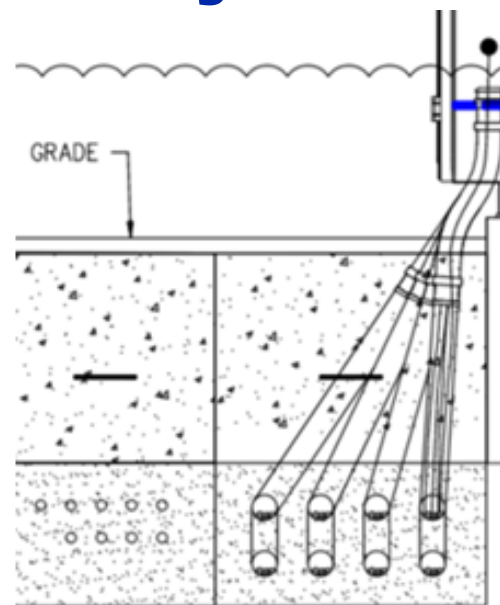
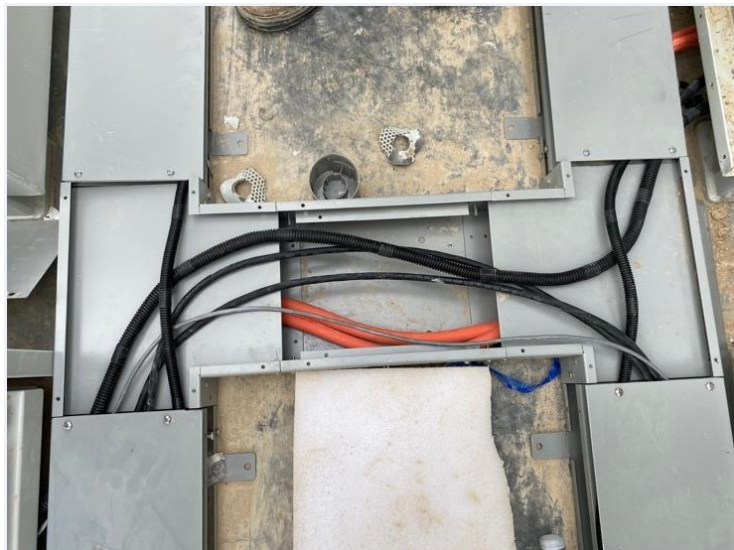


Installation Interface – Containers Cable Connection



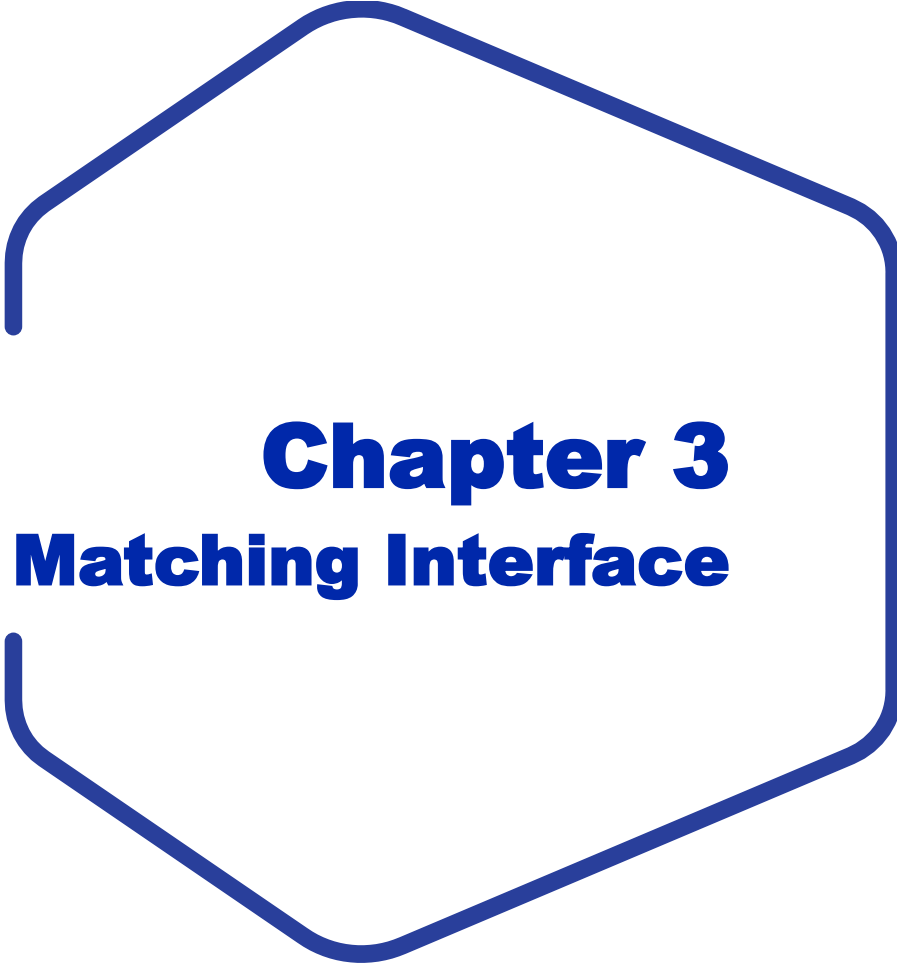
No.	Location	Interface	Name	Connector	Voltage	No. of wire	Remark	Connector information	Externa hardness requirement
1	DC Interface	DC Interface	Positive bus	Busbar	DC1500V	5	Positive bus	Terminal connection	HV cable
			Negative bus	Busbar	DC1500V	5	Negative bus	Terminal connection	HV cable
2	Aux. power Interface	Aux. power	AC400V	Terminal	AC380V-480V	5	Auxiliary power 3AC 380V-480V ,	Terminal connection	25mm ² for single cable
			AC230V	Terminal	AC230V	3	Auxiliary power AC230V	Terminal connection	2.5mm ² for single cable
3	M-Box	BMS communication and dry contact interface	A-CAN Bus	JX1	DC5V	3	CAN communication to PCS	Plug TJ0451520270G, Amphenol	Twisted and shielded wire. the sectional area of conduct is 0.5 mm ²
			485 Bus	JX2	DC5V	3	485 communication to PCS	Plug TJ0351520270G, Amphenol	Twisted and shielded wire. the sectional area of conduct is 0.5 mm ²
			Debug	JX3	DC5V	7	For internal debug	Plug TJ1051520270G, Amphenol	Twisted and shielded wire. the sectional area of conduct is 0.5 mm ²
			Emergency dry contact	JX5	DC24V	4	Emergency dry contact to PCS. Emergency dry contact to BMS.	Plug: T06E-8-4SW(005) Amphenol	Twisted and shielded wire. the sectional area of conduct is 0.5 mm ²
			M-CAN bus	JX6	DC5V	3	and for parallel containers communication	Plug: PT06E-8-4SX(005) Amphenol	Twisted and shielded wire. the sectional area of conduct is 0.5 mm ²
		Optical fiber	Optical fiber	Optical fiber	Optical	2	Ethernet communication to EMS	Optical fiber	Optical fiber
4	FSS	Optical fiber	Optical fiber	Optical fiber	Optical	2	Fire communication to Control Center	Optical fiber	Optical fiber

Cable Routing Method - Raceway or Conduit



After the external wiring of the container is completed, it is necessary to fill the gap between the threading opening and the wiring harness with fireproof mud and other materials for sealing. It is required that the filling is uniform, tight and seamless.

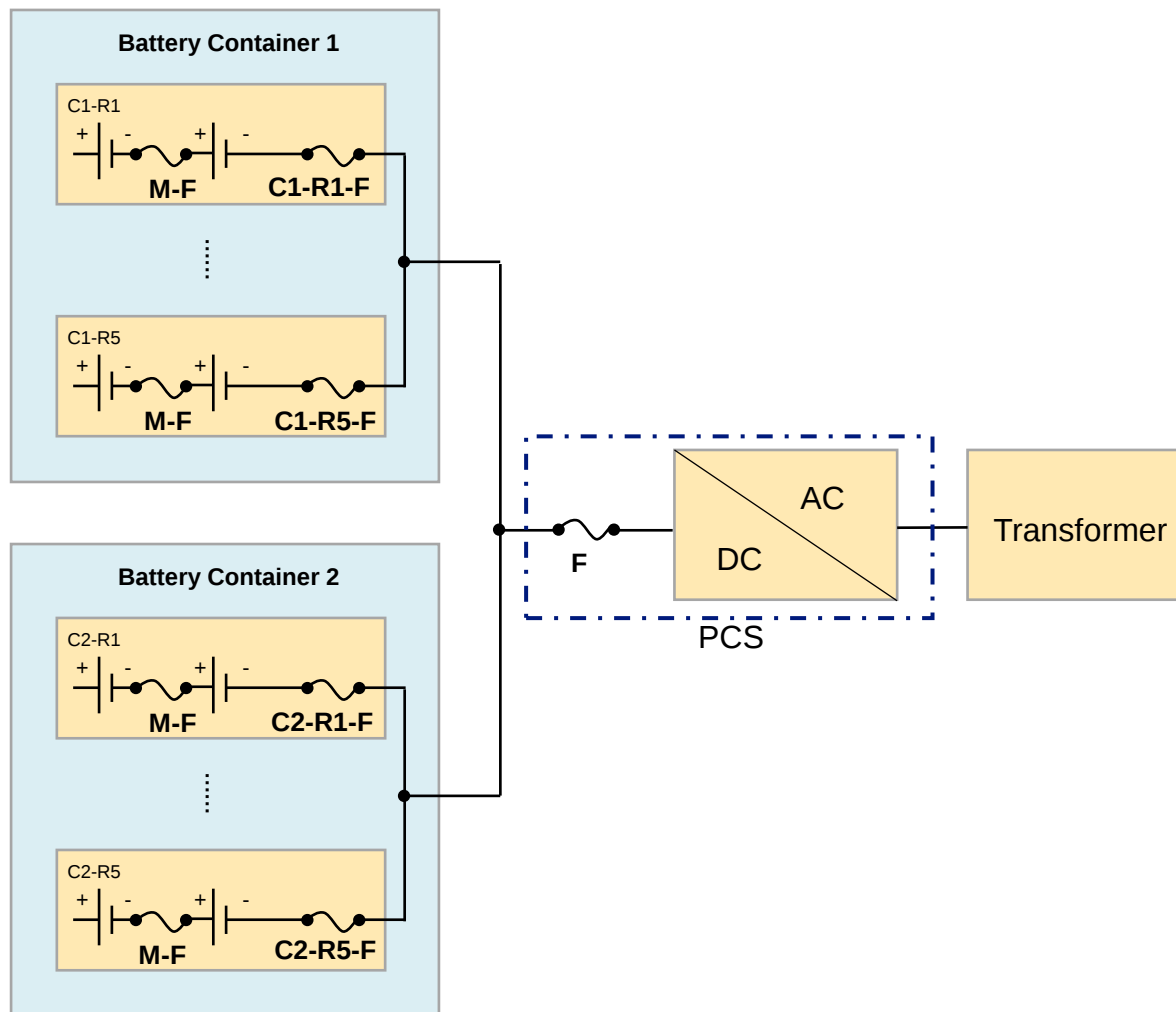
- Please refer to the cable diameter recommended by CATL before cable selecting.



Chapter 3

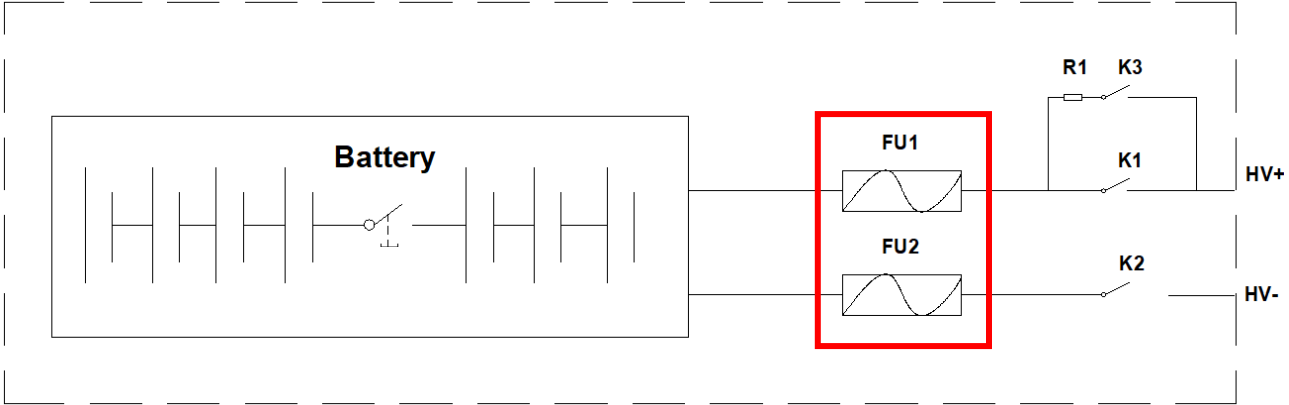
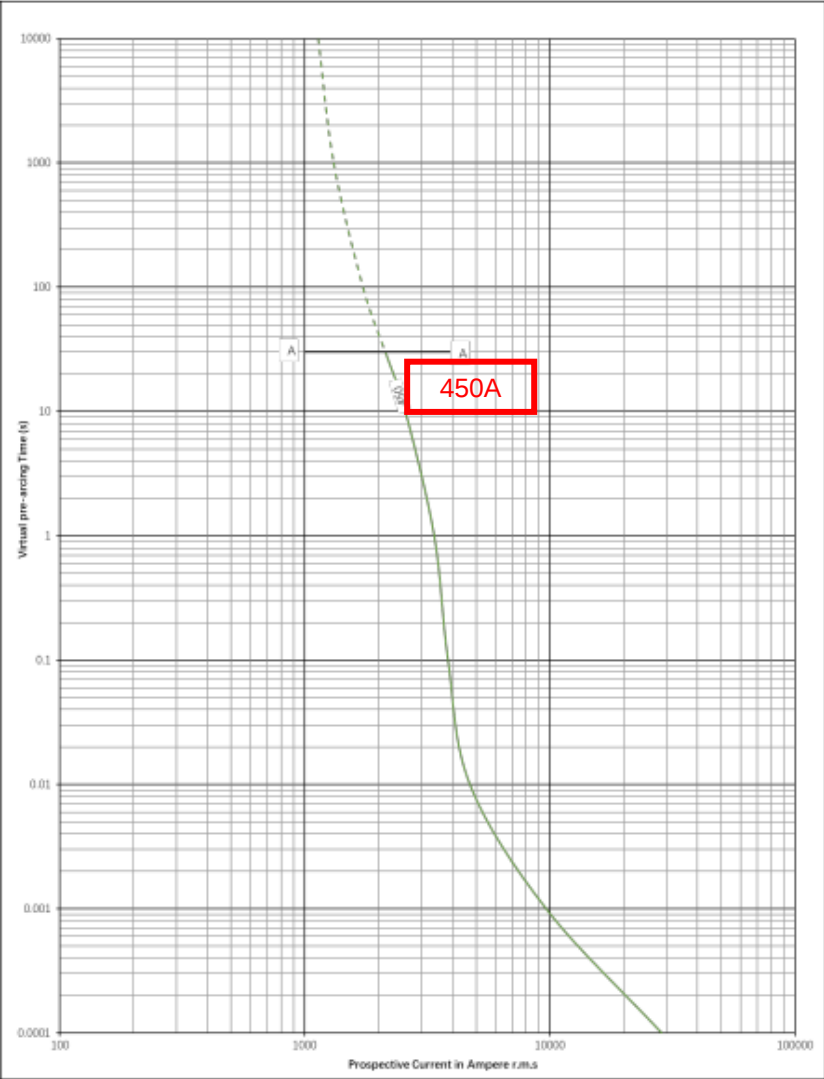
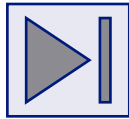
System Matching Interface

System Matching - Fuse Matching



- The principle of fuse matching:
 - Fuse Responding Time: $F < C-R-F < M-F$.
 - Voltage Level: 1500V
 - **One Container short circuit current is 64.7kA**
1. One PCS connect one container , every container has 5 racks .
 2. PCS DC side fuse is **Fuse F**.
 3. Battery rack fuse is C-R-F.
 4. Module fuse is M-F.

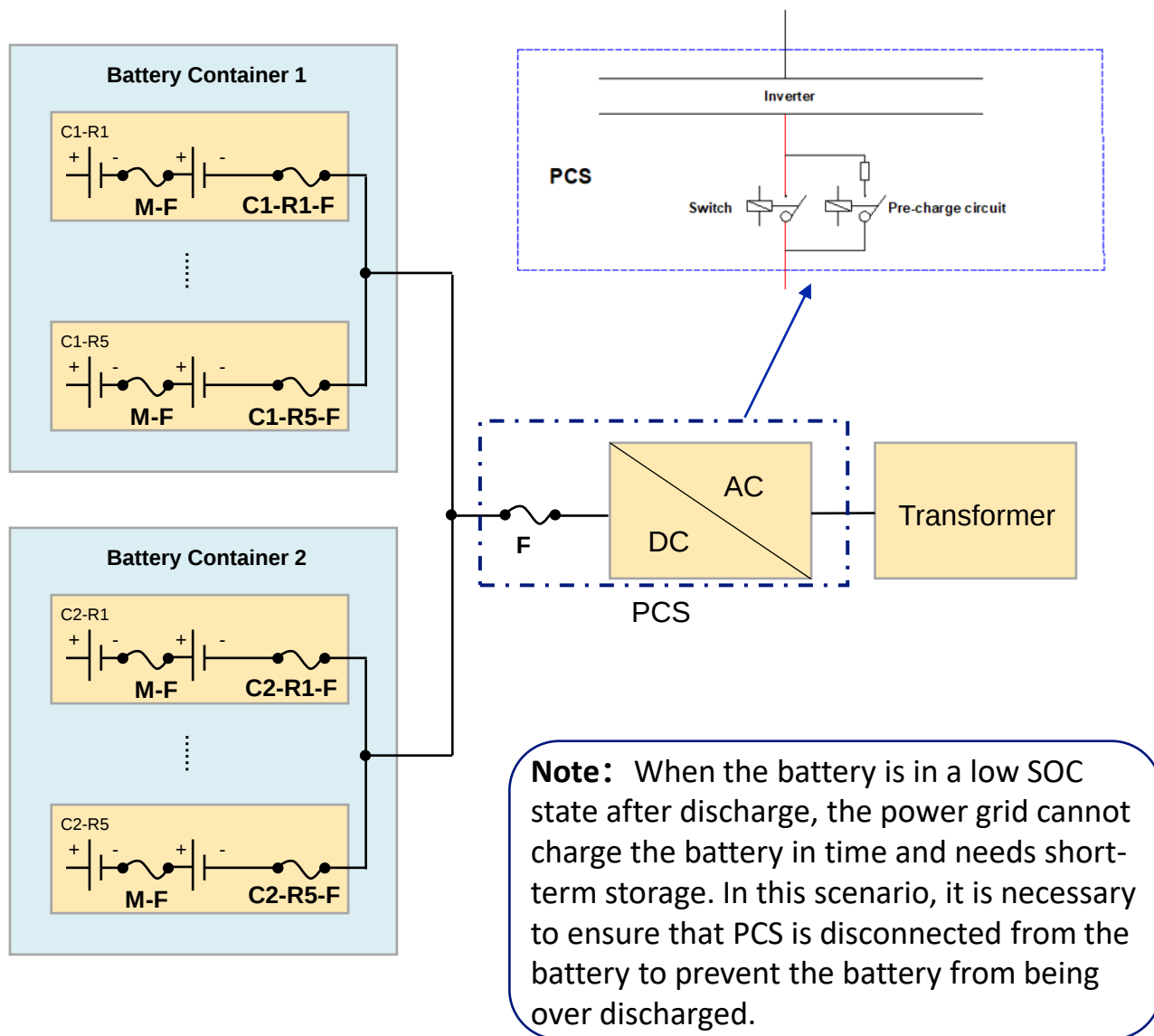
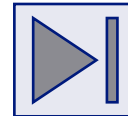
System Matching - Fuse Matching



- The figure shows Fuse on the Rack output loop, and the specifications are shown in the following table.

