

*Confidential*

**VaOpto**  
ESS Manufacturer

World-Class Microgrid Manufacturer

# EV Charger, BESS, MicroGrid Presentation

2024

**VAOPTO**

5178 West Patrick Lane  
Las Vegas, NV 89118, USA

Ph: 702-517-5789 [info@vaopto.com](mailto:info@vaopto.com) [www.vaopto.com](http://www.vaopto.com)



# Contents

<b>Part 1: About Us</b>	3
<b>Part 2: EV Charger Manufacturing Facilities</b>	6
<b>Part 3: <i>Residential/Commercial EV Charger – Level2</i></b>	10
<b>Part 4: <i>Commercial EV Charger – Ultra Fast Level3</i></b>	12
<b>Part 5: <i>EV Charger Leasing Program</i></b>	25
<b>Part 6: Solar Panels Manufacturing Facility</b>	31
<b>Part 7: Battery Energy Storage System Manufacturing Facility</b>	37
<b>Part 8: Power Conversion System Manufacturing Facility</b>	41
<b>Part 9: Transformer Manufacturing Facility</b>	44
<b>Part 10: <i>Residential ESS and MicroGrid</i></b>	47
<b>Part 11: <i>Commercial ESS and MicroGrid</i></b>	66
<b>Part 12: <i>Utility-Scale ESS and MicroGrid</i></b>	76

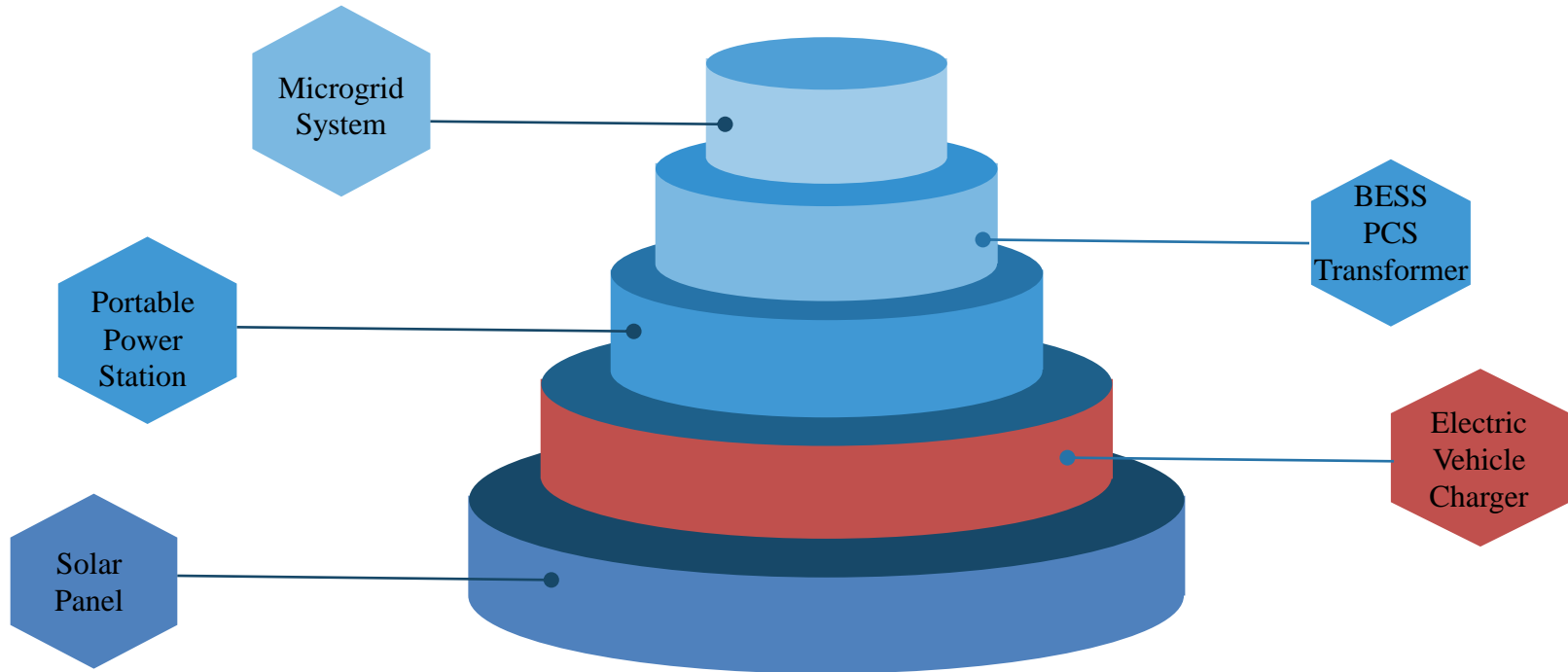
# About Us

- We are a leading "vertically integrated" manufacturer of standard and custom microgrid products specializing in R&D, Design, and Manufacture of Solar Panel, Electric Vehicle Charger, Portable Power Station, Battery Energy Storage System, and Microgrid System for residential, commercial, and utility scale.
  - > **Started at Virginia in 2005 and relocated at Las Vegas, Nevada in 2010**
  - > **Vertically-integrated-world class microgrid manufacturing facilities**
  - > **Certifications: ISO9001/ISO14001/ISO45001/cTUVus/cULus/cETLus/RoHS/FCC/MSDS/UN38.3**
  - > **R&D support for customer projects and custom products design to OEM/ODM**

- Some Valued Customers:



## Competitive Advantage with our Vertically-Integrated Manufacturing Capabilities





# Manufacturing Facilities



**Guangdong F1**



**Guangdong F2**





**Guangdong F3**



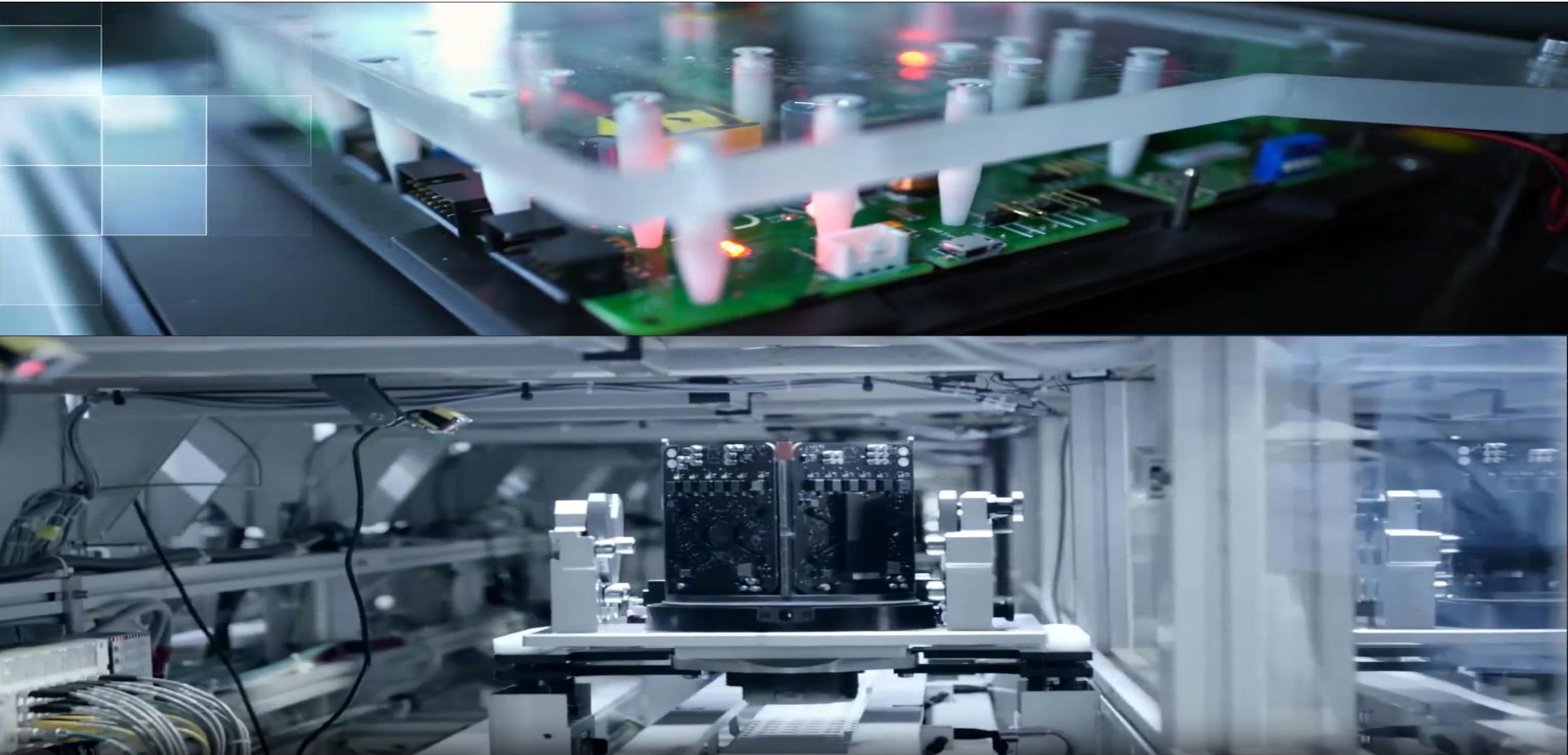
**Guangdong F4**



# EV Charger Manufacturing Facility

- Duration in industry: 10+ years
- Space: 1,500,000 ft<sup>2</sup>
- Workers: 1,800
- R&D engineers: 500
- Capacity: 50,000 pcs (45-480kW/pc) and  
1,000,000 pcs (less than 45kW/pc) per year
- Turnover: USD \$1 billion in 2022
- OEM/ODM customers:  **Shell** 

