TO-U
GLOBAL

Boundless Intelligence.

TO-U GLOBAL Integrated New Energy and Smart Warehousing Solutions



A Limited View. Limitless Possibilities.

www.tou-global.com

TO-U GLOBAL • Company Profile

TO-U GLOBAL provides integrated smart energy and smart warehousing solutions worldwide. Driven by new energy and smart warehousing, we bring together capabilities across the entire value chain, from photovoltaic generation, energy storage systems and traction batteries to advanced cells and unmanned warehousing hardware. We offer global customers one-stop, end-to-end green energy and intelligent logistics solutions.

Global Reach

Our business spans countries and regions worldwide, with sales and service networks in Europe, South America, the Middle East, Australia and Southeast Asia, and close partnerships with leading energy, industrial and logistics companies. Together with our partners, we operate R&D centres and production facilities around the world, enabling large-scale delivery of high-efficiency PV modules, sodium-ion batteries, lead-acid/gel batteries, solid-state/semi-solid-state batteries, BMS, PCS, EMS and unmanned warehousing equipment. Products carry internationally recognised certifications including IEC, UL, CE, TÜV and RoHS, meeting market access standards worldwide.

Core Strengths

Our core strength is system-level solutions covering the complete chain of generation, storage, consumption and handling. Our PV business provides high-efficiency modules and integrated PV, energy storage and charging solutions. Our energy storage business covers sodium-ion, lead-acid/gel, solid-state/semi-solid-state and traction battery systems. Our power conversion and control business provides PCS, EMS, BMS and solid-state transformers. Our unmanned warehousing business provides vertical conveyors, station conveyors, external loading, door control and safety systems. Together, these businesses serve utility-scale solar plants, industrial and commercial parks, data centres, telecom base stations, hospitals, logistics warehouses and remote microgrids.

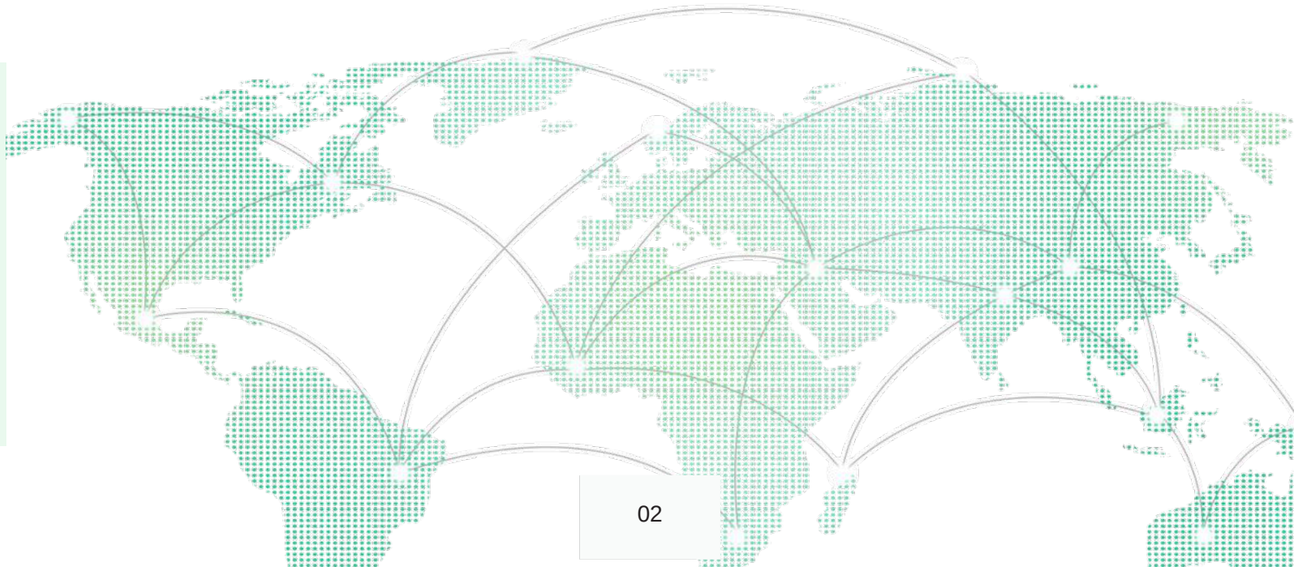
Through technological innovation and global collaboration, TO-U GLOBAL aims to become a world-leading partner for smart energy and smart warehousing solutions, working with customers towards a green, efficient, safe, zero-carbon future.

A Limited View. Limitless Possibilities.

This brochure presents selected products from TO-U GLOBAL's new energy and smart warehousing portfolio. Through our global supply chain network, we connect manufacturers, brands and specialist suppliers worldwide, continually expanding our range of PV modules, energy storage systems, traction batteries, advanced cells and unmanned warehousing hardware, together with our specialist resources.

From standard products to customised solutions, and from individual equipment to complete system integration, we match global resources and integrate supply chains to meet customer needs. Our coverage extends across PV generation, sodium-ion and lead-acid/gel storage, solid-state/semi-solid-state batteries, BMS/PCS/EMS, vertical conveying, station conveyors and door control safety.

Your needs define the scope of our solutions.



01

Chapter 1 • Photovoltaics



Solar Possibilities. A Greener Future.

High-Efficiency PV Modules and Integrated PV, Storage and Charging Solutions

TO-U GLOBAL's PV business focuses on the development and manufacture of high-efficiency modules and integrated PV, energy storage and charging solutions. Our range includes P-type 182/210, N-type TOPCon, heterojunction, flexible and coloured modules for utility-scale plants, industrial and commercial rooftops, and homes. Modules feature multi-busbar and HOT 2.0 technology, PID resistance, high load capacity, and certification for salt-mist and ammonia corrosion resistance, delivering high conversion efficiency and long-term reliability. Integrated with energy storage and charging systems, they enable intelligent energy management across generation, storage and consumption. Applications include deserts and Gobi regions, tidal flats, offshore sites, industrial parks and remote microgrids, supporting low-carbon energy and self-sufficiency.





Far vision ahead, long benefit behind!

3
Production Bases

10GW
Production Capacity

14+
Manufacturing Experience

80+
Overseas markets

GPSOLAR is a global smart solar energy service provider. Adhering to the concept and purpose of "Far vision ahead, long benefit behind!", the company strategically lays out research and development, production, and sales of photovoltaic modules, project development and construction, as well as providing photovoltaic storage and charging solutions. Since its establishment, it has provided photovoltaic smart products and services to over 80 countries and regions worldwide,such as Europe, South America, the Middle East, Australia, Southeast Asia, etc.

GPSOLAR is headquartered in Hangzhou and has established three major production bases nationwide. It has introduced internationally advanced fully automated production equipment and achieved digital production of photovoltaic modules, with a total production capacity of 10GW. The company has successively passed ISO three system certification and TUV DEKRA、CE、MCS、CEC、CB、IEC、BIS、PID、INMETRO、CQC、PCCC various international industry certifications. In recent years, GPSOLAR has accelerated innovation driven development, established academician expert workstation, empowered product technology research and development, and accelerated the construction of a more leading technology-based enterprise. It has been honored to be ranked among the World's Top 100 Solar PV Brands.

GPSOLAR

Mission

Focus on the development of green energy to create a new life for mankind.

Vision

Be the world's leading provider of smart solar energy services.

Values

Embrace Change，Unity of Knowledge and Action，and Never Give up.

Core Business

PV R&D/Production/Sales



Advanced intelligent production line, strict control of raw materials, comprehensive quality management system, ensuring high-quality delivery of every module.

-CAS Academician workstation
-10GW intelligent production line
-Sold to over 80 countries worldwide

Project development and construction



Led by senior engineers in the industry, with full system qualification certification. We provide integrated services including research and development, factory design, technical support, construction, and after-sales for various photovoltaic power plants, and are responsible for the progress, safety, and quality of the entire process.

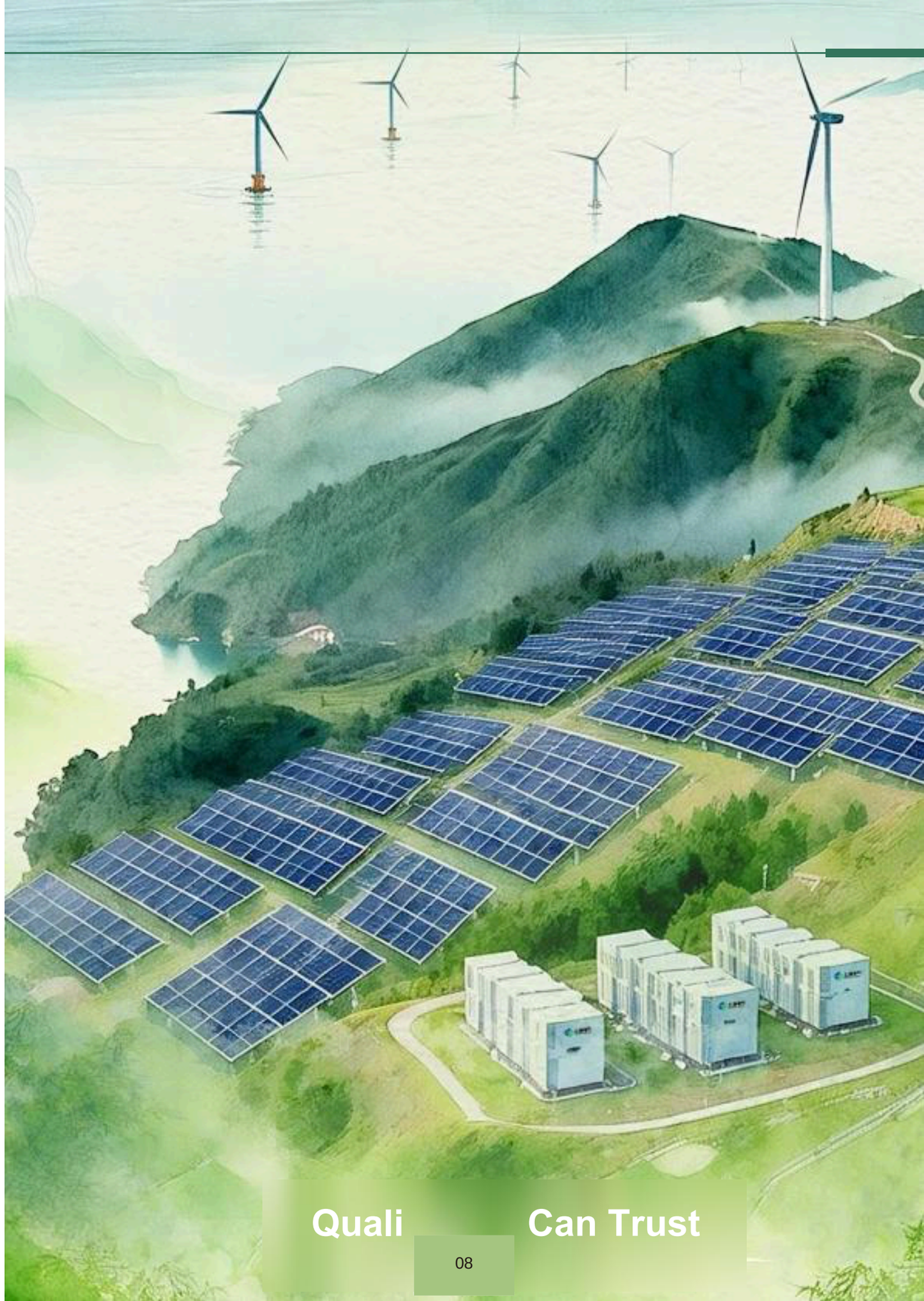
-Source component factory
-Professional technical team
-Flexible cooperation mode

Integrated energy storage and charging



A comprehensive solution provider for photovoltaic, energy storage, and charging systems, integrating excellent equipment throughout the entire chain to meet the full range of applications.