Item	Specification
Model	ESS3-450-D(1500 Vdc/450A)
PN	320542-00058
Current (A)	450
I ² t (A ² s)	Pre-arc : 78000 Total: 367000
Loss (W)	140
Mounting	Bolt: M10 Torque: 21±1N.m

System Matching - PCS Matching

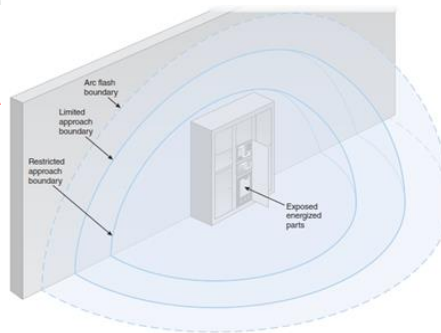


● PCS Matching:

1. Please make sure to use one **single Copper Busbar** for two battery container cable connection for positive or negative pole in PCS side.
2. Please make sure to use **Fuse(F)** between battery container and PCS.
3. Please make **sure PCS have pre-charge circuit**.
4. Please make sure the PCS has a **main circuit switch** on the DC side .
5. PCS should responds within 1S after BMS sending out the request.
6. PCS operation Power should not exceed battery power limitation.

- One PCS can match up to 2 battery containers.
- Common mode voltage value <100VAC, <15kHz
- PCS should **derating power to 0W within 2s once receiving BMS requirement**.
- PCS should have **SPD in DC high voltage bus**.
- PCS should **have insulation resistance monitor**. BMS monitor the insulation of DC bus before DC relay is closed. PCS monitor the insulation of DC bus after DC relay is closed.

System Matching - Arc Flash



- Operation window where arc flash may occur.

- Short Circuit Current: 64.7kA
- Approach boundary refer to NFPA 70E.
- Limited Approach Boundary : 1.5m
- Restricted Approach Boundary : 0.5m
- Arc Flash Incident Energy : 5.11Cal/cm²
(Note: Working Distance = 45.72cm)
- Flash Protection Boundary : 63.59cm
(Note : Arc Flash Incident Energy = 0.90Cal/cm²)
- Personnel Protective Equipment Requirement :
1. PPE Requirement, it is recommended to use PPE Category 3.

System Matching - Arc flash after grouping

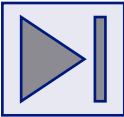


Item	Arc flash incident energy	Flash Protection Boundary	PPE Category	Notes
Two parallel battery containers	11.46 Cal/cm2	95.26 cm	3	PPE Category 3 is recommended.

Clarify:

- When two parallel battery containers are used, PPE Category 3 is recommended.

System Matching - PPE Category

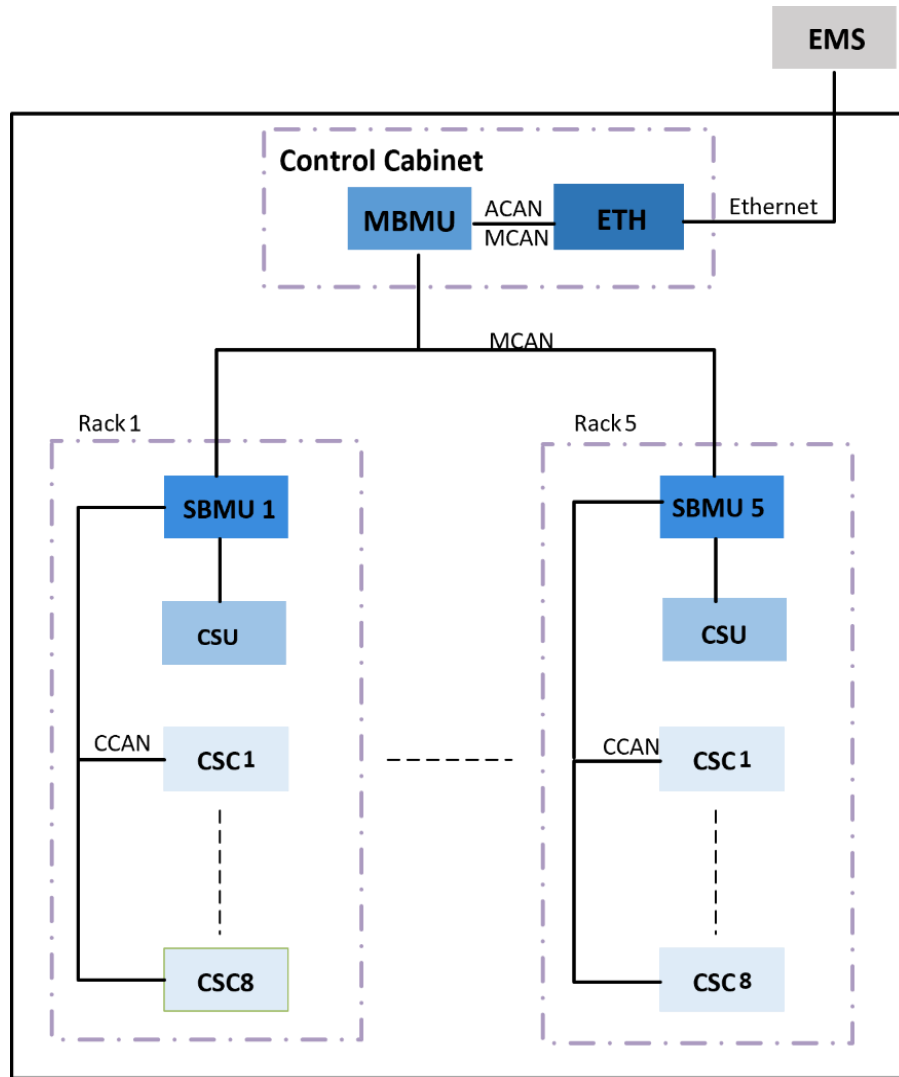


PPE category 3 requirement is as follows:

PPE CATEGORY 1	PPE CATEGORY 2	PPE CATEGORY 3	PPE CATEGORY 4
Minimum Arc Rating of 4 cal/cm² Arc Rated Clothing: • AR long-sleeve shirt and pants, or AR coverall • AR face shield, or AR flash suit hood • AR jacket, parka, rainwear, or hard hat liner (as needed)  Protective Equipment: • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Heavy-duty leather gloves • Leather footwear (as needed)	Minimum Arc Rating of 8 cal/cm² Arc Rated Clothing: • AR long-sleeve shirt and pants, or AR coverall • AR flash suit hood, or AR face shield and AR balaclava • AR jacket, parka, rainwear, or hard hat liner (as needed)  Protective Equipment: • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Heavy-duty leather gloves • Leather footwear	Minimum Arc Rating of 25 cal/cm² Arc Rated Clothing: • As required: AR long-sleeve shirt, AR pants, AR coverall, AR flash suit jacket, and/or AR flash suit pants • AR flash suit hood • AR gloves • AR jacket, parka, rainwear, or hard hat liner (as needed)  Protective Equipment: • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Leather footwear (as needed)	Minimum Arc Rating of 40 cal/cm² Arc Rated Clothing: • As required: AR long-sleeve shirt, AR pants, AR coverall, AR flash suit jacket, and/or AR flash suit pants • AR flash suit hood • AR gloves • AR jacket, parka, rainwear, or hard hat liner (as needed)  Protective Equipment: • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Leather footwear (as needed)

PPE Category Definition (Refer to NFPA 70E)

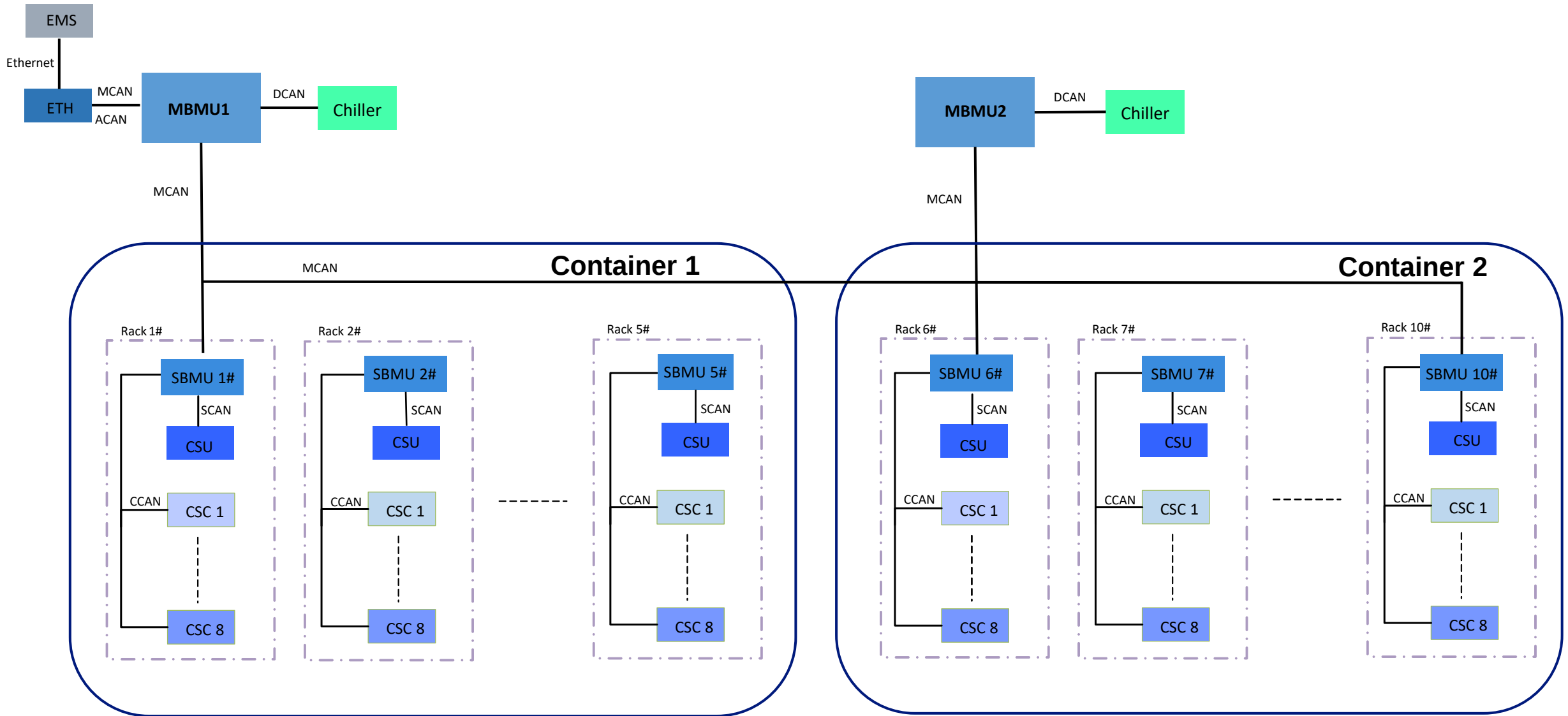
System Matching - Communication architecture Description



Single container communication topology

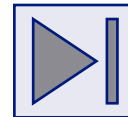
- The battery management system can be regarded as three levels: CSC/CSU, SBMU, MBMU/ETH.
- **CSC** collects data of cells inside the battery module, uploads the cell voltage and temperature data to SBMU, and completes the balance between cells in the battery module according to the commands given by SBMU.
- **SBMU** receives detailed voltage and temperature data uploaded by CSC and receives the current data uploaded by the CSU (current sensor). It is also responsible for SOC calculation and correction, the management of pre-charging, charging and discharging of the battery rack, and the uploading of relevant data to MBMU.
- **MBMU** is responsible for the operation and management of the whole Battery System. It receives the data uploaded by SBMU and controls the whole system power on/off.
- **ETH/Fiber** is the communication interface between the BESS system and EMS through Ethernet.
- **CAN Bridge** When the length of CAN communication line exceeds 30m, it is necessary to add CAN bridge to enhance communication signal.

System Matching - Communication architecture Description

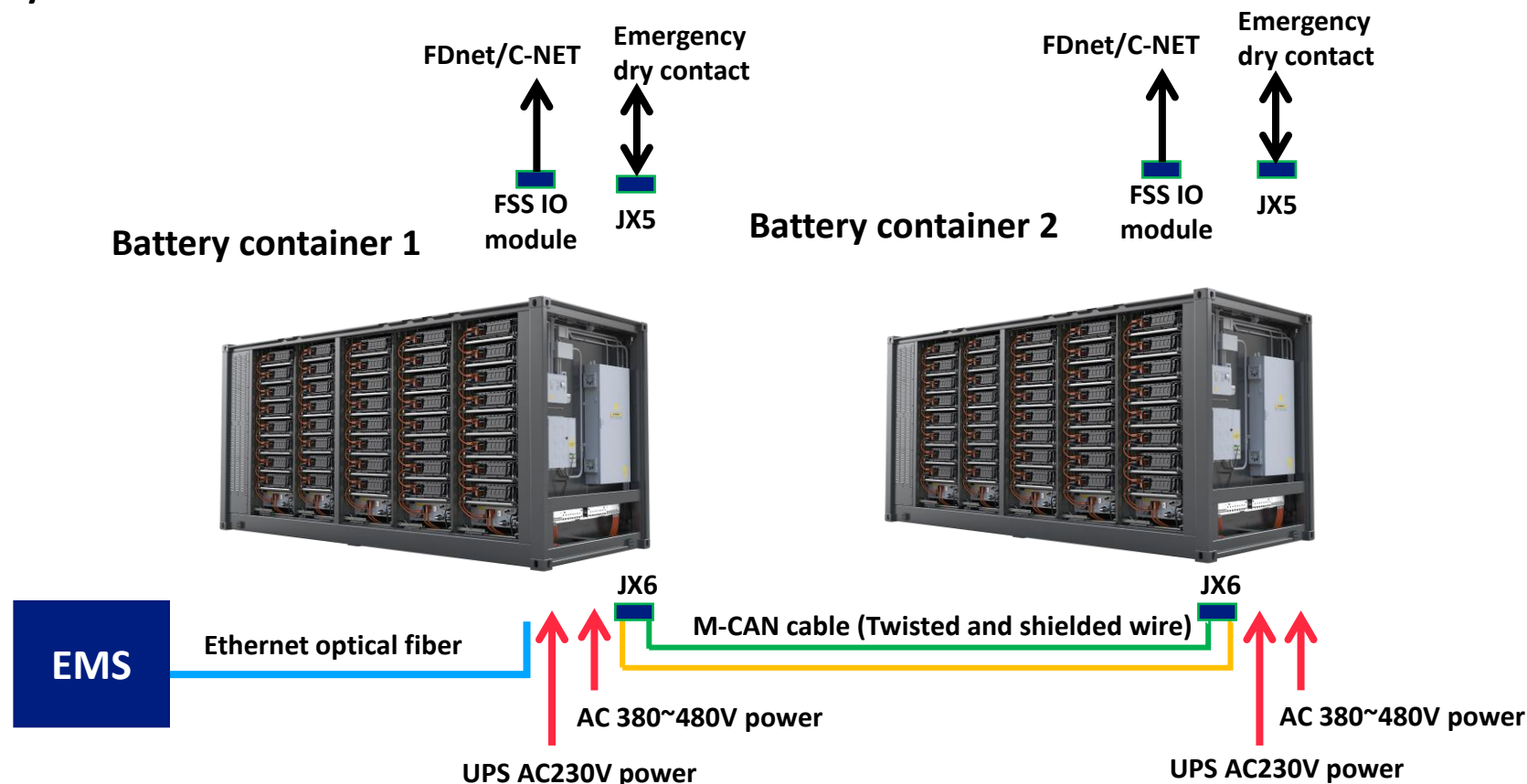


Two container in parallel communication topology

System Matching - Communication Connection Diagram



Two parallel Battery containers

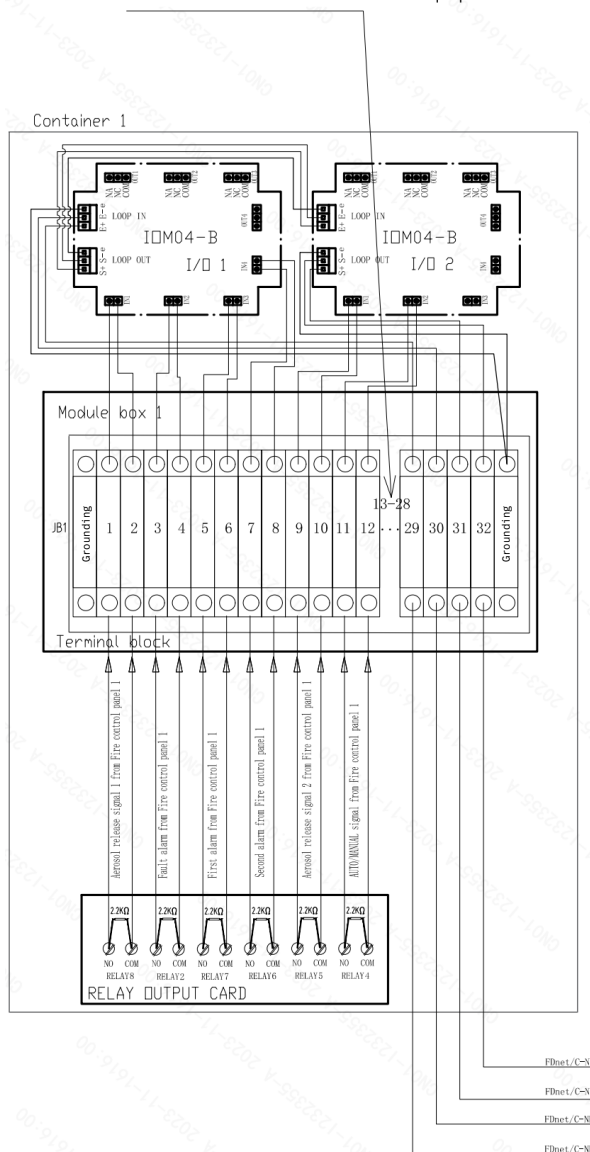


● Note:

1. When the length of CAN communication cable **exceeds 30m**, it is necessary to add **CAN bridge** to enhance communication signal.
2. The **data record requirements of EMS** : The 7 days' data can be backtracked after alarm occurs , and the alarm data record interval is 5s . General data record interval is 10s and send the data back to CATL every 6 months.