# EV Charger Production Capability



## EV Charger Production Test Center







LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

## EV Charger Production Capability



cETLus certified

## Residential EV Charger (3.5 & 7kW) Level 2



Product Power	3.5kW		7kW
Operating Current	16A		32A
Current Range	8A-10A-13A-16A		16A-20A-24A-32A
Safety Standard	☑GB/T20234, GB/T18487, NB/T33008.2, NB/T33002; ☑EN 62752: 2016+A1: 2020, EN 61543: 1995/A2: 2006; ☑UL2231-1/-2, UL2594, UL991, UL2251, UL1998;		
Basic Protection	OVP, UVP, OCP, Ground Protection, OTP, Leakage Protection		
Operating Voltage	220-240Vac±10%	Operating Humidity	5%~95%RH
Operating Frequency	50/60Hz±1Hz	Altitude	<2000m
Communication Method	WiFi&Bluetooth	Protection Degree	IP66
Length of Charging Gun	3.5m/5m/7m/7.5m	Appearance Size	298mm×105.8mm×53mm
Operating Temperature	-30~+50℃	Product Weight	<4.8KG
Length of Input Wire	0.5m	Installation Method	Wallbox
Screen Size	1.3inches	Surge Protection	Type1: L-N 3kV/LN-G 3kV GBT/Type2:L-N 2kV/LN-G 4kV
Connector Type	☑GB/T 20234.2 ☑SAE J1772    ☑IEC 62196	Leakage Protection	AC30mA/AC30mA+DC6mA/CCID20

**cETLus certified**

## Residential/Commercial EV Charger (7-19.2kW) Level 2

- High Quality Design
- Durable Materials
- Low Standby Static Power Consumption
- APP Charging Control
- Three-Color Indicator Lights
  - Power Connected-Solid Blue*
  - Standby-Solid Green*
  - Charging-Flash Green*
  - WiFi/Bluetooth Connected-Soft White*
- LCD Human Machine Interface
- RFID OCPP Payment (Option)
- WiFi/Bluetooth Communication (Option)
- Over Voltage Protection
- Under Voltage Protection
- Overload Protection
- Over Temperature Protection
- Grounding Protection
- Earth Leakage Protection
- Emergency Stop Protection
- Mean Time Between Failures 100,000 Hours
- Two-Years Limited Warranty



### Product Details

**Amperage** 32-40-48-80 Amp  
**Voltage** 208-240VAC (<15%) Single Phase  
**Input / Output Power** 7-9.6-11.5-19.2kW  
**Cable Length** 18 ft  
**Dimensions** 12.8" x 9.7" x 3.8"  
**Weight** 10 lbs

**Safety Standard**  
**Standard Compliance**  
**Plug**  
**Enclosure**  
**Installation Type**  
**Reliability**

UL2594•2231•NEC625• EnergyStar  
 cETLus Listed•RoHS•REACH•FCC  
 SAE J1772 Type 1  
 NEMA Type 4 IP65 IK08  
 NEMA 14-50R/6-50R Plug / Fixed  
 6000 Cycles



# Commercial EV Charger

## Robot EV Charger (60KW 64KWh) – Ultra Fast Level 3



Configuration	Specifications
Body form	Split type
Moving method	Automatic/manual driving
Communication	4/5G Communication
Body size	65*39*51 (inch)
Battery capacity	64KWh
Max. discharging power	60KW
Max. input current	250A
Number of cell cycles	≥6000 times
Charging interface	International DC charging gun
Operating temperature	-4°F~131°F (-20°C~55°C)
Elevation	≤6500 ft
Battery	Lithium iron phosphate battery
Usage scenario	Indoor & outdoor parking lot
Laser radar	2
Ultrasonic radar	6
Emergency stop	The emergency stop is integrated to realize synchronous emergency stop control of energy storage and chassis to avoid misjudgment and accidental triggering.



## Robot EV Charger (60KW 64KWh) – Ultra Fast Level 3



One click call electricity    Automatically come to your vehicle    Charging

Pay the bill and drive away

## Robot EV Charger (60KW 64KWh) – Ultra Fast Level 3





LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

**cTUVus certified**

# Commercial EV Charger (160-240KW) – Ultra Fast Level 3



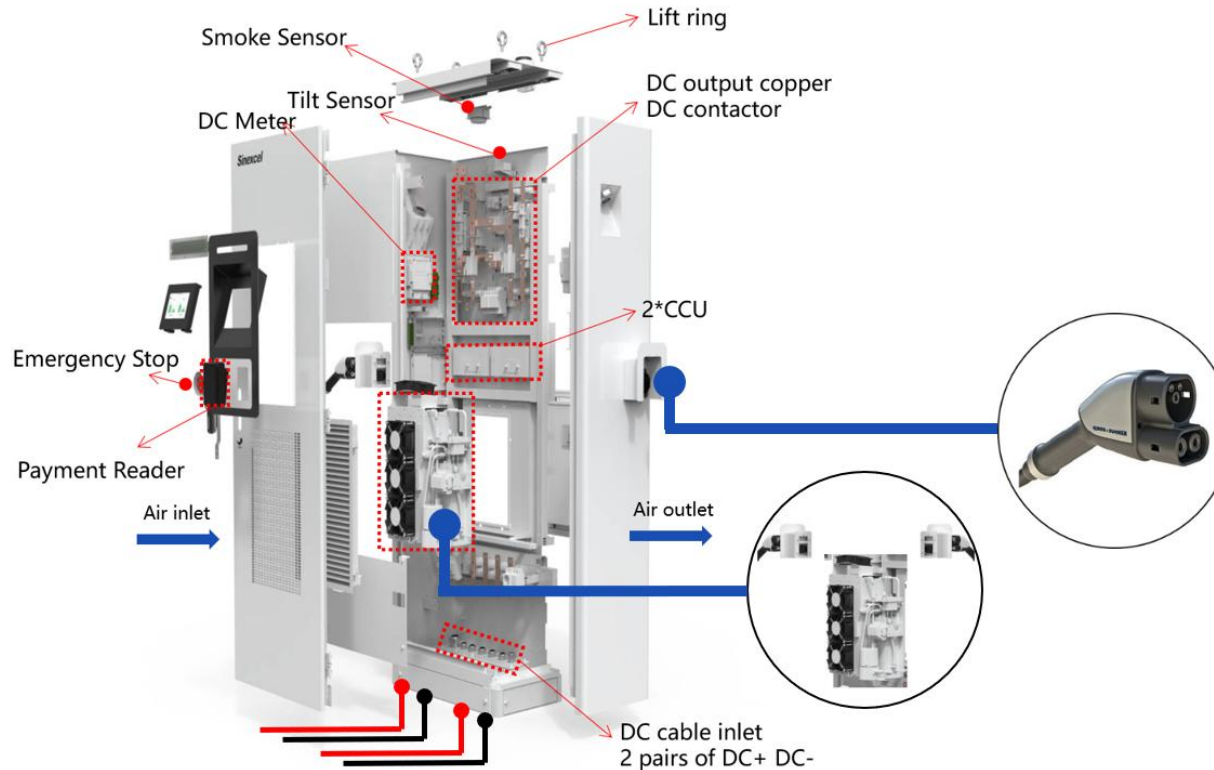


LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

**cTUVus certified**

## Commercial EV Charger (160-240KW) – Ultra Fast Level 3







LIFEWAVE SOLUTIONS  
BESS Manufacturer

**cTUVus certified**

## Commercial EV Charger (160-240KW ) – Ultra Fast Level 3

<b>Output Characteristic</b>	Output Voltage	50-1000V (CCS1) 200-500V (CHAdeMO)
	Rated power	160-240kW (CCS1)
	Cable Option	200A (CCS1) 300A (CCS1) 125A (CHAdeMO)
	AC->DC Transaction	VAOPTO 40kW Modules
	Peak efficiency	96% @half load rate
<b>Input Characteristics</b>	Input Voltage	AC 480±10% (3P+N+PE)
	Frequency	50~60Hz
	Power Factor	> 0.99
	THDi	< 5%
	Grounding Type	TT, TN-CS, TN-S
<b>User Interface</b>	Screen	15inch HD high-contrast touchscreen
	Payment terminal	RFID reader (ISO 14443 A + B to part 4 and ISO/IEC 15693, Mifare 1, NFC)
<b>Mechanical Dimensions</b>	Protection level	IP55/IK10
	Standard	UL 2202, UL 2231
	Size	W (800~918) mm*D750mm*H2000mm
	Communication protocol	OCPP1.6 / OCPP2.0.1(2023) DIN70121, ISO15118
<b>Environmental Conditions</b>	Operating temperature	-25 °C ~+65 °C (derating over 45°C)
	Humidity	5%~95%
	Altitude	<2000m