-Full scene coverage
-Digital empowerment
-Full cycle service



Quali Can Trust

Honor & Awards

GPSOLAR has always adhered to technological leadership and green production, and has won honors such as "High-tech Enterprise, Green Factory Enterprise, Digital Production Enterprise", and be ranked among the World's Top 100 Solar PV Brands.

- National high-tech enterprise 2024
- Zhejiang Manufacturing Certification Enterprise 2023
- CAS Academician Workstation 2023
- Digital production enterprises 2023
- Top 100 Solar PV Brands in the world 2025
- Renowned brand in China solar energy industry 2023
- Green Factory Enterprise 2022
- High quality PV module enterprise 2022
- Excellent supplier for government procurement 2020



Globalization

GPSOLAR Energy has become a partner with many state-owned enterprises with industry-leading strength. Its products are exported to Europe, South America, the Middle East, Australia, Southeast Asia and other regions. Since its establishment, it has provided photo-voltaic smart products and services to more than 80 countries and regions around the world.

80+ Countries Worldwide

30+ Overseas Branches



Cooperative Partner

国家能源集团 CHN ENERGY
中国华电 CHD
国家电投 SPIC
中国华能 CHINA HUANENG
中国能建 ENERGY CHINA
improinde sas
STERLING & WILSON
saturnpower
europower
Ecoambiente solar
EXELSOLAR
BEC GROUP
Suncore Solar Energy
CONSOLIDATED
SunEdison



Quality Guarantee

R&D Innovation

GPSOLAR accelerates innovation and drives development by establishing academician expert workstations and R&D centers. GPSOLAR has formed a R&D and engineering team, which is composed by master's and doctoral talents. This team researches and develops new products and technology, improves production process, and drives the company to be leading technology-based enterprise. Up to now, we have obtained over 50 exclusive patents.



Strict Supply Chain Management

Every raw material and accessory is selected from top suppliers in the industry, rigorously tested by professional engineers, and traceable throughout the entire process of procurement, logistics, inspection, warehousing, installation, and production.

Solar cell
RUNERGY 润阳悬浮 · 通威股份 TONGWEI CO., LTD. · 捷泰科技 JETTEC

Glass
旗滨集团 CIBING · SIMBA · 南玻集团

Junction box
CETC 40 · 益能光伏科技 YINENG PHOTOVOLTAIC

Ribbon
JOIN SUN 兆益兴科技 · 佰亿达 Baiyida

Backsheet
中来股份 JOLYWOOD · CYBRID

Silicone
BAIYUN白云

Frame
YoSol · STPV

EVA
中来股份 JOLYWOOD · 斯威新材 HUIXIN MATERIAL

Intelligent Manufacturing

GPSOLAR has introduced 15 World-leading fully-automated production lines and has equipped with MES production management system. Through intelligent, visual and digital production processes, GPSOLAR has achieves intelligent workshop, lean manufacturing, transparent and visual production processes, and production data collection, thereby it will significantly improves production efficiency, reduces production costs and enhance product quality.



Quality Management

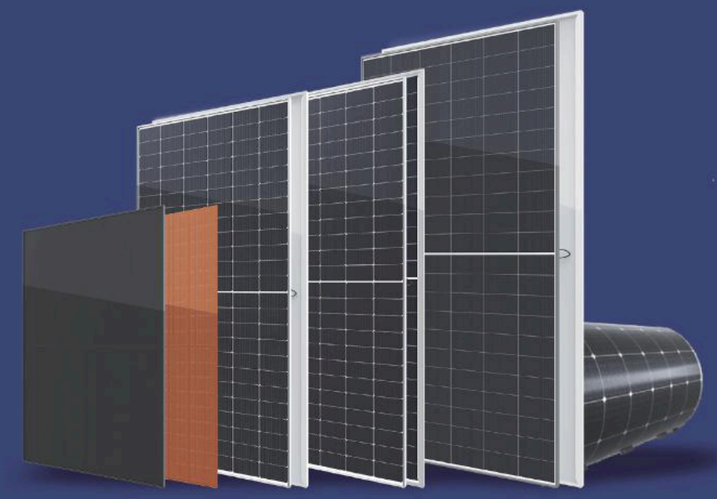
GPSOLAR implements strict quality control throughout the entire production and manufacturing process, with data monitoring throughout the entire process to truly achieve high-precision and high-quality products, creating stable and efficient photovoltaic products. Our factory has obtained full system certifications of ISO9001, ISO14001, and ISO45001.



Premium Modules

Full Range of Modules Covered

√182/210
√Single/Double
√Perc/TOPCon/BC/HJT



All Major Global Authoritative Certifications

GPSOLAR N-Type Series

Cutting Edge Technology
High Returns
All Scenarios



Limited Product Warranty
15 years

Limited Power Warranty
30 years

First Year Degradation Rate
1.0% **(Bifacial)**

Annual Degradation Rate
0.40% **(Bifacial)**

SMBB Technology
Better light trapping and current collection to improve module power output and reliability.

Hot 2.0 Technology
The N-type module with Hot 2.0 technology has better reliability and lower LID/LETID.

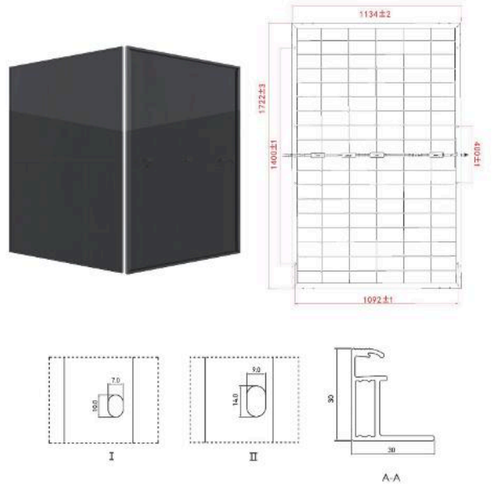
PID Resistance
Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.

Durabillity Against Extreme Environmental Conditions
High salt mist and ammonia resistance.

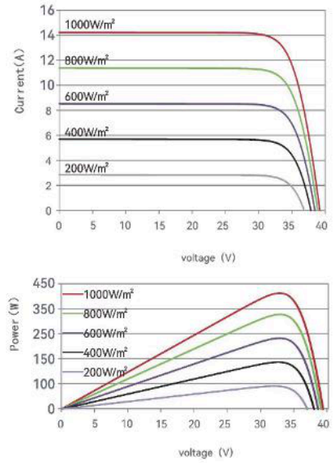
Enhanced Mechanical Load
Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

420W-445W N-Type 182 Mono-Bifacial Module
GPM10TG-445(108)

Engineering Drawings



Electical Performance（430W）



I-V curve

P-V curve

Electrical Parameters （STC*）

Maximum Power(W)	420	425	430	435	440	445
Maximum Power Voltage(V)	31.37	31.49	31.61	31.73	31.85	31.97
Maximum Power Current(A)	13.39	13.50	13.60	13.71	13.81	13.92
Open Circuit Voltage(V)	37.43	37.55	37.67	37.79	37.91	38.03
Short Circuit Current(A)	14.12	14.23	14.34	14.45	14.56	14.67
Module Efficiency(%)	21.51	21.76	22.02	22.28	22.53	22.79
Power tolerance	0~+3%					

* Irradiance 1000W/m², Module Temperature 25°C, Air Mass 1.5

Mechanical Parameters

Cell Type	182×91mm N-Type
Number of Cells	108cells (2x54)
Dimensions	1722×1134×30mm
Weight	23.5KG
Front Glass	2.0mm, Anti-Reflection Coating
Back Glass	2.0mm, Heat Strengthened Glass
Frame	Anodized aluminium alloy
J-Box	IP68 Rated,MC4 Compatible
Cable	4 mm²,300 mm standard

Electrical Parameters （NOCT*）

Maximum Power(W)	312.9	316.6	320.4	324.1	327.8	331.5
Maximum Power Voltage(V)	29.03	29.14	29.25	29.37	29.48	29.59
Maximum Power Current(A)	10.78	10.86	10.95	11.04	11.12	11.21
Open Circuit Voltage(V)	35.08	35.19	35.31	35.42	35.53	35.64
Short Circuit Current(A)	11.37	11.46	11.54	11.63	11.72	11.81

*Irradiance 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s

Temperature Coefficient

Nominal Operating Cell Temperature (NOCT)	45±2°C
Temperature Coefficient of Isc	0.045%/°C
Temperature Coefficient of Voc	-0.25%/°C
Temperature Coefficient of Pmax	-0.29%/°C

Backside Power Gain （For 430W）

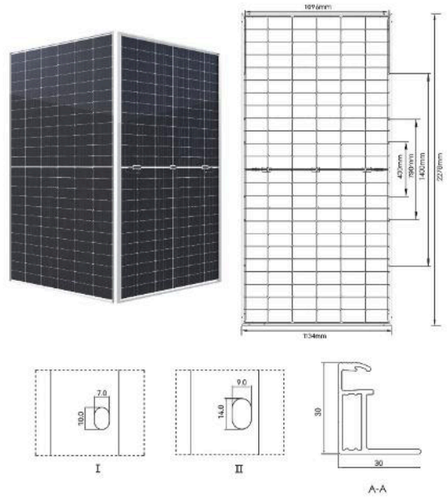
Backside Power Gain(%)	10%	15%	20%	25%	30%
Maximum Power(Pmax/W)	473.0	494.5	516.0	537.5	559.0
Open Circuit Voltage(Voc/V)	38.62	38.62	38.72	38.72	38.72
Short Circuit Current(Isc/A)	15.17	15.86	16.55	17.24	17.93
Maximum Power Voltage(Vmp/V)	32.69	32.69	32.79	32.79	32.79
Maximum Power Current(Imp/A)	14.47	15.13	15.74	16.39	17.05

Application Parameters

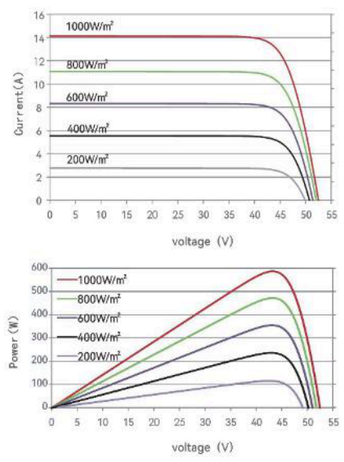
Operational Temperature(℃)	-40℃~+85℃
Maximum System Voltage	1500V DC
Max Series Fuse Rating	25A
Wind/ Snow Load	2400Pa/5400Pa
Packaging Configuration	36PCS/PLT,936PCS/40HQ

580W-600W N-Type 182 Mono-Bifacial Module
GPM10TG-600(144)

Engineering Drawings



Electical Performance(590W)



I-V curve

P-V curve

Electrical Parameters （STC*）

Maximum Power(W)	580	585	590	595	600
Maximum Power Voltage(V)	44.02	44.22	44.43	44.63	44.83
Maximum Power Current(A)	13.18	13.23	13.28	13.33	13.38
Open Circuit Voltage(V)	51.95	52.16	52.37	52.59	52.81
Short Circuit Current(A)	13.84	13.89	13.94	13.99	14.03
Module Efficiency(%)	22.45	22.65	22.84	23.03	23.22
Power tolerance	0~+3%				

*Irradiance 1000W/m², Module Temperature 25°C, Air Mass 1.5

Mechanical Parameters

Cell Type	182×91mm N-Type
Number of Cells	144cells (2x72)
Dimensions	2278×1134×30mm
Weight	30KG
Front Glass	2.0mm, Anti-Reflection Coating
Back Glass	2.0mm, Heat Strengthened Glass
Frame	Silver, anodized aluminium alloy
J-Box	IP68 Rated，MC4 Compatible
Output cable	4 mm²,300 mm standard