System Matching – I/O Module

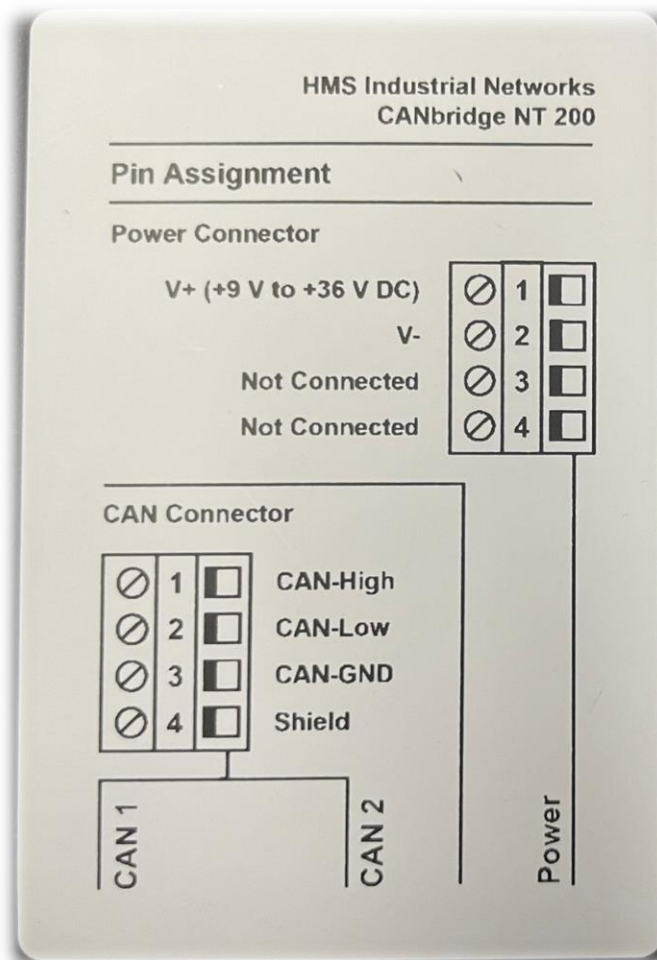
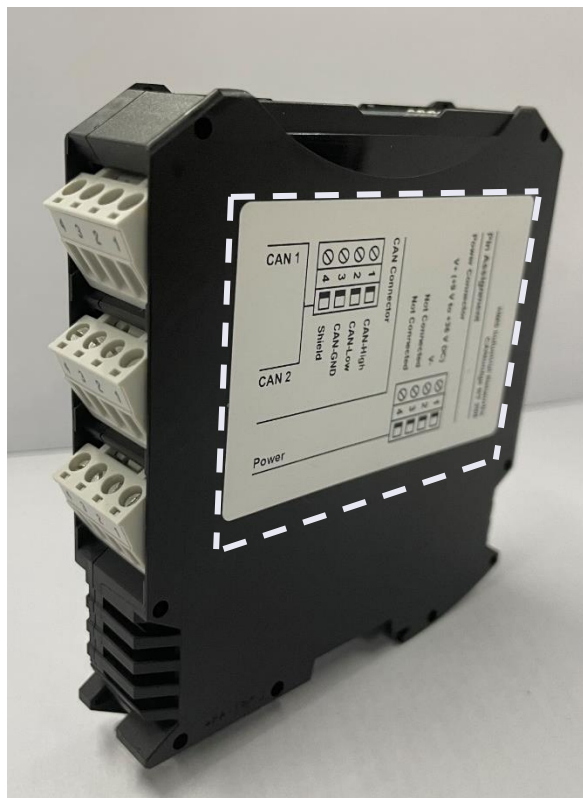
Remark: Terminal 13-28 connected to other equipment



I/O Module

- Supply voltage
 - range: 10Vdc-30Vdc
 - Nominal : 20Vdc
- Relay contact: SPDT, 30Vdc, 1A max (resistive load)
- End-of-line resistor: 2200 ohm, ¼W, 5%
- Alarm resistor: 560 ohm, ¼W, 5%
- Max. input line length: 1km (56 ohm)
- Screw specification: M4*20mm

System Matching - CAN Bridge Usage Guide



HMS CAN Bridge NT 200

- Web site: www.ixxat.com
- 2 CAN Connectors and 1 Power Connector
- PINs are annotated clearly
- PIN shield is connected to the device ground via a 1 MOhm resistor and a 10 nF capacitor.
- Please refer to the User Manual (Delivered with product) for the software installation and other detailed guides.

System Matching - CAN Bridge Usage Guide



ZLG CAN Bridge

- Web site: www.ZLG.cn
- 2-channel fully electrical isolated CAN
- Baud rate 5Kbps~1 Mbps
- Bidirectional forwarding speed 4500 frames/s
- Bus utilization ratio 80%~95%
- Forwarding delay 10 μ s
- Maximum node quantity 110
- Supply voltage: +9-26V
- Please refer to the User Manual (Delivered with product) for the software installation and other detailed guides.

System Matching – Auxiliary Power Supply

NO.	C-rate	Temperature/°C	Total power consumption/kWh	Maximum active power/kW
1	0.25P	-30°C	142.61	21.17
2		0°C	101.41	20.97
3		25°C	103.80	14.50
4		40°C	172.98	24.24
5		55°C	320.93	29.81
6	0.5P	-30°C	192.25	22.23
7		0°C	130.79	22.45
8		25°C	174.15	23.49
9		40°C	215.25	27.34
10		55°C	333.70	31.01

a) Auxiliary power consumption data tested by CATL laboratory

b) The data is based on 1 cycle per day c) the data is only for reference



System Matching - HV control logic



Power-On

Send power-on command

- EMS self-check , EMS Clean BMS fault, and request BMS HV power on

BMS HV on flow

- BMS receives HV on request.
- BMS self-check including insulation resistance monitor.
- Rack complete Pre-charge , Close the main circuit and cut off pre-charge circuit, stop insulation monitor.

BMS HV flow is completed

- BMS sends feedback to the EMS after the HV power-on of the battery side is completed.

EMS HV on flow

- PCS start to monitor insulation resistance.
- PCS Pre-charge and contactors close.
- Complete the pre-charge progress.

EMS HV flow is completed

- Close the main circuit and cut off the PCS pre-charge circuit.
- Request BMS HV stay-put.

Power-Off

EMS system inspects

- EMS state meet HV power off conditions.
- Power limits 0 less than 1s, and the EMS Contactor start HV off

Send power-off command

- BMS inspect:
- If BMS have level 6 fault , it will power off after 10s.
- If BMS have level 7 fault , it will power off without time delay.

BMS HV off flow

- BMS receives HV off request , cut off main circuit contactor.

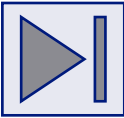
BMS HV off flow is completed

- BMS sends feedback to the EMS after the HV power-off of the battery side is completed.

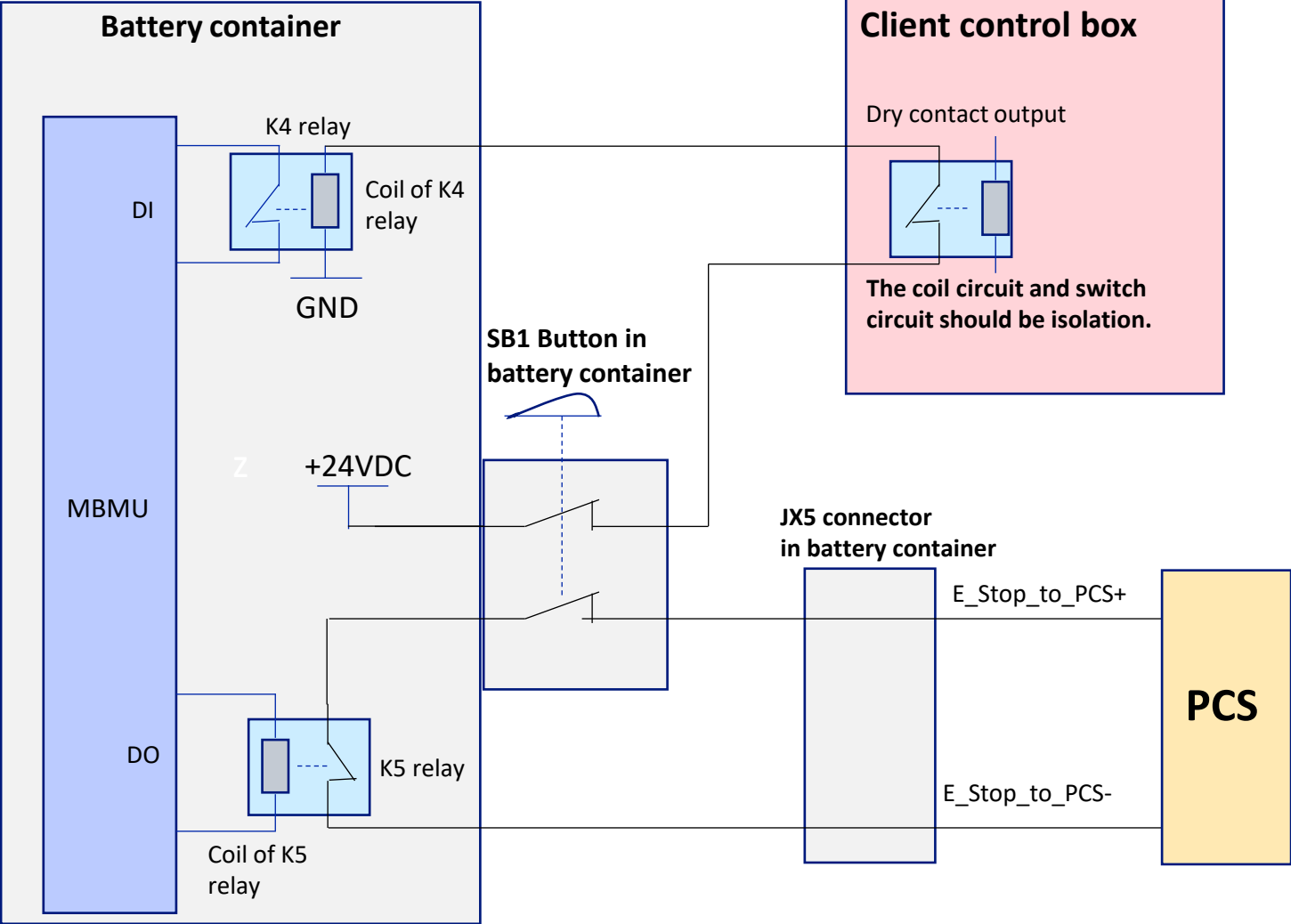
EMS HV Off flow is completed

Request BMS HV stay-put

System Matching - Emergency Stop



- Emergency stop



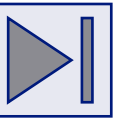
- Emergency stop dry contact from client

- If client control box output dry contact or SB1 Button(E-stop) is pushed, the BMS will receive the changed dry contact status.

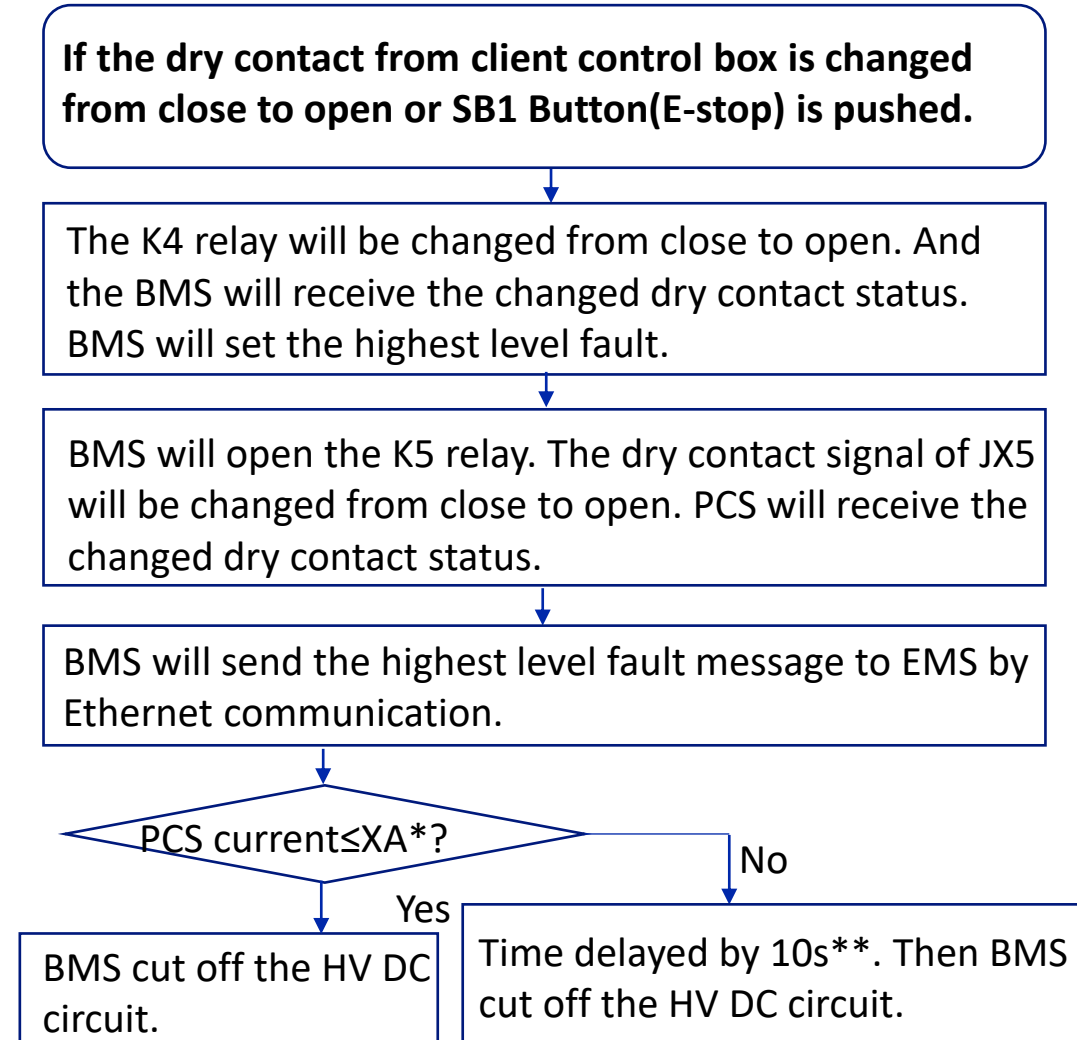
Client Control Box Dry Contact Status	Emergency Status
Close	Non-emergency
Open	Emergency

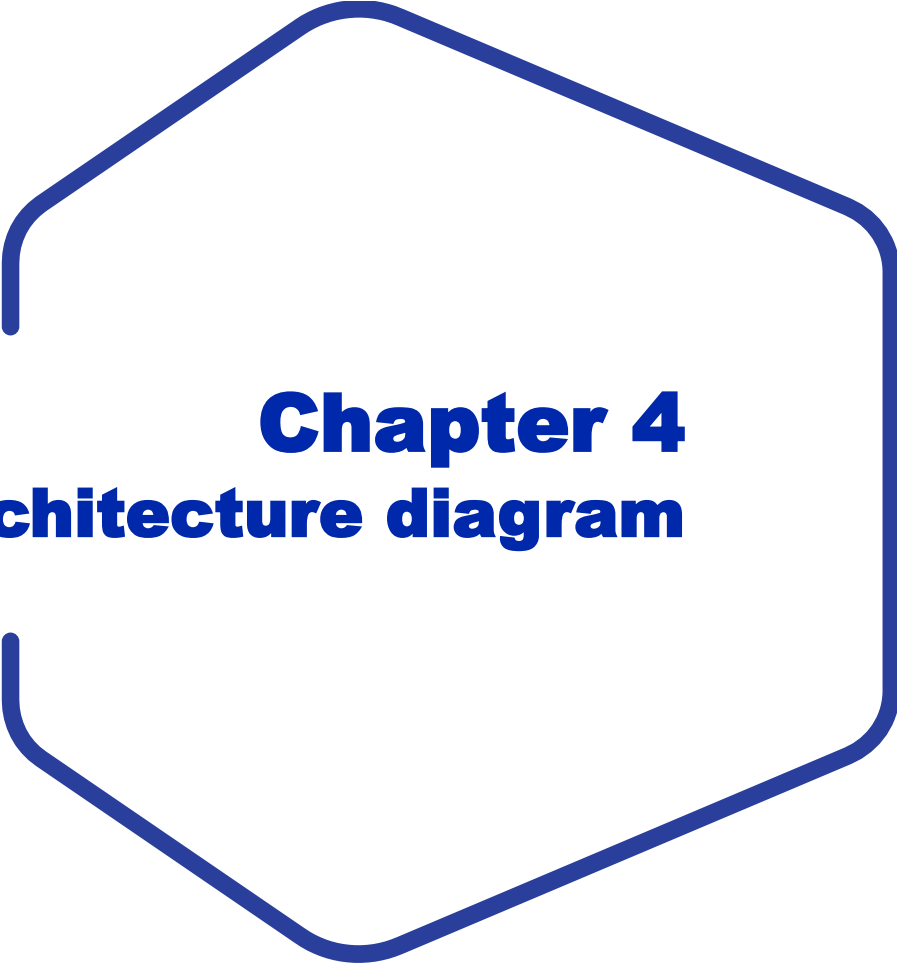
Battery Container Dry Contact Status	Emergency Status
Close	Non-emergency
Open	Emergency

System Matching - Emergency Stop



- Emergency stop
- Emergency stop from client

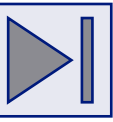




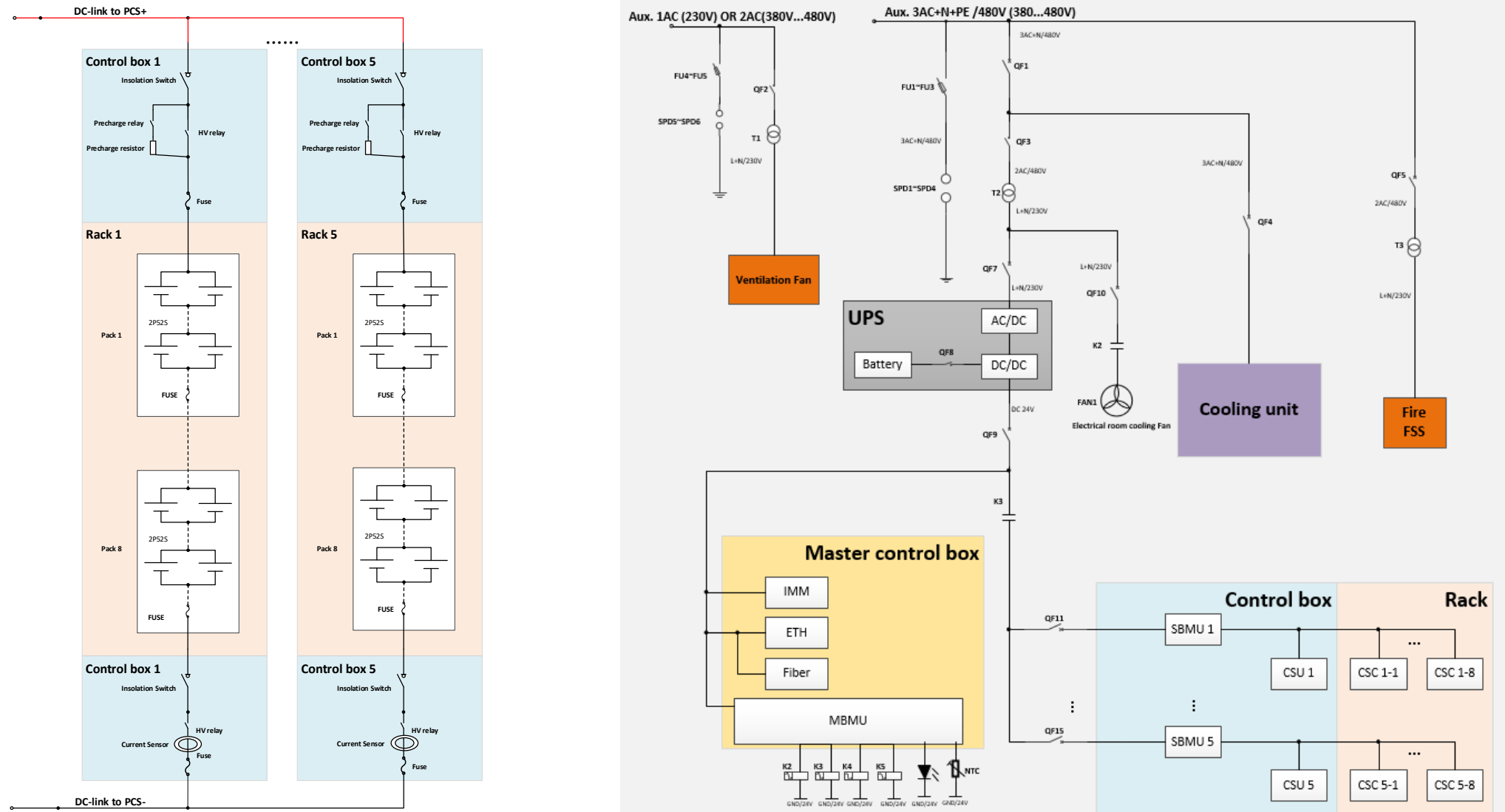
Chapter 4

System architecture diagram

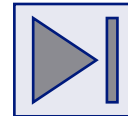
System Functional Diagram - EnerC+



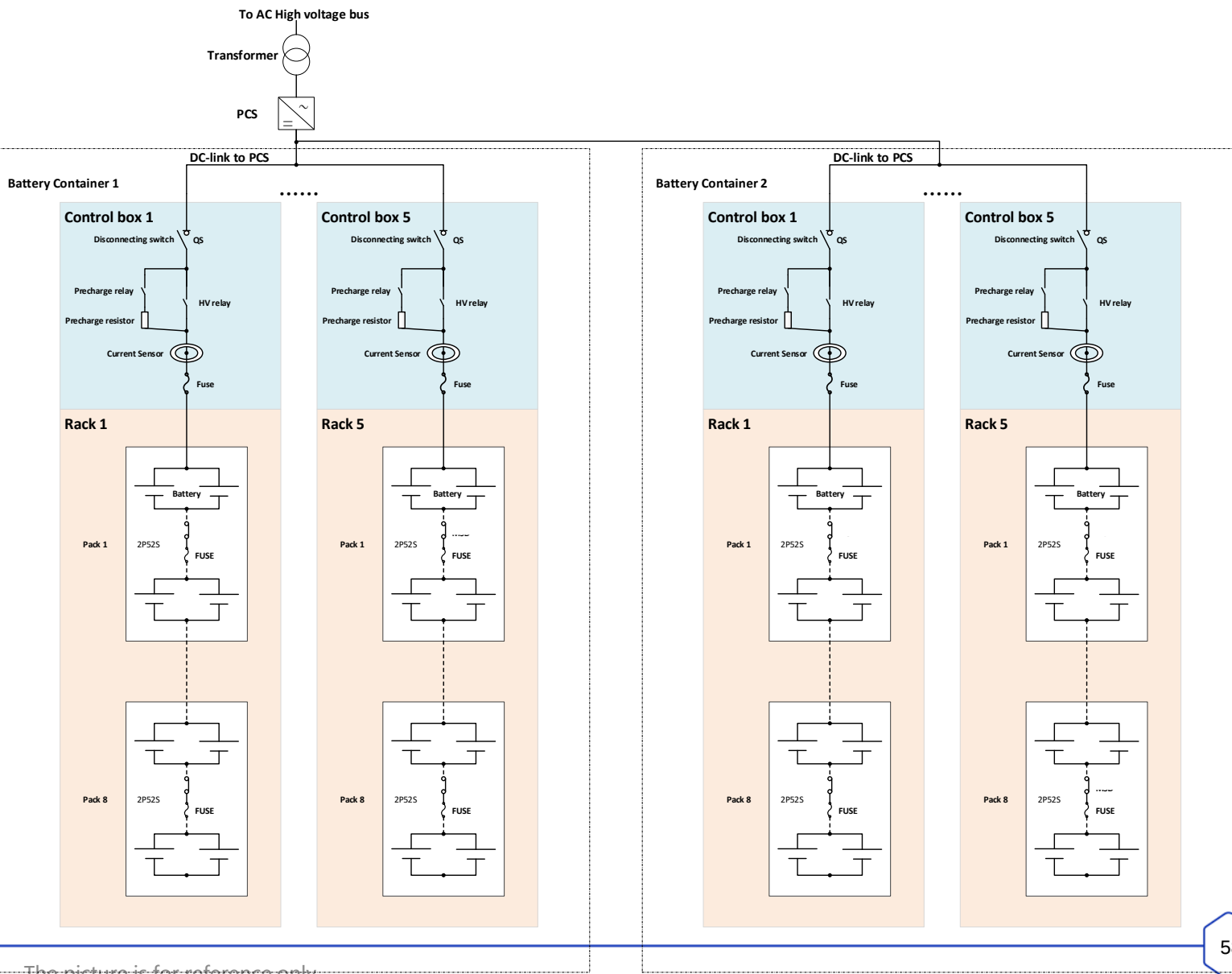
EnerC+ battery container system



System Single Line Diagram - EnerC+

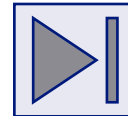


1. Single battery container power and energy is **2.0367MW/4.0734MWh**.
2. Two battery container power and energy are **4.0734MW/8.1468MWh**
3. 5 parallel racks in each battery container.
4. 8 modules in each rack.

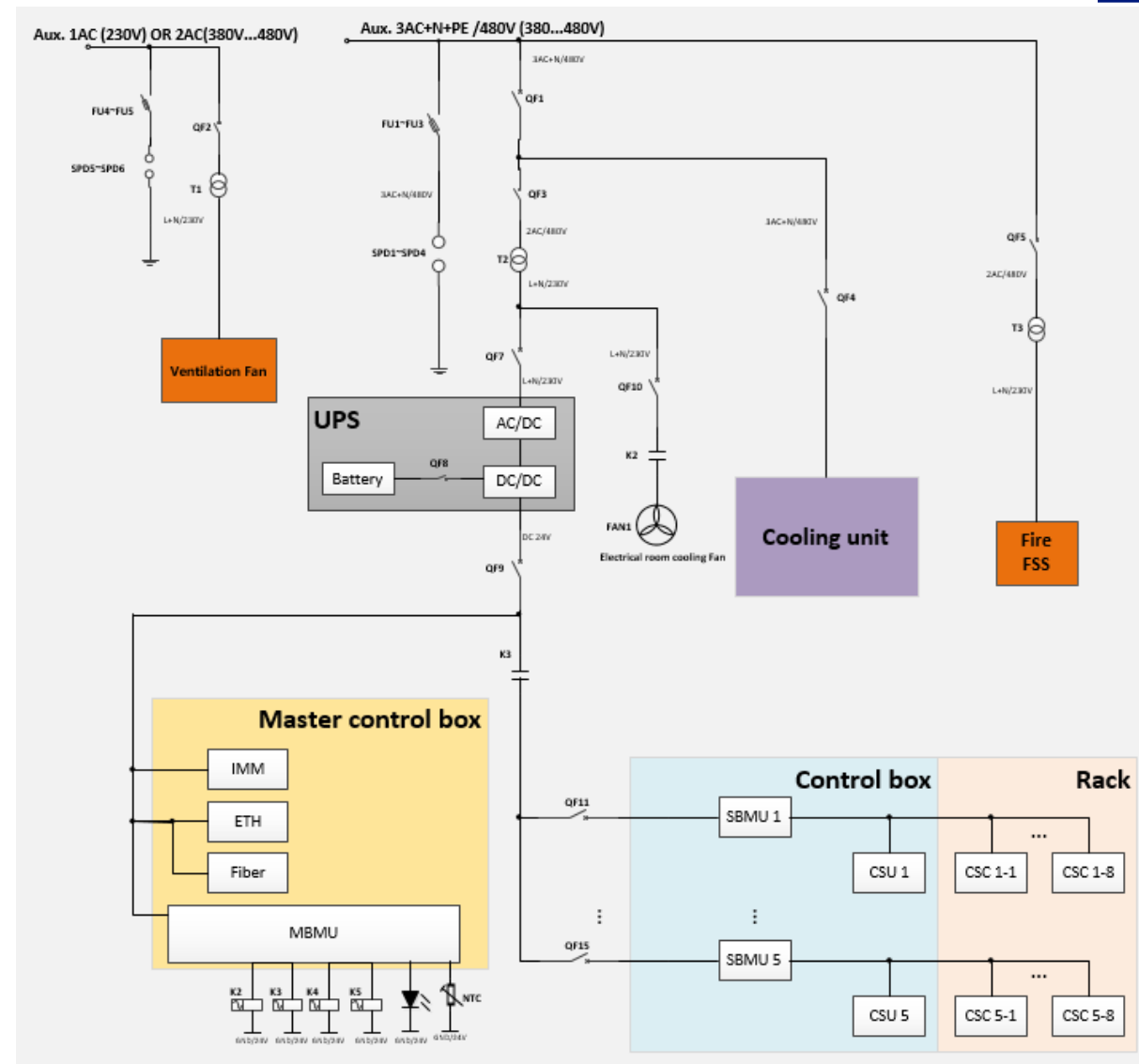


The picture is for reference only

System Single Line Diagram - EnerC+



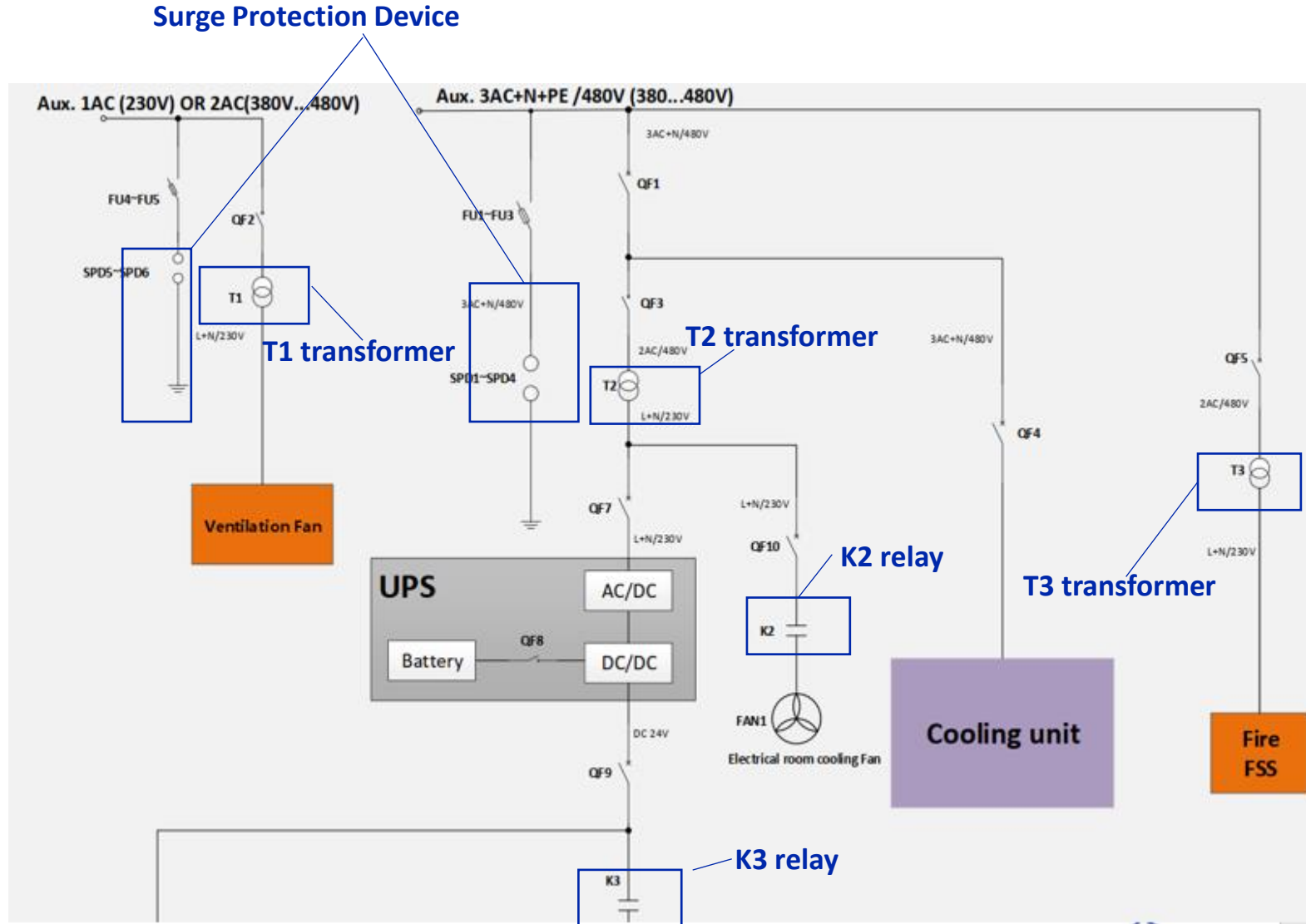
1. Two power sourcing, one is AC 3P+N+PE(380V-480V) ($\pm 10\%$), 50Hz/60Hz power, another one is AC L+N230V ($\pm 10\%$), 50Hz/60Hz power.
2. The AC230V power is for the Smoke exhaust ventilation fan.
3. There are two UPS in battery container. One is for FSS. Another one is for BMS. **The UPS for BMS is only supplying power for BMS components.**
4. All QFs(Breaker) are closed before the auxiliary power is supplied.

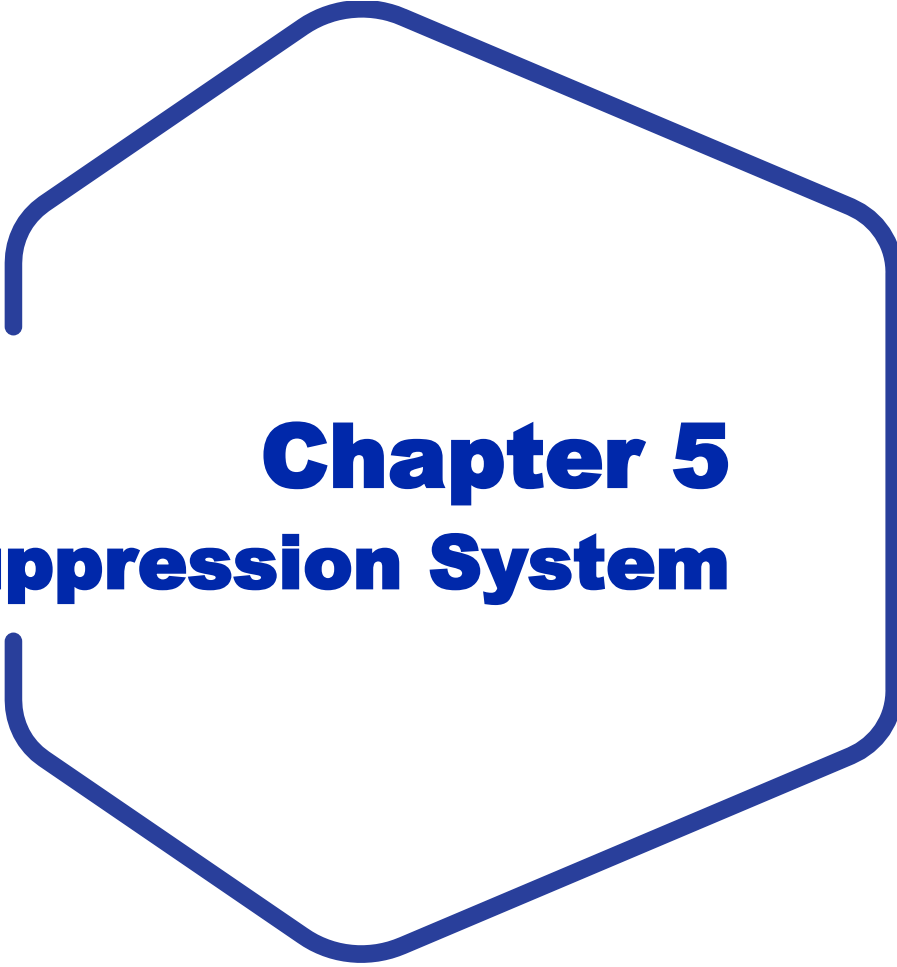


System Single Line Diagram - Ener C+



- ◆ Surge Protection Device is placed on the input port to protect the internal device from the surging power. **SPD 1-4** are for auxiliary 1, while **SPD 5-6** are for auxiliary 2.
- ◆ The **T1** transformer transforms the external UPS AC230V power to the isolated AC230V power.
- ◆ The **T2** transformer transforms the external 2AC/480V to the isolated L+N/230V power
- ◆ The **T3** transformer transforms the external 2AC/480V to the isolated L+N/230V power.
- ◆ **K2 relay** is controlled by MBMU and is used to control power supply to the electrical room cooling fan. When the temperature is high, the K2 will be closed.
- ◆ **K3 relay** is controlled by MBMU and is used to control power supply to all SBMUs and CSCs.

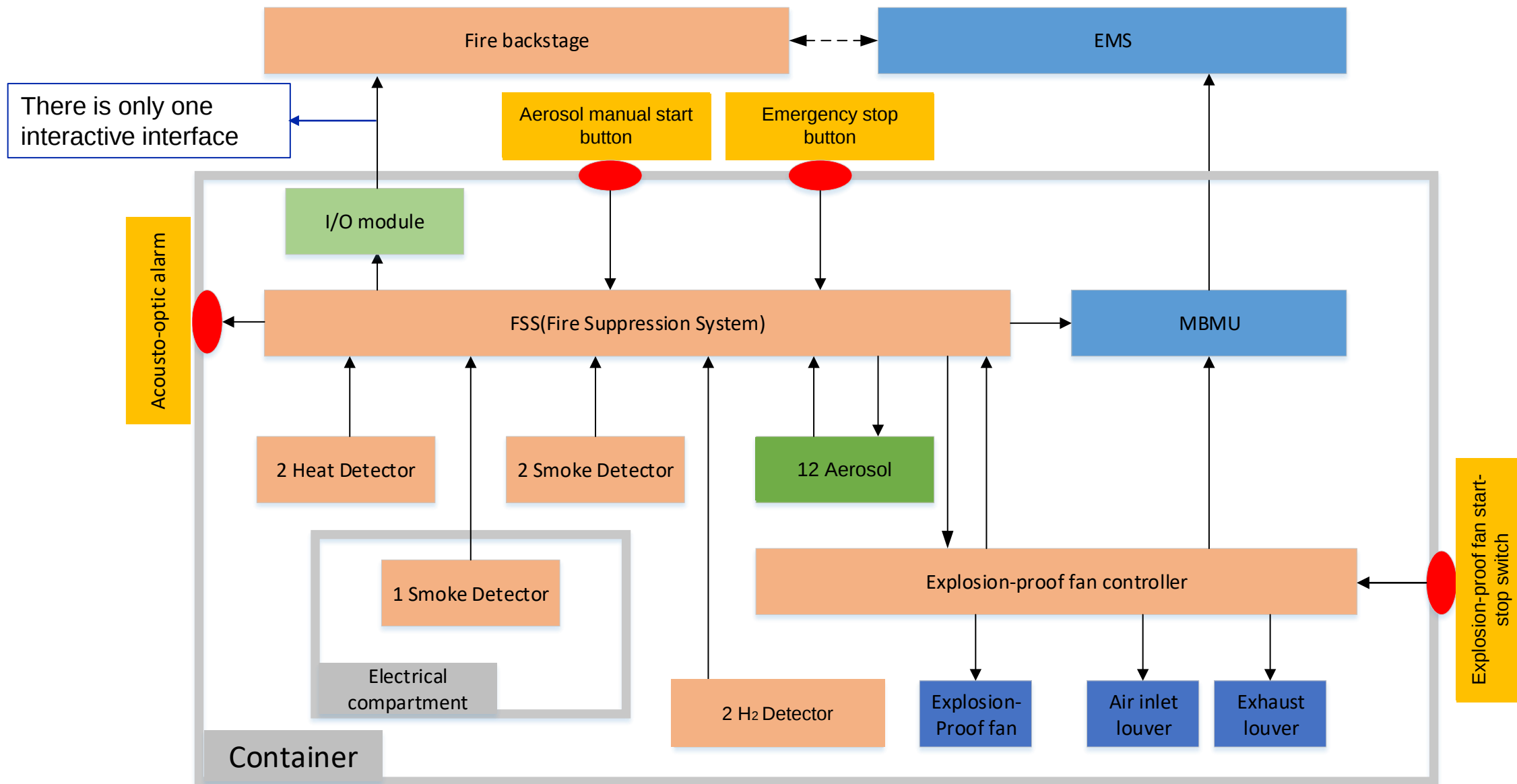
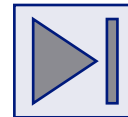




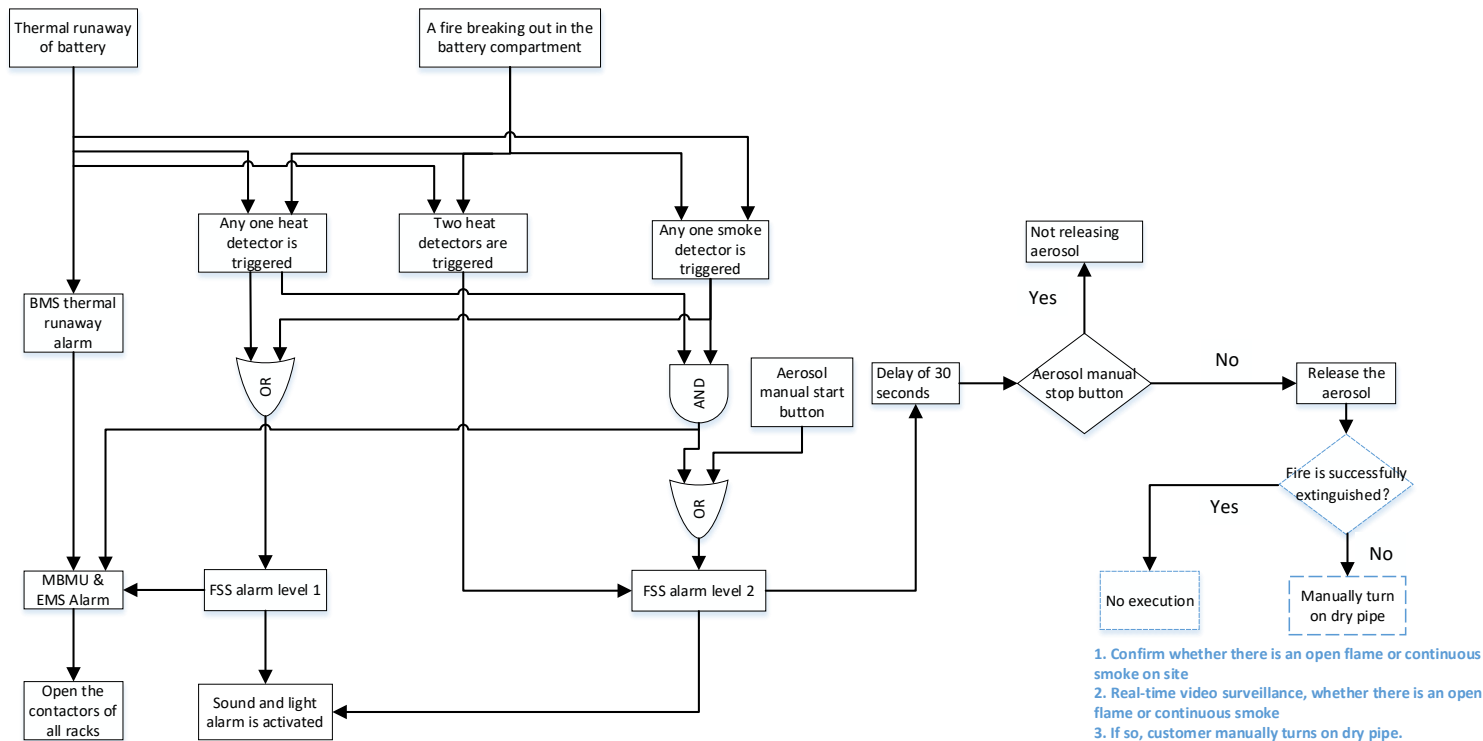
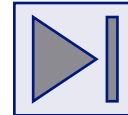
Chapter 5

Fire Suppression System

Fire Suppression System – Interactive Interface



Fire Suppression System – Control logic



Fire detection:

When any one heat or smoke detector gives an alarm, the fire control panel will trigger the FSS alarm level 1:

(1) Triggering sound and light alarm; (2) The fault is transmitted to EMS, and cut off PCS power after 10s.

When both one heat detector and one smoke detector are triggered simultaneously or two heat detectors are triggered simultaneously, the fire control panel will trigger the FSS alarm level 2:

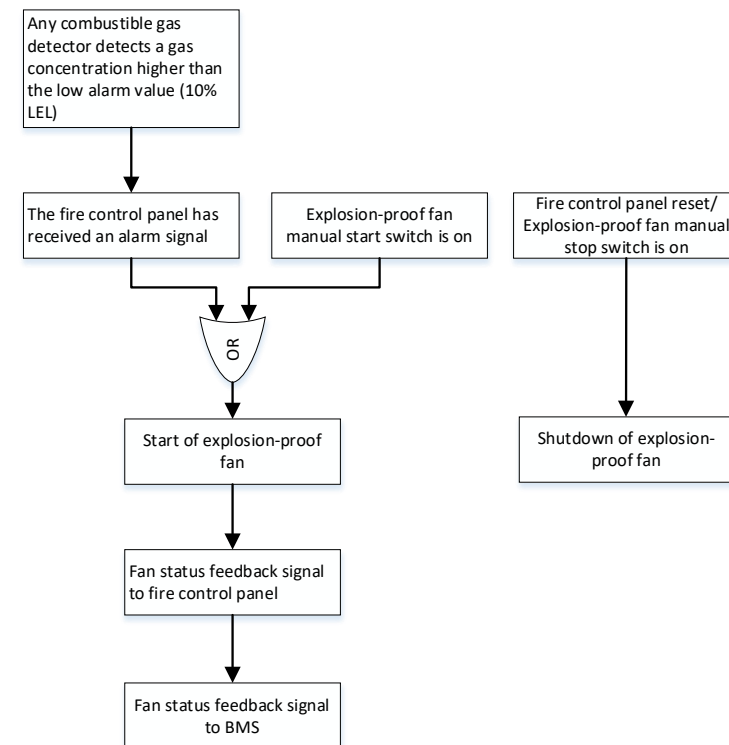
(1) Triggering sound and light report; (2) The fault is transmitted to EMS, and cut off PCS power Immediately.

Manual operation:

(1) When detectors fail, the FSS alarm level 2 can be manually triggered by aerosol manual start button;

(2) When detectors falsely alarms, releasing of aerosol can be manually deactivated by aerosol manual stop button;

(3) When fire is not successfully extinguished, dry pipe can be manually turned on by customer.



Fan start:

(1) Any combustible gas detector detects gas concentration higher than the low alarm value (10% LEL)

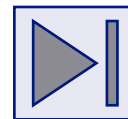
(2) When gas detectors fail, explosion-proof fan can be manually triggered by explosion-proof fan manual start switch

(3) The fault is transmitted to EMS, and cut off PCS power after 10s

Fan shutdown:

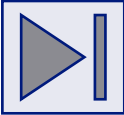
(1) Fire control panel reset/ Explosion-proof fan manual stop switch is on

Fire Suppression System - Configuration table



NO.	Category	Product name	Quantity	Configuration	Location
1	Detection and alarm system	Fire control panel	1	Standard	In the electrical compartment
2		Hydrogen detector	2	Standard	In the battery compartment
4		Smoke detector	3	Standard	Two in the battery compartment One in the electrical compartment
5		Heat detector	2	Standard	In the battery compartment
6		Aerosol manual stop button	1	Standard	In the electrical compartment
7		Horn-Strobe	1	Standard	On the electrical compartment door
9	Smoke exhaust and ventilation system	Ventilation Fan	1	Standard	Adjacent thermal management system
10		Inlet and exhaust louver	1	Standard	On the battery compartment door
11		Ventilation Fan manual start-stop button	1	Standard	On the electrical compartment door
12	Aerosol fire suppression system	Aerosol	12	Standard	In the battery compartment
13		Aerosol manual Start button	1	Standard	On the electrical compartment door
14		Aerosol manual stop button	1	Standard	In the electrical compartment
15	Dry pipe system	Nozzle with rubber plug	10	Optional	In the battery compartment
16		Flange	1		Adjacent thermal management system

Fire Suppression System - Fire control Panel



Fire control Panel (UL)

- The control unit of Fire Suppression System.
- The models shown are only for recommendation and reference.



NYC Fire Dept.
Certificate of Approval
6256



7165-0328;0509



S735



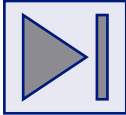
Fire control Panel (EN)

- The control unit of Fire Suppression System.
- The models shown are only for recommendation and reference.

Item	Specification
Supply voltage	240VAC 50/60HZ
Main supply fuse	T 8A H250VAC
Certification	UL864
Web Site	www.pottersignal.com
Model	ARC-100
Maximum Number of Addressing Device	100
Battery capacity	24V 28Ah (24h standby, 2h alarm)

Item	Specification
Supply voltage	200V-240V (+10%, -15%), 50/60Hz AC, 1.0A max
Main supply fuse	T 3.15A H 250V
Certification	EN12094-1, EN12094-3, EN54-2, EN54-4, EN54-13
Web Site	https://uk.advancedco.com/
Model	Ex-3001
Maximum Number of Fire Zones	3
Battery capacity	24V 9Ah (24h standby, 2h alarm)

Fire Suppression System – Sensor and Horn & Strobe(UL)



1.Smoke Detector



2.Heat Detector



3. Flammable Gas Detector



4. Horn & Strobe

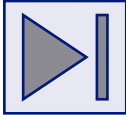
1. Item	Specification
Certification	UL268
Brand/Model	Potter/PAD200-PD
Operating temperature range	0~49 °C

2. Item	Specification
Certification	UL268
Brand/Model	Potter/PAD100-HD
Operating temperature range	0~49 °C

3. Item	Specification
Certification	EN/UL/IEC61010-1, CSA-C22.2, EN 50270, UL2075 , AS 1668.2
Brand/Model	Honeywell/XCL
Operating temperature range	-20°C ~ 50°C
Detection Range	10 to 100%LEL

4. Item	Specification
Decibel	82dBA
Certification	UL 464 & UL 1638
Brand/Model	Potter/HS-24WR-WP
Operating temperature range	-35°C ~ 66°C

Fire Suppression System - Sensor and Horn & Strobe(EN)



1.Smoke Detector



2.Heat Detector



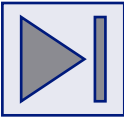
3. Flammable Gas Detector



4. Horn & Strobe

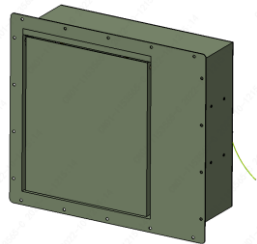
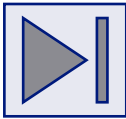
1.	Specification	
	Certification	EN54-7
	Brand/Model	Advanced/AS1000
	Operating temperature range	-30°C / +70°C
2.	Specification	
	Certification	CPR、 LPCB、 VdS, etc
	Brand/Model	Apollo
	Operating temperature range	-20°C ~ 90°C
3.	Specification	
	Certification	ATEX
	Brand/Model	Sensitron-Smart C2
	Operating temperature range	-40°C ~ 60°C
4.	Specification	
	Decibel	94-97dBA
	Certification	EN54-23
	Brand/Model	Advanced/ESC-5003
	Operating temperature range	-10°C to +55°C

Fire Suppression System - Aerosol



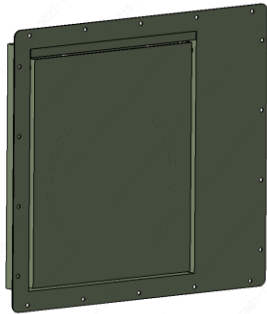
Model	JAD300-U01
Product description	Condensed Aerosol Generator
Executive Standard	ANSI/CAN/ULIULC 2775:2022A Standard for Fixed Condensed Aerosol Extinguishing System Units NFPA2010 Standard for Fixed Aerosol Fire-Extinguishing Systems
Activation method	• Electrical
Weight (gross)	2320g (±2%)
Mass of FPC compound	300g (±6g)
Operational discharge time	15s (±5s)
Dimensions	φ76mm(±0.2mm)x192mm(±1mm) (without bracket)
Fire class	EN 2: A, B, C, E, F - NFPA 10: A, B, C, K

Fire Suppression System –Ventilation fan system



Outlet

The outlet receives the alarm signal from the gas detector, turns on the smoke exhaust ventilation fan and Reduce the concentration of combustible gas in the energy storage box.



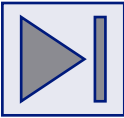
Inlet

The inlet electric louver receives the alarm signal sent by the gas detector and opens the electric louver.

Item	Specification
Air Flow	820±15%CFM
Protection level	IP66

Item	Specification
Protection level	IP66

Fire Suppression System - Dry Pipe

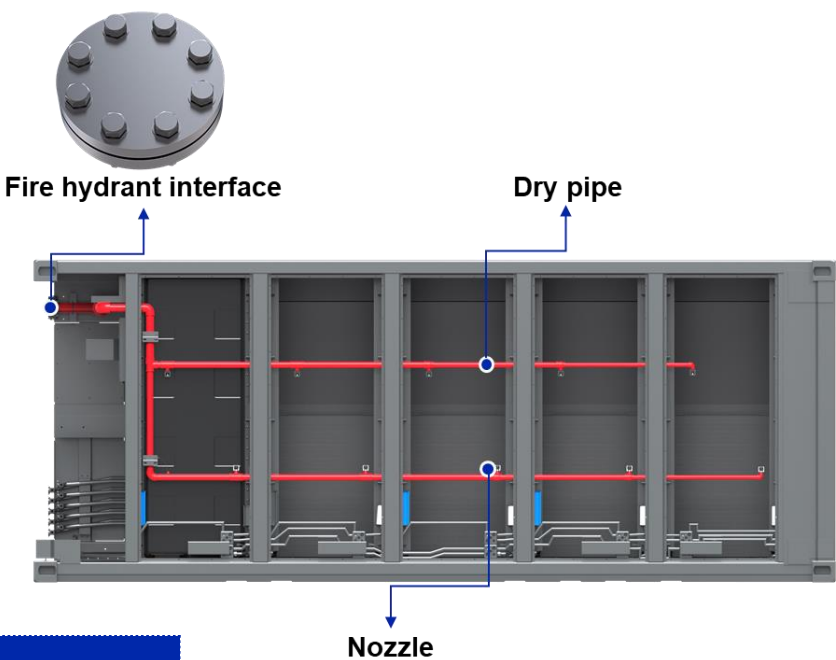


➤ **Dry Pipe**

Pipe design meets API (API 5L Grade B Pipe Seamless, SCH 40) & NFPA 15 standard, Color: RAL 3000 (Red).

➤ **Fire Hydrant Interface**

The flange is installed at the entrance of the water fire protection system, for the connection between the pipes.

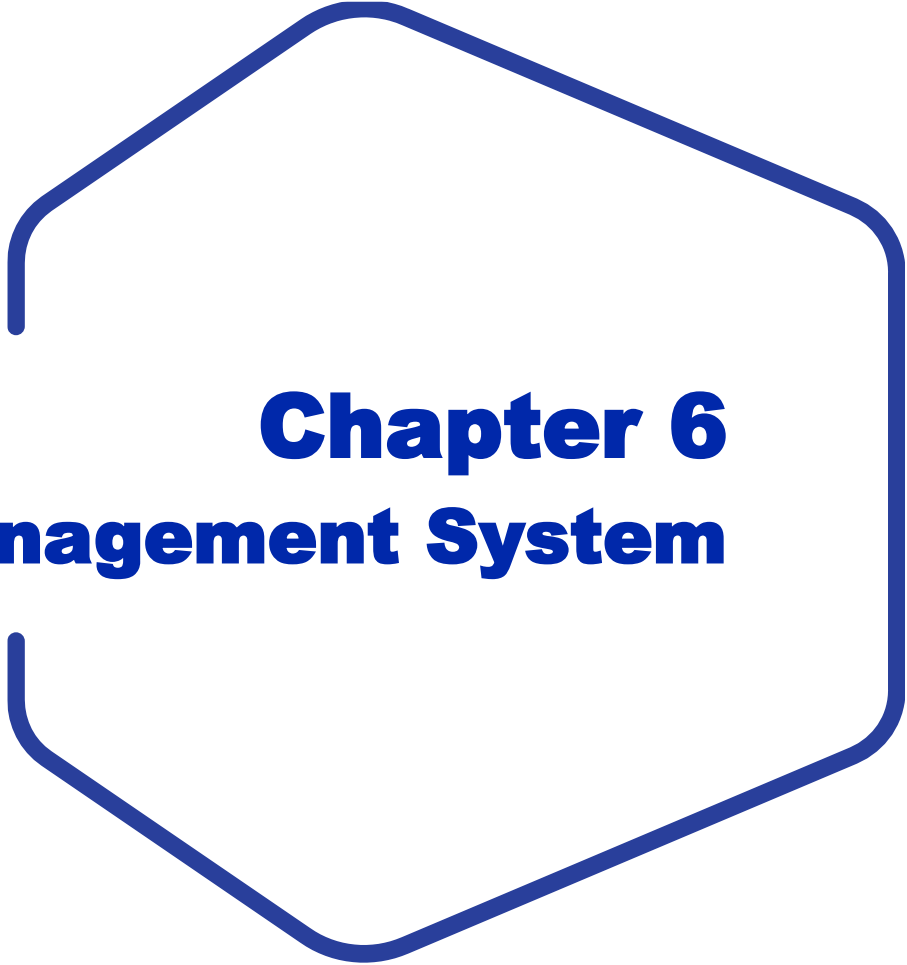


➤ **Nozzle with rubber plug**

The HD Medium Velocity Water Spray Nozzles are open type (non-automatic) nozzles with rubber plug, designed for directional spray application in fixed fire protection system.

Item	Specification
Model	DN65
Standard	EN1092-1
Material	ASTM A105
Class	PN 16
Flange type	TYPE 01 Plate flange for welding TYPE 05 Blind flange
Certificate	PED 4.3 for material
End connection	Integrate in Rack

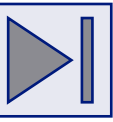
Item	Specification
Model	MV-A Brass Material
Type	MV-A
Maximum working pressure	12bar (175 psi)
End connection	½ BSPT
Heat Sensor Position	Integrate in Rack



Chapter 6

Thermal Management System

Thermal Management System – Description



- **Operating Mode:**

1. Shutdown Mode
2. Cooling Mode
3. Heating Mode
4. Self-circulation Mode

- **Control Mode:**

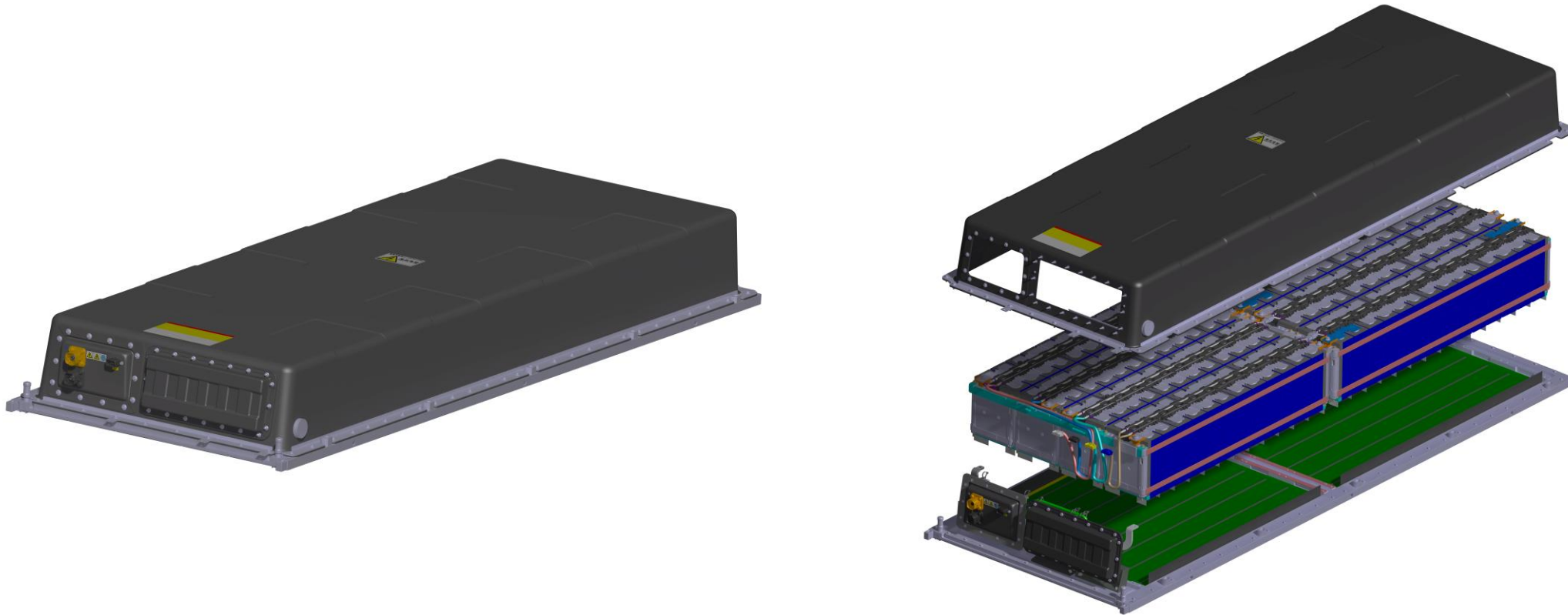
BMS sending mode and target water temperature, the TMS unit works according to the instruction.

- **Abbreviations**

CAN : Controller Area Network

TMS : Thermal Management System

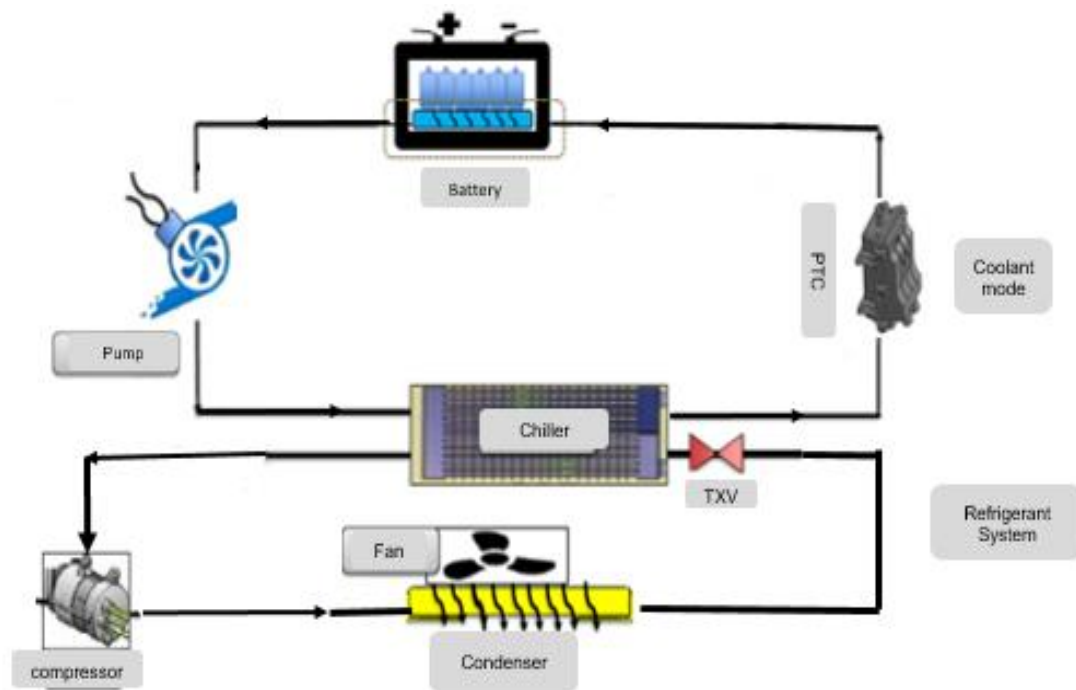
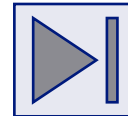
Thermal Management System – Description



Note:

- The bottom plate is at the bottom of battery module , connect to external coolant inlet and outlet pipe . The material is aluminum alloy.
- The whole battery module has passed the insulation test and air tightness test ,do not disassemble without CATL authorization.

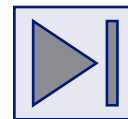
Thermal Management System - Control Logic



BMS send mode and target water temperature, the unit works according to the instruction:

- **Shutdown mode: standby state except HCM (Thermal Control Model) , other parts no working.**
- **Cooling mode: HCM controls the work of cooling elements.**
 1. When the outlet water temperature reaches the target water temperature $(N-5)^{\circ}\text{C}$, the compressor is turned off, and the fan delays to stop. The pump continues to work and enters self-circulation mode;
 2. When the outlet water temperature reaches the target water temp. $(N+1)^{\circ}\text{C}$, the fan and compressor will restart to work.
 3. When the target water temperature $N < 5^{\circ}\text{C}$, the target water temperature is treated as 5°C .
- **Heating mode: HCM controls heating original work**
 1. When the outlet water temperature reaches the target water temperature $(N+5)^{\circ}\text{C}$, close the PTC and the water pump continues to work.
 2. When the outlet water temperature reaches the target water temperature $(N-5)^{\circ}\text{C}$, PTC starts again.
 1. When the target water temperature $N > 55^{\circ}\text{C}$, the target water temperature is treated as 55°C .
- **Self-circulation mode: HCM controls the pump to work at a constant speed.**

Thermal Management System - Maintenance

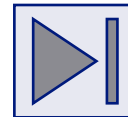


Inspection Scope	Normal Value Range	Maintenance	Inspection Period	Notes
Inlet and outlet pressure difference	< 50 kPa	If the unit has alarm 51 , add coolant.	24 months	Pump Running
Refrigerant low pressure	< 140 kPa	If the unit has alarm 11/14 , add refrigerant.	24 months	Compressor Running
Refrigerant high pressure	> 280 kPa	If the unit has alarm 22/25 , add refrigerant.	24 months	Compressor Running
Inlet filter	/	Use special tools to clean air inlet filter.	12 months	System power off
Outlet filter	/	Use special tools to clean air inlet filter.	12 months	System power off
Condenser	/	Use special tools to clean condenser.	12 months	System power off

Note:

- The inspection period is determined according to the site environment.
- Please communicate with CATL's after-sales team about routine maintenance on site.
- It is forbidden to mix different brands of coolant.

Thermal Management System - Discharge Power Mapping

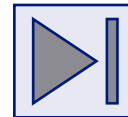


T \ SoC	0.0	5.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100
-30°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-25°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-20°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
-15°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
-10°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
-5°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
0°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
5°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
10°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
15°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
20°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
25°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
30°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
35°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
40°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
45°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
50°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
55°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
60°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note:

- “T” means the cell temperature.
- BMS will do power limit according to Discharge Power Mapping, please respond to BMS power limit request.
- Standard thermal management strategy:
- Cooling: $T > 24^{\circ}\text{C}$ On / $T < 21^{\circ}\text{C}$ Off
- Heating: $T < 16^{\circ}\text{C}$ On / $T > 18^{\circ}\text{C}$ Off

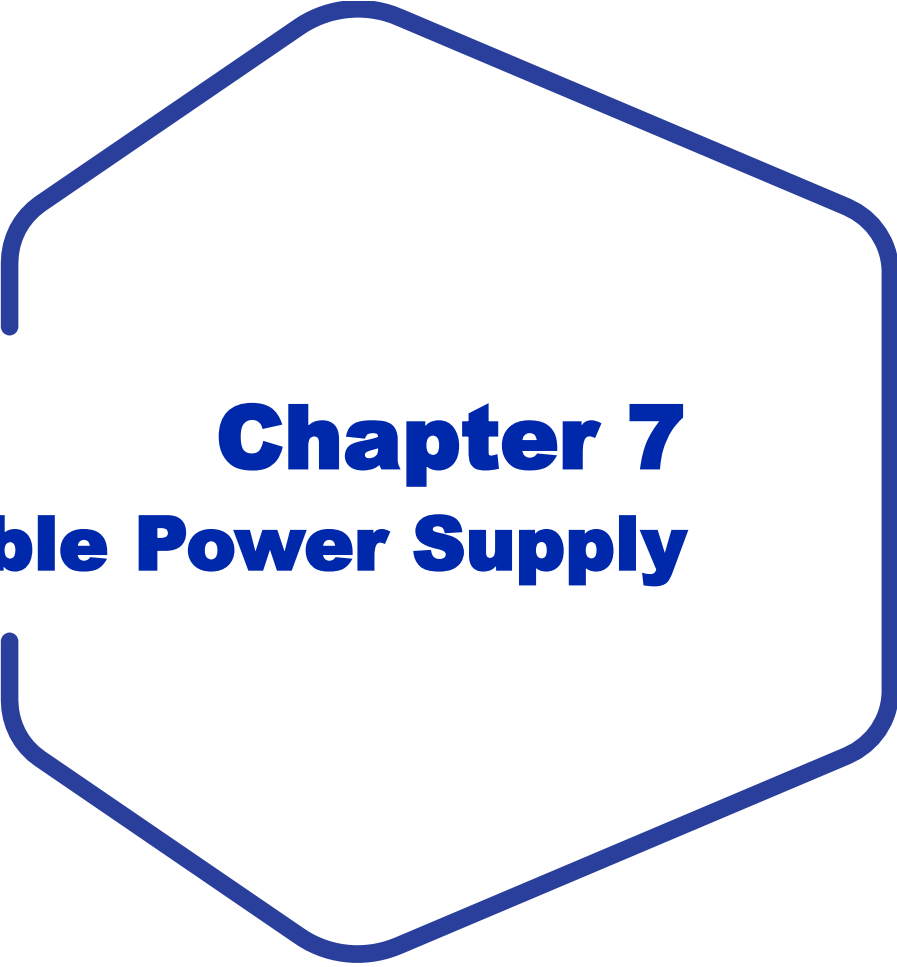
Thermal Management System - Charge Power Mapping



T\SoC	0.0	5.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	95.0	100
-30°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-25°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-20°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-15°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-10°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-5°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5°C	0.30	0.31	0.28	0.23	0.19	0.16	0.13	0.11	0.09	0.07	0.06	0.05	0.05
10°C	0.50	0.50	0.50	0.46	0.37	0.31	0.26	0.23	0.18	0.15	0.12	0.11	0.10
15°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.45	0.37	0.30	0.24	0.22	0.21
20°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.46	0.46
25°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
30°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
35°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
40°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
45°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
50°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
55°C	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
60°C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note:

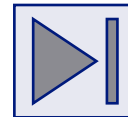
- “T” means the cell temperature.
- BMS will do power limit according to Discharge Power Mapping, please respond to BMS power limit request.
- Standard thermal management strategy:
- Cooling: $T > 24^{\circ}\text{C}$ On / $T < 21^{\circ}\text{C}$ Off
- Heating: $T < 16^{\circ}\text{C}$ On / $T > 18^{\circ}\text{C}$ Off



Chapter 7

Uninterruptible Power Supply

Uninterruptible Power Supply – Description

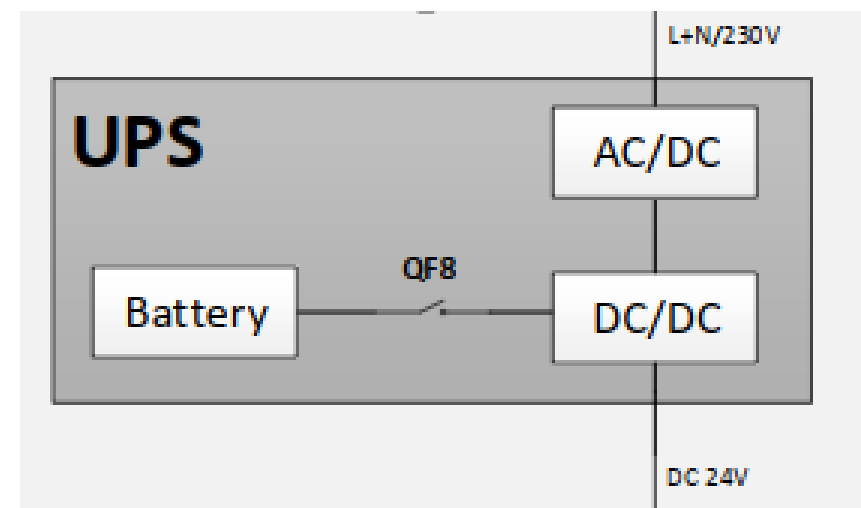


There are two UPS in battery container. One is for FSS. Another one is for BMS. The UPS for BMS is only supplying power for BMS components.

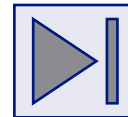
UPS 1: UPS for BMS

- The UPS consist of AC/DC component, DC/DC component and UPS battery. Input voltage of UPS is AC 230V which is from T2 transformer in battery container. Output voltage of UPS is DC 24V which is used for BMS components power supply.
- The UPS is only used to supply power to BMS components. The Power supply time is up to 20 minutes for BMS.

Item	input voltage	Output Power	output voltage
UPS AC/DC component	AC230V	960W	DC24V
UPS DC/DC component	DC24V	960W	DC24V
UPS battery	DC24V. 7Ah capacity.		



Uninterruptible Power Supply – Description



Case 1: UPS was discharged to supply the system

- (1) Once the UPS was discharged to supply the system. please recharge the battery to full state in 7 days. Once the interval time exceeds 30 days, the battery will have the risk of over discharged.



Case 2: UPS is stored for more than 3 months

- (1) UPS should be stored with full charged state, and it needs to be recharged every 3 months
- (2) Charge method: Connect auxiliary power supply (3AC,400V), close QF1, QF3,QF7 and QF8 one by one. When you found “Battery Capacity” of UPS green light on, continue charging for 12h. Then the battery can be considered full charged. UPS voltage of full charged is around 27V.Disconnect QF8 before you disconnect auxiliary power supply.
- (3) Please keep the voltage of UPS over 19.2V. The minimum voltage should not be less than 12 V in any case, Otherwise, the battery will over-discharged and can not be repaired.

Power consumption in different Profiles	Storage	Normal start up	Operation	Normal running	Normal shut down	Emergency shut down	Thermal runaway
BMS component(W)	0	503.4	252.6	252.6	110	110	0
UPS backup time@25°C	\	\	10min	10min	20min	20min	0
UPS backup time@-10°C	\	\	5min	5min	15min	15min	0

Note: The above table shows the parameters when the UPS time knob is 20min

Uninterruptible Power Supply – Description

UPS 2: UPS for FSS

1. Charge requirements

- **Charge method:** Connect auxiliary power supply firstly, then close QF5, start Fire control panel and connect UPS battery charge circuit manually(Fig.2). When charging duration over 24h or voltage over 25.9V, UPS battery can be seen full charged.

2. Before COD

- Please recharge UPS battery each 3 months before COD, especially after the transportation during FAT to SAT.
- Disconnect battery circuit (Fig.2) manually if you want to store UPS for a long period. please recharge UPS battery each 3 months.

3. Normal operation

- UPS battery can supply power for 24h automatically. Disconnect UPS battery circuit manually when power off duration over 24h.
- After 24h of discharge , please reconnect UPS battery circuit and recharge UPS battery with 24h according to the standard EN54. It will cause UPS battery over-discharge and irreversible loss if interval duration exceeds standard time.

4. Voltage requirement

- Please ensure UPS voltage over 24V at any conditions.



Fig.1 Fire Control panel

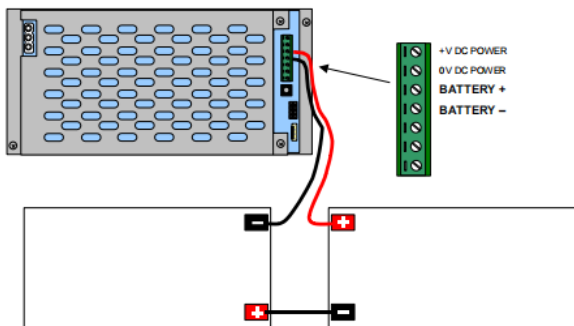
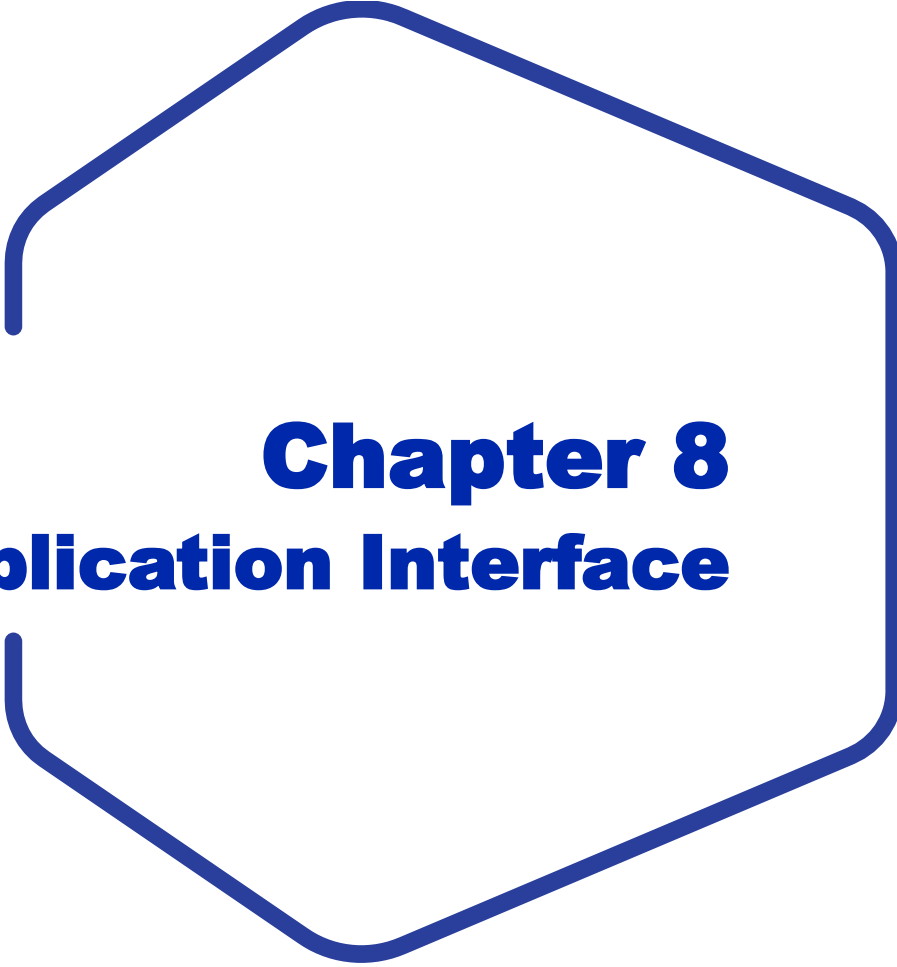


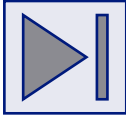
Fig.2 UPS battery circuit



Chapter 8

System Application Interface

System Application - Containers Label & Marking



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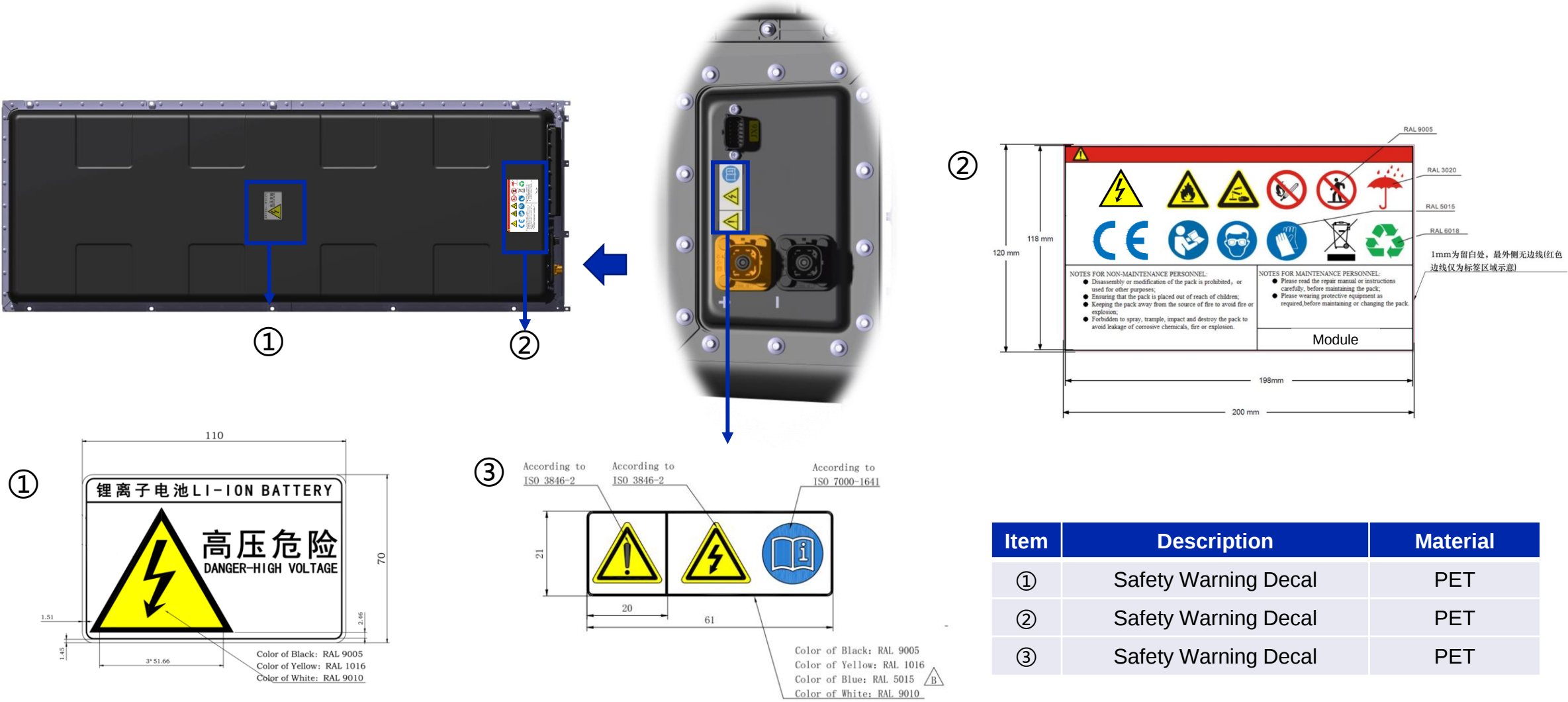
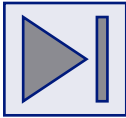
CATL 宁德时代

*Confidential 秘密

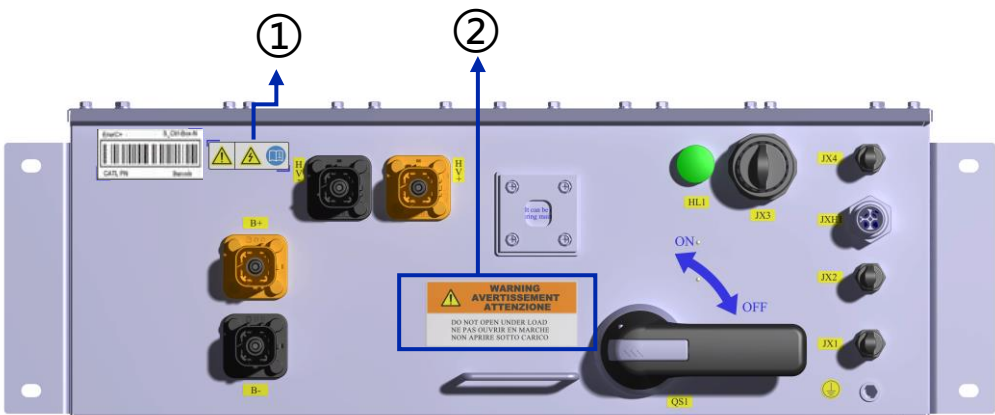
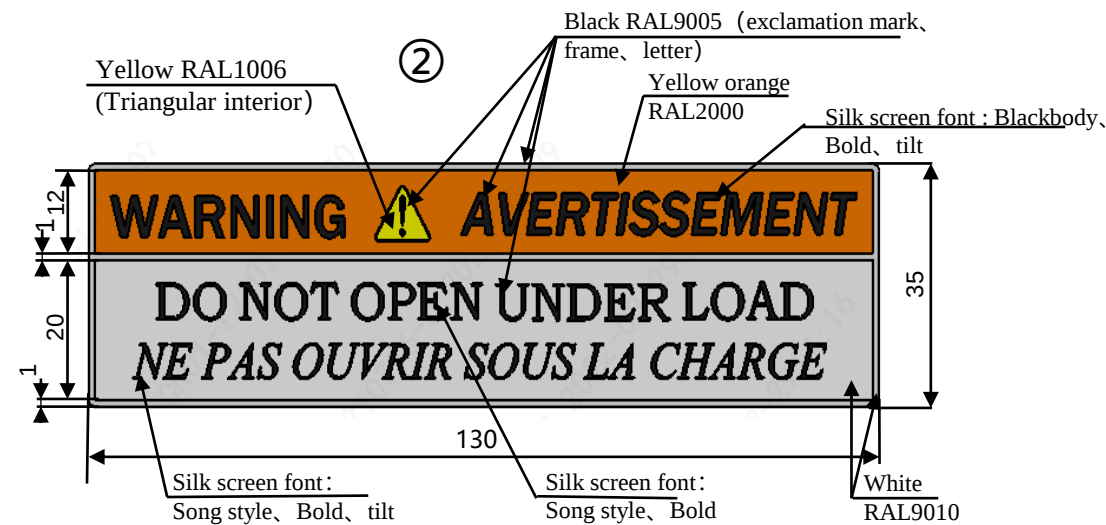
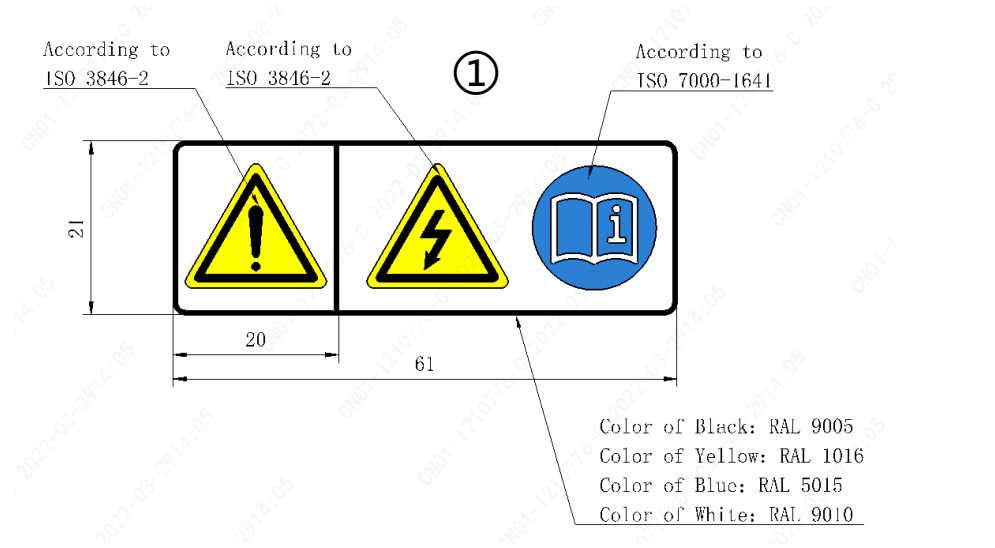
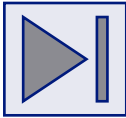
The picture is for reference only

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System Application - Battery Module Label & Marking

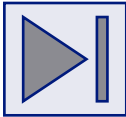


System Application - Control Box Label & Marking



Item	Description	Material
①	Warning Label	PET
②	Warning Label	Silk Screen

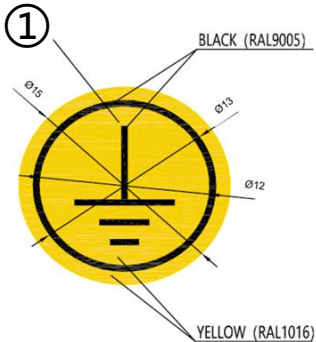
System Application - GND Marking



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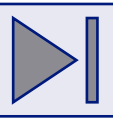


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Item	Description	Material
①	GND Marking	PET

System Application - SOC Calibration Description

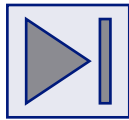


- CATL BMS shall automatically calibrate individual Battery Subsystems SOC as well as the System SOC in cases where pre-conditions of one of the Calibration modes defined below are fulfilled.
- All specific details related to maintaining SOC accuracy as defined in this document are assuming that the actual cell temperature will be higher than +10°C, which is a precondition for successful SOC Calibration.
- The table below defines maximum accumulated SOC error values as a function of Full-Equivalent cycles performed without SOC Calibration. Those Accumulated SOC Error values shall be valid universally for all different use cases independently from the actual power profile and throughout the entire lifetime of the battery until reaching its End-of-Life.
- Absolute maximum SOC inaccuracy that could be achieved by not meeting any of the possible calibration conditions is $\pm 15\%$.

# of full-equivalent cycles without SOC calibration	Maximum SOC error Δ SOC, %
≤ 0.25	$\pm 0.125\%$
≤ 0.5	$\pm 0.25\%$
≤ 1	$\pm 0.5\%$
≤ 2	$\pm 1\%$
≤ 7	$\pm 3.5\%$
≤ 14	$\pm 7\%$
> 14	$\pm 15\%$

Note : Full equivalent cycle is defined as Discharged Energy throughput equal to the battery BOL nominal energy capacity .

System Application - SOC Calibration Methods



SOC calibration		
	SOC-Range	Calibration Condition
Static Calibration	$\leq 25\%$	Stay 1 h below 25% SOC with current $\leq 2A$.
Dynamic Calibration	$\leq 25\%$	Stay 3 min below 25% SOC with current $\leq 3A$.
High-end Calibration	100%	Stay full charge cut-off voltage for 2 sec.

* For Static and Dynamic Calibration ($\leq 25\%$ SOC Range), Suggest to discharge the cell to cut-off voltage.

System Application - ESS Storage Environment



- Environmental conditions during short-term storage

Parameter	Value/Range	Comment
Allowed Ambient Temperature Range (°C)	-30 ~ 60	The storage temperature shall not exceed the allowable range in any case.
Resting Daily average ambient temperature (°C)	≤25	Higher temperature storage will cause additional irreversible degradation.
SOC Value of battery storage	> 10%	Recommended Value

- Environmental conditions during long-term storage

Parameter	Value/Range	Comment
Allowed Ambient Temperature Range (°C)	-30 ~ 60	The storage temperature shall not exceed the allowable range in any case.
Resting Daily average ambient temperature (°C)	≤25	Higher temperature storage will cause additional irreversible degradation.
SOC Value of battery storage	50%	Recommended Value
Minimum voltage during long-term storage	Cell Voltage (OCV) shall not drop below 3.1Vdc	Appropriate recharging procedure needs to be followed in accordance with CATL O&M manual.
Storage environment	Humidity≤95% No condensing	Inspection & maintenance every three months accordance with CATL Q&M manual.

System Application - ESS Standby Scenario

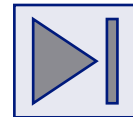


- Environmental conditions during standby scenario

Parameter	Value/Range	Comment
Allowed Ambient Temperature Range (°C)	-25 ~ 55	The storage temperature shall not exceed the allowable range in any case.
SOC Value of battery standby	> 5%	Recommended Value, Take the minimum Cell voltage value as the judgment basis (SOC 5%, corresponding static voltage is 3.186V) .
Minimum voltage during standby scenario	Cell Voltage (OCV) shall not drop below 2.5Vdc	◆ The minimum cell voltage should not be less than 2.5 V in any case, Otherwise, the warranty will be lost. ◆ The minimum cell voltage should not be less than 2.0 V in any case, Otherwise, the battery will over-discharged and may not be repaired.
Self-discharge of battery in standby state	1.5% + 2% per month	◆ Considering the standby state of the battery, the function module in BMS will take power consumption on the battery side in standby state is 1.5% per month, and the self-discharge of the battery is 2% per month. Noted: 3.5% self-discharge per month from battery side should be considered.
Power consumption on PCS side	/	When the BESS high voltage circuit is closed, the power consumption on the DC side of PCS (such as voltage divider resistor, IGBT, etc.) will increase the power consumption on the battery side. Therefore, when SOC is kept at low level, there will be over-discharge risk.

★ In standby state, please monitor the battery status according to the above requirements to prevent the battery from over-discharge risk.

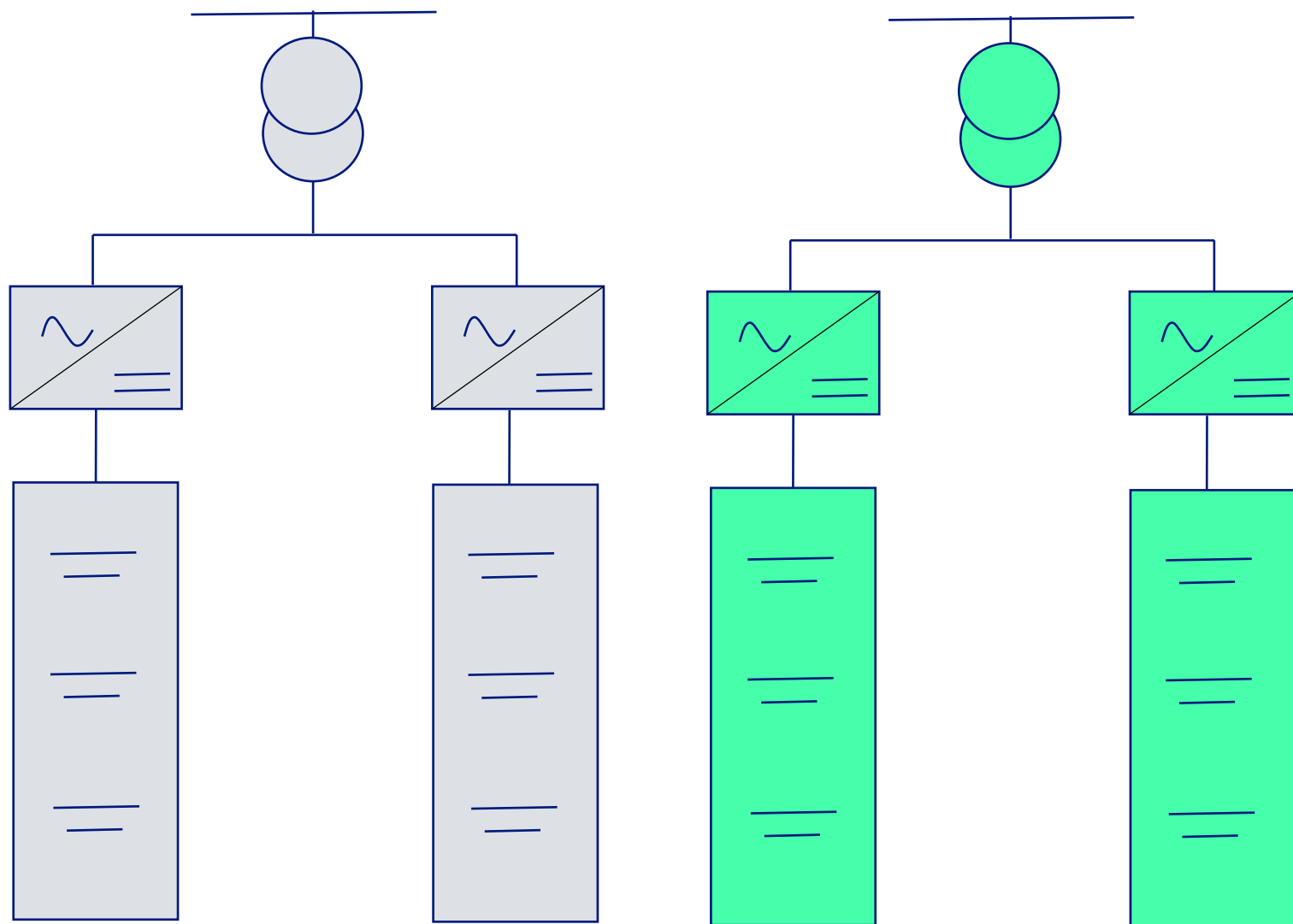
System Application - ESS Operation Scenario



- Environmental conditions during operation scenario

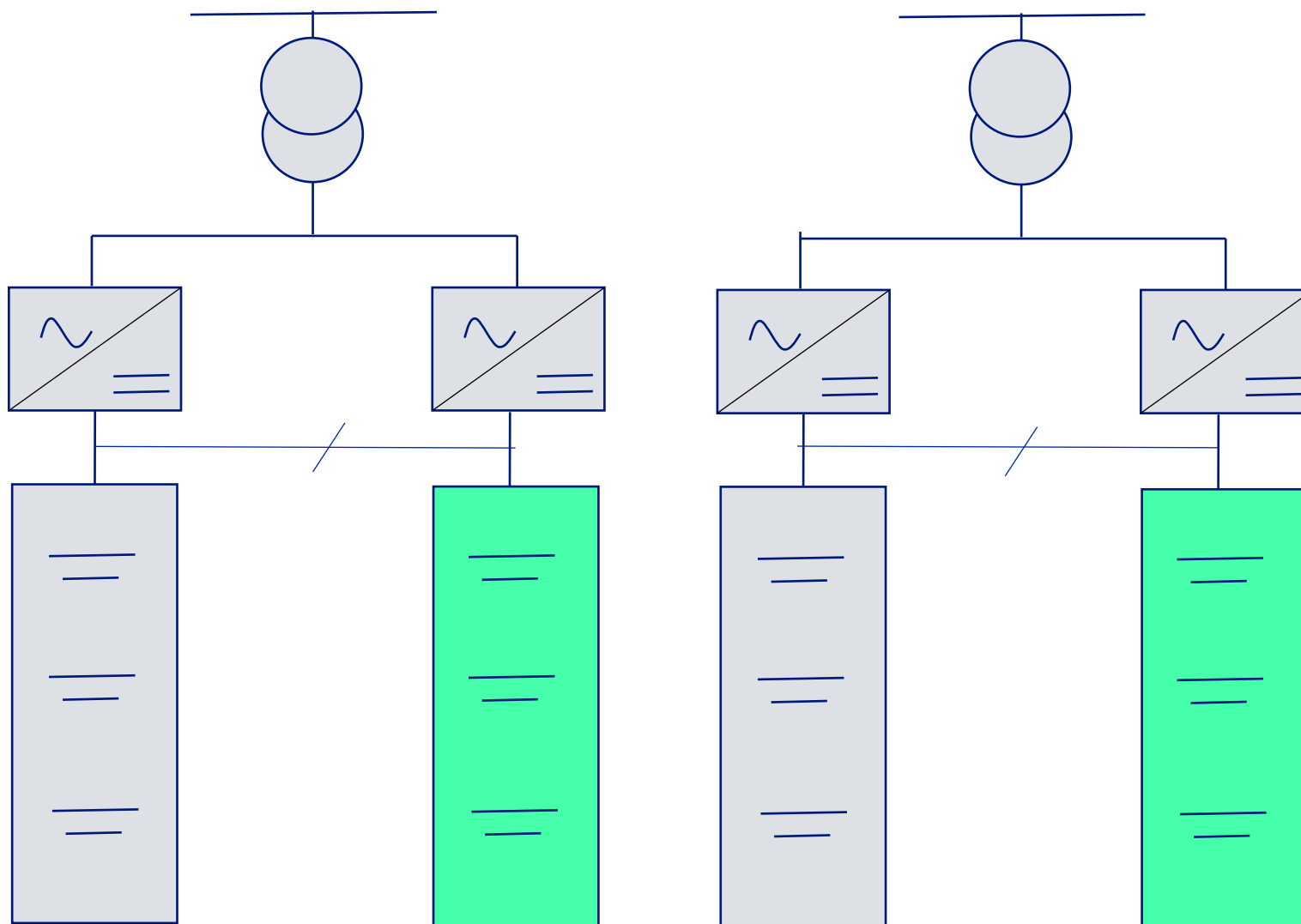
Parameter	Value/Range	Comment
Allowed Ambient Temperature Range (°C)	-25 ~ 55	The storage temperature shall not exceed the allowable range in any case.
SOC Value of battery operation	0~100%	The battery can work in the range of 0-100% SOC. Please note that when there is standby operation condition, please keep the SOC above 5%.
Minimum voltage during operation scenario	Cell Voltage (OCV) shall not drop below 2.5Vdc	◆ The minimum cell voltage should not be less than 2.5 V in any case , Otherwise, the warranty will be lost. ◆ The minimum cell voltage should not be less than 2.0 V in any case , Otherwise, the battery will over-discharged and may not be repaired.

System Application - Augmentation plan 1



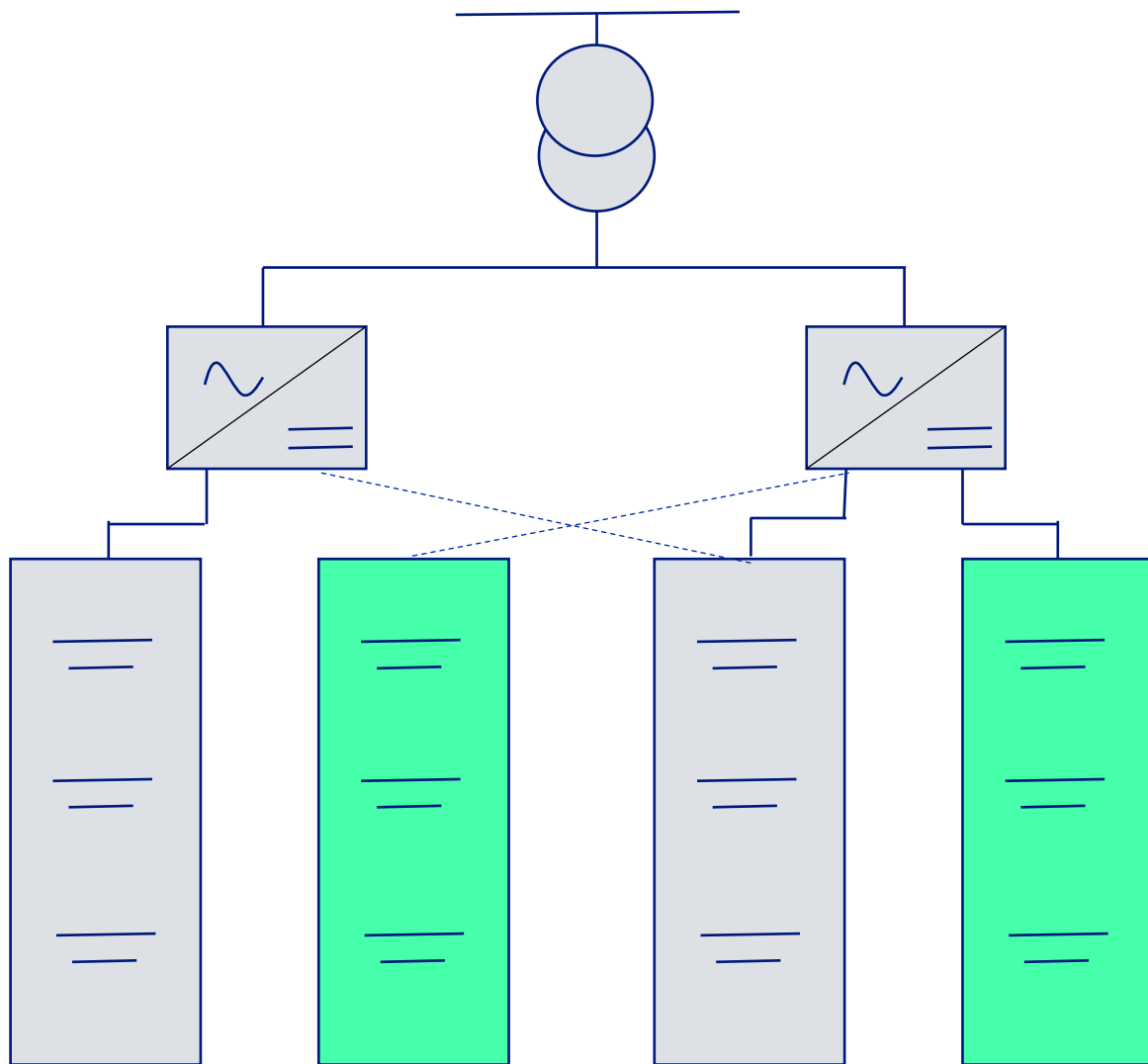
- Augmentation of AC Side
- Reserve capacity on AC side, when there is requirement for augmentation, we can increase the capacity of BESS by adding transformers, PCS, batteries, etc. at the AC side.

System Application - Augmentation plan 2



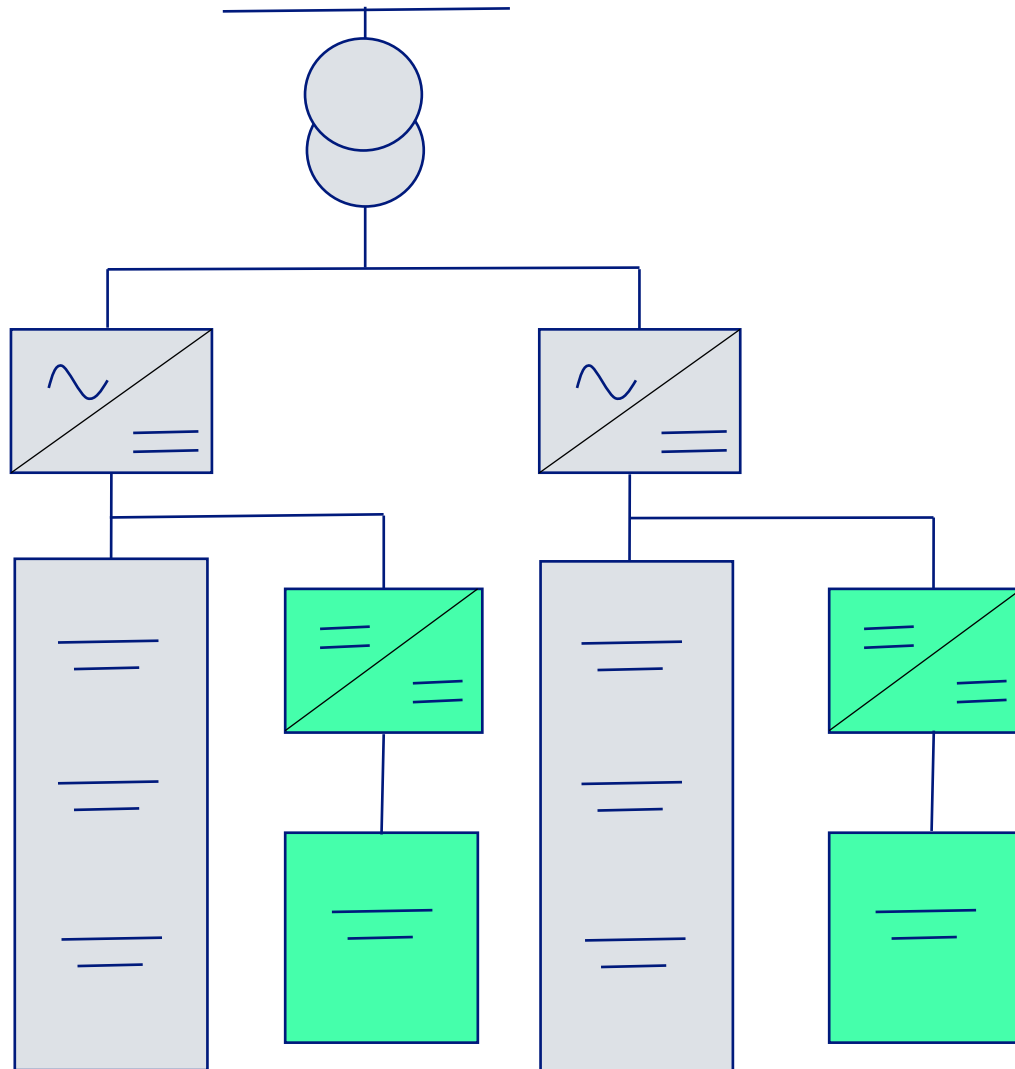
- Augmentation of DC Side:
- Reserve capacity on DC side, by reserving PCS.
When there is requirement for augmentation.
We can increase the capacity of BESS by adding battery under the reserved PCS.

System Application - Augmentation plan 3



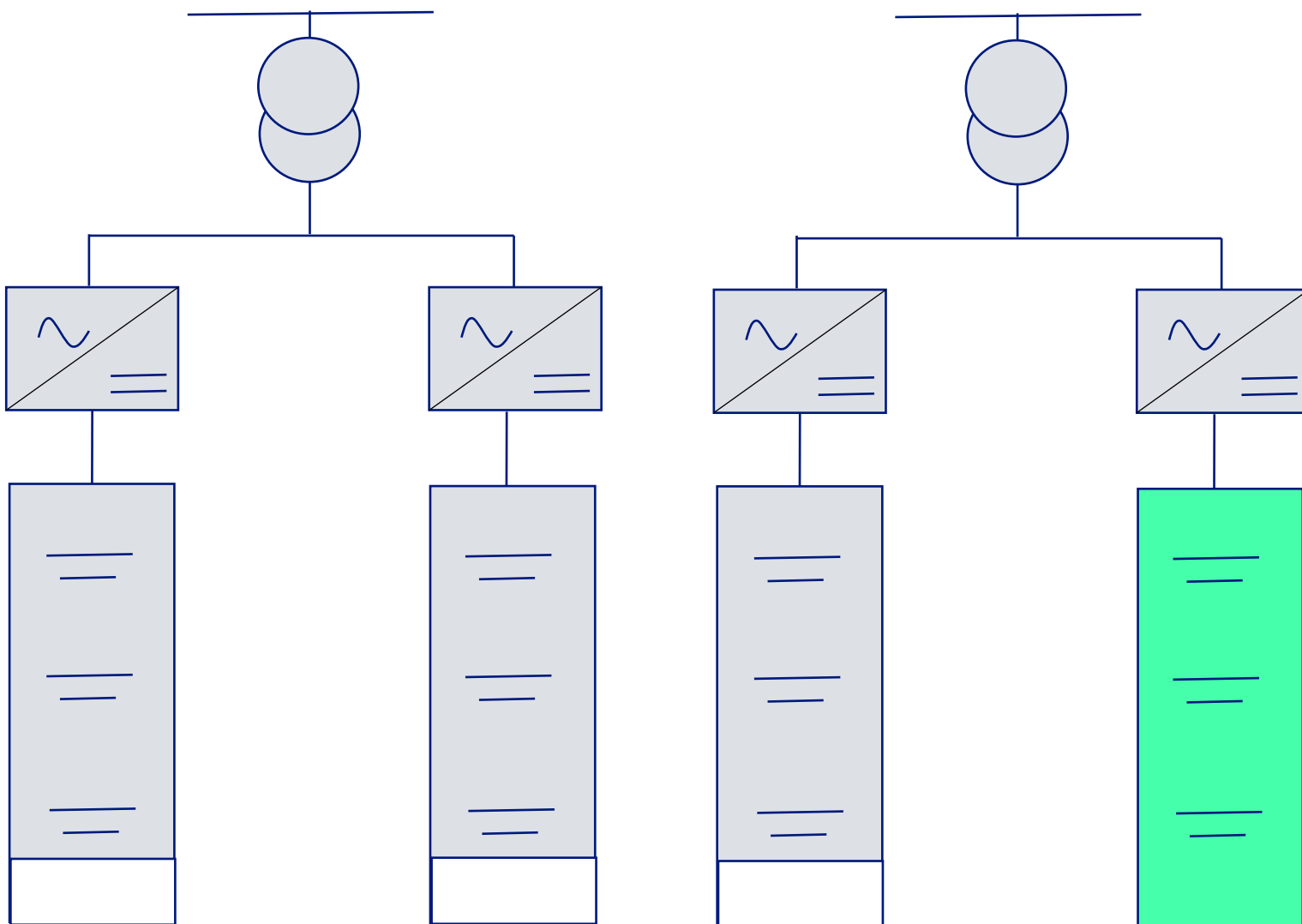
- Augmentation of DC Side :
- Reserve capacity on DC side, by reserving PCS capacity. When there is requirement for augmentation. We can increase the capacity of BESS by adding battery under the reserved PCS capacity, and make sure new battery use under same PCS, and old battery use under same PCS.

System Application - Augmentation plan 4



- Augmentation of DC side:
- Reserve capacity on DC side, by reserving PCS capacity. When there is requirement for augmentation. We can increase the capacity of BESS by adding battery under the reserved PCS capacity, and using DC/DC to do balance.

System Application - Augmentation plan 5



- Augmentation of DC side:
- Reserve capacity on DC side, by reserving PCS capacity. When there is requirement for augmentation. We can increase the capacity of BESS by adding battery under the reserved PCS capacity, and keep new battery or old battery at same PCS.

Compliance Checklist

NO.	Items	Link	Check	Notes
1.1	Does the parameter shown in the overview of the Container meet the requirements? Has CATL provided an Product specification ? (P4,P5)	Click to view	Yes or No	If no , please make notes.
1.2	Does the parameter shown in the overview of the Battery Module meet the requirements? (P6)	Click to view	Yes or No	If no , please make notes.
1.3	Does the parameter shown in the overview of the TMS meet the requirements? (P7)	Click to view	Yes or No	If no , please make notes.
1.4	Does the fire protection configuration for E is clear? Please confirm the fire protection configuration requirements . (P8~P11) Note: Do not do fire test on site without CATL authorization .	Click to view	Yes or No	If no , please make notes.
1.5	Does the parameter shown in the overview of the UPS meet the requirements? (P12)	Click to view	Yes or No	If no , please make notes.
1.6	Does the scope of supply meet the customer requirements ? (P13~P16)	Click to view	Yes or No	If no , please make notes.
2.1	Does the on-site tool and operation meet the requirements of hoisting and transferring containers? (P18~P21)	Click to view	Yes or No	If no , please make notes.
2.2	Does on-site tool and site condition meet the installation requirements of Containers? Has CATL provided an installation manual ? (P22~P23)	Click to view	Yes or No	If no , please make notes.
2.3	Does the on-site layout meet the clearance requirements between Containers? (P24~P25)	Click to view	Yes or No	If no , please make notes.

Compliance Checklist

NO.	Items	Link	Check	Notes
2.4	Are the definitions and the external connection interface clear ? (P26)	Click to view	Yes or No	If no , please make notes.
2.5	Are the High voltage DC power cable connection interfaces clear? (P27)	Click to view	Yes or No	If no , please make notes.
2.6	Are the auxiliary power 1&2 cable connection interfaces clear? (P28~P29)	Click to view	Yes or No	If no , please make notes.
2.7	Are the BMS communication (Fiber) and dry contact interfaces clear? (P30~P34)	Click to view	Yes or No	If no , please make notes.
2.8	Are the FSS dry contact interfaces clear? (P35)	Click to view	Yes or No	If no , please make notes.
2.9	Are the recommends of On-site cable routing clear? Please provide the site layout to CATL . (P36~P37)	Click to view	Yes or No	If no , please make notes.
3.1	Can system design meet the requirements of fuse matching ? (P39~P40)	Click to view	Yes or No	If no , please make notes.
3.2	Can system design meet the requirements of PCS matching ? Please provide PCS Spec and SLD to CATL.(P41)	Click to view	Yes or No	If no , please make notes.
3.3	Does the parameter of the arc flash and the use of PPE on site meet the customer requirements? (P42~P44)	Click to view	Yes or No	If no , please make notes.

Compliance Checklist

NO.	Items	Link	Check	Notes
3.4	Are the architecture and functions of BMS clear? Has CATL provided an Communication protocol ? (P45~P46)	Click to view	Yes or No	If no , please make notes.
3.5	Are the requirements of communication connection clear ? (P47)	Click to view	Yes or No	If no , please make notes.
3.6	Are the installation requirements and parameters of CAN Bridge clear? (P48~P49)	Click to view	Yes or No	If no , please make notes.
3.7	Are the requirements for auxiliary power supply clear? (P50)	Click to view	Yes or No	If no , please make notes.
3.8	Is the HV control logic conform to the system design? (P51)	Click to view	Yes or No	If no , please make notes.
3.9	Is the function of E-STOP clear? Does it meet the design requirements? (P52~P53)	Click to view	Yes or No	If no , please make notes.
4.1	Is the System Single Line Diagram & System Functional Diagram of EnerC+ clear? (P55~P58)	Click to view	Yes or No	If no , please make notes.
5.1	Is the interactive interface and control logic of FSS clear? (P60~P61)	Click to view	Yes or No	If no , please make notes.
5.2	Is the fire configuration table clear? Is it in line with local fire protection requirements?(P62)	Click to view	Yes or No	If no , please make notes.

Compliance Checklist

NO.	Items	Link	Check	Notes
5.3	Are the component parameters of the FSS clear? Please choose the standard for local fire protection, EN or UL. (P63~P68)	Click to view	Yes or No	If no , please make notes.
6.1	Is the TMS architecture and operating mode clear? (P70)	Click to view	Yes or No	If no , please make notes.
6.2	Is the location of coolant plate and caution clear? (P71)	Click to view	Yes or No	If no , please make notes.
6.3	Is the TMS control logic description clear? (P72)	Click to view	Yes or No	If no , please make notes.
6.4	Are the TMS maintenance requirements clear? Do the facilities on site meet the maintenance requirements? (P73)	Click to view	Yes or No	If no , please make notes.
6.5	Does the discharging power “window” meet the on-site application requirements? (P74)	Click to view	Yes or No	If no , please make notes.
6.6	Does the charging power “window” meet the on-site application requirements? (P75)	Click to view	Yes or No	If no , please make notes.
7.1	Are UPS specifications and descriptions clear? (P77)	Click to view	Yes or No	If no , please make notes.
7.2	Is the backup time of UPS clear? Does it meet the design requirements of the whole station? (P78~P79)	Click to view	Yes or No	If no , please make notes.

Compliance Checklist

NO.	Items	Link	Check	Notes
8.1	Is the container label and marking clear? Does it meet the customer requirements? (P81)	Click to view	Yes or No	If no , please make notes.
8.2	Is the battery module label and marking clear? Does it meet the customer requirements? (P82)	Click to view	Yes or No	If no , please make notes.
8.3	Is the Sub control box label and marking clear? Does it meet the customer requirements? P(83)	Click to view	Yes or No	If no , please make notes.
8.4	Is the GND marking clear? Does it meet the customer requirements? (P84)	Click to view	Yes or No	If no , please make notes.
8.5	Is the SOC calibration method clear? Is the necessity for SOC correction clear? (P85~P86)	Click to view	Yes or No	If no , please make notes.
8.6	Are the environmental requirements for short-term storage and long-term storage clear? Has CATL provided an Q&M manual ? (P87)	Click to view	Yes or No	If no , please make notes.
8.7	Are the environmental requirements for standby scenario clear? (P88)	Click to view	Yes or No	If no , please make notes.
8.8	Are the environmental requirements for operation scenario clear? (P89)	Click to view	Yes or No	If no , please make notes.
8.9	Please check five type of Augmentation methods for reference. If there are any other methods, please provide the solutions for feasibility study. (P90~P94)	Click to view	Yes or No	If no , please make notes.

**Rooted in the Chinese culture
while embracing the global
culture, strive to be a global
premier innovative technology
corporation, deliver excellent
contribution to green energy
resolution for mankind!**

