



EnerX 530Ah Container Product Specification

Version	Date	Changes
1.0	2024/07/31	First Release
2.0	2024/10/28	Second Release

2 System Description

2.1 Application

The EnerX container is a modular, fully integrated product consisting of rechargeable lithium-ion batteries with the characteristics of high energy density, long service life, high efficiency. It can provide stable energy release for over 2h when the batteries are fully charged. The EnerX energy storage product is capable of various on-grid applications, such as frequency regulation, voltage support, arbitrage, peak shaving and valley filling, and demand response; in addition, EnerX container can also be used in black start, backup energy, congestion management, microgrid or other off-grid scenarios.

2.2 Overview

Figures 1&2 provide an illustration of the container. The detailed information can be found in the following chapters.

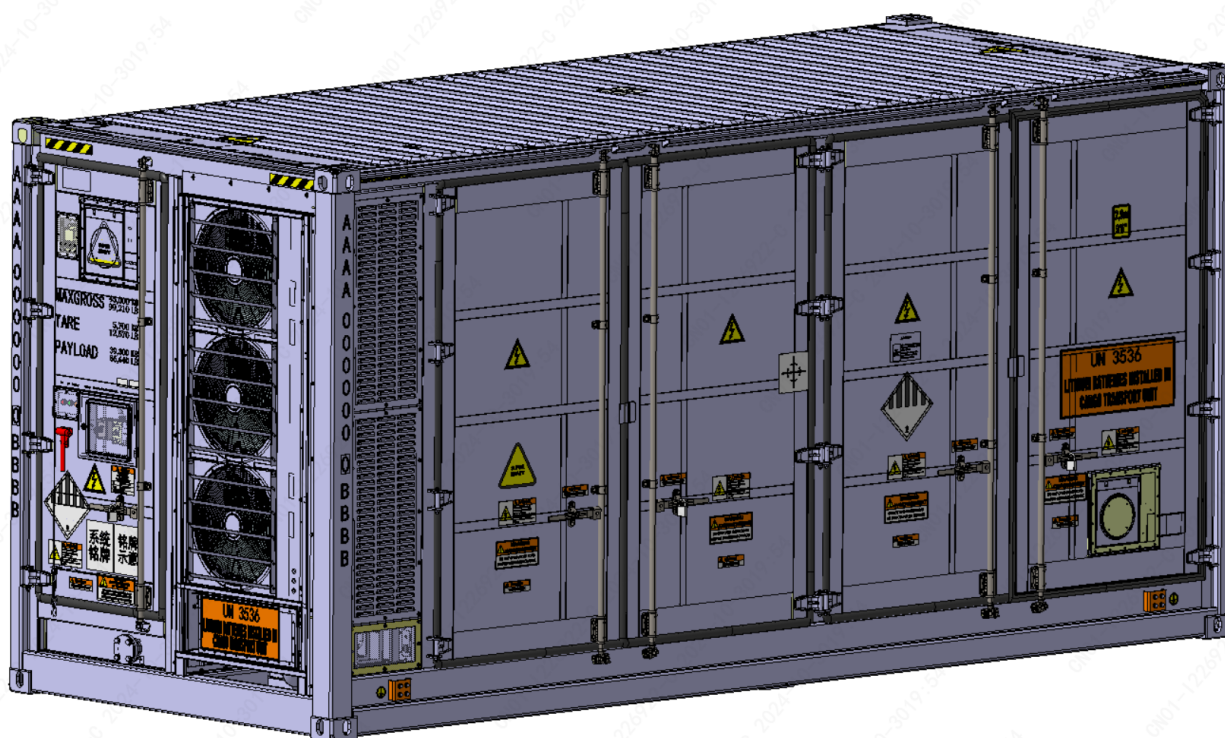


Figure 1 EnerX Liquid Cooling Energy Storage Container – Profile View1

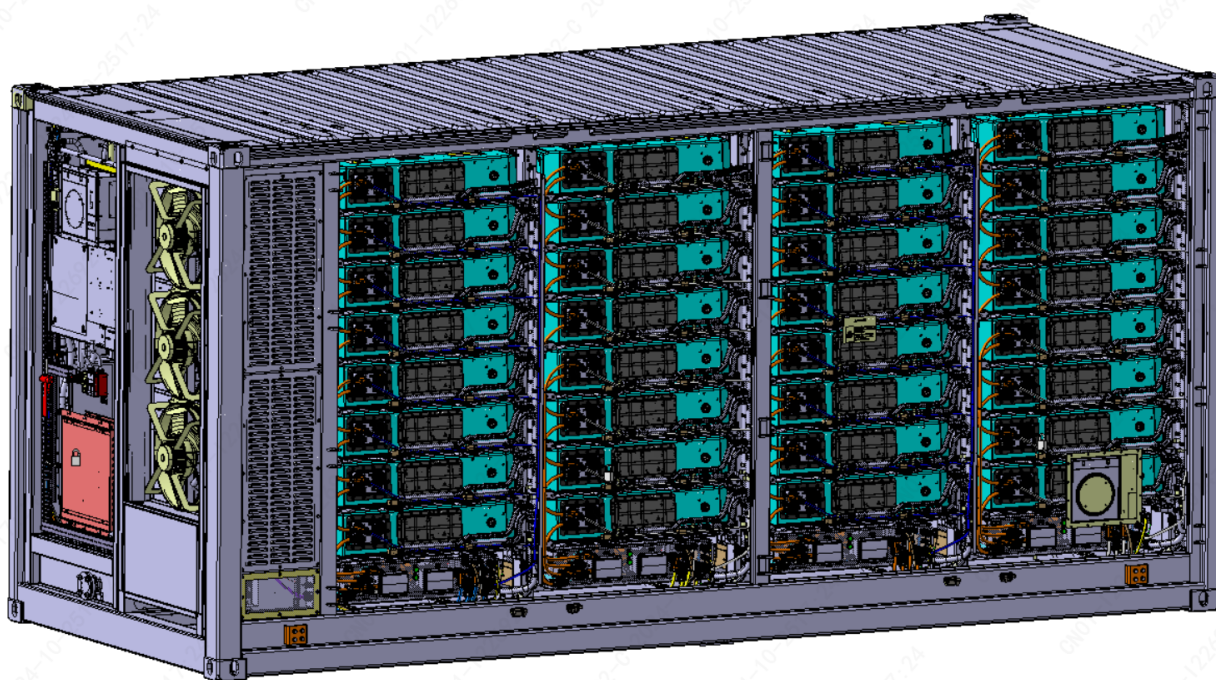


Figure 2 EnerX Liquid Cooling Energy Storage Container – Profile View2

The EnerX container consists of the following parts: batteries, BMS, FSS and TMS, which are integrated together to maintain the normal operation of the container.

2.2.1 Battery

The cell capacity is 530Ah, 1P104S cells integrated in one battery pack, 8 battery packs integrated in one rack, 4 racks integrated in one container. As the core of the ESS, the battery releases and stores energy.

2.2.2 BMS

BMS adopts the distributed scheme, through the three-level (CSC--SBMU--MBMU) architecture to control the BESS, to ensure the stable operation of the ESS. It can manage energy absorption and release, the thermal management system and low voltage power supply according to the detected information: battery voltage, current and temperature. It can monitor high voltage DC/AC security, diagnose and analyze faults according information from various detectors and dry-contacts. And it can keep communication with PCS and EMS through CAN. The BMS is the most important control unit of EnerX container. The BMS possesses the UPS to keep normal function when facing the temporary out of power.

2.2.3 FSS