Electrical Parameters （NOCT*）

Maximum Power(W)	432.1	435.8	439.6	443.3	447.0
Maximum Power Voltage(V)	40.74	40.92	41.12	41.30	41.49
Maximum Power Current(A)	10.61	10.65	10.69	10.73	10.77
Open Circuit Voltage(V)	48.08	48.27	48.47	48.67	48.87
Short Circuit Current(A)	11.14	11.18	11.22	11.26	11.29

* Irradiance 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s

Temperature Coefficient

Nominal Operating Cell Temperature (NOCT)	45±2°C
Temperature Coefficient of Isc	0.045%/°C
Temperature Coefficient of Voc	-0.25%/°C
Temperature Coefficient of Pmax	-0.29%/°C

Backside Power Gain （For 590W）

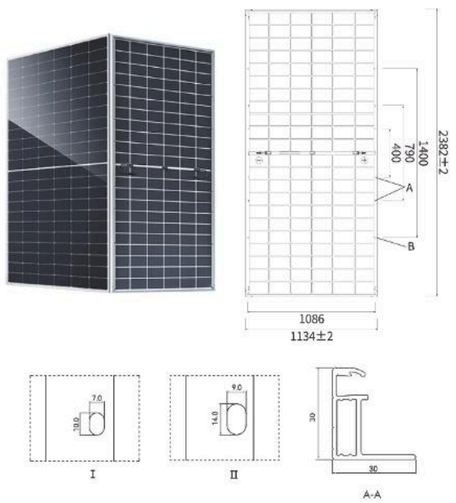
Backside Power Gain(%)	10%	15%	20%	25%	30%
Maximum Power(Pmax/W)	649.0	678.5	708.0	737.5	767.0
Open Circuit Voltage(Voc/V)	52.37	52.37	52.41	52.41	52.43
Short Circuit Current(Isc/A)	15.36	16.06	16.75	17.44	18.13
Maximum Power Voltage(Vmp/V)	44.43	44.43	44.50	44.50	44.52
Maximum Power Current(Imp/A)	14.61	15.27	15.91	16.57	17.23

Application Parameters

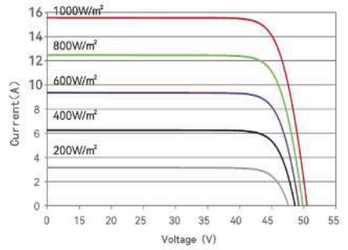
Operational Temperature(℃)	-40℃~+85℃
Maximum System Voltage	1500V DC
Max Series Fuse Rating	25A
Wind/ Snow Load	2400Pa/5400Pa
Packaging Configuration	36PCS/PLT,720PCS/40HQ

620W-630W N-Type 182 Mono-Bifacial Module
GPM12RTG-630(132)

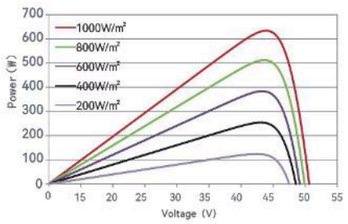
Engineering Drawings



Electical Performance (630W)



I-V curve



P-V curve

Electrical Parameters (STC*)

Maximum Power(W)	620	625	630
Maximum Power Voltage(V)	41.4	41.7	41.95
Maximum Power Current(A)	14.98	14.99	15.02
Open Circuit Voltage(V)	49.6	49.9	50.2
Short Circuit Current(A)	15.91	15.92	15.94
Module Efficiency(%)	22.95	23.14	23.32
Power tolerance		0~+3%	

*Irradiance 1000W/m², Module Temperature 25°C, Air Mass 1.5

Mechanical Parameters

Cell Type	182×105mm N-Type
Number of Cells	132cells (2x66)
Dimensions	2382×1134×30mm
Weight	32.5KG
Front Glass	2.0mm, Anti-Reflection Coating
Back Glass	2.0mm, Heat Strengthened Glass
Frame	Silver, anodized aluminium alloy
J-Box	IP68 Rated,MC4 Compatible
Cable	4 mm²,300 mm standard

Electrical Parameters (NOCT*)

Maximum Power(W)	461.9	465.6	469.4
Maximum Power Voltage(V)	38.31	38.59	38.82
Maximum Power Current(A)	12.06	12.07	12.09
Open Circuit Voltage(V)	45.9	46.18	46.46
Short Circuit Current(A)	12.81	12.82	12.83

* Irradiance 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s

Temperature Coefficient

Nominal Operating Cell Temperature (NOCT)	45±2°C
Temperature Coefficient of Isc	0.045%/°C
Temperature Coefficient of Voc	-0.25%/°C
Temperature Coefficient of Pmax	-0.29%/°C

Backside Power Gain (For 630W)

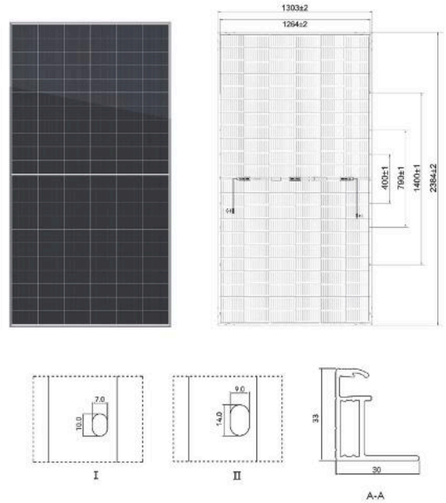
Backside Power Gain(%)	10%	15%	20%	25%	30%
Maximum Power(Pmax/W)	693	724	756	787	819
Open Circuit Voltage(Voc/V)	50.7	50.7	50.7	50.7	50.7
Short Circuit Current(Isc/A)	17.53	18.33	19.13	19.93	20.72
Maximum Power Voltage(Vmp/V)	42.45	42.45	42.45	42.45	42.45
Maximum Power Current(Imp/A)	16.33	17.07	17.81	18.55	19.29

Application Parameters

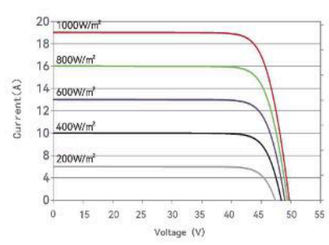
Operational Temperature(℃)	-40℃~+85℃
Maximum System Voltage	1500V DC
Max Series Fuse Rating	30A
Wind/ Snow Load	2400Pa/5400Pa
Packaging Configuration	36PCS/PLT,720PCS/40HQ

700W-720W N-Type 210 Mono-Bifacial Module
GPM12TG-720(132)

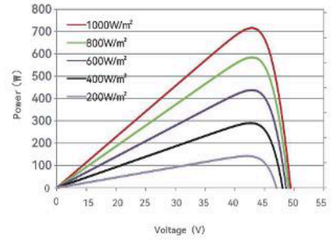
Engineering Drawings



Electical Performance (710W)



I-V curve



P-V curve

Electrical Parameters (STC*)

Maximum Power(W)	700	705	710	715	720
Maximum Power Voltage(V)	40.5	40.7	40.9	41.1	41.3
Maximum Power Current(A)	17.28	17.32	17.36	17.4	17.44
Open Circuit Voltage(V)	48.6	48.8	49	49.2	49.4
Short Circuit Current(A)	18.32	18.36	18.4	18.44	18.49
Module Efficiency(%)	22.53	22.7	22.86	23.02	23.18
Power tolerance			0~+3%		

* Irradiance 1000W/m², Module Temperature 25°C, Air Mass 1.5

Mechanical Parameters

Cell Type	210×105mm N-Type
Number of Cells	132cells (2x66)
Dimensions	2384×1303×33mm
Weight	37KG
Front Glass	2.0mm, Anti-Reflection Coating
Back Glass	2.0mm, Heat Strengthened Glass
Frame	Silver, anodized aluminium alloy
J-Box	IP68 Rated,MC4 Compatible
Cable	4 mm²,300 mm standard

Electrical Parameters (NOCT*)

Maximum Power(W)	521.5	525.2	529	532.7	536.4
Maximum Power Voltage(V)	37.48	37.67	37.85	38.04	38.22
Maximum Power Current(A)	13.91	13.94	13.97	14	14.03
Open Circuit Voltage(V)	45.56	45.74	45.93	46.12	46.31
Short Circuit Current(A)	14.75	14.78	14.81	14.84	14.88

* Irradiance 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s

Temperature Coefficient

Nominal Operating Cell Temperature (NOCT)	45±2°C
Temperature Coefficient of Isc	0.045%/°C
Temperature Coefficient of Voc	-0.25%/°C
Temperature Coefficient of Pmax	-0.29%/°C

Backside Power Gain (For710W)

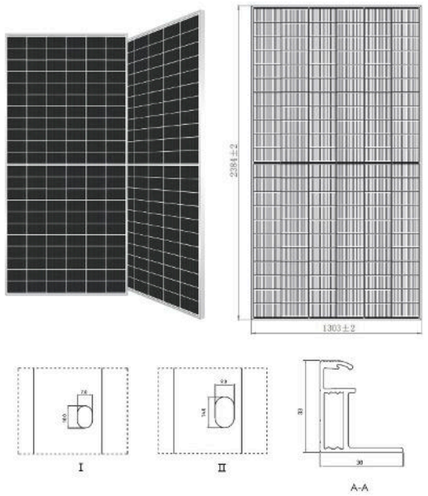
Backside Power Gain(%)	10%	15%	20%	25%	30%
Maximum Power(Pmax/W)	781	816.5	852	887.5	923
Open Circuit Voltage(Voc/V)	49.5	49.5	49.5	49.7	49.7
Short Circuit Current(Isc/A)	20.24	21.16	22.08	23.0	23.92
Maximum Power Voltage(Vmp/V)	41.4	41.4	41.4	41.6	41.6
Maximum Power Current(Imp/A)	18.86	19.72	20.58	21.33	22.19

Application Parameters

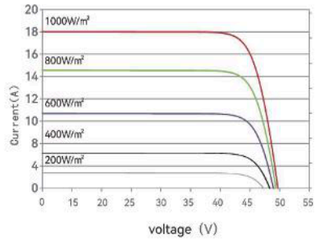
Operational Temperature(℃)	-40℃~+85℃
Maximum System Voltage	1500V DC
Max Series Fuse Rating	30A
Wind/ Snow Load	2400Pa/5400Pa
Packaging Configuration	33PCS/PLT,594PCS/40HQ

710W-730W N-Type HJT MBB Half-cut Bifacial Module
GPG12H66-730HC

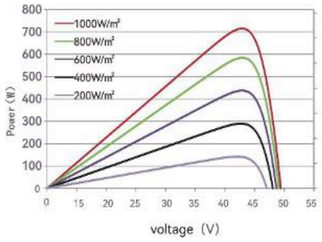
Engineering Drawings



Electical Performance(710W)



I-V curve



P-V curve

Electrical Parameters (STC*)

Maximum Power(W)	710	715	720	725	730
Maximum Power Voltage(V)	41.93	42.00	42.07	42.14	42.21
Maximum Power Current(A)	16.95	17.05	17.15	17.25	17.35
Open Circuit Voltage(V)	50.01	50.09	50.17	50.25	50.33
Short Circuit Current(A)	18.00	18.10	18.20	18.30	18.40
Module Efficiency(%)	22.86	23.02	23.18	23.34	23.50
Power tolerance(%)			0 ~ +3		

*STOC (Standard Test Condition): Irradiance 1000W/m2 , Cell Temperature 25 C, Air Mass 1.5

Mechanical Parameters

Cell Type	HJT 210x105mm
Number of Cells	132cells(2x66)
Dimensions	2384x1303x33mm
Weight	38.3kg
Frame	Silver, anodized aluminium alloy
J-Box	IP68 Rated, MC4 Compatible
Cable	4 mm²,300 mm standard

Temperature Coefficient

Temperature Coefficient of Isc	-0.24%/℃
Temperature Coefficient of Voc	-0.22%/ ℃
Temperature Coefficient of Pmax	+0.047%/ ℃

Backside Power Gain (For 710W)

Backside Power Gain(%)	5%	10%	15%	20%	25%
Maximum Power(Pmax/W)	746	781	815	850	886
Open Circuit Voltage(Voc/V)	50.71	50.71	50.81	50.81	50.81
Short Circuit Current(Isc/A)	18.11	18.98	19.84	20.70	21.56
Maximum Power Voltage(Vmp/V)	43.46	43.46	43.36	43.36	43.36
Maximum Power Current(Imp/A)	17.16	17.97	18.79	19.61	20.43

Application Parameters

Operational Temperature(℃)	-40~+85℃
Maximum System Voltage	1500V DC
Max Series Fuse Rating	35A
Wind/ Snow Load	2400Pa/5400Pa
Packaging Configuration	33PCS/PLT,594PCS/40HQ

GPSOLAR P-Type Series

Mature Process
Efficient and Stable



Limited Product Warranty
12 years

Limited Power Warranty
30 years (Bifacial)

First Year Degradation Rate
2.0%

Annual Degradation Rate
0.45% (Bifacial)

SMBB Technology
Better light trapping and current collection to improve module power output and reliability.