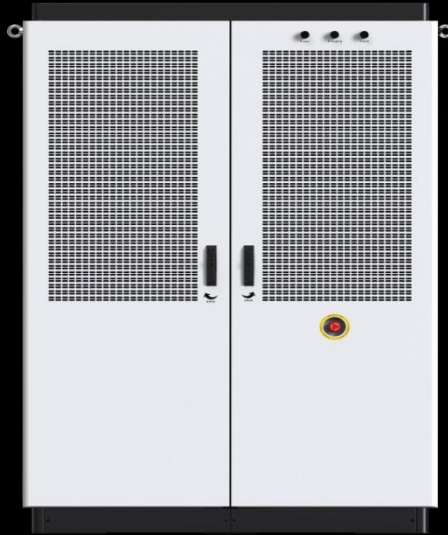


LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

**cTUVus certified**

# Commercial EV Charger (360-480KW) – Ultra Fast Level 3



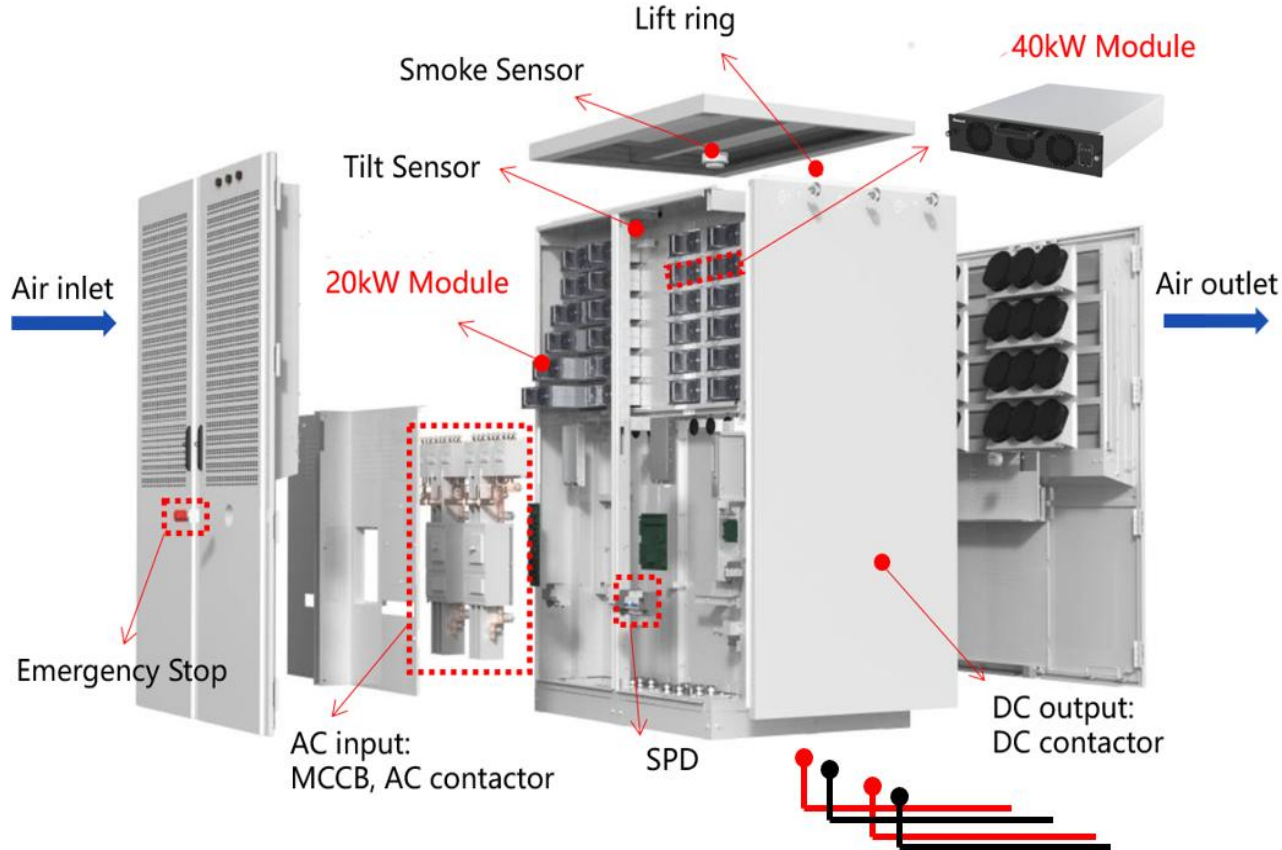


LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

**cTUVus certified**

## Commercial EV Charger (360-480KW) – Ultra Fast Level 3





LIFEWAVE SOLUTIONS  
BESS Manufacturer

**cTUVus certified**

## Commercial EV Charger (360-480KW) – Ultra Fast Level 3

<b>Output Characteristic</b>	Output Voltage	50-1000V(CCS1) 200-500V(CHAdemo)
	Rated power	360-480kW (CCS1)
	Max Current	200A (CCS1) 500A liquid cooling (CCS1) Support Dual 500A 125A (CHAdemo)
	AC->DC Transaction	VAOPTO 40kW Modules
	Peak efficiency	96% @half load rate
<b>Input Characteristics</b>	Input Voltage	AC 400±10%
	Frequency	50~60HZ
	Power Factor	> 0.99
	THDi	< 5%
	Grounding Type	TT, TN-CS, TN-S
<b>User Interface</b>	Screen	7 inch HD high-contrast touchscreen
	Payment terminal	RFID reader (ISO 14443 A + B to part 4 and ISO/IEC 15693, Mifare 1, NFC)
<b>Mechanical Dimensions</b>	Protection level	IP55/IK10
	Standard	UL 2202, UL 2231
	Size	Power Bank: W1400*D1000*H2100 mm User Terminal: W450*D750*H2100 mm
	Communication protocol	OCPP1.6 / OCPP2.0.1(2023) DIN70121, ISO15118
<b>Environmental Conditions</b>	Operating temperature	-30 °C ~+65 °C (derating over 45°C)
	Humidity	5%~95%
	Altitude	<2000m



# Commercial EV Charger Cases



LIFEWAVE SOLUTIONS  
BESS Manufacturer





LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

## Commercial EV Charger Case







LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

## Commercial EV Charger Case





LIFEWAVE SOLUTIONS  
BESS Manufacturer

## Commercial EV Charger Case

**VaOpto**  
ESS Manufacturer





LIFEWAVE SOLUTIONS  
BESS Manufacturer

# EV Charger Capital Leasing Program

## Robot 60KW-Ultra Fast Level 3

**VaOpto**  
ESS Manufacturer

Term (Yrs)	Rate	Fees	# of paymts/yr	per payem't	Annual Paym't
2	12.15%	\$0.00	12	\$4,902.93	\$58,835.16
3	11.29%	\$0.00	12	\$3,419.13	\$41,029.56
4	10.51%	\$0.00	12	\$2,663.25	\$31,959.00
5	9.8%	\$0.00	12	\$2,199.47	\$26,393.64
6	9.15%	\$0.00	12	\$1,882.41	\$22,588.92
7	8.55%	\$0.00	12	\$1,649.61	\$19,795.32

### Notes about this option

\$10,000 Min.	Minimum transaction cost must be no less than \$10,000.
DISCLOSURE	Final rate, term, & fees are subject to underwriting approval.
Essential	Financed equipment, machinery, or software must address an essential aspect to the business.
Soft Costs Max.	Soft Costs are eligible to be rolled into lease payments. (E.g. Taxes, shipping, etc.)(Up to a maximum 20% of Equipment Cost)
Terms	Well-qualified borrowers may be eligible for more attractive rates & terms, subject to underwriting approval.



## EV Charger Capital Leasing Program-160KW-Ultra Fast Level 3

Term (Yrs)	Rate	Fees	# of paymts/yr	per payem't	Annual Paym't
2	12.15%	\$0.00	12	\$3,922.34	\$47,068.08
3	11.29%	\$0.00	12	\$2,735.30	\$32,823.60
4	10.51%	\$0.00	12	\$2,130.60	\$25,567.20
5	9.8%	\$0.00	12	\$1,759.58	\$21,114.96
6	9.15%	\$0.00	12	\$1,505.93	\$18,071.16
7	8.55%	\$0.00	12	\$1,319.69	\$15,836.28

### Notes about this option

\$10,000 Min.	Minimum transaction cost must be no less than \$10,000.
DISCLOSURE	Final rate, term, & fees are subject to underwriting approval.
Essential	Financed equipment, machinery, or software must address an essential aspect to the business.
Soft Costs Max.	Soft Costs are eligible to be rolled into lease payments. (E.g. Taxes, shipping, etc.)(Up to a maximum 20% of Equipment Cost)
Terms	Well-qualified borrowers may be eligible for more attractive rates & terms, subject to underwriting approval.



## EV Charger Capital Leasing Program - 200KW - Ultra Fast Level 3

Term (Yrs)	Rate	Fees	# of paymts/yr	per payem't	Annual Paym't
2	12.15%	\$0.00	12	\$4,412.64	\$52,951.68
3	11.29%	\$0.00	12	\$3,077.21	\$36,926.52
4	10.51%	\$0.00	12	\$2,396.93	\$28,763.16
5	9.8%	\$0.00	12	\$1,979.52	\$23,754.24
6	9.15%	\$0.00	12	\$1,694.17	\$20,330.04
7	8.55%	\$0.00	12	\$1,484.65	\$17,815.80

### Notes about this option

\$10,000 Min.	Minimum transaction cost must be no less than \$10,000.
DISCLOSURE	Final rate, term, & fees are subject to underwriting approval.
Essential	Financed equipment, machinery, or software must address an essential aspect to the business.
Soft Costs Max.	Soft Costs are eligible to be rolled into lease payments. (E.g. Taxes, shipping, etc.)(Up to a maximum 20% of Equipment Cost)
Terms	Well-qualified borrowers may be eligible for more attractive rates & terms, subject to underwriting approval.



## EV Charger Capital Leasing Program - 240KW - Ultra Fast Level 3

Term (Yrs)	Rate	Fees	# of paymts/yr	per payem't	Annual Paym't
2	12.15%	\$0.00	12	\$4,902.93	\$58,835.16
3	11.29%	\$0.00	12	\$3,419.13	\$41,029.56
4	10.51%	\$0.00	12	\$2,663.25	\$31,959.00
5	9.8%	\$0.00	12	\$2,199.47	\$26,393.64
6	9.15%	\$0.00	12	\$1,882.41	\$22,588.92
7	8.55%	\$0.00	12	\$1,649.61	\$19,795.32

### Notes about this option

\$10,000 Min.	Minimum transaction cost must be no less than \$10,000.
DISCLOSURE	Final rate, term, & fees are subject to underwriting approval.
Essential	Financed equipment, machinery, or software must address an essential aspect to the business.
Soft Costs Max.	Soft Costs are eligible to be rolled into lease payments. (E.g. Taxes, shipping, etc.)(Up to a maximum 20% of Equipment Cost)
Terms	Well-qualified borrowers may be eligible for more attractive rates & terms, subject to underwriting approval.





## EV Charger Capital Leasing Program - 360KW - Ultra Fast Level 3

Term (Yrs)	Rate	# of paymts/yr	Per Paymt	Annual Paymt
2	12.15%	12	\$6,312.52	\$75,750.24
3	11.29%	12	\$4,402.13	\$52,825.56
4	10.51%	12	\$3,428.94	\$41,147.28
5	9.8%	12	\$2,831.82	\$33,981.84
6	9.15%	12	\$2,423.60	\$29,083.20
7	8.55%	12	\$2,123.87	\$25,486.44

### Notes about this option

\$10,000 Min.	Minimum transaction cost must be no less than \$10,000.
DISCLOSURE	Final rate, term, & fees are subject to underwriting approval.
Essential	Financed equipment, machinery, or software must address an essential aspect to the business.
Soft Costs Max.	Soft Costs are eligible to be rolled into lease payments. (E.g. Taxes, shipping, etc.)(Up to a maximum 20% of Equipment Cost)
Terms	Well-qualified borrowers may be eligible for more attractive rates & terms, subject to underwriting approval.



## EV Charger Capital Leasing Program - 480KW - Ultra Fast Level 3

Term (Yrs)	Rate	Fees	# of paymts/yr	per payem't	Annual Paym't
2	12.15%	\$0.00	12	\$7,283.68	\$87,404.16
3	11.29%	\$0.00	12	\$5,079.38	\$60,952.56
4	10.51%	\$0.00	12	\$3,956.47	\$47,477.64
5	9.8%	\$0.00	12	\$3,267.49	\$39,209.88
6	9.15%	\$0.00	12	\$2,796.46	\$33,557.52
7	8.55%	\$0.00	12	\$2,450.62	\$29,407.44

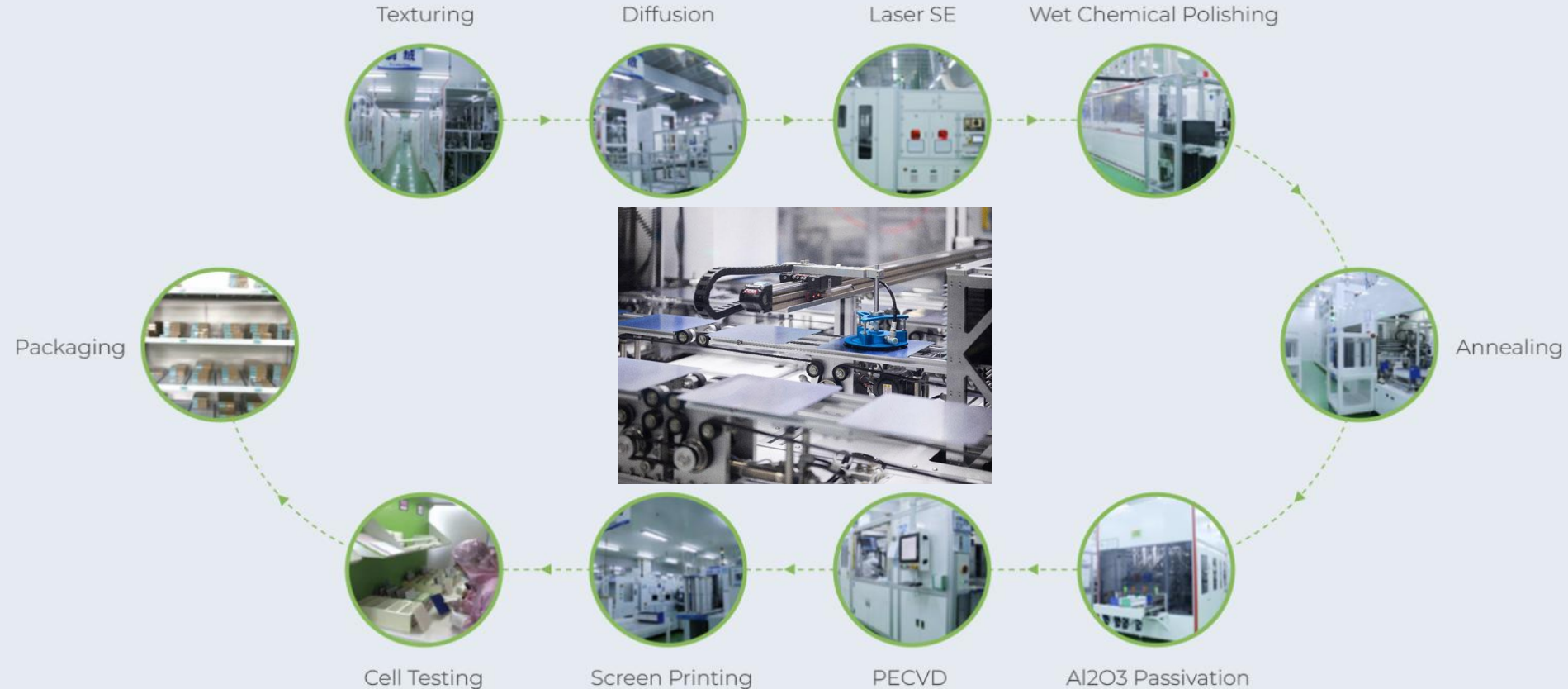
### Notes about this option

\$10,000 Min.	Minimum transaction cost must be no less than \$10,000.
DISCLOSURE	Final rate, term, & fees are subject to underwriting approval.
Essential	Financed equipment, machinery, or software must address an essential aspect to the business.
Soft Costs Max.	Soft Costs are eligible to be rolled into lease payments. (E.g. Taxes, shipping, etc.)(Up to a maximum 20% of Equipment Cost)
Terms	Well-qualified borrowers may be eligible for more attractive rates & terms, subject to underwriting approval.

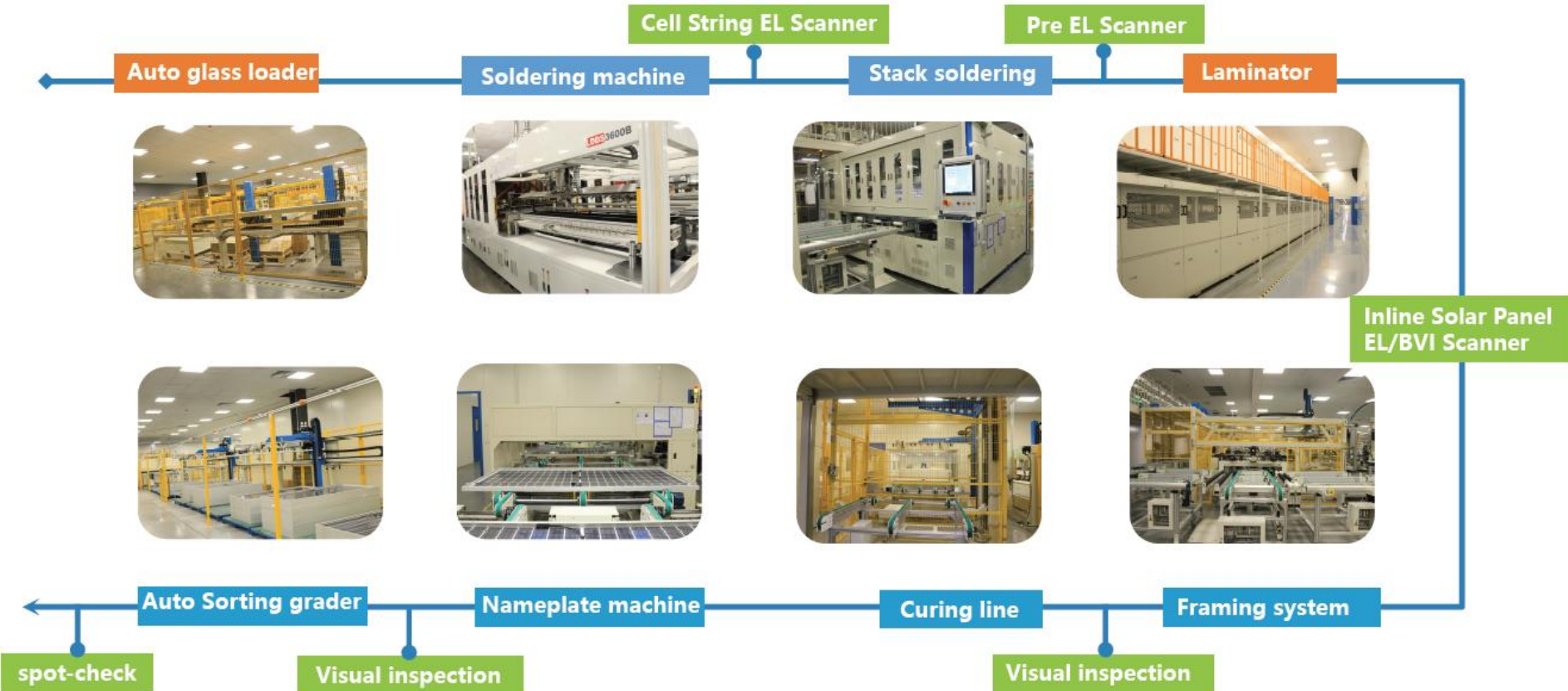
# Solar Panel Manufacturing Facility

- Duration in industry: 10+ years
- Space: 10,000,000 ft<sup>2</sup>
- Workers: 6,000
- R&D engineers: 700
- Capacity: 60GW in cell, 6GW in panels
- Turnover: USD \$2 billion in 2022
- Sub-Factories: Cambodia, Laos, Vietnam

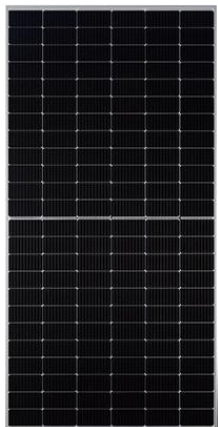
## Solar Cell Production Process



## Solar Panel Production Process



## cETLus certified Solar Panels



### Electric Characteristics

STC: Irradiation 1000W/m<sup>2</sup>, Cell Temperature 25°C, AM=1.5 NMOT: Irradiance 800 W/m<sup>2</sup>, Ambient Temperature 20 °C, Wind Speed 1 m/s, AM=1.5

Module Type	535		540		545		550		555	
	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT	STC	NMOT
Maximum Power (Pmax) [W]	535	405	540	408	545	412	550	416	555	420
Open-Circuit Voltage (Voc)[V]	49.44	46.31	49.61	46.43	49.76	46.55	49.91	46.68	50.03	46.84
Maximum Power Voltage (Vmp) [V]	41.46	38.84	41.65	39.00	41.81	39.21	41.97	39.44	42.15	39.67
Short-Circuit Current (Isc)[A]	13.78	11.05	13.85	11.10	13.92	11.13	14.02	11.18	14.07	11.22
Maximum Power Current (Imp) [A]	12.90	10.43	12.97	10.47	13.04	10.51	13.10	10.55	13.17	10.59
Module Efficiency	20.71%		20.90%		21.10%		21.29%		21.48%	
Power Tolerance					0~+5W					
Temperature coefficient of Isc					+0.045%/°C					
Temperature coefficient of Voc					-0.275%/°C					
Temperature coefficient of Pmax					-0.350%/°C					

### Bifacial Output-Rearside Power Gain (545 W)

Power Gain	5%	10%	15%	20%	25%
Maximum Power (Pmax) [W]	572	600	627	654	681
Open-Circuit Voltage (Voc)[V]	49.77	49.77	49.77	49.87	49.87
Maximum Power Voltage (Vmp) [V]	41.81	41.82	41.82	41.92	41.92
Short-Circuit Current (Isc)[A]	14.59	15.29	15.99	16.68	17.37
Maximum Power Current (Imp) [A]	13.69	14.35	15.01	15.64	16.26



## cETLus certified Solar Panels

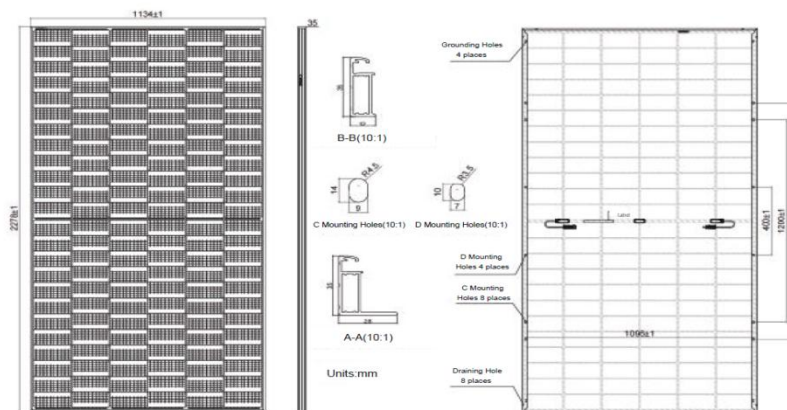
### Mechanical Characteristics

Cell Type	Mono PERC (M10)
Number of Cells	144(6x24)
Dimensions	2278X1134X35mm
Weight	31.0kg
Glass	Front Glass, 2.0mm AR coated tempered glass Back Glass, 2.0mm glazed tempered glass
Frame	Silver, Anodized Aluminum Alloy
Output Cables	4mm <sup>2</sup> (IEC), 12AWG(UL) 300mm (including connector) or Customized Length
Junction Box	IP68 Rated, 3 diodes
Connector	MC4-EVO2 or MC4 Compatible
Packaging	31 Pieces/Pallet, 620 pieces/40' container

### Operating Conditions

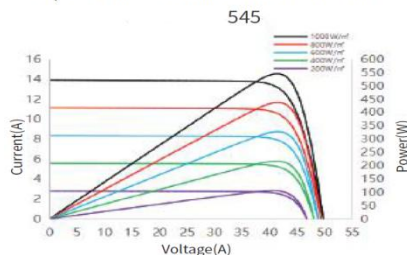
Maximum System Voltage	1500V DC (IEC)
Operating Temperature	-40°C~+85°C
Maximum Series Fuse Rating	30A
Mechanical Load Front Rear	5400Pa
Mechanical Load Back Rear	2400Pa
Nominal operating cell temperature	45±2°C
Bifaciality	70±10%
Fire Rating	Type2/9

### Engineering Design

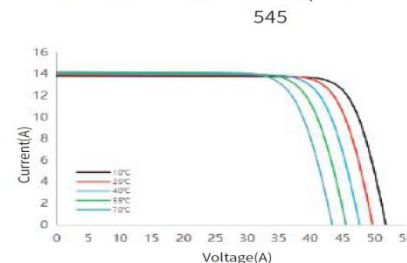


### Characteristics

I-V/P-V Curve at Different Irradiation



I-V Curve at Different Temperature



## Solar Panel Cases





# BESS Manufacturing Facility

- Duration in industry: 10+ years
- Space: 3,000,000 ft<sup>2</sup>
- Workers: 6,000
- R&D engineers: 2,000
- Capacity: 50GWh
- Turnover: USD \$3 billion in 2022

## **BESS Manufacturing Facility** **(Using Tier 1 Battery Cells in the Industry)**



## BESS Manufacturing Facility





## BESS Manufacturing Facility



# PCS Manufacturing Facility

- Duration in industry: 10+ years
- Space: 750,000 ft<sup>2</sup>
- Workers: 900
- R&D engineers: 250
- Capacity: 500,000 pcs annually
- Turnover: USD \$500 million in 2022





# PCS Manufacturing Facility

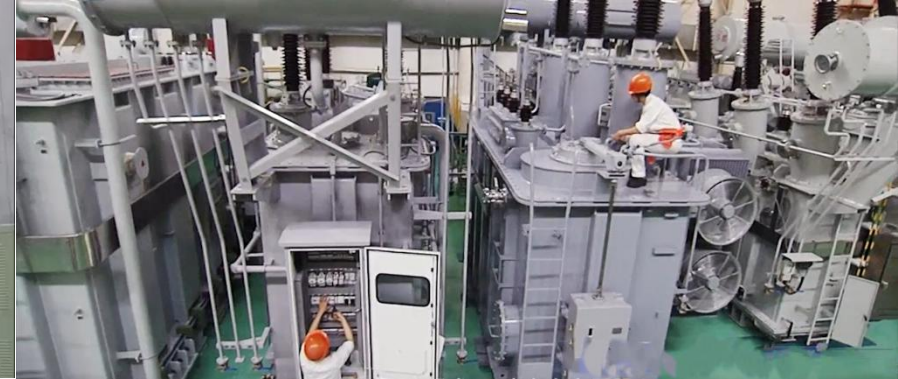


# Transformer Manufacturing Facility

- Duration in industry: 50+ years
- Space: 3,000,000 ft<sup>2</sup>
- Workers: 2,500
- R&D engineers: 700
- Capacity: 200GVA
- Turnover: USD \$1 billion in 2022



## Transformer Manufacturing Facility



## Transformer Manufacturing Facility





# Residential ESS and MicroGrid



House



Communication Base  
Station



Small Merchants

# Portable Power Station Capability



# Portable Power Station 2000W



Battery information	Model NO.	LWS-PPS-2000
	Battery materials	LiFePO4
	Battery Capacity	1720Wh(38.4Ah/44.8V)
Recharge	AC Charging	AC90~120V(1400W Bi-directional inverter Max)
	Car Charging	12V vehicle: 140W MAX    24V vehicle: 280W MAX
	Solar Charging	DC16V~60V/10A 500W Max
Output SPEC	Rated Power	2000W Max
	Peak Power	4000W Max
	Output Voltage	110V±10%
	Output Frequency	60HZ±5%
	USB Output	QC18W *2+PD27W+PD100W Max
	DC Output	Car cigarette lighter Output 12.8V/12A Max+12.8V/5A Max
Function	Recharging time	Quick Charge: 1.5-2.0Hrs
		Normal Charge: 3-4Hrs
		Silent Charge: 6-7Hrs
	Battery expandable	SUPPORT
	App control	SUPPORT
	Output Waveform	Pure Sine Wave
	UPS Function	SUPPORT
	LED	3 Levels(HML)+SOS
	Weight/Size	21KG/46.5*26*29.5CM



## Portable Power Station 2000W

### Home Battery Backup

More strong Expandable battery, a reliable partner of your household power storage system.

