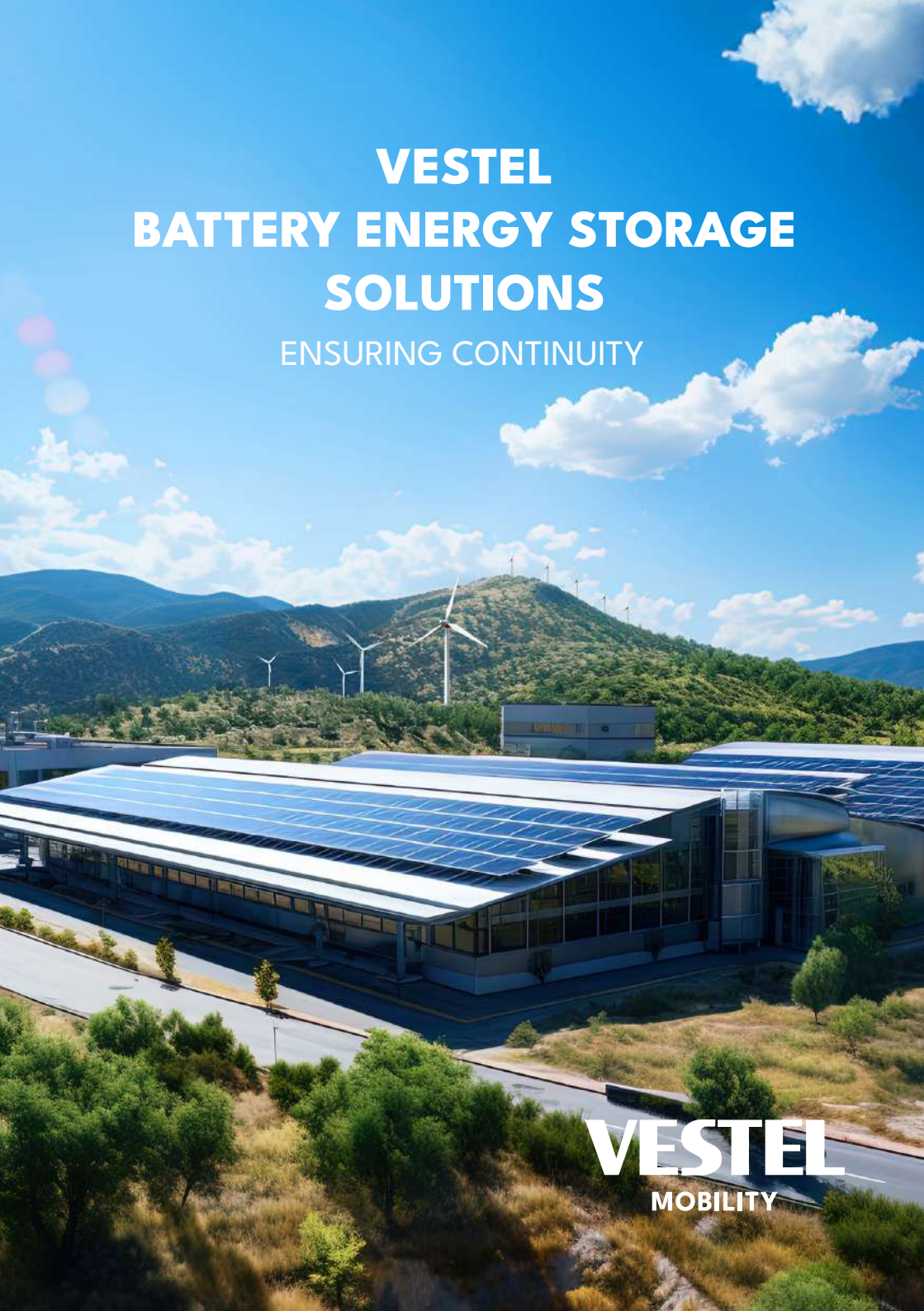
VESTEL
BATTERY ENERGY STORAGE SOLUTIONS

ENSURING CONTINUITY



VESTEL
MOBILITY

VESTEL MOBILITY

Vestel Mobility is a part of Vestel Group which is a renowned global leader in the field of innovation and technology. Vestel Mobility is actively contributing towards the future of transportation and energy transition by specializing in automotive electronics, battery solutions, and electric vehicle (EV) chargers.