Better Resistance To Heat Spots
By optimizing circuit design and working current, better temperature coefficient and heat spot resistance can be obtained.

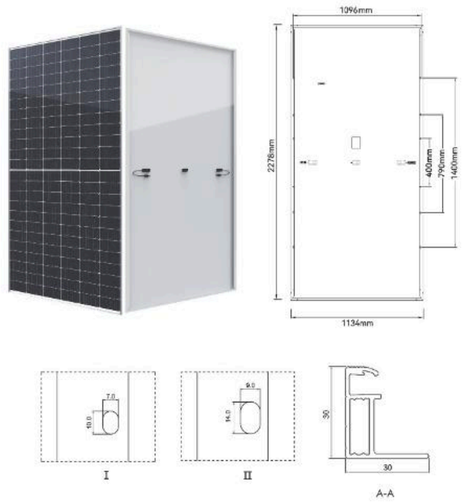
PID Resistance
Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.

Durabillity Against Extreme Environmental Conditions
High salt mist and ammonia resistance.

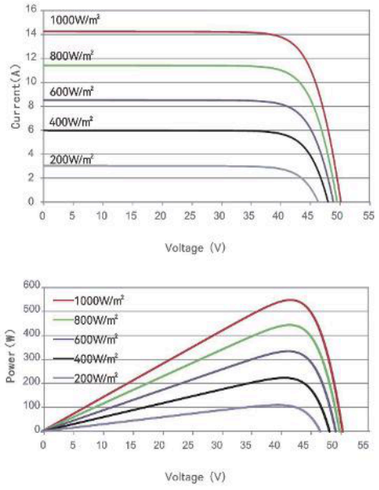
Enhanced Mechanical Load
Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

540W-560W P-Type 182 Mono-Facial Module
GPM-560W(144)

Engineering Drawings



Electical Performance (550W)



I-V curve

P-V curve

Electrical Parameters (STC*)

Maximum Power(W)	540	545	550	555	560
Maximum Power Voltage(V)	41.63	41.79	41.95	42.11	42.27
Maximum Power Current(A)	12.97	13.04	13.11	13.18	13.25
Open Circuit Voltage(V)	49.60	49.75	49.90	50.05	50.20
Short Circuit Current(A)	13.94	14.02	14.09	14.17	14.24
Module Efficiency(%)	20.90	21.10	21.29	21.48	21.68
Power tolerance			0~+3%		

* Irradiance 1000W/m², Module Temperature 25℃, Air Mass 1.5

Mechanical Parameters

Cell Type	182×91mm Perc
Number of Cells	144cells (2x72)
Dimensions	2278×1134×30mm
Weight	26.4KG
Glass	3.2mm, Anti-Reflection Coating
Frame	Silver, anodized aluminium alloy
J-Box	IP68 Rated,MC4 Compatible
Cable	4 mm²,300 mm standard

Electrical Parameters (NOCT*)

Maximum Power(W)	402.3	406.0	409.8	413.5	417.2
Maximum Power Voltage(V)	38.53	38.68	38.82	38.97	39.12
Maximum Power Current(A)	10.44	10.50	10.55	10.61	10.66
Open Circuit Voltage(V)	46.50	46.64	46.78	46.92	47.06
Short Circuit Current(A)	11.22	11.28	11.34	11.40	11.47

*Irradiance 800W/m², Ambient Temperature 20℃, Wind Speed 1m/s

Temperature Coefficient

Nominal Operating Cell Temperature (NOCT)	45±2℃
Temperature Coefficient of Isc	0.048%/℃
Temperature Coefficient of Voc	-0.28%/℃
Temperature Coefficient of Pmax	-0.35%/℃

Application Parameters

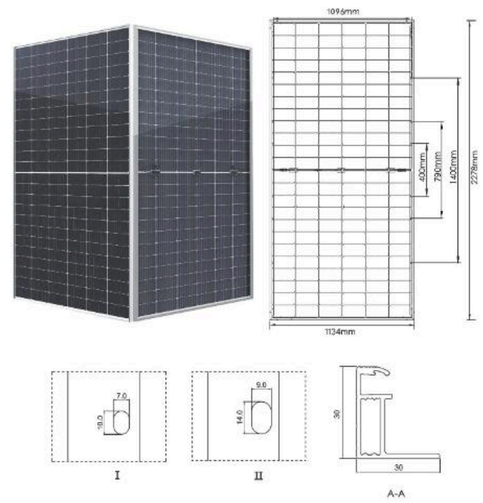
Operational Temperature(℃)	-40℃~+85℃
Maximum System Voltage	1500V DC
Max Series Fuse Rating	20A
Wind/ Snow Load	2400Pa/5400Pa

Packaging Configuration

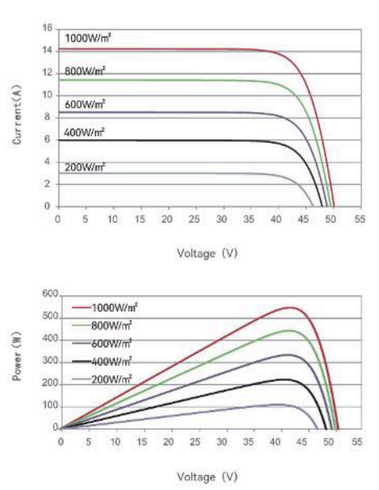
Pallet	36 pieces
40HQ	720 pieces

540W-560W P-Type 182 Mono-Bifacial Module
GPMDG-560W(144)

Engineering Drawings



Electical Performance(550W)



I-V curve

P-V curve

Electrical Parameters (STC*)

Maximum Power(W)	540	545	550	555	560
Maximum Power Voltage(V)	41.63	41.79	41.95	42.11	42.27
Maximum Power Current(A)	12.97	13.04	13.11	13.18	13.25
Open Circuit Voltage(V)	49.60	49.75	49.90	50.05	50.20
Short Circuit Current(A)	13.94	14.02	14.09	14.17	14.24
Module Efficiency(%)	20.90	21.10	21.29	21.48	21.68
Power tolerance			0~+3%		

* Irradiance 1000W/m², Module Temperature 25℃, Air Mass 1.5

Mechanical Parameters

Cell Type	182×91mm Perc
Number of Cells	144cells (2x72)
Dimensions	2278×1134×30mm
Weight	30KG
Front Glass	2.0mm, Anti-Reflection Coating
Back Glass	2.0mm, Heat Strengthened Glass
Frame	Silver, anodized aluminium alloy
J-Box	IP68 Rated,MC4 Compatible
Cable	4 mm²,300 mm standard

Electrical Parameters (NOCT*)

Maximum Power(W)	402.3	406.0	409.8	413.5	417.2
Maximum Power Voltage(V)	38.53	38.68	38.82	38.97	39.12
Maximum Power Current(A)	10.44	10.50	10.55	10.61	10.66
Open Circuit Voltage(V)	46.50	46.64	46.78	46.92	47.06
Short Circuit Current(A)	11.22	11.28	11.34	11.40	11.47

* Irradiance 800W/m², Ambient Temperature 20℃, Wind Speed 1m/s

Temperature Coefficient

Nominal Operating Cell Temperature (NOCT)	45±2℃
Temperature Coefficient of Isc	0.048%/℃
Temperature Coefficient of Voc	-0.28%/℃
Temperature Coefficient of Pmax	-0.35%/℃

Backside Power Gain (For550W)

Backside Power Gain(%)	10%	15%	20%	25%	30%
Maximum Power(Pmax/W)	605.0	632.5	660.0	687.5	715.0
Open Circuit Voltage(Voc/V)	49.84	49.84	49.94	49.94	49.94
Short Circuit Current(Isc/A)	15.38	16.08	16.78	17.48	18.17
Maximum Power Voltage(Vmp/V)	41.99	41.99	42.09	42.09	42.09
Maximum Power Current(Imp/A)	14.41	15.06	15.68	16.33	16.99

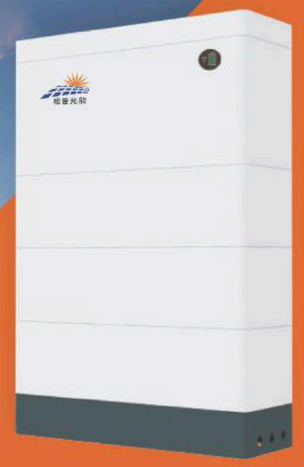
Application Parameters

Operational Temperature(℃)	-40℃~+85℃
Maximum System Voltage	1500V DC
Max Series Fuse Rating	20A
Wind/ Snow Load	2400Pa/5400Pa
Packaging Configuration	36PCS/PLT,720PCS/40HQ

[Household Energy Storage]

High Voltage
Stackable Energy Storage Battery





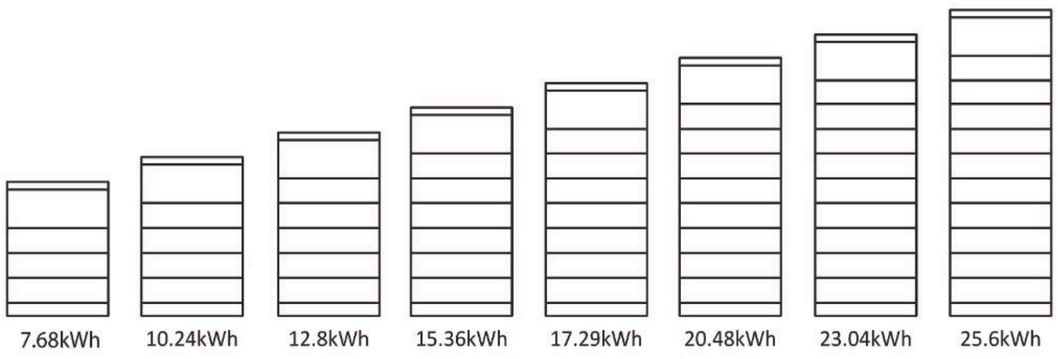
High Voltage
153.6V-512V

Modules Stackable
3-10

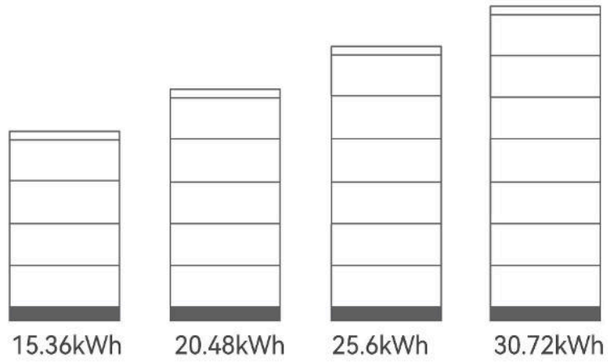
Product Characteristics

- High capacity
- Scalable Design
- Efficient Performance
- Real-time Monitoring
- Safe and Reliable
- Seamless Integration