 *Air Conditioner(1150W) 1.3+ Hrs	 TV(110W) 14 Hrs	 *Refrigerator(520W) 2.9+ Hrs	 Microwave(1150W) 78 Min	 Washer(500W) 3 Hrs
 Coffee Maker(550W) 2.8 Hrs	 Rice Cooker(550W) 2.8 Hrs	 Foldable Kettle(700W) 2.2+ Hrs	 Blender(300W) 5 Hrs	 CPCA(40W) 38+ Hrs







## Portable Power Station 2000W

Massive off-grid outdoor power supply, power up to 2000W,  
Never worry about power outage, Enjoy your wonderful trip.

 *Mini Cooler(90W) 17+ Hrs	 Electric Grill(1600W) 50 Min	 DRONE(100W) 15+ Hrs	 Projector(100W) 15+ Hrs	 Audio(10W) 154+ Hrs
 Hand Drill(60W) 25+ Hrs	 Fan(90W) 30+ Hrs	 Laptop 13"(70W) 22+ Hrs	 Phone(10W) 154+ Hrs	 Lamp(10W) 154+ Hrs





## Portable Power Station Expandable Battery up to 5x1720Wh (Working with LWS-PPS-2000 together only)



Battery information	Model No.	LWS-PPS-2B
	Battery Materials	LiFePo4
	Battery Capacity	1720Wh(38.4Ah/44.8V)
Function	Expandable Battery	Yes
	LED	3 levels(HMS)+SOS
	Weight/Size	18kgs / 480x255x240mm



## Portable Power Station Expandable Battery up to 5x1720Wh

### Massive Power Station Never Run Out of Power

Expandable Up To **8600Wh** with 4  
LiFePO4 Battery with **3,000+**  
Life Cycles to **80%**



### ALL-ROUND UPGRADED EXPANDABLE LIFEPO4 POWER STATION

**3442WH/2000W 2500 TIMES SOH≥70%**

#### 3 Intelligent Charging Modes

**2**  
HOUR

Fast Charging

**4-5**  
HOUR

Normal Charging

**8**  
HOUR

Silent Charging  
(≤20dB)



- A-grade EV-level LiFePO4 Battery
- 12 Forms of Protection for High Safety and Reliability
- 3 Intelligent Charging Modes for Diverse Charging Needs
- Auto-switch UPS Function for Unexpected Power Outage

# Portable Power Station 2400W



**Inverter included**  
**Connectable to home solar system**

Battery Type	LiFePO4 Battery
Rated Power	2400 W (Peak 5000W)
Capacity	2621Wh
USB-C Port	1*PD100W (5-15V/3V, 20V/5A), 1* Individual port 5-15V/3V (Max 40W)
USB Output	4*QC3.0 18W
DC Output	1*DC5521 13V 5A (Max. 65W), 1*DC5525 24V 5A (Max. 120W)
AC Output	110V/220V (Optional according to customer requirements)
Cigarette Lighter Output	DC13V-10A 130W (Max.)
Input	City charger 2000W max / Car charger 12-16 Solar charger 15-100V 1500W max (XT60)
Highlights	Enhancement package + AC parallel + bidirectional inverter (support Bluetooth, WIFI, APP, off-grid and grid-connected mode), 3 sets of products can be combined as 3-phase power
Net weight	Approx. 25kg
Dimension D*W*H(mm)	502.11×255×378.5mm
Lifecycles	Approx. 3000 cycles
Storage temperature	-20°C~60°C
Operating temperature	-10°C~45°C
Charging time	Approx. 2 H
Certificates	UN38.3, PSE-EMC, Circle PSE safety certification, METI filling, FCC/SDOC, California 65, California Energy Certification CEC, US Energy Efficiency DOE, WERCs Registration, UL2743, CE-EMC, CE-LVD, CE-ROHS, CE-Battery Directive, CE-ERP, REACH, UKCA-LVD, UKCA-EMC, UKCA-ROHS

## Portable Power Station Expandable Battery up to 6x2621Wh







LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

# Portable Power Station 3600W

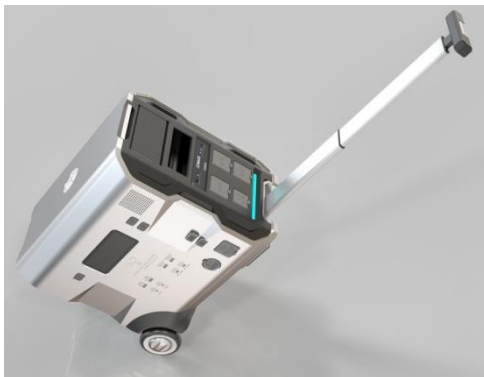


**Inverter included**  
**Connectable to home solar system**

Battery Type	LiFePO4 Battery
Rated Power	3600 W ( Peak 7200W )
Capacity	3072Wh
USB-C Port	1*PD100W (5-15V/3V, 20V/5A), 1* Individual port 5-15V/3V (Max 40W)
USB Output	4*QC3.0 18W
DC Output	1*DC5521 13V 5A (Max. 65W), 1*DC5525 24V 5A (Max. 120W)
AC Output	110V/220V (Optional according to customer requirements)
Cigarette Lighter Output	DC13V-10A 130W (Max.)
Input	City charger 2000W max / Car charger 12-16 Solar charger 15-100V 3000W max (XT60)
Highlights	Enhancement package + AC parallel + bidirectional inverter (support Bluetooth, WIFI, APP, off-grid and grid-connected mode), 3 sets of products can be combined as 3-phase power
Net weight	Approx.35kg
Dimension D*W*H(mm)	502.11×255×378.5mm
Lifecycles	Approx. 3000 cycles
Storage temperature	-20°C~60°C
Operating temperature	-10°C~45°C
Charging time	Approx.2 H
Certificates	UN38.3, PSE-EMC, Circle PSE safety certification, METI filing, FCC/SDOC, California65, California Energy Certification CEC, US Energy Efficiency DOE, WERCS Registration, UL2743, CE-EMC, CE-LVD, CE-ROHS, CE-Battery Directive, CE-ERP, REACH, UNICA-LVD, UNICA-EMC, UNICA-ROHS



## Portable Power Station Expandable Battery up to 6x3072Wh



# Residential Energy Storage System **up to 153.6KWh**



**Inverter included**  
**Connectable to home solar system**



Battery Type	Lithium Ion Battery
Rated Power	5600W
Battery Capacity	5120Wh
Rated voltage	51.2V
Rated capacity (monolayer)	5120Wh
Charging Current	50A Max
Charge cut- off voltage	56±2V
Discharge cut- off voltage	45±0.2V
Charging temperature	-20°C~60°C
Operating temperature	-10°C~50°C

**Note:** 5.12KWh/module, Max 25.6KWh with 5 modules per unit, up to 6 units in connection totally.

**cULus certified**

## Residential Energy Storage System up to 81.92KWh



**Inverter  
included or separated**

Performance					
Product Type	5	10	15	20	20
Cell Type	LFP-100Ah				
Scalability	1	2	3	4 (Max 16PSC)	4
Nominal Capacity (kWh)	5	10	15	20	20
Operating Voltage Range	44.8~57.6				
Standard Charge/Discharge Current (A)	50/100	100/110			200/250
Max Charge / Discharge Current (A)	100/100	110/110			250/250
General Specification					
Dimensions (W×D×H)(mm)	392*591*198	392*591*391	392*591*584	392*591*777	529*763*931
Weight (kg)	45	93	140	186	220
Depth of Discharge (%)	95				
Communication Method	RS485/CAN/Ethernet (Remote Maintenance)				
Protection Class	IP22				IP54
Operating Ambient Temperature (°C)	Charge: 0~45 ; Discharge: -20~45				
Operating Ambient Humidity (%)	5~95 (No Condensation)				
Operating Altitude (m)	< 2000				
Life Cycle (25°C, 0.5C/0.5C@70%SOH)	≥6000				
Certification					
Certification	IEC62619, UL1973, UN38.3, CE-EMC, FCC, UL 60730-1, VDE2510-50, UL9540A				

**cULus certified**

## Residential Energy Storage System up to 81.92KWh



**Hybrid Inverter**

### Modulization Design

Flexible capacity expansion by adding and removing savings units as required



### High Flexibility

5kWh single battery pack ;  
Scalable to 40.96kWh  
Easy installation with individual control of the single battery box

### Long Life Cycle

Life Cycle  $\geq$  6000 (70% SOH)  
10-year battery warranty

### High Compatibility

110A or 250A high current output available ;  
Compatible with mainstream brands of inverters  
Brackets or battery cabinet options