In the automotive electronics sector, Vestel Mobility excels in engineering and manufacturing advanced electronic control units (ECUs), EV powertrain components and cockpit electronics such as clusters and infotainment displays.

Vestel Mobility is also a prominent player in the battery solutions arena, producing high-quality battery packages for eBikes, telecom towers, and energy storage systems. These solutions cater to a wide range of residential, commercial, industrial and utility applications.

Furthermore, Vestel Mobility showcases its commitment to promoting sustainable transportation systems by offering a comprehensive range of EV chargers. With both AC and DC options available, Vestel aims to provide seamless and eco-friendly charging infrastructure to support the growing adoption of electric vehicles.

With over 40 years of experience, a vast city-size 1.3 million m2 industrial complex, 11 offices based around the world, clientele from over 160 countries, a client-orientated mindset, and true R&D, Vestel embodies a legacy of excellence and a commitment to advancing industries at the intersection of innovation and sustainable solutions.

Exports
160+ countries

Export Leader of Turkey
for the last 26 consecutive years

900+ Customers
500+ Brands

Established over
1.3 million m^2

20.000+
Employees

VESTEL SUSTAINABILITY GOALS

42% absolute value reduction in Scope 1 and 2 greenhouse gas emissions.

30% reduction in energy intensity (per unit product).

Using **50%** recovered and recycled water.

Reducing the amount of water withdrawn per unit of production by **35%.**

Zeroing the amount of waste sent to landfills.

Achieving a female employee ratio of **40%** of the total workforce.

Vestel's vision is to be a technology company creating social and environmental benefits through accessible and smart products that make life easier. We are investing in innovative business models for transition to a net zero emission economy and striving to implement circular models in both our products and operations.

We are developing solutions that meet the needs of the future. We are designing products free from hazardous chemicals, that use recycled and recyclable materials, which are durable, easy to repair as well as energy and water efficient.

We calculate and report our carbon footprint according to the ISO 14064 standard and our water footprint according to the ISO 14046 standard and have these verified by independent third parties. We share our performance transparently through our CDP reports. We aim to reach net zero emissions by 2050, first in our own operations and then throughout our entire value chain. To that end, we aim to switch to technologies that cause less greenhouse gas emissions in production, increase renewable energy investments and manufacture products with high energy efficiency, less water consumption, and resource efficiency benefits.

We aim to strengthen our presence as a global player with our experience, vision, intellectual power, and technological prowess; and we are determined to contribute to a better and livable world, ocusing on our environmental, social and governance performance.

INNOVATION

VESTEL's approach brings the true meaning of custom design experience and creates the highest level of technology solutions from scratch. VESTEL Battery Solutions R&D team ensures complete client satisfaction by meeting the needs of any project at the highest quality. Combining the latest technology test and simulation tools alongside the design and manufacturing capabilities all in-house.

Fast and Fully Customized Projects by Providing Direct Access to our R&D Team.

R&D Investment Amounting to an Average 80M USD.

7 R&D Centers in 4 Countries.

Among Top 50 Companies in Patent Applications in Europe

PRODUCTION WITH HIGHEST QUALITY

TPM Awarded Manufacturing Facility
Awarded for World-Class TPM Achievement

Auto Grade Production for BMS
Automotive Grade In-house BMS Manufacturing with IATF 16949 Certification at Europe's biggest automated PCB facility.

Automated Production Lines
Fully automated cell sorting for the best possible cell balancing.

Laser Welding
Fully automated laser welding technology.

In-house Accredited Testing Facilities
Vestel Battery Solutions provides the utmost quality products with highest standards of quality with in-house accredited testing facilities for environmental, electrical, software and mechanical tests.