FSS consists of smoke detectors, heat detectors, H2 detectors, CO detectors, the fire control panel, aerosol (optional), the dry pipe (optional), the smoke exhaust ventilation system, fiber optic networking card(optional)

and the UPS. FSS undertakes functions: monitor the thermal run-away risks of container through the detectors, extinguish the thermal run away, especially the flame fire, control the loss to minimum. The control panel will control and record information for the fire suppression system. The FSS is independent with any other system and it is the security guard of EnerX container.

2.2.4 TMS

TMS consists of one powerful chiller, the PTC heater and the liquid cooling pipe distributed in each battery module. The TMS will control and keep the temperature of battery within reasonable range. The battery will work at best state and reach longest life under the thermal management system.

2.3 Advantages

EnerX container possesses the following advantages:

- 1) Standard design for transportation. After removing the external cooling fan, the container size reaches 20 feet, which is very convenient for transportation.
- 2) New generation cell. EnerX container integrates the LFP 530Ah cells from CATL, with more capacity, longer service life and higher efficiency.
- 3) High integration. The cell to pack and modular design will increase significantly the energy density of the same area. The system is highly integrated, with an area energy density of over 361kWh/m² or 382kWh/m² (excluding the external chiller area) .
- 4) Extreme safety. The system supports three levels of safety:

Firstly, the cell safety, the highly stable lithium iron phosphate is used in the EnerX container. LFP is a kind of safety material especially for the BESS.

Secondly, the electrical safety: a) E-Stop design; b) multiple fuse protection design; c) insulation monitor voltage monitor; d) multi-channel isolation design; e) lightning protection design.

Thirdly, the fire protection design, CATL has four-level fire control strategy. The first-level is the alarm. The second-level is ventilation and smoke exhausting to prevent deflagration. The third-level is aerosol to extinguish initial fire, and the fourth-level is the dry pipe sprinkle fire protection to prevent fire spread.