### High Safety

LFP cells , safe and stable ;  
Remote maintenance and update



**cULus certified**

## Residential Energy Storage System up to 228.8KWh



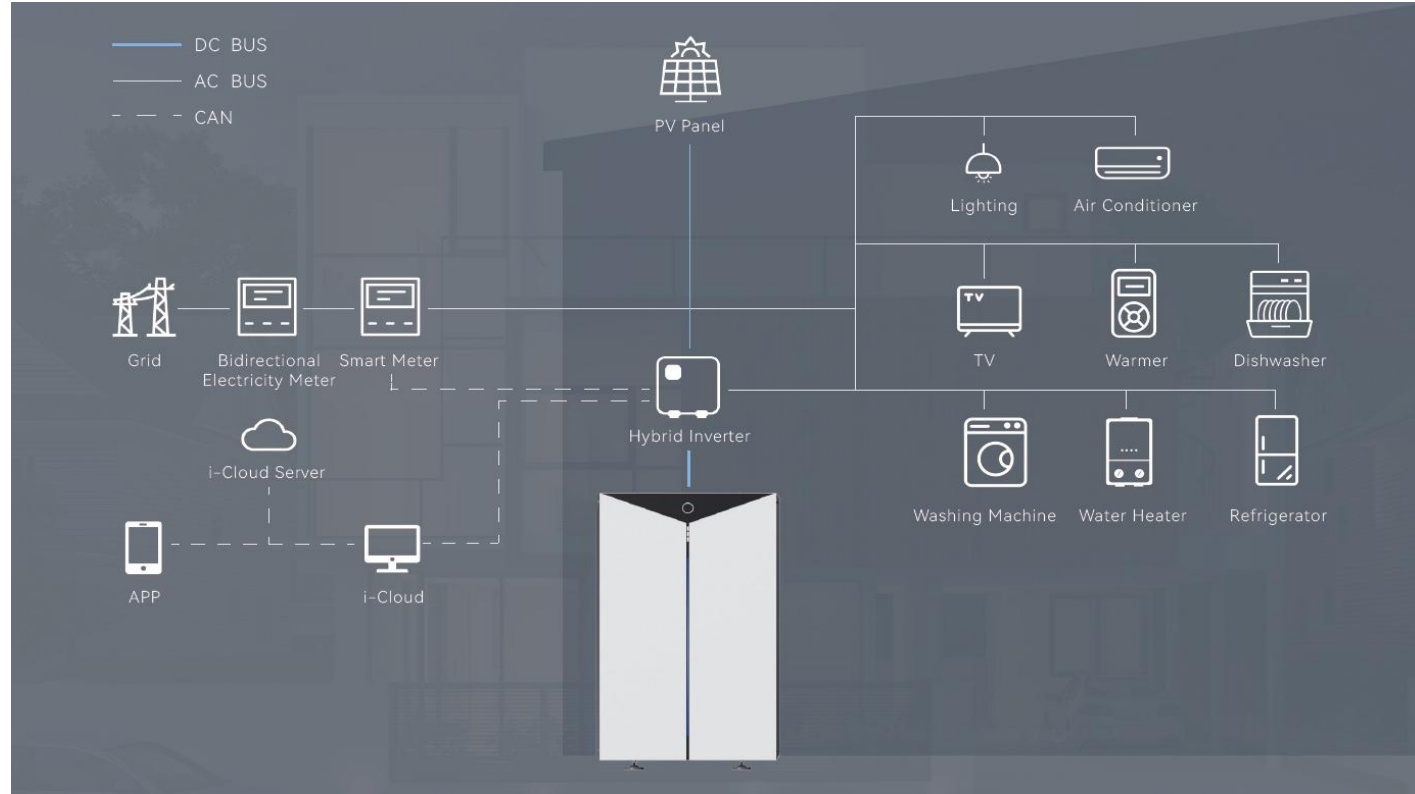
**Inverter**  
**included or separated**

Performance	
Product Type	ESS 14
Cell Type	LFP-280Ah
Scalability	1 (Support for parallel expansion of 16 units)
Nominal Capacity (kWh)	14.3
Operating Voltage Range	44.8~57.6
Standard Charge / Discharge Current (A)	140
Max Charge / Discharge Current (A)	200
General Specification	
Dimensions (W×D×H) (mm)	735*217*1163
Weight (kg)	170
Depth of Discharge (%)	95
Communication Method	RS485/CAN/Ethernet (Remote Maintenance)
Protection Class	IP66
Operating Ambient Temperature (°C)	Charge: -10~45 ; Discharge: -20~45
Operating Ambient Humidity (%)	5~95 (No Condensation)
Operating Altitude (m)	< 2000
Life Cycle (25°C, 0.5C/0.5C @60%SOH)	≥8000
Certification	
Certification	IEC62619, UL1973, UN38.3, CE-EMC, FCC, UL 60730-1

# cULus certified Residential Energy Storage System up to 228.8KWh



**Hybrid Inverter**



cULus certified

## Residential Energy Storage System up to 228.8KWh



### High Capacity

**14.3kWh** single battery pack ;  
Scalable to **228.8kWh**

### Long Cycle Life

Life Cycle  $\geq 8000$  (60% SOH) ;  
**10-year** battery warranty and  
extended warranty up to **15 years**

### High Safety

LFP cells  
Safe and stable  
Remote maintenance and update

cULus certified

## Residential Energy Storage System up to 228.8KWh





## Residential Energy Storage System up to 141KWh Case



# cULus certified Commercial ESS and MicroGrid



Factory



City

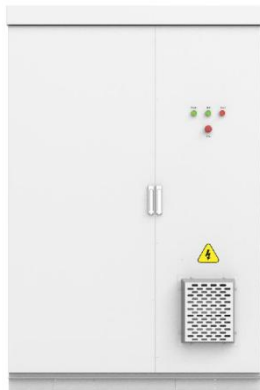


Auto Shop



Shopping Arcade

## cULus certified Commercial Energy Storage System 100KWh



### General Data

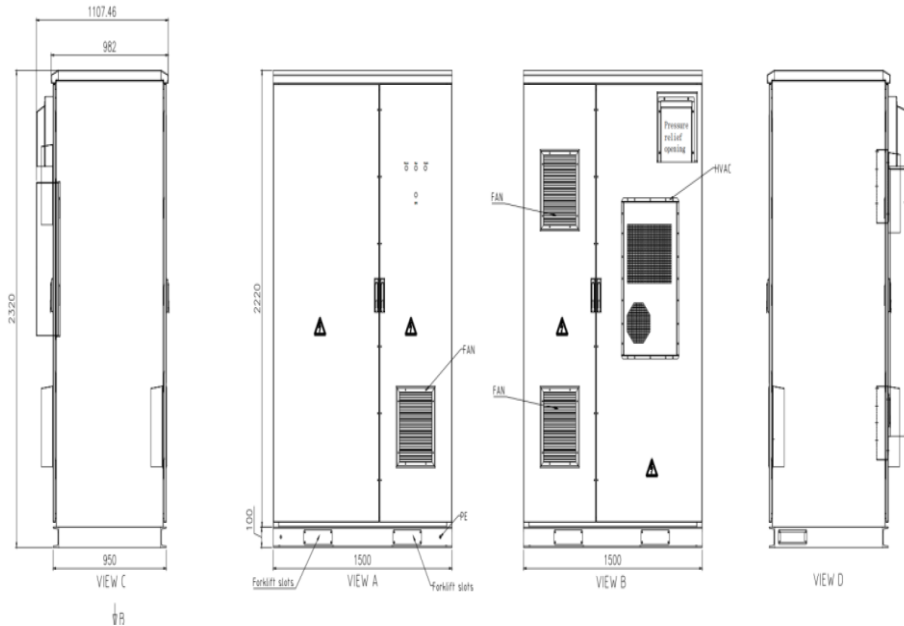
Dimension(W*H*D mm)	1500*2320*1107.5
Weight(Kg)	2600 ( incl. battery)
Working Temperature Range ( °C )	-20~60
Protection Class	IP54
Altitude	3000
Humidity	0~95%
Fire Extinguishing	Perfluoro
Air Conditioner	2kW
Anti-Corrosion	C3 (Optional upgrade to C5)
Authentication level	CE/IEC62619/UN38.3/UN3536

### Battery Data

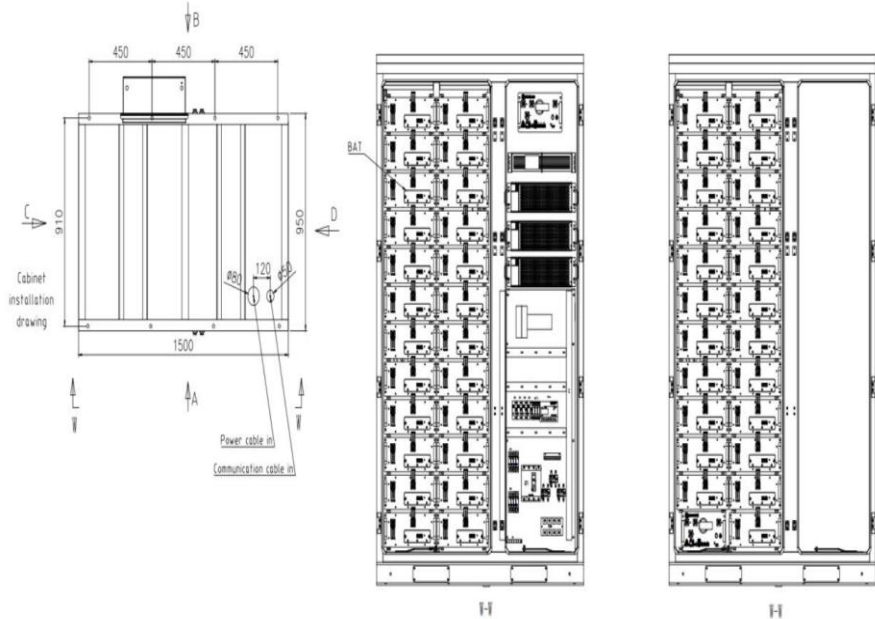
Battery Type	Li-Ion (LFP)
Nominal Capacity (kWh)	113.7
Battery Item	Powercube-M1C
Battery Module Qty.	24
DC Voltage Range(V)	696~864
Max. Operation Current (A)	148
Efficiency	95%