GP2500W-HB



GP5000W-HC



- Higher Conversion Efficiency
- Increased Independence from the Grid
- Better Suitable for Peaking Applicatlons
- Greater Flexibility
- Lower Cost, Larger System
- Faster Charging and Discharging
- Energy Savings

Model	GP2500W-HB	GP5000W-HC
Parameter		
Nominal Voltage(Vdc)	51.2	51.2
Nominal Capacity(Wh)	2560	5120
Working Voltage Range(Vdc)	129.6-516.6	129.6-350.4
Charge Voltage(Vdc)	56.16	56.16
Nominal Charge/Discharge Current(A)	25	50
Max.Charge/Discharge Current(A)	50	100
Peak Current(A)	100@3sec	200@3sec
Series Connection	3-10 pcs	3-6 pcs
Cycle Life	6000@80%DOD,25℃/0.5C	

Structure

Power Module Dimensions(mm)/Weight(kg)	600*210*250/14	610*225*250/15
Battery Module Dimensions(mm)/Weight(kg)	600*210*160/27	610*225*250/52
Lampstand Module Dimensions(mm)/Weight(kg)	600*210*90/5	610*225*90/5.5
Top Cap Module Dimensions(mm)/Weight(kg)	600*210*50/2.5	610*225*50/3
IP Rating	IP65	
Installation	Stacked	

Working Environment

Charge Working Temperature(℃)	0-55
Discharge Working Temperature(℃)	-20~60
Altitude(M)	<2500
Humidity(RH)	5-95% (w/o condensing)

Communication

Communication Port	RS485,CAN
Display	SOC status indicator, LED indicator

Certification

CB, IEC62619, CE-EMC, CE-GPSD, UKCA, UL1973, UL9540A, EN62040, IEC62040; UN38.3, MSDS

Photovoltaic Storage Charging Integrated system solution provider

GPSolar is a comprehensive solution provider for photovoltaic, energy storage, and charging systems, integrating excellent equipment throughout the entire chain to meet the full range of applications such as large-scale photovoltaic energy storage integration, commercial & industrial photovoltaic energy storage and charging, and household photovoltaic energy storage.

By comprehensively utilizing GP Cloud data management system, we aim to build intelligent management from power generation, energy storage to application, achieving more worry free management, efficient operation and maintenance, and higher returns.



Large scale integrated energy storage solution

- Adapt to multiple scenarios
- Full link security design
- Tailored to the needs of the grid



Commercial & Industrial energy storage and charging

- Activate fixed assets to increase returns
- Flexible cooperation mode
- Good social benefits

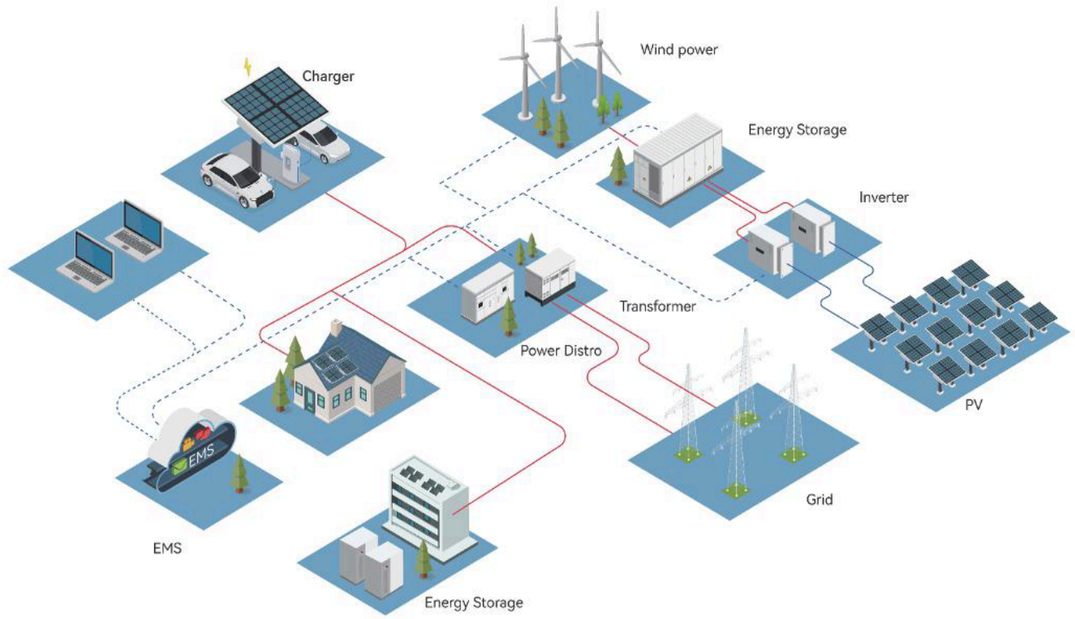




Household energy storage

- Family peak shaving and valley filling
- Self use by family spontaneously
- Revenue from surplus electricity grid connection

Integrated solution



COOPERATIVE PARTNER

HUAWEI · 锦浪科技 · GOODWE 固德威 · CATL 宁德时代
EVE 亿纬锂能 · REPT 瑞浦兰钧 · Schneider Electric 施耐德电气 · ABB
QRE 钱江电气 QIANTANG RIVER ELECTRIC · SIEMENS · TBEA 特变电工 · CEEG 中电电气

Utility-Scale Solar Projects


India Project • 100 MW


Western China Central SOE Project • 586 MW


Australia • 40 MW


Thailand Project • 33 MW


Indonesia Project • 15 MW


Spain Project • 16 MW


Hubei Project • 361 MW


Gansu Project • 85 MW


Lop Project • 236 MW


Karakax Project • 190 MW

Commercial and Industrial Rooftop Projects



Shandong Project • 5.6 MW



Portugal Project • 8 MW



Haikou, Hainan • 3.2 MW



Zhuhai, Guangdong • 2.5 MW



Zhengzhou, Henan • 1.2 MW



Suzhou, Jiangsu • 2 MW



Jinhua, Zhejiang • 2 MW



Lanxi, Zhejiang • 1 MW



Yiwu, Zhejiang • 1.2 MW



Yongkang, Zhejiang • 1 MW

02

Chapter 2 • Solution A

New Horizons in Sodium. Energy Storage Without Limits.

Sodium-Ion Batteries and Smart Energy Storage Systems

TO-U GLOBAL Solution A focuses on sodium-ion batteries and smart energy storage systems for automotive start-stop applications, UPS/EPS/DC power cabinets, 800 V data-centre power supplies, distribution-transformer service-area storage and high-altitude AC/DC-coupled microgrids. Using standard 3 V/12 V modules, the systems support parallel battery strings and series-connected modules to form high-voltage platforms below 1,500 V. Integrated intelligent BCU control and distributed balancing BMS provide system-wide management, protection and dynamic balancing. Sodium-ion batteries offer a wide operating range of −40 °C to 80 °C, high-rate capability, long cycle life and recovery after deep discharge to 0 V. They can replace conventional lead-acid batteries in cold, remote and safety-critical energy storage and backup-power applications.



Product Overview

Product Series	Applications	Operating Temperature	Capacity / Specifications	Product Status
Automotive Sodium-Ion Starter Batteries	Passenger-Car Start–Stop / Heavy-Truck and Bus Starting / Parking Air Conditioning / Cold Regions	−40 °C to 80 °C	60–190 Ah	• In Mass Production
UPS/EPS/DC-Cabinet Battery Storage Systems	Finance / Data Centres / Substations / Hydropower Plants	−40 °C to 80 °C	Standard 3 V / 12 V Battery Modules	• In Use
Distribution-Transformer Service-Area Storage	Grid Frequency/Amplitude Regulation / Peak–Valley Support / Reactive Power Compensation	−40 °C to 80 °C	From 500 kW / 90.72 kWh	• Customisable
800 V Data-Centre Power Systems	800 V Data-Centre Power Supplies	−40 °C to 80 °C	Standard 3 V / 12 V Battery Modules	• Customisable
Modular Wind–PV–Storage–Generator Microgrids	Unattended Off-Grid Power for Remote Areas	—	Modular Configuration	• Customisable
Emergency Power Series	Construction / Outdoor Living / Emergency Charging	—	30–250 kW	• Customisable
Multifunction Energy Storage and Power Distribution	Outdoor Construction: 220 V AC / 24 V DC Supply	—	Customised to Requirements	• Customisable
Battery Capacity Test Systems (Test Cabinets / Battery Cabinets)	Capacity Testing for Power-Plant/Substation DC Systems	—	220 V DC Systems	• Customisable

Status key: • In Mass Production • In Use • Customisable (Technical specifications can be tailored to the user's operating requirements and application.)

Mass-Production Automotive Sodium-Ion Start–Stop Battery Specifications

Model	Rating	CCA	Maximum Dimensions: L × W × H, excluding / including terminals (mm)	Weight	Notes
SL-MQ060-12N	60 Ah	650 A	231*174*181*200	9.5 kg	Series connection for 24 V use
SL-MQ070-12N	70 Ah	740 A	280*176*185	10.4 kg	Series connection for 24 V use
SL-MQ080-12N	80 Ah	850 A	315*175*187	11.5 kg	Series connection for 24 V use
SL-MQ090-12N	90 Ah	950 A	356*178*186	12.8 kg	Series connection for 24 V use
SL-MQ100-12N	100 Ah	1050 A	400*178*187	14.4 kg	Series connection for 24 V use
SL-MQ170-12N	170 Ah	1250 A	513*221*207*227	25.9 kg	Series connection for 24 V use

Core Product 1 | Automotive Sodium-Ion Start–Stop Batteries [In Mass Production]

Built with proprietary sodium-ion cells and the SL-B01D4Q intelligent battery management system, these batteries provide millisecond-level cell balancing. Compared with conventional lead-acid batteries, they offer low-temperature performance, a long cycle life, safety and reliability, setting a new industry standard.



01 Core Technical Advantages

Recovery from Deep Discharge to 0 V

Rechargeable after complete discharge, with no memory effect or loss of performance.

Safety and Explosion Resistance

Passes rigorous overcharge and puncture tests without fire or explosion.

Ten-Year Service Life

Designed for a service life of up to 10 years, with a 60-month replacement-instead-of-repair warranty.

Direct Replacement Compatibility

Standard dimensions and interfaces allow direct replacement of lead-acid or lithium batteries without modification.

02 Applications

Passenger-Car Start–Stop

High-rate discharge supports frequent start–stop operation in congested urban traffic.

Commercial-Vehicle Starting

High cold-cranking current starts large-displacement diesel engines in heavy trucks and buses with ease.

Cold-Climate Starting

Reliable starting at −40 °C helps prevent winter battery depletion in cold northern regions.

Power While Parked

Stable output powers parking air conditioning, vehicle refrigerators and other equipment for extended periods.

Automotive Sodium-Ion Start–Stop Battery Range



Model: 170 Ah SL-MQ170-12N
Dimensions: L 513 × W 221 × H 207/227



Model: 100 Ah SL-MQ100-12N
Dimensions: 400 × 178 × 187



Model: 80 Ah SL-MQ080-12N
Dimensions: L 315 × W 175 × H 187



Model: 90 Ah SL-MQ090-12N
Dimensions: 356 × 178 × 186



Model: 70 Ah SL-MQ070-12N
Dimensions: L 280 × W 176 × H 185



Model: 60 Ah SL-MQ060-12N
Dimensions: L 231 × W 174 × H 181/200

Core Product 2 | Sodium-Ion Batteries for UPS, 220 V DC and EPS

Products for UPS, 220 V DC and EPS Systems

01 Standard Sodium-Ion Battery Modules

Standard 3 V Sodium-Ion Module

Voltage: 3 V. Capacity: 100–1,000 Ah, customised to requirements. For sodium-ion battery systems supporting UPS, 220 V DC and EPS in large substations.