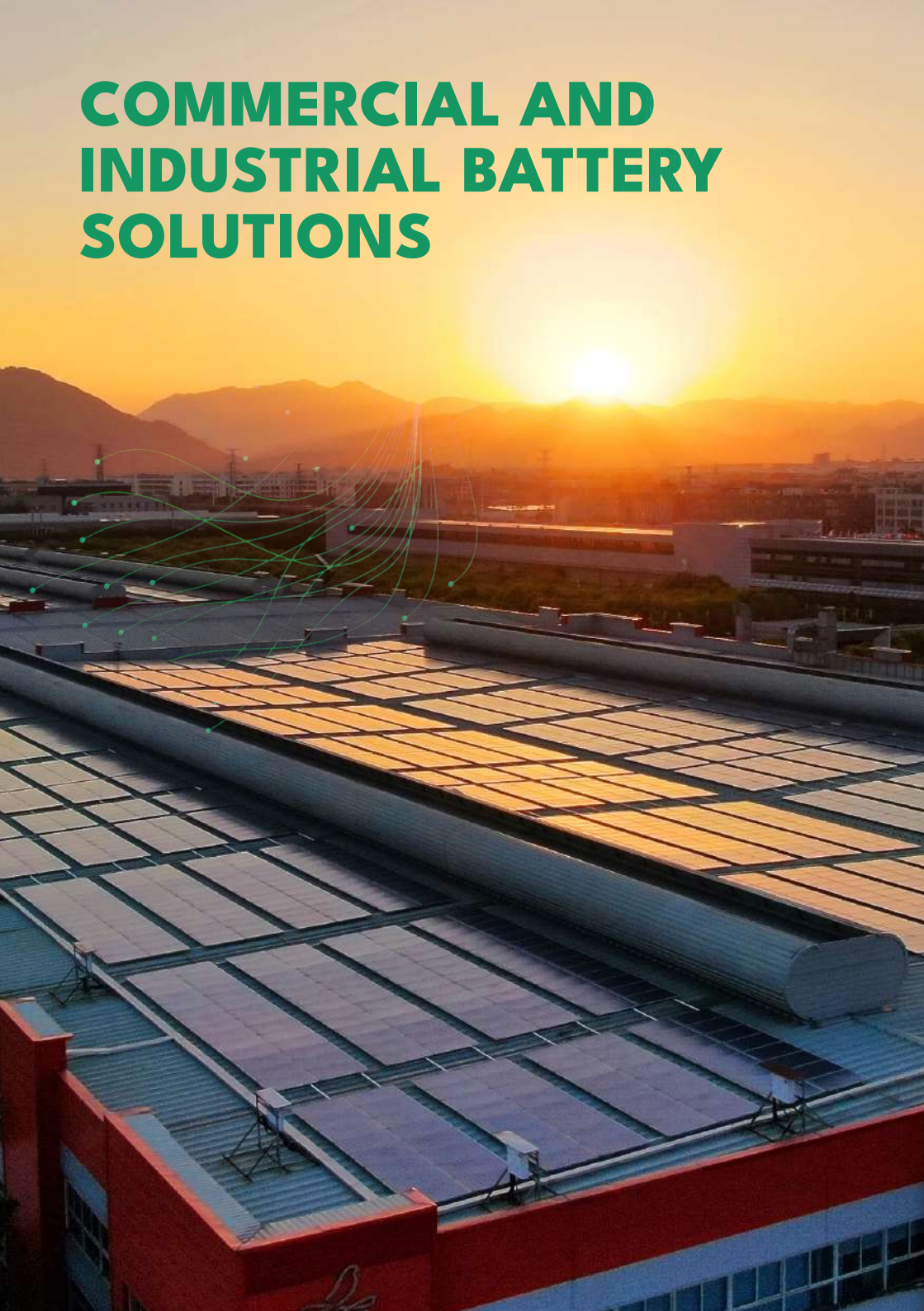
Tracking Real Time

ERP Integration

Real Time Planning

Traceability

COMMERCIAL AND INDUSTRIAL BATTERY SOLUTIONS



COMMERCIAL AND INDUSTRIAL BATTERY SOLUTIONS

KEY DESIGN FEATURES

Safe and Reliable

Integrated BMS, DC, AC multi layer protection, maximum safety performance design. Serially designed PCS and battery pack eliminates circulating current and improve system reliability. BMS can effectively protect the battery from overcharge, over discharge and over current.

Robust Design

Laser welding connection with high strength and low impedance. Cells are designed with PC holders and reinforce steel structure to guarantee the highest safety of the system in transportation, installation and operation.