- 5) Adaptive thermal management. EnerX integrated single-cluster water pump, temperature control strategy automatically adjusted with battery status, prolonging battery life.
- 6) Easy extension. It is very convenient for the augmentation of containers or racks. Furthermore, the EnerX support one PCS connected to 2 containers; this will decrease the covered area significantly.

- 7) Independent UPS. EnerX container have integrated two UPS systems, one is for FSS monitoring system which available capacity is 24 hours, another one is for BMS which available capacity is 20min or 24 hours(optional).

3 System Specifications

In this chapter, the systems specifications will be introduced in detail. For the BESS, the system specifications included the power and energy, electrical specifications, the environmental specifications, the mechanical specifications and certification standards..

3.1 Power and Energy

Table 1 Power and Energy of EnerX1

DC Side Data		
P-Rate	0.5P	Remark
Cell		
Cell Type	LFP	
Cell Capacity	530Ah	
Cell Voltage Range	2.5-3.65V	Should never below 2.5V
Cell Rated Energy	1696Wh	
System		
Configuration	8P4S(1P104S)	
Rated Energy	5644.29kWh	
Rated Voltage	1331.2VDC	
Voltage Range	1040 ~ 1500VDC	
Rated Charging Current	2120A	
Maximum Charging Current	2714A	For 1 minute
Rated Charging Power	2822.14kW	
Rated Discharging Current	2120A	
Maximum Discharging Current	2714A	For 1 minute
Rated Discharging Power	2822.14kW	

3.2 Electrical Specifications

For the auxiliary power supply, the standard configuration is 2 auxiliary power circuit. Auxiliary 1 and auxiliary 2 is listed in Table 2. The UPS for the BMS components is include in the auxiliary power circuit. The optional configuration is 1 auxiliary power circuit and the detailed configurations can be consulted to CATL.

Table 2 Electrical specifications of EnerX

Auxiliary Power & Communication			
P-Rate		0.5P	
Auxiliary Power 1	Voltage Range	3AC+N+PE 480V(380...480V) $\pm 10\%$, 50/60HZ	
	Power	Max.: to be updated Rated: to be updated	
	Inrush Current	to be updated	
Auxiliary Power 2	Voltage Range	1AC (L+N+PE) 230V or 2AC+PE(380...480V)	
	Power	Max: to be updated	
	Inrush Current	to be updated	
UPS for BMS	Time	DC24V. 20min. (optional 1) DC24V. 24h. (optional 2)	The UPS is only used to supply power to BMS components.
UPS for FSS	Time	DC24V. 24h	
Communication Protocol		CAN, Modbus/TCP	

3.3 Mechanical Specifications

Table 3 Mechanical Data of EnerX

Mechanical Data		
Transportation	Land or sea transportation	
Size	6058mm(W)*2438mm(D)*2896mm(H)	
Weight	~45t	In areas where overweight restrictions apply, CATL can provide a transportation scheme for disassembly battery packs
Color	RAL7035/7042/6021/9003 (Optional)	
IP Level	IP55 (Battery Room)	
	IP55 (Electrical Room)	
	IP67 (Electrical Control Box of Chiller)	

3.4 Environmental Specifications

Table 4 Environmental Specifications of EnerX

地址：福建省宁德市蕉城区漳湾镇新港路 2 号 ADD: No.2 Xin'gang Road, Zhangwan Town, Jiaocheng District, Ningde City, Fujian, PRC 352100
<http://www.CATL.com>

Environment Condition		
Specifications	Range	Remark
Charge Temperature Range	-35℃...+55℃	It is necessary to inform CATL for professional evaluation if temperature beyond range
Discharge Temperature Range	-35℃...+55℃	
Storage Temperature Range	-35℃...+60℃	
Application Altitude	≤4000m (no derating)	
Relative Humidity	0 ~ 95 % (non-condensing)	
Degree of Anti-corrosion of Battery Unit	C5	
Seismic Level	IEEE 693-2018 moderate design level	

3.5 Certification Standard

Table 5 Certification Standard

Standards & Certificates		
Cell	UN38.3	UN Transportation Testing for Lithium Batteries
	UL1973	Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
	IEC62619	Safety requirements for secondary lithium cells and batteries, for use in industrial applications
	UL9540A	Energy Storage Systems and Equipment
Container	UL1973	Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications
	NFPA855	Standard for the Installation of Stationary Energy Storage Systems
	NFPA69	Standard on Explosion Prevention Systems
	UL9540A	Energy Storage Systems and Equipment

	IEC 62477	Safety requirements for power electronic converter systems and equipment –Part 1: General
	IEC 62619	Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications
	IEC 62933-5-2	Electrical energy storage (EES) systems – Part 5-2: Safety requirements for grid-integrated EES systems – Electrochemical-based systems
	IEC61000-6-2	Generic standards – Emission standard for industrial environments
	IEC61000-6-2/4	Electromagnetic compatibility (EMC) –Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields