



Containerized Lithium Ion Battery Storage System (Rechargeable Li-ion Battery System)

Product Specifications

Product Name: EnerC 1P (285Ah)

Responsible agency:	SC-ES	Confidential level:	Confidential
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- CATL Confidential -

Revision	Chapter	Description	Date
1.0	All	With EnerC_ 1P 280plus dual branch modified for base version	2023/08/10
1.1	Acronyms and Abbreviations	删除对 MSD 的描述	2023/11/21
1.1	1	Table 1 EnerC liquid-cooling energy storage container characteristics 根据 285 集装箱参数对应修改	2023/11/21
1.1	1	Figure 1 EnerC liquid-cooling energy storage container ---outside & inside overview 中inside overview 修改为 285 集装箱实拍图	2023/11/21
1.1	2.1	Figure 2 Circuit diagram of battery rack 修改为修改为取消 MSD 的图	2023/11/21
1.1	2.1	Battery module 部分的文字描述删除 MSD 的部分, Figure 4 更换为取消 MSD 的电箱图片	2023/11/21
1.1	2.2	文字描述增加 Optical Fiber Module	2023/11/21
1.1	2.2	Figure 5 修改图片中文字“客户端 EMS”为“Client EMS”	2023/11/21
1.1	2.2.1	修改 table 3 和 table 4 为 BSD 提供的最新的接插件信息	2023/11/21
1.1	2.2.2	修改 figure 9 为更改标签位置后的主控箱图片	2023/11/21
1.1	2.2.2	修改 table 7 为 BSD 提供的最新接插件信息	2023/11/21
1.1	3	新增图片 Figure 13 Clearance requirement	2023/11/21
1.1	2.4	Table 11 修改最大制冷功率为 30.73kW	2023/11/21
1.1	2.5	Table 12 修改配电箱图片为实物图	2023/11/21
1.1	1	Battery Module IP 等级更新为 IP67	2023/12/12
1.2	2.4	修改 table 11 最大制热量为 17.6kW, 最大制冷量为 30.73kW	2023/12/21
1.2	2.4	修改 table 10 水冷机组操作温度为 -25°C...+55°C, 修改气流需求为 $\geq 15000\text{m}^3/\text{h}$	2023/12/21
1.2	2.2	Figure 5 修改 BMS 三级架构图	2023/12/21
1.2	2.2.1	Figure 9 和 Figure 10 补充总控箱内部实物图	2023/12/21
1.2	2.2	Figure 7 three-level BMS 架构图修改	2023/12/21
1.2	1	增加防腐等级说明 (C5)	2023/12/21
1.3	FSS	去除气感配置, 使用温感替代	2024/01/12

1.4	3	修 改 Table 1 Installation site requirement 中集装箱重量为 36t	2024/03/13
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Acronyms and Abbreviations

CATL	Contemporary Amperex Technology Limited
ACAN	CAN net between MBMU with PCS
BMU	Battery Management Unit
BMS	Battery Management System
BOL	Begin of Life
CAN	Controller Area Network
CCAN	CAN between BMU and CSC
CSC	Cell Supervision Circuit
CSU	Current Sensor Unit
DCAN	Internal CAN for Debugging
EOL	End of Life
ETH	Ethernet Module
SBMU	Slave Battery Management Unit
SCAN	CAN net between SBMU and CSU
SOC	State of Charge
SOE	State Of Energy
SOH	State of Health
SOP	State Of Power

1 Product Specification

Table 2 EnerC liquid-cooling energy storage container characteristics

EnerC liquid-cooling energy storage container				
Product model		EnerC_1P		
Product Type		LFP battery bank		
NO.	Item		Specification	Remark
1	Configuration		2x5P416S	
2	Rated Energy		3793.92kWh	
3	Rated Voltage		1331.2VDC	
4	Voltage Range		1040...1500VDC	
1 P System				
5	Charging Current (1 P)	Rated	1425A*2	
		Maximum	1700A*2 for 1 minute	
6	Charging Power (1P)	Rated	3793.92kW	
7	Discharging Current (1P)	Rated	1425A*2	
		Maximum	1700A*2 for 1 minute	
8	Discharging Power (1P)	Rated	3793.92kW	
9	Auxiliary power supply (1P)	Voltage range	3AC 380...480V/50/60Hz	
		Power	Max. 62 kW (Including BMS & Chiller consumption)	
10	Operating Ambient Temperature	Charge	-25 °C...+55 °C	
		Discharge	-25 °C...+55 °C	
11	Environment condition	Storage Temperature	-30 °C...+60 °C	
		Application altitude	≤4000m (derating over 2000 meters)	
12	General Parameters	Size	2896mm(H)*2462mm(W)*6058mm(D)	
		Color	RAL7035	
		Weight	~36t	
		IP Level	IP55/NEMA 3R (Battery Room) IP67 (Battery Module) IP66 (Sub Control Box) IP55 (Electrical Room) IP56(Cooling unit)	

		Degree of Anti-corrosion of Battery Unit	C5	
		Cooling mode	Liquid Cooling	
		Communication protocol	CAN, RS485, TCP/IP	
		Fiber Port	Single Mode, ST Connection	
		Communication connection	Fast plug	
		HV Power connection	Cable lug: M12 Quantity: Split 2 DC busbar /5 connection per busbar	
		Aux Power connection	Terminal	
		Coolant	50% Ethylene glycol aqueous solution	
13	Fulfill standard	Cell	UN38.3	
			UL1973	
			IEC62619	
			UL9540A	
		Container	IEC62477	
			IEC62619	
			IEC 62933-5-2	
			IEC63056	
			UL1973	
			UL9540A	
			IEC61000-2-4/ IEC 61000-2-6	

*The actual power consumption depends on the ambient temperature and Charge/Discharge working profile.

2 Product Description

EnerC liquid-cooling energy storage battery container is an integrated high energy density system, which is in consisting of battery rack system, battery management system (BMS), fire suppression system (FSS), thermal management system (TMS) and auxiliary distribution system.



Figure 3 EnerC liquid-cooling energy storage container ---outside & inside overview

The basic units for whole system are listed as following:

Table 3 Components of EnerC liquid-cooling energy storage container

System	Sub Components	Quantity	Remark
Battery	20 feet Container	1	2896mm(H)*2462mm(W)*6058mm(D)
Racks	Battery Modules	80	With CSC
BMS	Master Control box 1#	1	Including IMM,MBMU,ETH, Fiber Conversion Module
	Master Control box 2#	1	Including IMM,MBMU,ETH
	Sub Control Box	10	Including SBMU, fuse, isolation switch and so on
TMS	Cooling unit	2	Including compressor, pump, fan, heater and others
FSS	Fire Suppression Control Panel	1	
	Smoke detector	3	
	Heat detector	4	
	Aerosol	10	
Auxiliary distribution system	Distribution box	1	Auxiliary power supply system

2.1 Battery system overview

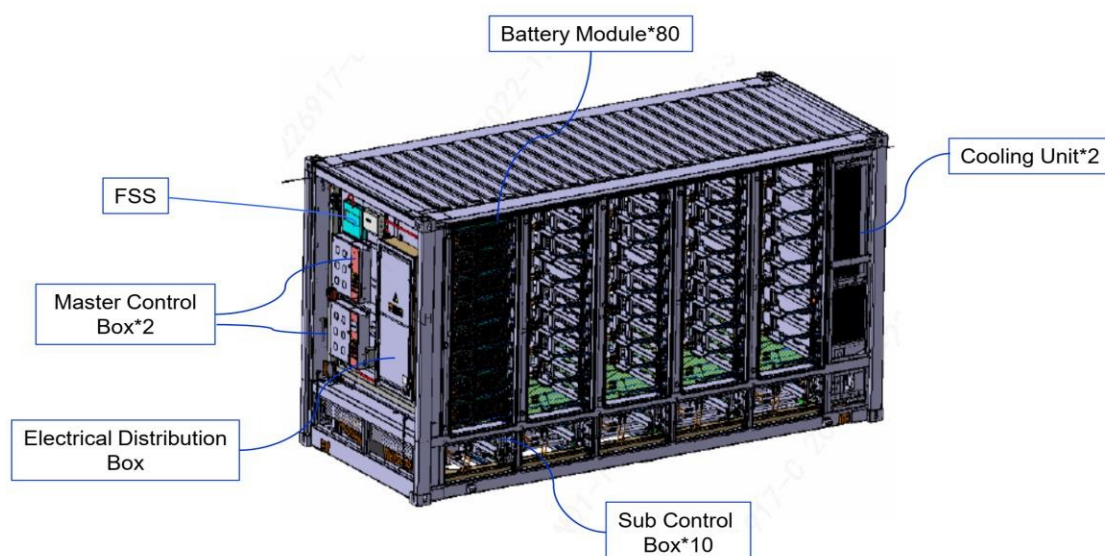


Figure 4 EnerC liquid-cooling energy storage container overview – inside

The battery system is composed of 2 DC branches. Each branch contains 5 battery racks connected in parallel. Each battery rack contains 8 battery modules, each battery modules is composed of 52 battery cells in series connection, so each rack contains 416 battery cells. Totally, EnerC liquid-cooling container's configuration is 2*5P416S.

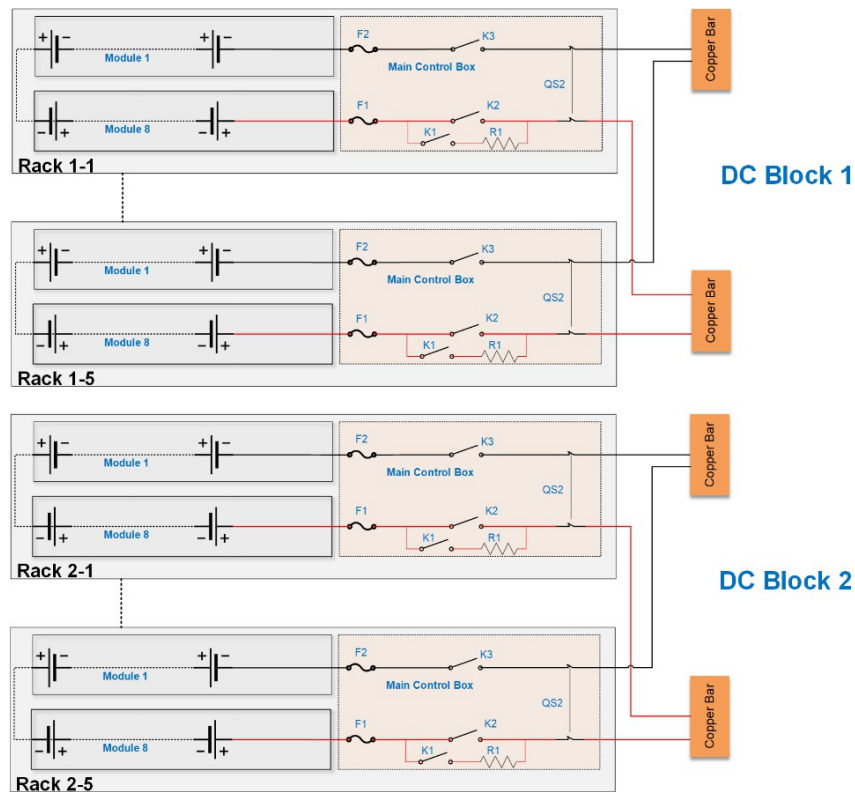


Figure 5 Circuit diagram of battery rack

Battery module

Total 52 pieces lithium iron cells (285Ah/3.2V) in series connection are used for every battery module.



Figure 6 Liquid cooling battery module

2.2 BMS system overview

BMS is used in conjunction with the ESS, which can monitor the battery voltage, current, temperature, manage energy absorption and release, thermal management, low voltage power supply, high voltage security monitoring,

fault diagnosis and management, external communication with PCS and EMS, ensure the stable operation of the energy storage system.

The BMS is composed of 2 units of MBMU, 2 unit of IMM, 2 units of ETH, 1 unit of Optical Fiber Module, 10 units of SBMUs, 80 units of CSCs.

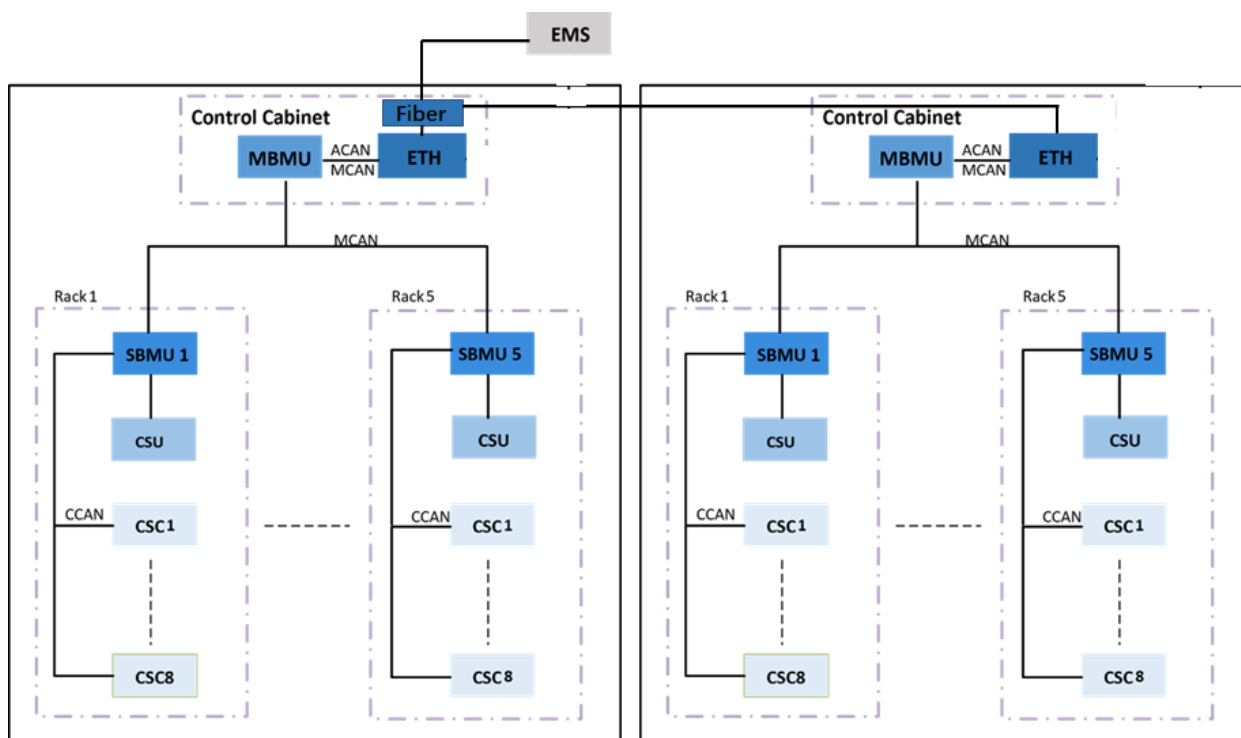


Figure 7 Three-level BMS architecture

2.2.1 Master Control Box

Master control box includes MBMU, IMM, ETH. And Optical Fiber Conversion module is only included in Master Control box 1#.

Module function of master control box

Module	Function
MBMU	- Controlling of system On and Off MBMU detects the condition of system power button to switch state. When receive system power on command from EMS, MBMU can turn itself on from off; When receive system power off command, MBMU can turn itself off to on. - Synchronize time - MBMU synchronizes time via CAN communication. - CAN communication - MBMU contains 3 channels of CAN communication such as MCAN, DCAN and ACAN: - MBMU communicates with SBMU, PC monitor via MCAN. - MBMU realizes Calibration function via DCAN. - MBMU communicates with PCS equipment via ACAN. - Environment temperature detection - MBMU contains 2 temperature detection inputs: range - 40°C...85°C, accuracy $\pm 3^{\circ}\text{C}$. - RS485 communication - MBMU contains 2 channels of RS485 which support MODBUS RTU Communication protocol and can be configured with host and slave machine. - Address - MBMU can address CAN and RS485. - System status upload - MBMU can upload system SOC、SOH、SOP and operation status.

Module	Function
	8. Contactor driver and auxiliary equipment power supply ● MBMU controls the rack HV relays switch on or off when receiving PCS or EMS command via SBMU. ● MBMU have 12 high-side outputs, used to drive a power supply relay for external devices or to supply power directly to auxiliary devices. High-side output also has fault diagnosis function. 9. Dry contact detection ● MBMU has 10 dry contactor detections, which used for identify the working states of SPD, UPS, FSS, auxiliary power supply and so on.
IMM	1. Insulation testing ● Support insulation detection function to measure insulation resistance between HV+ and housing, and between HV- and housing. 2. CAN communication ● It has a CAN communication function to communicate with MBMU
ETH	1. Ethernet communication: ● ETH communicates with PCS and EMS externally via RJ45 interface. Based on TCP/IP, The IP address allocation method can be configured as fixed IP or DHCP according to requirements. Modbus protocol is now supported 2. Remote update: ● ETH supports to updates the BMS system from a remote client via Ethernet 3. CAN Communication: ● ETH has two CAN interfaces, which receive the status information of the BMS through MCAN, and receive and send PCS information through ACAN 4. RS485 Communication: ● ETH has a total of two RS485 interfaces as reservations, which can be expanded according to the actual needs of the hardware function and communicate with external attachments

Module	Function
	5. The ETH has an Ethernet interface
Optical Fiber Conversion	Converse Ethernet to optical signal

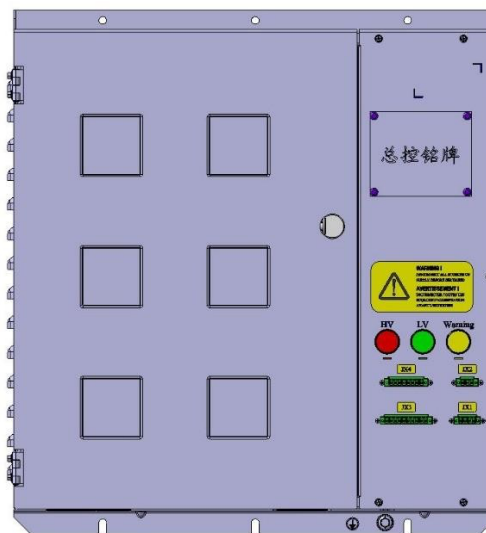


Figure 8 Master Control box---Outside view

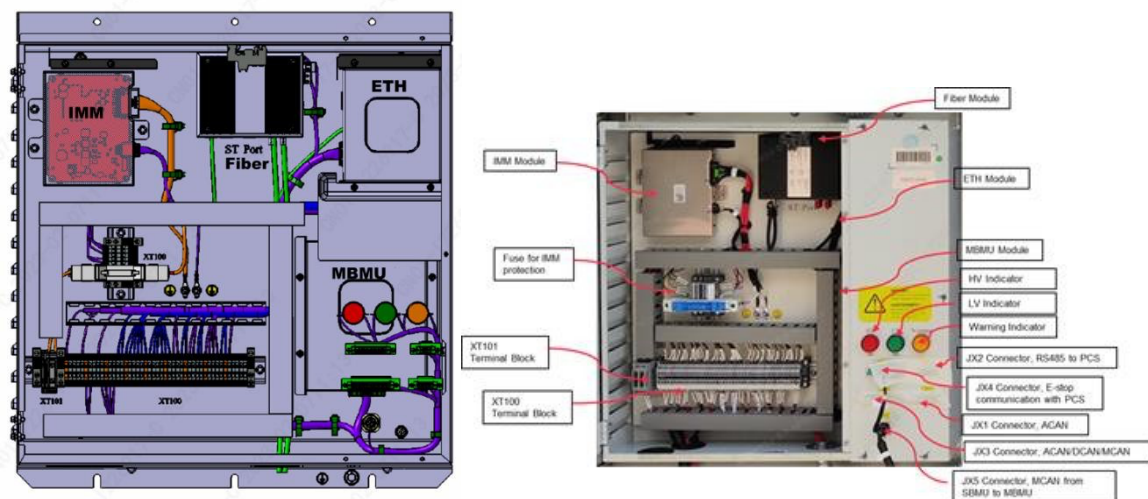


Figure 9 Master Control box 1#---inside view

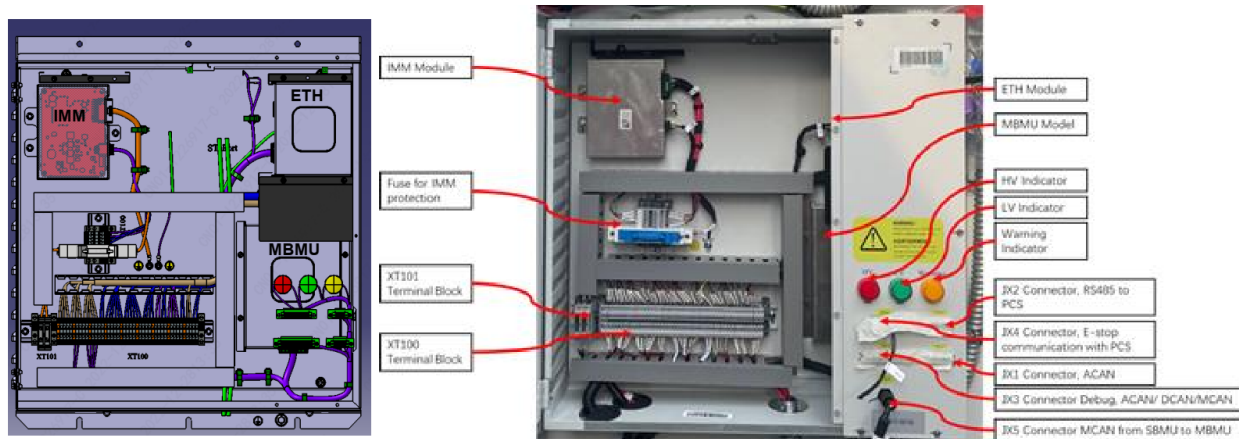


Figure 10 Master Control box 2#---inside view

Table 4 Connector information of Master Control box 1#

No.	Connector	Definition	Connector information	Remark
1	JX1-1	A-CAN-H	Plug: TJ0451520270G	Communicate with PCS through CAN port
2	JX1-2	A-CAN-L		
3	JX1-3	GND_ACAN		
4	JX1-4	Reserve		
4	JX2-1	RS485A	Plug: TJ0351520270G	Communication with PCS through 485 port
5	JX2-2	RS485B		
6	JX2-3	GND		
7	JX3-1	D-CAN-H	Plug: TJ1051520270G	Debug
8	JX3-2	D-CAN-L		
9	JX3-3	A-CAN-H		
10	JX3-4	A-CAN-L		
11	JX3-5	M-CAN-H		
12	JX3-6	M-CAN-L		
11	JX3-7...8	Reserve	Plug: TJ0851520270G	
13	JX4-1	Reserve		
14	JX4-2	Reserve		
15	JX4-3	Estop to PCS+		
16	JX4-4	Estop to PCS-		
17	JX4-5	Estop from PCS+		
18	JX4-6	Estop from PCS-	Plug: PT06E-8-4SW(005)	Communication with SBMU
19	JX5-1	IMM-MCAN-H		
20	JX5-2	IMM-MCAN-L		
21	JX5-3	SBMU-Code		
22	JX5-4	SBMU-Code-GND		

Table 5 Connector information of Master Control box 2#

No.	Connector	Definition	Connector information	Remark
1	JX1-1	A-CAN-H	Plug: TJ0451520270G	Communicate with PCS through CAN port
2	JX1-2	A-CAN-L		
3	JX1-3	GND_ACAN		
4	JX1-4	Reserve		
4	JX2-1	RS485A	Plug: TJ0351520270G	Communication with PCS through 485 port
5	JX2-2	RS485B		
6	JX2-3	GND		
7	JX3-1	D-CAN-H	Plug: TJ1051520270G	Debug
8	JX3-2	D-CAN-L		
9	JX3-3	A-CAN-H		
10	JX3-4	A-CAN-L		
11	JX3-5	M-CAN-H		
12	JX3-6	M-CAN-L		
11	JX3-7...8	Reserve		
13	JX4-1	Reserve	Plug: TJ0851520270G	
14	JX4-2	Reserve		
15	JX4-3	Estop to PCS+		
19	JX5-1	IMM-MCAN-H	Plug: PT06E-8-4SW(005)	Communication with SBMU
20	JX5-2	IMM-MCAN-L		
21	JX5-3	SBMU-Code		
22	JX5-4	SBMU-Code-GND		

Table 6 Definition of indication lights for master control box

No.	Indicator lights	Name of indicator lights	Function
1	HV(Red)	High voltage indicator	When the 10 sub control box high voltage indicator lights are on, the high voltage indicator light is on
2	LV(Green)	Low voltage indicator	Lights up when 24V power supply is normal
3	Warning(Yellow)	Indicator lights of Warning	Lights on when warning happen

Table 7 Definition of Fiber Conversion module

No.	Item	Description
1	Mode	Single Mode
2	Fiber Port	100Base-FX, ST Port
3	Copper Port	10/100Base-T(X), RJ45,

2.2.2 Sub Control box

Ten sub control boxes are included in one container, which panel diagram is show in Figure 11

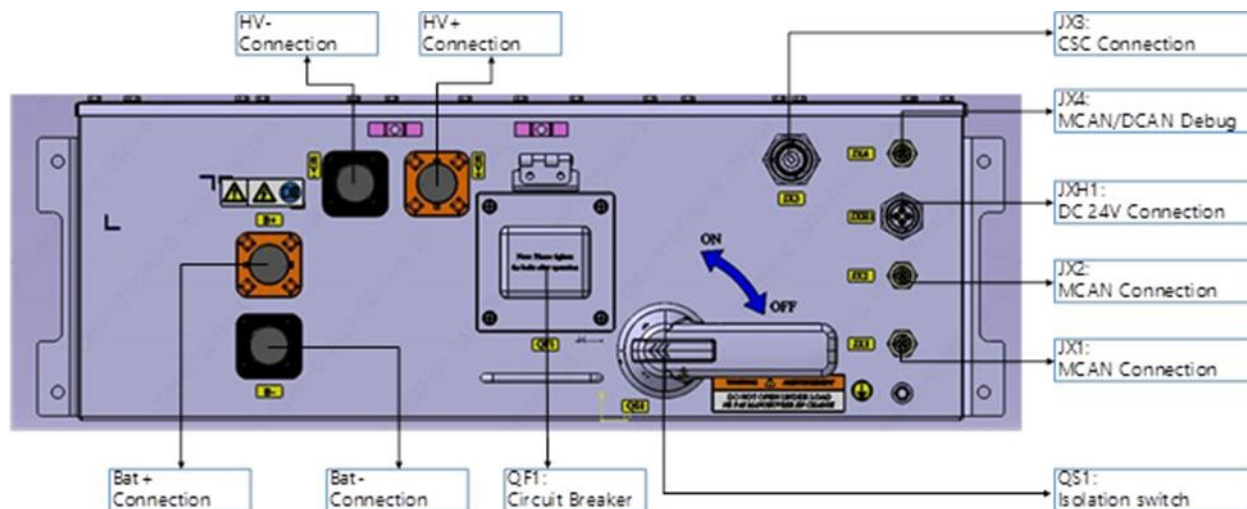


Figure 11 Sub Control box

Table 7 Connector information of sub control box

No.	Connector	Definition	Connector information	Remark
1	JX1-1	M-CAN-H	Plug: PT06E-8-4SX(005)	Connect to the next sub control box
2	JX1-2	M-CAN-L		
3	JX1-3	SBMU-Code-OUT		
4	JX1-4	SBMU-Code-OUT-GND		
5	JX2-1	M-CAN-H	Plug: PT06E-8-4SW(005)	Connect to the previous sub control box
6	JX2-2	M-CAN-L		
7	JX2-3	SBMU-Code-IN		
8	JX2-4	SBMU-Code-IN-GND		
9	JX3		Plug: PT06E-18-32S(005)	The physical connection of the 8 electric boxes in the electric cabinet
10	JX4-1	M-CAN-H	Plug: PT06E-8-4S(005)	Debug for commissioning
11	JX4-2	M-CAN-L		
12	JX4-3	C-CAN-H		
13	JX4-4	C-CAN-L		
14	JXH1-1	Control power-Output-L	Plug: PT06E-14-AAP_(FP)(005)	Auxiliary power supply for the next sub control box
15	JXH1-2	Control power-Output-N		Auxiliary power supply for the previous sub control box
16	JXH1-3	Control power-Input-L		
17	JXH1-4	Control power-Input-N		
18	HV+	Positive output	Plug receptacle: ES095-01M8-2SYZ-01(orange)	Connect to high voltage

			Plug: ES095-03C95-2SYZ-01 (orange) Manufacturer: SANCO	
19	HV-	Negative output	Plug receptacle: ES095-01M8-1SYW-01 (black) Plug: ES095-03C95-1SYW-01 (black) Manufacturer: SANCO	

Table 8 Information of switch

No.	Switch	Name of switch	Function
1	QF1	Circuit Breaker	To switch on and off the auxiliary power supply of the sub control box
2	QS1	Isolation switch	To switch on and off the output of battery system. (Cannot operate with load)

Table 9 Definition of the indication lights

No.	Indicator lights	Name of indicator lights	Function
1	HV(Red)	High voltage indicator	The indicator light is on when the high voltage is normal
2	LV(Green)	Low voltage indicator	Lights up when 24V power supply is normal
3	Warning(Yellow)	Indicator lights of Warning	Lights on when warning happen

2.2.3 Communication Protocol

Adopt CATL standard communication protocol

2.3 FSS system overview

The FSS system is composed of smoke detectors, Heat detectors and aerosols, whose main function is to prevent fire spread in time when any open flame signal s in the battery system and sent out fire signal to EMS system. The main components are listed as following.

Table 10 Main components of FSS system

Component	Quantity	location
Smoke detector	3	One in electrical room, two in Battery room
Heat detector	4	On the top of Battery rack
Aerosol	10	On the top of Battery rack
Fire system control Panel (FSCP)	1	Electrical room
Sound and light alarm device	1	Electrical room
Abort switch	1	Electrical room
Manual Pull Station	1	Electrical room

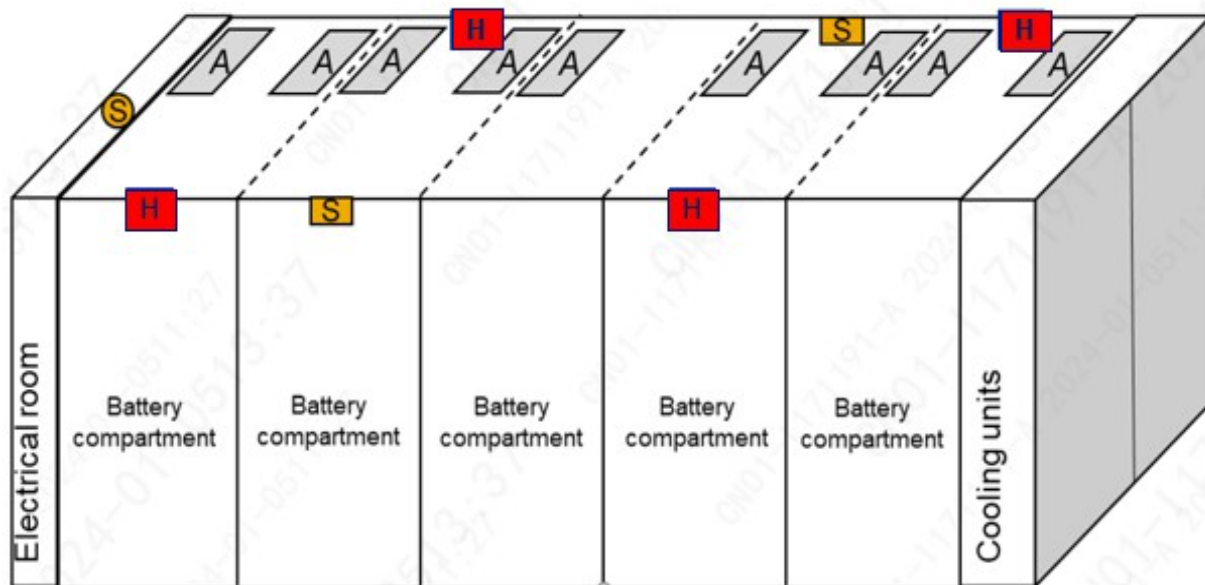
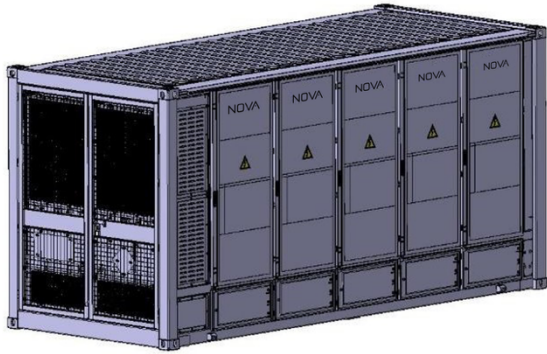


Figure 12 Layout of Heatdetectors (H), Smoke detectors(S) and Aerosols (A)

2.4 TMS system overview

The TMS system utilises liquid cooling method, the main function of which is to maintain the temperature of the battery system within allowable operating temperature range.

Table 11 Main feature of TMS system

	✓ Coolant: L70 coolant(Lopal Tech) ✓ Refrigerant type: R134a ✓ Suitable for extreme ambient temperature application: -25°C... +55 °C ✓ Airflow requirement: $\geq 15000\text{m}^3/\text{h}$ ✓ Power supply: 3AC 380...480V ✓ 2* 40kW cooling power for 1P System ✓ Two cooling units are included for one Container ✓ Cooling power is auto-adjustable according to ambient temperature & discharge/charge status
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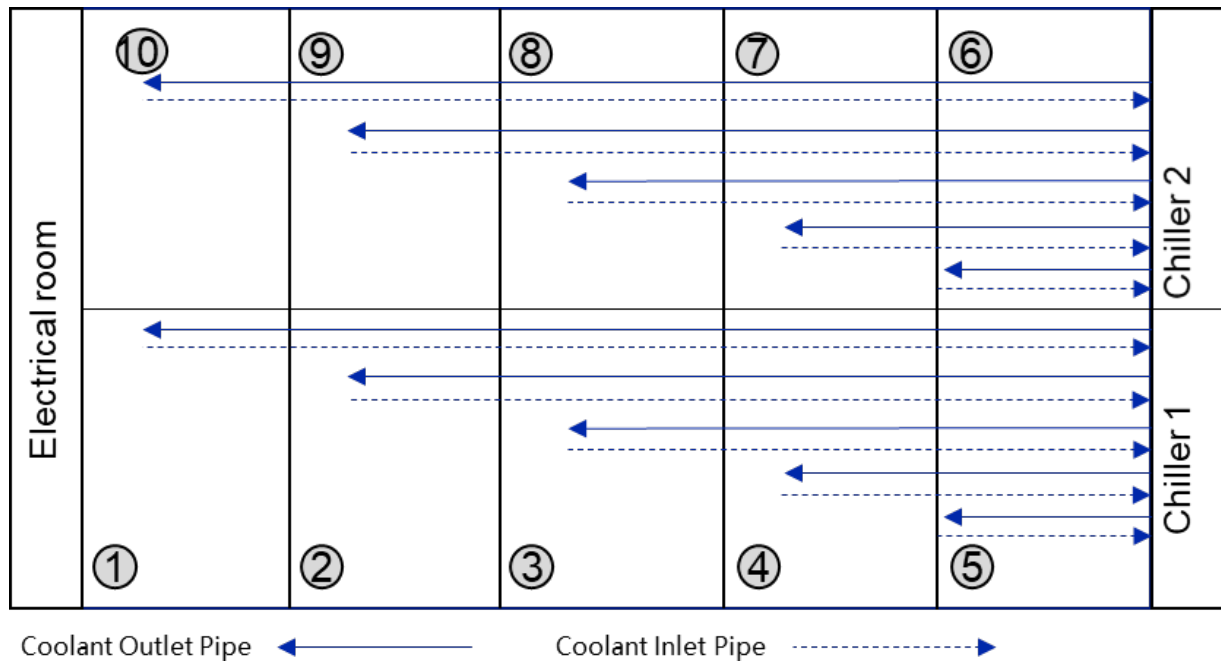


Figure 13 Pipe layout of TMS system

Table 12 Power consumption of TMS system

Type of EnerC	1 P System	Remark
Quantity of Cooling unit	2	
Refrigerating Capacity	2 x 40 kW	
Maximum Heating Power (-25°C)	2 x 17.6 kW	
Maximum Cooling Power (+55°C)	2 x 30.73 kW	

2.5 Auxiliary distribution box overview

The Auxiliary distribution box is for providing the auxiliary power for whole control system and liquid cooling system.

Table 13 Main feature of electrical distribution box

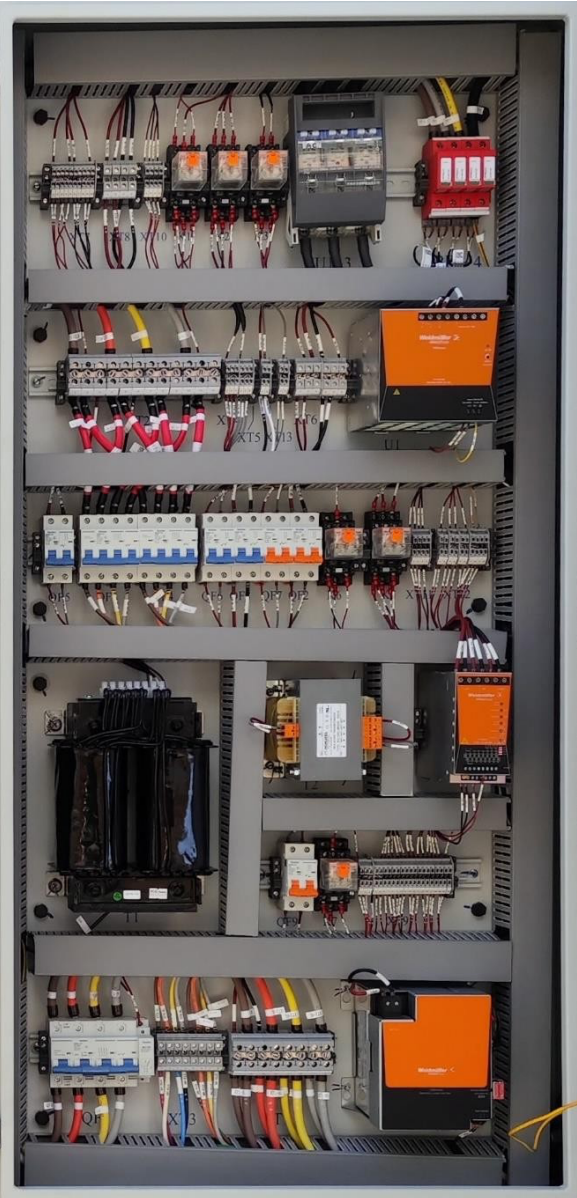
	✓ Auxiliary power supply input: 380...480V 3AC, 50/60Hz ✓ Include DC24V power supply output & DC24V UPS for BMS system ✓ Include E-stop circuit ✓ Include circuit protection and power supply on-off control circuit ✓ Include Type II SPD for AC Power supply
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Table 14 Component description of distribution box

Designation	Description	Function
QF1	Circuit breaker (incl. shut trip)	Main auxiliary power supply switch & protection
QF2	Circuit breaker	1AC circuit protection of fire suppression system
QF3	Circuit breaker	3AC circuit protection of chiller 1
QF4	Circuit breaker	3AC circuit protection of chiller 2

QF5	Circuit breaker	1AC circuit protection of transformer T1
QF6	Circuit breaker	1AC circuit protection of AC/DC power supply
QF7	Circuit breaker	1AC circuit protection of electrical room cooling fan
QF8	Circuit breaker	DC circuit protection of UPS battery
QF9	Circuit breaker	1AC circuit protection of commissioning socket
K1	Relay	Relay for QF1 circuit breaker shunt trip controlling
K2	Relay	Relay for SBMU power supply controlling
K3	Relay	Relay for electrical room cooling fan controlling
K5	Relay	Relay for SBMU power supply controlling
K6	Relay	Relay for Estop circuit(1#MBMU)
K7	Relay	Relay for Estop circuit(2#MBMU)
T1	480/230V Transformer	Transformer for BMS & chiller
U1	AC230V/DC24V Power supply	For BMS DC 24V UPS system
U2	24V DC/DC UPS	For BMS DC 24V UPS system
U3	UPS Battery	

3 Site installation requirements

The site installation requirements for temperature, humidity and altitude, etc. are the same as those for storage and operating environments, and the requirements for ground flatness are shown as following:

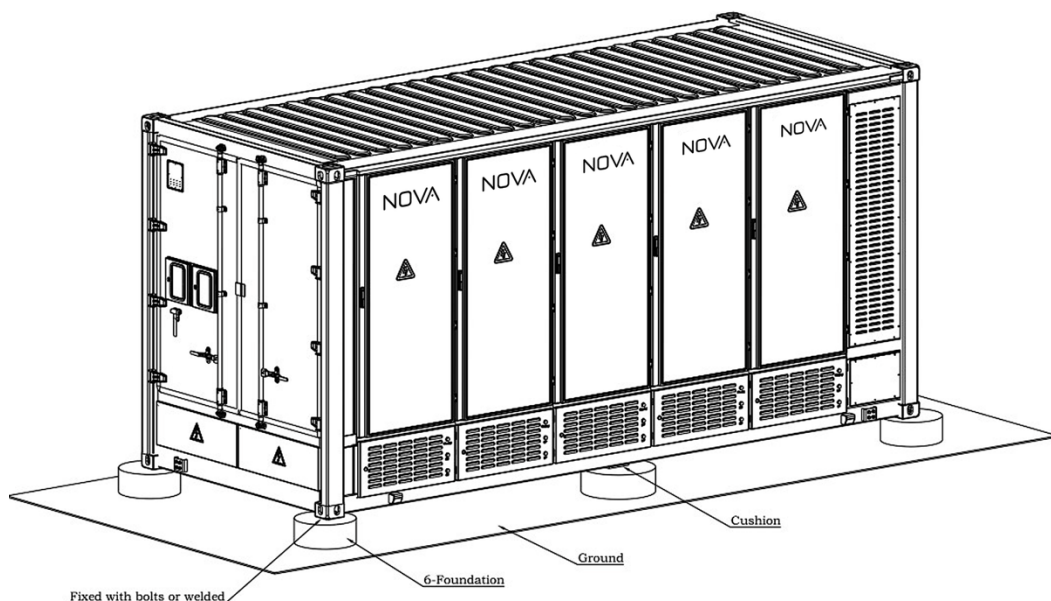


Figure 14 Installation site overview

Table 15 Installation site requirement

Ground type	Condition requirements	Foundation requirement
Concrete floor	The ground needs to be able to bear a load of 36 tons	◆ Minimum foundation support points: Six
Plain land surface		◆ Level deviation $\leq \pm 5\text{mm}$ ◆ Flatness deviation $\leq \pm 4\text{mm}/2\text{m}$

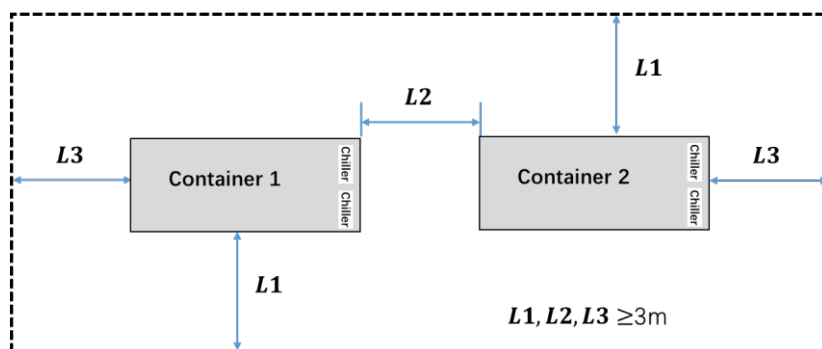


Figure 15 Clearance requirement

At least 3m between foundation columns and columns, in order to entering after-sales vehicles;

Contact us

Note

To find the contact ways for your region
please refer to our webpage:

www.catl.com

www.nova1.se

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