Battery System Design

The system consists of safe, efficient and long life lithium iron phosphate cells, which are connected in series to form battery modules, and multiple modules are connected in series to form battery clusters.

Power Conversion System

Bidirectional AC / DC converter can realize the bidirectional conversion from DC to AC and AC to DC. It can not only convert AC to DC to charge battery, but also convert DC to AC to supply power to load or feed back to power grid.

Air Conditioning

HVAC system is configured to maintained an optimal temperature to maximize energy system operational life and reliability.

Energy Management System

System operation data monitoring, operation strategy management, historical data record, system status record.

INDUSTRY APPLICATIONS

Solar and Wind Farms

EV Charging Facilities

Microgrids

Factories

Data Centers

Offices

Hospitals

Mobile EV Charging

Entertainment

COMMERCIAL AND INDUSTRIAL BATTERY SOLUTIONS

FLEXIBLE SYSTEM

Easy access to PV and diesel generator, intelligent multi energy management. One investment can fulfill different requirements.

Emergency Backup

Providing power to critical loads during a power outage.

Renewable Integration

Storing excess energy generated by renewable sources during periods of high production and releasing during times of peak demand.

EVC Complimentary

Storing excess renewable or grid energy and using it to charge EVs, reducing reliance on traditional power grids and fossil fuels.

Peak Shaving

Managing overall demand to eliminate short-term demand spikes. This process lowers and smooths out peak loads, which reduces the overall cost of demand charges.

Microgrid Building

A microgrid is a group of interconnected loads and distributed energy resources that acts as a single controllable entity with respect to the grid. It can connect and disconnect from the grid to operate in grid-connected or island mode.

Bill Management

Arbitrage feature of the battery is utilized. Manage bills by storing energy when electricity prices are low and using the stored energy when prices are high.

SYSTEM COMPONENTS

Vestel C&I battery solution is an all-in-one product that includes PCS, EMS, HVAC, and STS components. MPPT and transformer features can be provided depending on the project requirements.

Electrical Cabinet

Static Transfer Switch (STS)
+
Bidirectional AC/DC Converter
+
Solar Controller (MPPT)

Battery Cabinet

75-150-225-300 kWh Single Battery Cabinet
+
HVAC System

C&I BATTERY SOLUTIONS

IT CAN BE SCALED UP AND EASILY CUSTOMIZED

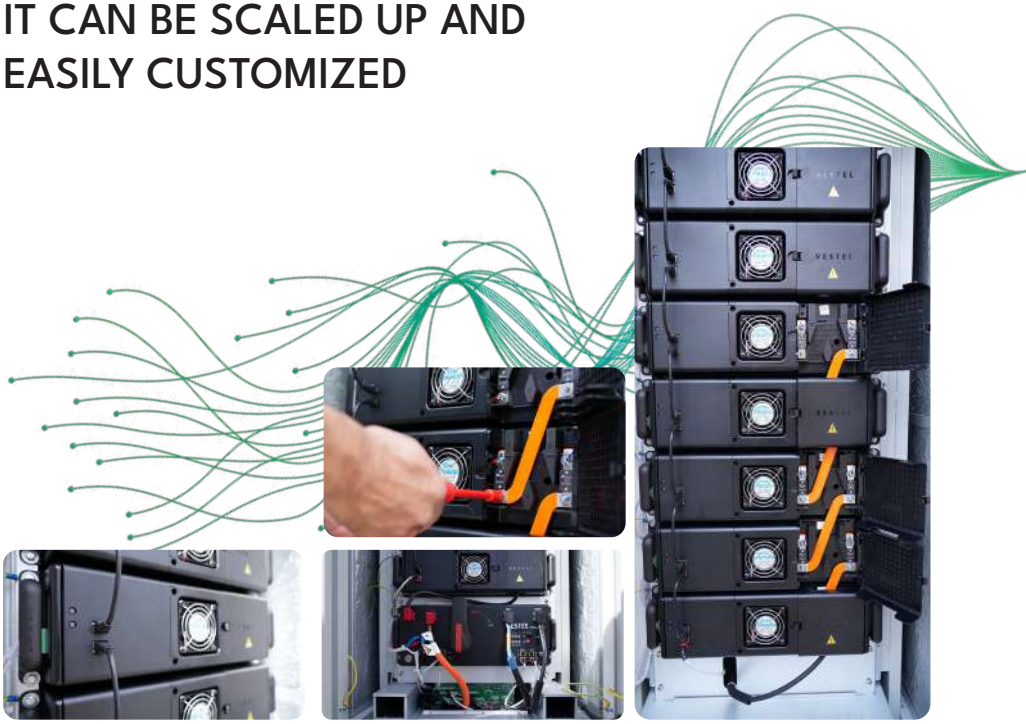
PARAMETERS	VSTL-CBS-75-50	VSTL-CBS-150-100	VSTL-CBS-225-150	VSTL-CBS-300-200
PV Parameters				
MPPT Voltage Range	DC 200V-700V			
Full Power MPPT Voltage Range	DC 370V-700V			
MPPT Channel Qty	0-2 (Optional)			
Single-Circuit MPPT Max Current	135 A			
Single-way MPPT Rated Power)	50 kW			
AC parameters (grid connected)				
Rated Output Power	50 kW	100 kW	150 kW	200 kW
Max Output Power	55 kW	110 kW	165 kW	220 kW
Rated Grid Voltage	AC 380/400 V			
Grid Voltage Range	-15%~+10%			
Rated Grid Frequency	50/60 Hz			
Grid Frequency Range	±2 Hz			
Output Current Harmonics	≤3% (rated power)			
DC Component	<0.5%In			
Power Factor	-0.9~+0.9			
Overload Capacity	105%]: continous operation; (105%~120%]: 10 min; 120%): stop operation			
AC parameters (off grid)				
Rated Output Power	50 kW	100 kW	150 kW	200 kW
Max Output Power	55 kW	110 kW	165 kW	220 kW
Rated Grid Voltage	3W+N+PE, 380/400 V			
Output Voltage Harmonics	3% linear full load			
Rated Frequency	50/60 Hz			
Overload Capacity	105%]: continous operation; (105%~120%]: 10 min; 120%): stop operation			
Battery				
Energy of Each Module	5.12 kWh			
Module Quantity	15	30	45	60
Total Power	76.8 kWh	153.6 kWh	230.4 kWh	307.2 kWh
Running Time	1.5 Optional by changing module qty h			

BATTERY MODULE SPECIFICATIONS

PARAMETERS	
Enclosure Size	19"3.2U
Lithium Chemistry	LiFePO4
Voltage Range	46V-57.5V (Nom.51.2V)
Rated Capacity	102 Ah
Rated Energy	5.12 kWh
Circuit breaker	200 A, 2 pcs
Cooling	Smart Fan
Operating Temperature	0 to 50 ˚C9
Max Charge Current	1C recommended 0.5C
Max Discharge Current	1C recommended 0.7C
Cycle Life	≥4000 times %70 SOC, 25 ˚C 1C/ 1C ≥5000 times %80 SOC, 25 ˚C 0.5C/ 0.5C
Weight	47 kg
Dimensions (WxLxH)	430x440x140 mm
Communication Protocols	RS485, CANBUS, Ethernet
Safety Standarts	IEC63056, IEC62619, IEC62620, UN38.3

C&I BATTERY SOLUTIONS

IT CAN BE SCALED UP AND EASILY CUSTOMIZED



PARAMETERS	VSTL-CBS-75-50	VSTL-CBS-150-100	VSTL-CBS-225-150	VSTL-CBS-300-200
System Efficiency				
Max Efficiency	%95			
Protection	YES			
AC and DC Switch	YES			
Grid Monitoring	YES			
Surge Protection	DC/AC 2nd level			
Basic Parameters				
Dimension (WxLxH)	1680x1500x1700 mm	1680x2270x1700 mm	1680x3050x1700 mm	1680x3830x1700 mm
Weight	1395 kg	2470 kg	3545 kg	4620 kg
Isolated Transformer	YES			
On/off Grid Switching	STS			
Protection	Outdoor IP54			
Working Temperature	-20~55˚C (>45˚C derating)			
Relative Humidity	0~95% (no condensing)			
Cooling	Intelligent air cooling (intelligent heating optional)			
Max. Working Altitude	4000 m (>2000 m derating)			
EMS	Cloud based integrated, with Touch Screen			
Communication	RS485, CAN, LAN			
Communication Protocol	Modbus-RTU, Modbus-TCP, CAN2.0B			

UTILITY SCALE ENERGY STORAGE SOLUTIONS

VESTEL CONTAINERIZED ENERGY STORAGE SYSTEMS

USE CASES

Vestel Containerized BESS can be adapted to project requirements and usage scenarios.

Peak Shaving

Charge during valley hours and discharge during peak hours to reduce enterprise or park electricity costs and save customers electricity costs.

Demand Response

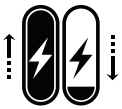
When the short-term power consumption exceeds the transformers capacity, the energy storage system performs rapid discharge to meet the load energy demand.

Backup Power

Provide uninterrupted short-term power supply for important loads during power interruption and reduce ecomical loses caused by sudden power failure of loads.

Power Trading

On the electricity market trading platform, short-term power trading is conducted by combining load forecasting to maximize profits.



Frequency Regulation

The system can quickly charge or discharge power as needed to balance the supply and demand, helping to maintain the grid's frequency within acceptable limits.

Voltage Regulation

The system helps to adjust voltage levels, ensuring they remain within acceptable limits. This capability helps improve grid stability, reliability, and efficiency, ultimately ensuring consistent and reliable electricity supply to consumers.

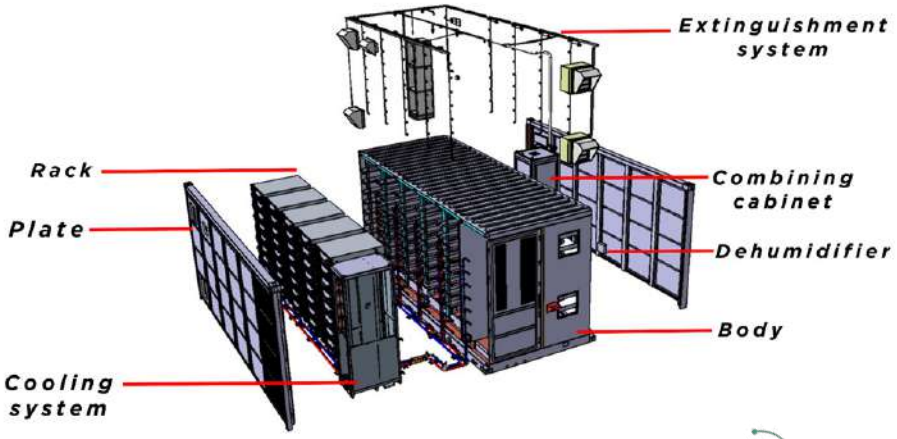
USE & CHARGE / DAY

USE / NIGHT

5MWH CONTAINER PARAMETERS

Technical Parameters	
Item	**Parameter**
Capacity	5 MWh
Voltage	1331.2 V
Voltage range	1040~1500 V
Configuration	6*1P832S
SOC	≤5%
Self Discharge	≤3% M
IP Level	IP54
Balance	Active/Passive Balancing
Weight	50.000 kg
Cooling System	Liquid cooling
Noise	<65dB
Dimension (L*W*H)	6058*2438*2896 mm

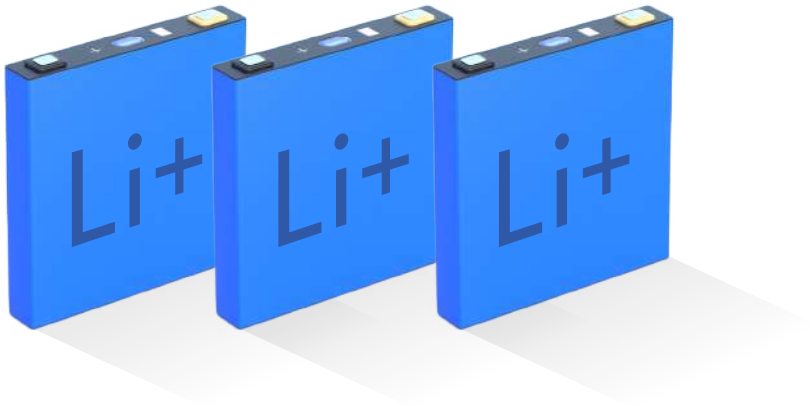
VESTEL CONTAINERIZED BESS SYSTEM COMPONENTS



Description	QTY	Unit
Rack	6	pcs
Bus Control Cabinet	1	pcs
Cooling System	1	pcs
Fire Extinguishing System	1	pcs
Cabinet Body and Other Component	1	pcs

CELL FOR HIGHER CAPACITY

The battery is designed with higher density lithium iron phosphate cell which has 314Ah cell.



Product Feature		
Item		**Cell**
Nominal capacity		314 AH
Nominal voltage		3.2 V
Standard charge		0.5 C
Standard disscharge		0.5 C
Temperature	Charge	0-55 ˚C
	Discharge	-20-55 ˚C
Dimension		T71˚W173*H207 mm
Weight		5.68+0.15 kg
Energy density		182 Wh/kg
Certification		GB/T 36276-2023, UL1973. UL9540A, IEC62619. UN38.3. ROHS. REACH
Cycle life		8000. 10000

BATTERY MODULE SPECIFICATIONS

5MWH

20 ft.
Container

104
Serial Cell

314 Ah

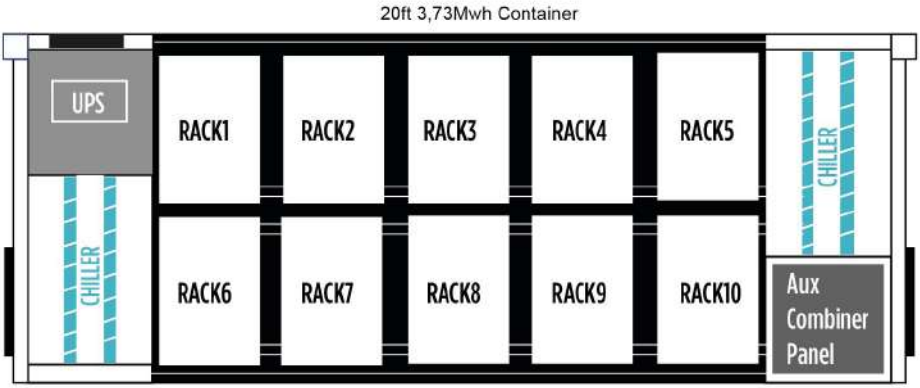
BESS
Layout Plan

Package Parameters	
Lithium Chemistry	LiFePO4
Voltage Range	145.6V-187.2V (Nom.166.4V)
Rated Capacity	314 Ah
Rated Energy	104.5kW
Circuit breaker	315 A, 2 pcs
Cooling	Liquid cooling system
Operating Temperature	0 to 50 ˚C
Max Charge Current	0.5C
Max Discharge Current	0.5C
Cycle Life	≥8000 times %70 SOC, 25 ˚C 1C/ 1C
Weight	660 kg
Dimensions (WxLxH)	2314x848x244mm
Communication Protocols	RS485, CANBUS, Ethernet
Safety Standarts	IEC63056, IEC62619, IEC62620, UN38.3

3,73MWH CONTAINER PARAMETERS

Technical Parameters	
Item	**Parameter**
Capacity	3.73 MWh
Voltage	1331.2 V
Voltage range	1040~1500 V
Configuration	10*1P416S
IP Level	IP54
Balance	Active/ Passivity
Weight	38000 kg
Cooling syste	Liquid cooling
Dimension (L*W*H)	6058*2438*2896 mm

VESTEL CONTAINERIZED BESS SYSTEM COMPONENTS



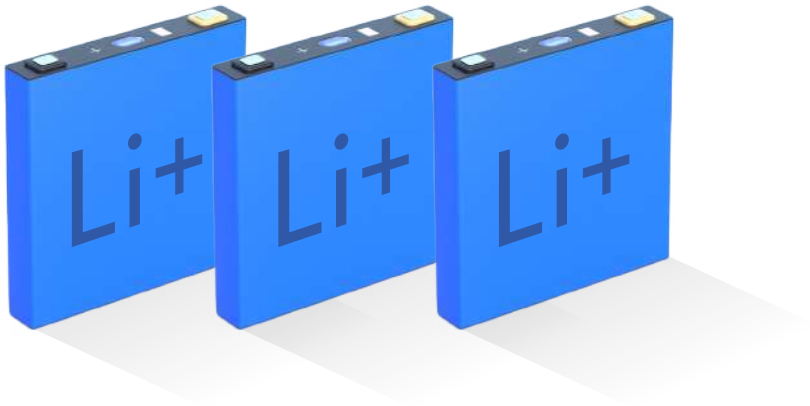
Description	QTY	Unit
Rack	10	pcs
Bus Control Cabinet	1	pcs
Cooling System	1	pcs
Fire Extinguishing System	1	pcs
Cabinet Body and Other Component	1	pcs

CELL FOR HIGHER CAPACITY

The battery is designed with higher density lithium iron phosphate cell which has 280Ah cell.

The size of the battery cell is 173*71*207mm (LxWxH)

The total weight is about 5.5 kg.



Product Feature		
Item		**Cell**
Nominal capacity		280 AH
Nominal voltage		3.2 V
Standard charge		1 C
Standard disscharge		1 C
Temperature	Charge	0-60 ˚C
	Discharge	-30-60 ˚C
Dimension		T71˚W173*H207 mm
Weight		5490 g±300 g
Energy density		162.9 Wh/kg
Certification		GB/T 36276-2023, UL1973. UL9540A, IEC62619. UN38.3. ROHS. REACH
Cycle life		8000

BATTERY MODULE SPECIFICATIONS

3,73MWH

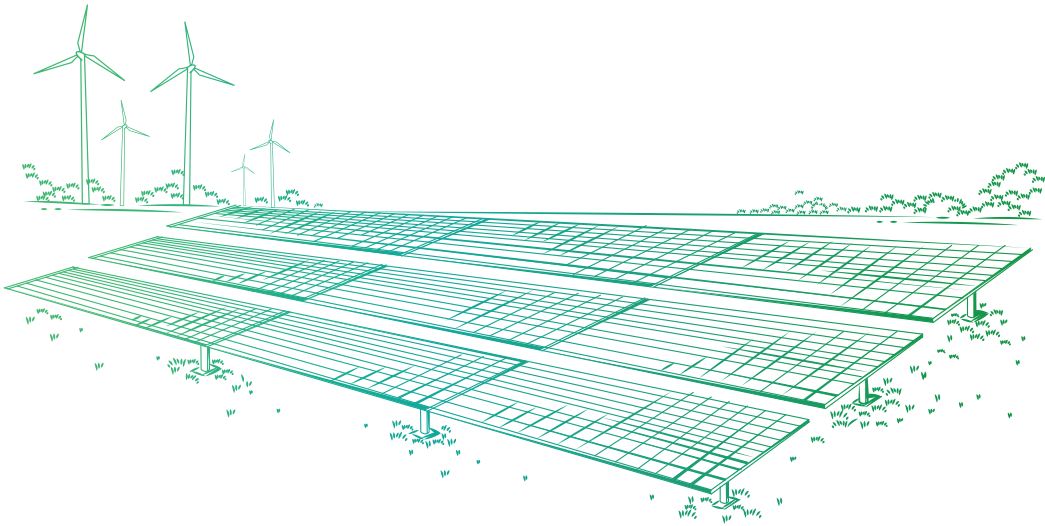
20 ft.
Container

52
Serial Cell

280 Ah

BESS
Layout Plan

Package Parameters	
Lithium Chemistry	LiFePO4
Voltage Range	145.6V-187.2V (Nom.166.4V)
Rated Capacity	280 Ah
Rated Energy	46.6 kWh
Circuit breaker	315 A, 2 pcs
Cooling	Liquid cooling system
Operating Temperature	0 to 50 ˚C
Max Charge Current	1C
Max Discharge Current	1C
Cycle Life	≥8000 times %70 SOC, 25 ˚C 1C/ 1C
Weight	330 kg
Dimensions (WxLxH)	1157x848x244mm
Communication Protocols	RS485, CANBUS, Ethernet
Safety Standarts	IEC63056, IEC62619, IEC62620, UN38.3



NOTES

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MOBILITY

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