# cULus certified Commercial Energy Storage System 100KWh

External dimension drawings:



Internal layout:



Unit: mm



# cULus certified Commercial Energy Storage System 100KWh Case



## cULus certified Commercial Energy Storage System 200KWh-2MWh



## cULus certified

# Commercial Energy Storage System 200KWh-2MWh

<b>Energy Storage Capacity</b>	200KWh – 2MWh
<b>Rated Power</b>	100KW – 1MW
<b>Gird Access Parameters</b>	380Vac@50Hz
<b>Auxiliary Power Supply</b>	7 – 50 KW
<b>Battery Management System</b>	Integration
<b>Battery Type</b>	Lithium Iron Phosphate Batteries
<b>Max. Charge / Discharge Multiplier</b>	0.5P/0.5P (Sustainable)
<b>Enclosure Protection Level</b>	IP67
<b>Operating Temperature</b>	-25~55°C
<b>Relative Humidity</b>	0~95% , Non-Condensing

<b>Fire Protection System</b>	Fire Suppression(up to electrical box level )
<b>Operating Temperature Difference</b>	≤4°C (National Standard Operating Conditions, 0.5P Charge/Discharge)
<b>Battery Compartment</b>	IP54
<b>Communication Method</b>	Ethernet
<b>Main Configurations</b>	280Ah Battery Cell, Liquid Cooling System, Fire Suppression System, PCS System
<b>Dimensions (W*D*H)</b>	1689*1450*2350 mm – 6058*2438*2896 mm
<b>Weight</b>	3-30 T
<b>Cell Model</b>	B2W
<b>Cell Cycle Life</b>	≥10000 Times (25°C, 0.5P Charge/Discharge)

## Commercial Energy Storage System 200KWh-2MWh Cases





## Commercial Energy Storage System 200KWh-2MWh Case



## Commercial ESS and MicroGrid Case





## Commercial ESS and MicroGrid Case



# cULus certified Utility-Scale ESS and MicroGrid



Grid Side



Power Generation Side



# cULus certified

## Utility-Scale Energy Storage System 2MWh



Capacity	2556kWh	Firefighting Systems	Precision Fire Suppression
Auxiliary Power Supply	~35kW	Operating Temperature Difference	≤8°C (National Standard Operating Conditions, 0.5P Charge/discharge)
Auxiliary Power Access	380Vac@50Hz	Battery Compartment Protection Class	IP54
Battery Management System	Integration	Communication Method	CAN2.0 / Ethernet
Battery Type	Lithium Iron Phosphate Batteries	Main Configuration	280Ah Battery Cell, Liquid Cooling System, Fire Suppression System, Junction System, Energy Storage Prefabricated Chamber
Battery Voltage Range	666.4~856.8Vdc	Dimensions (W*D*H)	12196mm*2438mm*2896mm
Max. Charge / Discharge Multiplier	0.8P/0.8P (Sustainable)	Weight	~35T
Enclosure Protection Level	IP20	Cell Model	B2W
Operating Temperature	-25~55°C	Cell Cycle Life	≥10000 (25°C, 0.5P Charge/discharge)
Relative Humidity	0~95% , Non-Condensing		

cULus certified

## Utility-Scale Energy Storage System 368MWh



<b>DC Side</b>	
Initial Battery Nominal Energy	368,620kWh
Battery Voltage Range	630~810V
<b>AC Side</b>	
Nominal Power	4000kVA
AC Usable Energy @FAT	336,400kWh
Nominal Voltage	400V/360~440V
Power Factor	0.95(lagging)~0.95(leading)
THD	<3% (rated power)
<b>Transformer Output Parameters</b>	
Rated Power	4000kVA
AC Usable Energy (BOL)@FAT	333,000kWh
Nominal Grid Frequency	50Hz
Grid Frequency Range	47~52Hz
LV / MV Voltage	0.4kV/10~35kV(Dy11)
<b>General Parameters</b>	
Dimensions of Battery Container (W×D×H)	12192x2438x2896mm
Battery Container Weight	29,000kg
IP Rating	IP54
Operating Ambient Temperature	-20°C~+45°C
Relative humidity	5%~95%
Max. Working Altitude	3000m
Cooling Concept(PCS)	Forced air cooling
Cooling Concept (Battery Container)	Smart Air Cooling
Fire Suppression System	Heptafluoropropane or perfluorohexanone
Communication Interfaces	Ethernet
Communication Protocols	Modbus TCP/IP
Compliance	IEC62619,UL1642,UL1973,UL9540A

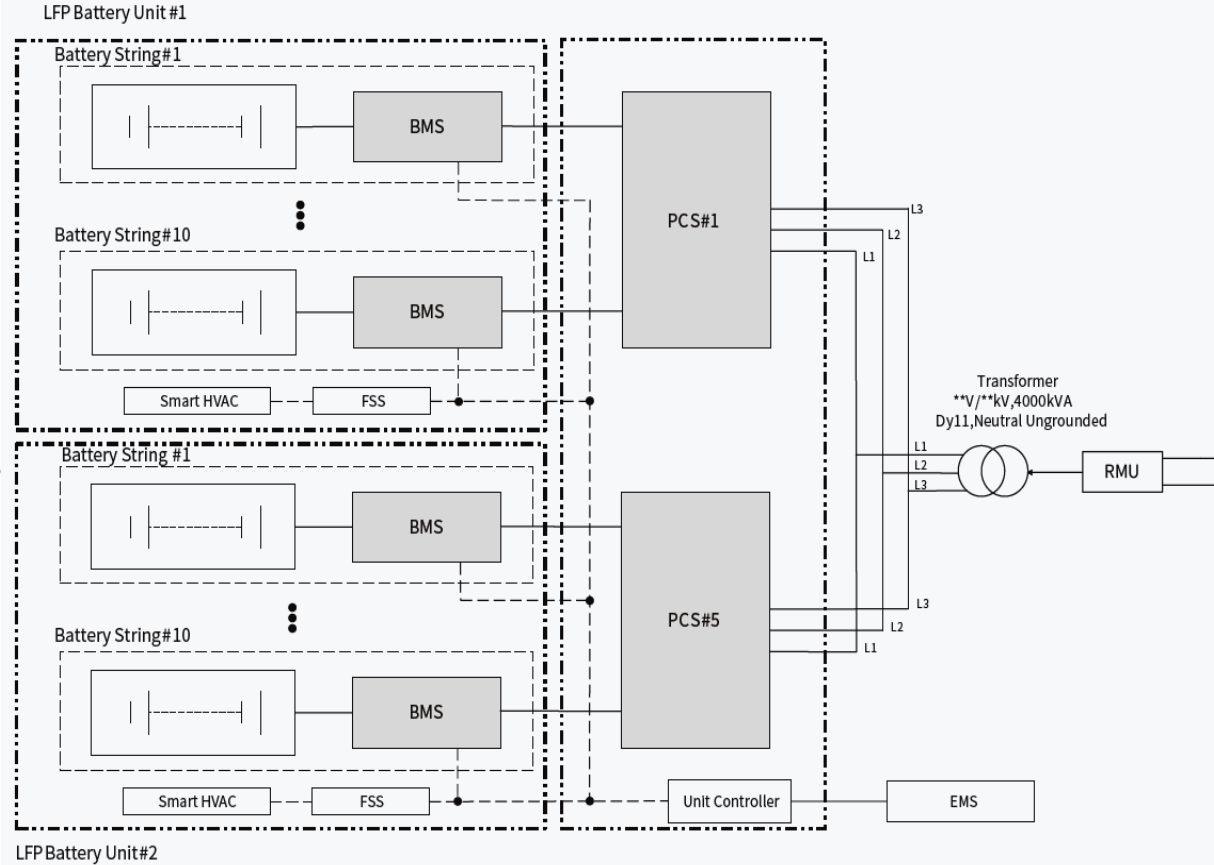


cULus certified

# Utility-Scale Energy Storage System 368MWh



Picture for informational purposes  
final product may be different.



## Utility-Scale ESS and MicroGrid Case





## Utility-Scale ESS and MicroGrid Case



# Utility-Scale ESS and MicroGrid Case





## Utility-Scale ESS and MicroGrid Case



## Utility-Scale ESS and MicroGrid Case







case20230725-1.webp

LIFEWAVE SOLUTIONS  
BESS Manufacturer

**VaOpto**  
ESS Manufacturer

## Utility-Scale ESS and MicroGrid Case



Your Requirement, Volume, and Target Price?

**Thanks!**