Standard 12 V Sodium-Ion Module

Voltage: 3 V. Capacity: 100–1,000 Ah, customised to requirements. For sodium-ion battery systems supporting UPS, 220 V DC and EPS in small and medium-sized substations.







02 Intelligent Power Distribution and Management

Flexible Parallel Battery Strings

Supports six parallel strings, with capacity expansion to suit different requirements.

Flexible Series Connection

Modules connect in series as required to create a high-voltage platform below 1,500 V.

Intelligent BCU Controller

Integrated control provides system-wide management, protection and dynamic balancing.

Intelligent Balancing BMS

Distributed sensing and monitoring automatically balance cells and extend service life.

- High-voltage distribution units connect and interconnect strings of series-connected battery packs.
- Connects up to six battery strings.
- An integrated BCU master controller within the BMS manages, protects and balances connected battery strings.
- The LCD touchscreen displays operating parameters for every string, pack and cell, and supports system operation and configuration.

Core Product 3 | 800 V Sodium-Ion Power Systems for Data Centres

01 Standard Sodium-Ion Modules for 800 V DC Data-Centre Power

Standard 3 V Sodium-Ion Module

Voltage: 3 V. Capacity: 100–1,000 Ah, customised to requirements.
For 800 V power supplies in large data centres.

Standard 12 V Sodium-Ion Module

Voltage: 3 V. Capacity: 100–1,000 Ah, customised to requirements.
For 800 V power supplies in large data centres.

02 Intelligent Power Distribution and Management

Flexible Parallel Battery Strings

Supports six parallel strings, with capacity expansion to suit different requirements.

Flexible Series Connection

Modules connect in series as required to create a high-voltage platform below 1,500 V.

Intelligent BCU Controller

Integrated control provides system-wide management, protection and dynamic balancing.

Intelligent Balancing BMS

Distributed sensing and monitoring automatically balance cells and extend service life.

Designed specifically for 800 V DC data-centre power supplies, increasing available power and maintaining stable voltage.

Products for 800 V DC Sodium-Ion Data-Centre Power

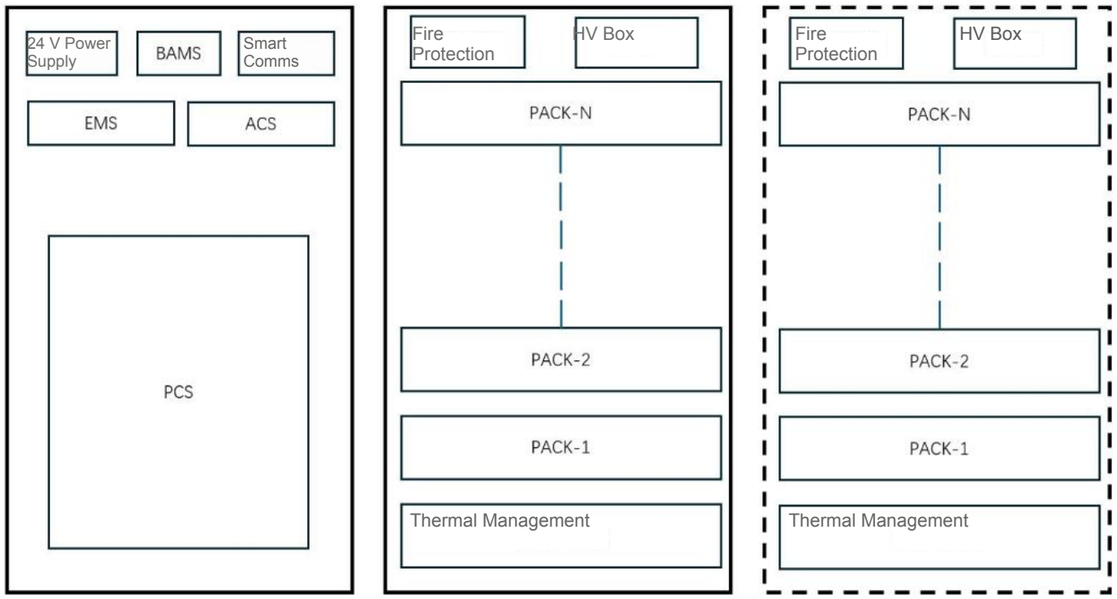






- High-voltage distribution units connect and interconnect strings of series-connected battery packs.
- Connects up to six battery strings.
- An integrated BCU master controller within the BMS manages, protects and balances connected battery strings.
- The LCD touchscreen displays operating parameters for every string, pack and cell, and supports system operation and configuration.

Core Product 4 | Sodium-Ion Storage for Distribution Areas





Core Product 4 | Sodium-Ion High-Altitude AC/DC-Coupled Microgrid



Applications: off-grid power in remote areas without electricity; self-supplied power for construction sites and camps; peak–valley arbitrage and demand response.

Features

Complementary energy sources and intelligent control: strong internal compatibility, modular electrical interfaces and a simple structure, with switching between grid-connected and islanded operation.

High efficiency: autonomous balancing and dispatch support self-generation and self-consumption.

High reliability: AC coupling allows independent operation without interference. Mature technology and good compatibility suit small-scale power transmission and distribution.

Advantages

Versatile applications: construction and residential power, off-grid supply, peak–valley arbitrage and demand response.

Broad compatibility: proven Chinese brand technologies support grid-forming and grid-following operation, with a shared AC 380 V / 50 Hz bus interface and unified local dispatch.

Customisable: configuration is selected for load power and supply-assurance require uit different operating environments.

Core Product 4 | Energy Storage and Microgrid Solutions

01 High-Altitude AC/DC-Coupled Microgrid

Applications: safe, reliable local power for remote off-grid locations, construction sites and camps, commercial and industrial peak–valley arbitrage, and grid demand response, enabling energy self-sufficiency.

Intelligent Dual-Mode Control

Coordinated dispatch of complementary energy sources and modular interfaces enable seamless switching between grid-connected and islanded modes for continuous power.

Independent Coupling Architecture

AC-coupled branches operate independently without interference, supporting autonomous energy balancing and self-consumption to improve utilisation.

Standard System Compatibility

A standard AC 380 V / 50 Hz bus supports grid-forming and grid-following modes and accommodates a wide range of Chinese electrical equipment and loads.

Application-Specific Customisation

System configurations are tailored to load power, required supply duration and application needs, meeting individual power requirements.



Integrated Wind, PV and Storage Demonstration Project

Combining solar PV and wind generation with intelligent energy storage enables efficient storage and dispatch. The resulting green, low-carbon, stable microgrid provides sustainable power for remote areas and specialist applications.

Core Product 5 | SL-B01D1 Battery Sensor

The SL-B01D1 battery sensor measures individual-cell voltage and temperature, provides active and passive balancing, and evaluates battery performance. The sensor (CS) outputs data over CAN for direct access by the host system. Connecting it to a BCU creates a fully distributed BMS; integration with an ACU supports large energy storage BMS installations with multiple parallel strings. Its fast response makes it particularly suitable for battery monitoring in pulsed power supplies and large energy storage systems.

01 Integrated Core Functions

Multidimensional Data Acquisition

Real-time cell voltage and temperature measurements with millisecond response ensure accurate source data.

Active and Passive Balancing

100 mA active balancing plus 30 mA passive balancing effectively reduces cell inconsistency.

Health Assessment

Core algorithms calculate SOC/SOH accurately and flag battery health and service-life risks in real time.

CAN Bus Networking

Supports 120 cascaded nodes per segment and mainstream BCU/ACU controllers for large clusters.

02 Key Performance Specifications

Low Power	High Accuracy	Wide Temperature Range	High Integration
Consumption <10 mA	Voltage: ±10 mV	−40 °C to 125 °C	32.5 × 20 × 8 mm
Supply: 10–13.2 V	SOC Error ≤5%	Response <2 ms	Onboard Sensing and Balancing



SL-B01D1 hardware: a highly integrated PCB optimised for dense energy storage installations, with excellent interference resistance.

Product Installations











Other Custom-Developed Products

Beyond standard energy storage products, we develop customised solutions for grid applications, construction and power-system operation and maintenance. These solutions address specific energy requirements and enable efficient, stable energy management.

Distribution-Area Energy Storage

Designed for distribution-transformer service areas, the system regulates frequency and amplitude, adjusts energy dynamically between peak and off-peak periods, and provides reactive power compensation. It improves supply stability and dispatch efficiency for precise distribution-grid management.

Multifunction Storage and Power Distribution

Integrated AC/DC power provides stable 220 V AC and 24 V DC output for outdoor construction, emergency response and similar applications. Its portability and reliability meet power needs in demanding field conditions.

Battery Capacity Test System

Developed for power-plant and substation DC systems, it accurately verifies battery capacity, tests performance and assesses health. This supports safe, stable DC operating power and reduces operation and maintenance risks.

Our customisation commitment: guided by customer needs, we provide one-stop energy storage solutions from system design and product customisation to operation and maintenance support. We help you manage energy more efficiently and safely as your trusted long-term partner.

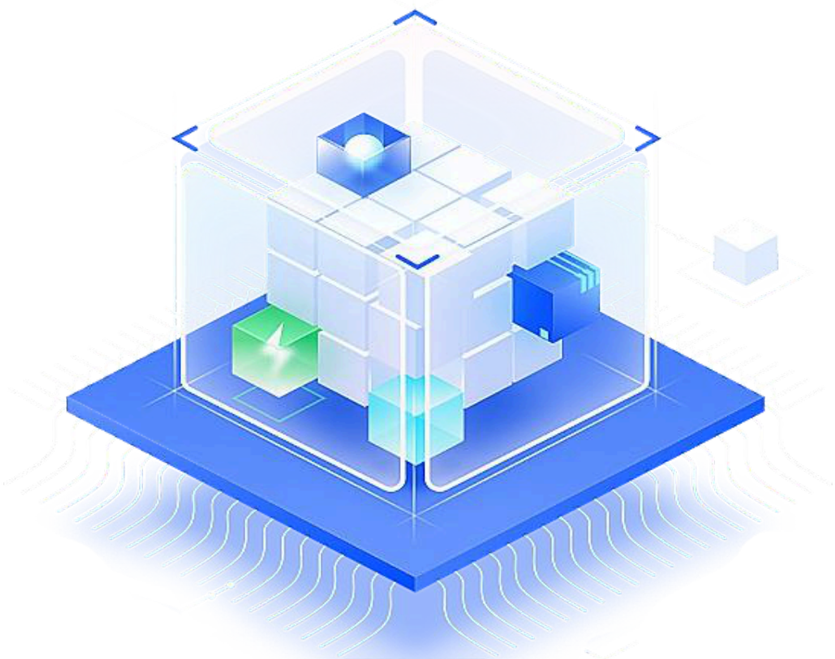
Chapter 3 • Solution B



Intelligent Battery Power. Boundless Conversion.

Traction Batteries, BMS and Energy Storage Power Conversion

TO-U GLOBAL Solution B covers traction batteries, BMS and energy storage power conversion, with a complete product chain from PCS and EMS to battery packs, protection boards and solid-state transformers. Energy storage converters span 1,250–1,725 kW and support grid-connected/off-grid operation and high-/low-voltage ride-through. EMS controllers integrate BSU and EMS functions, multiple communication protocols and cloud management. Traction batteries include 24 V, 48 V, 60 V and 72 V systems and high-rate UAV batteries, with high-power BMS protection boards supporting CAN, RS485, Bluetooth and 4G communications, active/passive balancing and low-temperature heating. SST solid-state transformers use SiC devices and high-frequency isolation to convert 10 kV medium voltage to 690 V/380 V low-voltage outputs. Applications include AGVs, forklifts, electric motorcycles, UAVs, commercial and industrial storage, and microgrids.



PCS Product Overview

PCS Introduction

ZHIDUN Power has developed system-level engineering capabilities for energy storage power conversion systems (PCS), with in-house R&D spanning mechanical structures, electrical architecture, thermal management, control hardware, embedded software, manufacturing processes and system testing and validation. These capabilities enable rapid PCS customisation, reliable validation and delivery at scale.



Application type	Outdoor
Product models	ZD PCS-1500/1250F-N-T-D ZD PCS-1500/1500F-N-T-D ZD PCS-1500/1725 F-N-T-D
AC Specifications (Grid-Connected)	
Rated power	1250 kW / 1500 kW / 1725 kW
Maximum AC power (continuous)	1375 kW / 1650 kW / 1897 kW
Overload capability	110%: continuous operation 120%: at least 1 min
Rated AC voltage	690 V (accommodates grid voltage fluctuations of ±10%)
Grid frequency range	50 Hz / 45–55 Hz
Maximum current	1310 A / 1558 A / 1807 A
Current harmonics	<3% (at rated power)
Grid-connected power factor (leading–lagging)	−1 (leading) to +1 (lagging)
DC component	≤0.5% In
Reactive power response time	<30 ms
High-voltage ride-through	Supported
Low-voltage ride-through	Supported
AC Specifications (Off-Grid)	
Frequency range	45–55 Hz
Output voltage range	690 V ±3%
Rated frequency	50 Hz

EMS Controller Specifications

Ems Controller Parameters

The ZHIDUN SMARC EMS controller combines BSU and conventional EMS functions, reducing BSU hardware requirements. For commercial and industrial energy storage, it can integrate BMS functions and provide a hardware platform for AI applications in the BMS.



Parameter	Specification
SOC	RK3588, 4 × Cortex-A76 @ 2.4 GHz + 4 × Cortex-A55 @ 1.8 GHz
GPU	Arm Mali-G610 MP4 GPU
NPU	6 TOPS
RAM	4 GB / 8 GB
Flash	64 GB / 128 GB / 256 GB
CAN	3 × CAN2.0 / CANFD
RS485	3 × RS485
USB	4 × USB
DI	16 channels
DO	8 channels
Operating temperature	−40 °C to 70 °C
Communication protocols	DL/T645、DL/T667、Modbus、IEC104、 IEC61850 GOOSE/MMS、MQTT、Modbus-TCP

24 V Sodium-Ion Replacement for Lead-Acid Batteries

24 V Sodium-ion Battery

The 24 V sodium-ion battery directly replaces a lead-acid battery of the same specification. It offers a longer service life, better low-temperature performance and lower weight, and fits vehicles and equipment without rewiring. With no heavy-metal pollution and improved safety, its long-term cost of use is 50% lower than that of lead-acid batteries.



Key Specifications	
Battery type	Sodium-ion battery
Rated capacity	200 Ah
Battery energy	5.12 kWh
Rated power	3500 W
Cells in series	8S
Nominal voltage	25.6 V
Dimensions	533.5 × 367.5 × 190 mm
Maximum continuous discharge current	150 A
Maximum continuous charge current	150 A
Performance Specifications	
Discharge temperature	−35 °C to 60 °C
Charge temperature	0 °C to 55 °C
Cycle life	≥6,000 cycles (80% DOD)
IP rating	IP54
Internal resistance	≤30 mΩ

48 V Integrated Starting and Parked-Power Battery

48 V Integrated Starting and Parked-Power Battery for Vehicles

Replaces a conventional 12 V lead-acid battery, providing high-rate discharge for engine start-stop systems and meeting ignition power requirements under frequent start-stop operation to improve starting reliability and service life. Integrated onboard energy storage also supplies power to vehicle appliances and outdoor camping equipment while the vehicle is parked with the engine off.





Key Specifications	
Battery capacity	100 Ah
Maximum continuous discharge current	1000 A
Maximum continuous charge current	100 A
Compatible batteries	Sodium-ion / lithium iron phosphate (LiFePO4)
Cells in series	16S
Communication	Bluetooth / RS485 / 4G / CAN
Balancing method	Passive balancing: 200 mA; active balancing: 3 A
Short-circuit protection	Short-circuit current: 2,033 A; protection delay: 50 μs
Performance Specifications	
Cycle life	≥5,000 cycles at 0.2C
Round-trip efficiency	≥93%; self-discharge ≤3%/month
Measurement accuracy	Cell voltage: ±5 mV; temperature: ±2 °C; SOC: ≤±3%
Storage temperature	−40 °C to +85 °C
Operating humidity	5% ~ 95%

60 V Range-Extension Battery for Electric Tricycles

60 V Range-Extended　　Battery for Tricycle

Provides electric tricycles with high-energy-density power and a long cycle life. It supports continuous high-rate discharge for high-current conditions such as hill climbing and heavy loads. An integrated smart BMS with Bluetooth and RS485 communication enables real-time battery monitoring. It also supports external power supply while parked (requires an inverter).



Key Specifications	
Rated voltage	60 V
Rated capacity	30 Ah
Maximum continuous charge current	30 A
Balancing method	Passive balancing; maximum balancing current: 100 mA
Weight	13 kg
Cells in series	20S
Dimensions	184 × 156 × 315 mm
Short-circuit protection	Short-circuit threshold: 300 A; protection delay: 50 μs
Performance Specifications	
Cycle life	≥5,000 cycles at 0.2C
Round-trip efficiency	≥93%; self-discharge ≤3%/month
Measurement accuracy	Cell voltage: ±5 mV; temperature: ±2 °C; SOC: ≤±3%
Storage temperature	−40 °C to +85 °C
Operating humidity	5% ~ 95%

72 V Lithium-Ion Batteries for Electric Mopeds and Motorcycles

72 V Lithium　　Battery

Designed for high-performance electric motorcycles, electric bicycles and modified vehicles. High-energy-density ternary lithium-ion cells support high-rate discharge for high-speed riding, hill climbing and instant acceleration. Voltage, current, temperature and SOC can be monitored in real time on a phone. Multiple protections cover overcharging, overdischarging, short circuits and overheating.



Key Specifications	
Rated voltage	72 V
Rated capacity	24 Ah
Maximum continuous charge current	30 A
Balancing method	Passive balancing; maximum balancing current: 100 mA
Weight	13.6 kg
Cells in series	24S
Dimensions	184 × 165 × 300 mm
Short-circuit protection	Short-circuit threshold: 300 A; protection delay: 50 μs
Performance Specifications	
Cycle life	≥5,000 cycles at 0.2C
Round-trip efficiency	≥93%; self-discharge ≤3%/month
Measurement accuracy	Cell voltage: ±5 mV; temperature: ±2 °C; SOC: ≤±3%
Storage temperature	−40 °C to +85 °C
Operating humidity	5% ~ 95%

Smart Motorcycle Instrument Cluster

Smart Motorcycle Instrument Cluster

Battery Information

Provides electric tricycles with high-energy-density power and a long cycle life. It supports continuous high-rate discharge for high-current conditions such as hill climbing and heavy loads. An integrated smart BMS with Bluetooth and RS485 communication enables real-time battery monitoring. It also supports external power supply while parked (requires an inverter).



Parameter	Specification
Screen size	7-inch TFT colour display
Display resolution	840 × 512
Display brightness	450 cd/m²
Display colours	16 million colours
Viewing angle	>160°
Control platform	9X60
CPU performance	32-bit processor; 600 MHz clock speed
Memory	1 Gbit DDR2 SDRAM
Input voltage	DC 12 V
Quiescent current	<1.5 mA
Communication interfaces	CAN interface; multiple GPIOs
Wireless communication	Bluetooth 5.3; external antenna support
Software updates	Bluetooth OTA update support
RTC	Built-in real-time clock
Data storage	Retains data after power loss
Operating / storage temperature	−30 °C to +85 °C
Housing material	ABS rear housing + alloy front cover
Backlight system	LED backlight; approx. 20,000-hour life
Display functions	Speed, RPM, fuel level, mileage, coolant temperature, gear, tyre pressure and battery voltage
Alert functions	ABS, braking, oil pressure, engine fault and battery fault alerts
Display modes	Day/night UI modes and adjustable backlight brightness

Smart Vehicle Ultrasonic Radar + Probes

Ultrasonic Radar

This product covers vehicle blind spots, measures distance precisely and provides graded alerts to help prevent collisions. The system supports fault self-diagnosis and operates in extreme temperatures and complex electromagnetic environments, providing reliable protection in all weather conditions.



Parameter	Specification
Product type	Vehicle ultrasonic radar + probes
Controller	STM8 microcontroller
Radar IC	E524.33 ultrasonic IC
I/O resources	38 independent I/O interfaces
Vehicle communication	CAN / LIN bus support
Detection range	2.5–5.0 m
Minimum detection distance	25–35 cm
Alert method	Buzzer frequency varies by distance band
System functions	Self-diagnosis, fault alerts and EMI immunity
Application areas	Low-speed turns, side blind-spot monitoring and ADAS assistance

Smart Motorcycle Instrument Cluster

Smart Motorcycle Instrument Cluster

Blind-spot Monitoring

This product covers vehicle blind spots, measures distance precisely and provides graded alerts to help prevent collisions. The system supports fault self-diagnosis and operates in extreme temperatures and complex electromagnetic environments, providing reliable protection in all weather conditions.

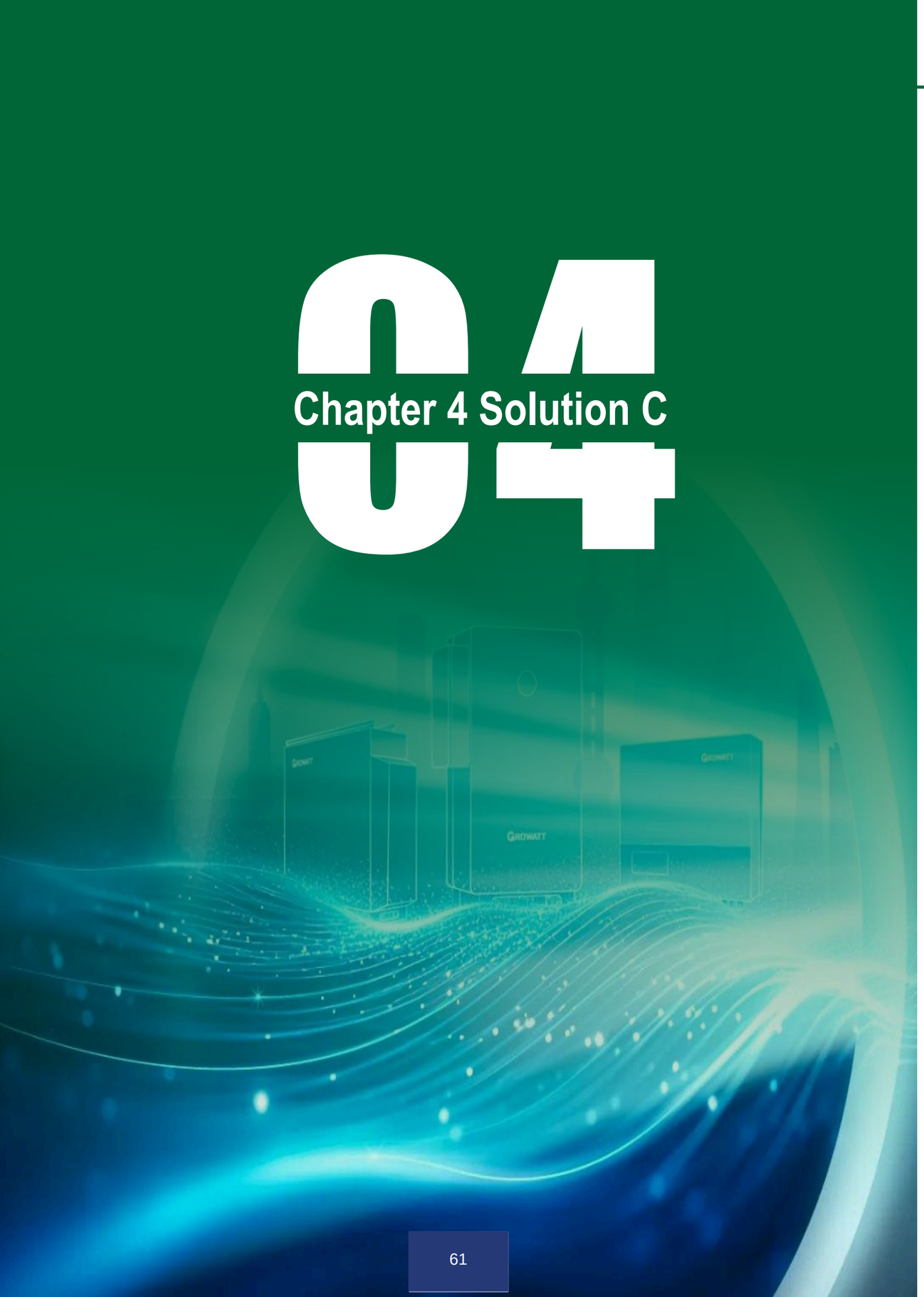


Battery / BMS Specifications

Parameter	Specification
Battery chemistry	Ternary lithium-ion battery
Cells in series	Compatible with 18S–24S
Nominal voltage range	66.6 V to 88.8 V
Maximum charging voltage range	75.6 V to 100.8 V
Charge/discharge configuration	Common charge/discharge port
Continuous discharge current	≥50 A
Short-duration discharge capability	200 A for 3 min
Parallel battery capability	Supports 4 battery packs in parallel
BMS address management	Configurable battery ID; assignable parallel-operation ID
Operating temperature	−20 °C to 60 °C
Sleep-mode consumption	≤100 μA
Voltage measurement accuracy	Cell voltage: ≤±20 mV; total voltage: ≤±0.5 V
Current measurement range	0–250 A; accuracy ≤3%
Temperature measurement	≥3 channels; range: −40 °C to 100 °C
SOC estimation accuracy	≤5%; SOH estimation supported
Communication interfaces	Isolated CAN communication
Core functions	Soft start, flight-state detection, balancing, fault diagnosis, cycle logging and automatic storage discharge

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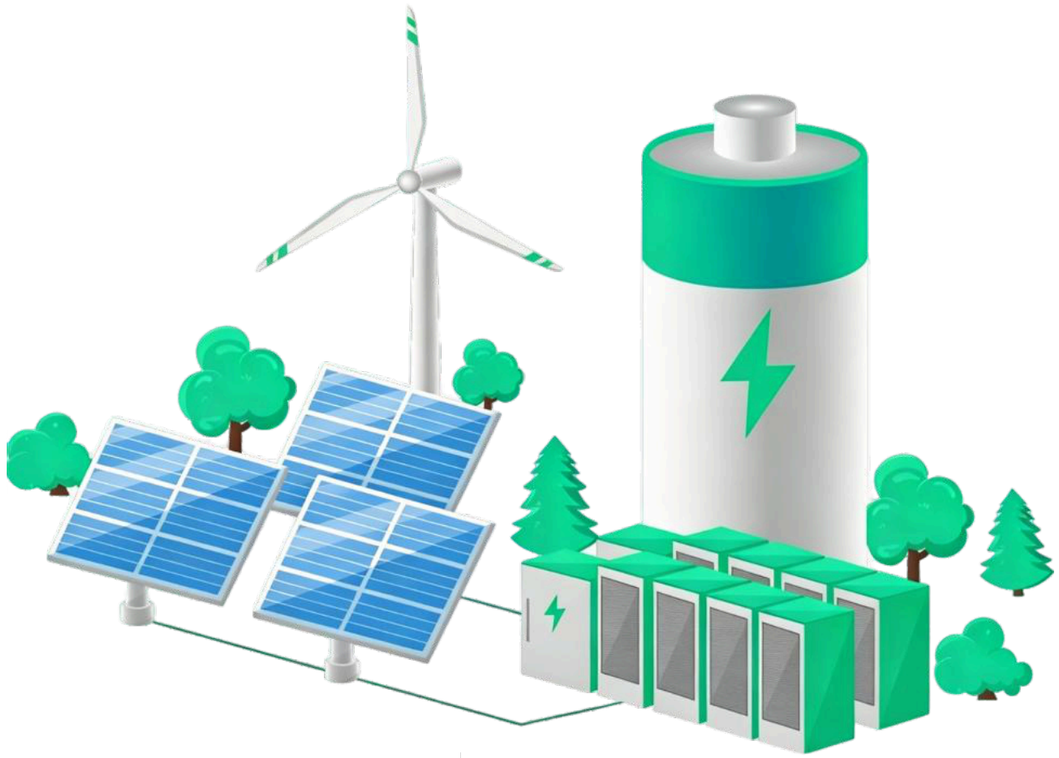
Chapter 4 Solution C



Rock-Solid Power. Lasting Protection.

Industrial Power Supplies and Lead-Acid / Gel Battery Systems

TO-U GLOBAL Solution C provides industrial power supplies and lead-acid / gel battery systems, covering small and medium sealed batteries, stationary valve-regulated batteries, front-terminal batteries, deep-cycle and deep-cycle gel batteries, large OPzV / OPzS tubular batteries, and batteries for electric road vehicles. Capacities range from 3 Ah to 3,000 Ah across 6 V, 12 V and 2 V platforms. Using high-tin Pb-Ca-Sn-Al alloys, 4BS/48S crystal seeds, high-temperature, high-humidity curing and imported gelling agents, the products offer resistance to overcharge and overdischarge, recovery after deep discharge, low self-discharge, long float service life and a wide operating temperature range. Applications include UPS systems, data centres, telecom base stations, railway signalling, medical equipment, photovoltaic energy storage, forklifts and motorcycle starting, providing critical infrastructure with stable, maintenance-free backup and motive power.



Research and Development



Advanced R&D Team

Through multidimensional collaboration with renowned universities and research teams, we have built a research workforce with diverse academic qualifications and technical backgrounds to pursue research and applications in frontier technologies.

Advanced Standards

LEISHI DAYTOU is one of the principal drafters of national industry standards, a vice-chair organisation of the China Battery Industry Association, one of the top 10 enterprises in China's light-industry lead-acid battery sector, and a High-tech Enterprise in Fujian Province.





Green Industry

Guided by green development and a commitment to cleaner, environmentally responsible production, LEISHI DAYTOU continually upgrades its production equipment. Its project was recognised by the Ministry of Industry and Information Technology as a national Key Demonstration Project for Cleaner Production.

Automated Production

Automated Production

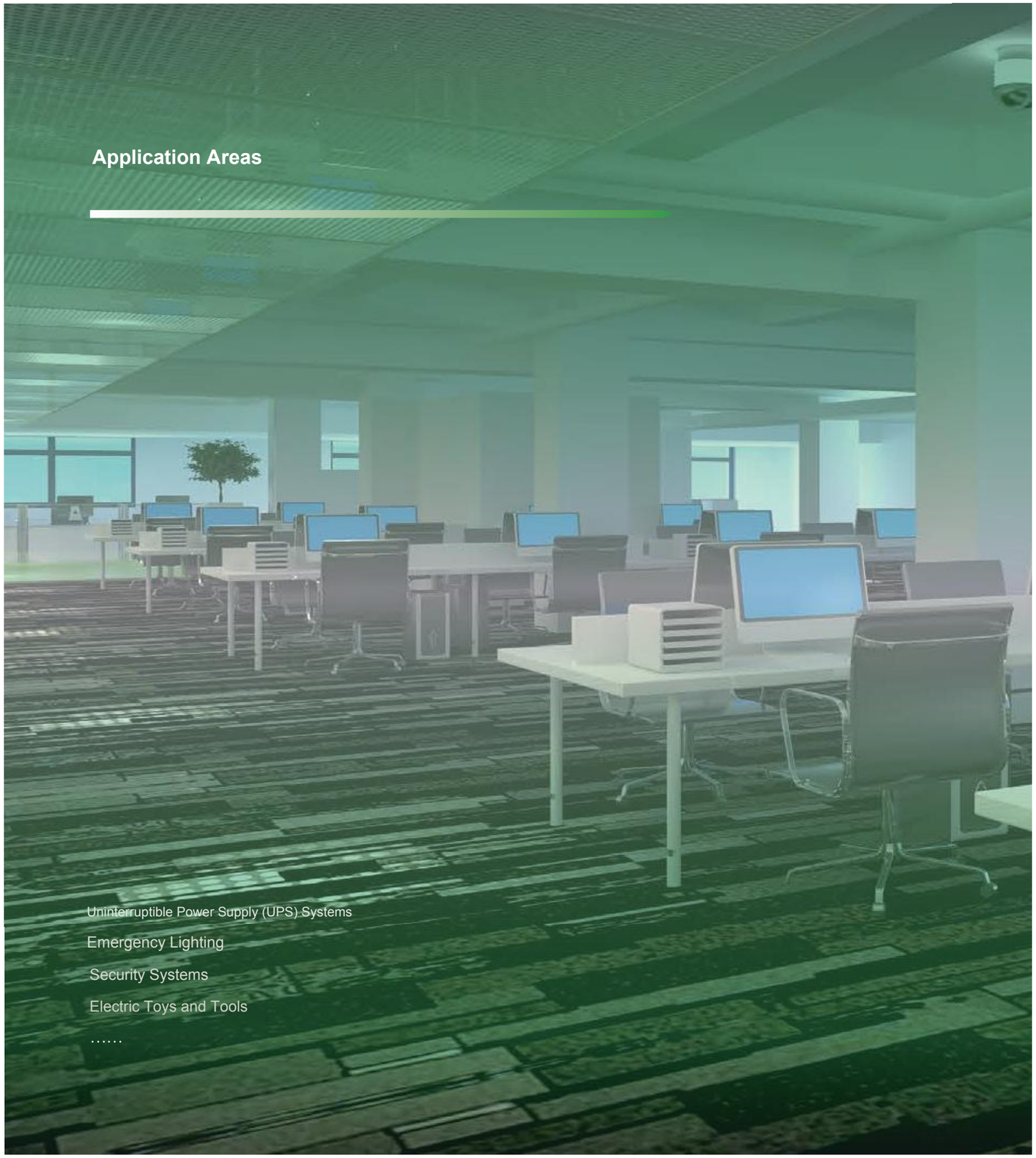
Advanced intelligent technologies enable automated production of UPS batteries. The company uses the latest automated equipment and intelligent control systems for efficient, stable production. From raw-material input to finished-product dispatch, intelligent systems monitor the process in real time, ensuring consistent, reliable product quality. Intelligent production improves both efficiency and quality consistency. LEISHI DAYTOU Power is committed to high-performance, high-quality UPS battery solutions and to advancing innovation across the industry.





Energy Storage Manufacturing Base

We specialise in the R&D, manufacture and sale of a full range of valve-regulated sealed lead-acid batteries and lead-acid battery plates. Our products span four categories—standby, starting, stationary and energy storage—with over 600 specifications to meet diverse regional and customer needs. This broad range serves many applications. Comprehensive product coverage, consistent quality, and outstanding technology and service enable us to provide diverse, high-quality battery solutions.



Small VRLA Batteries

A small VRLA battery is a compact, maintenance-free battery that uses valve-regulated technology to control internal pressure and prevent electrolyte leakage. Its sealed construction, high safety and long service life make it suitable for applications with demanding reliability requirements, including telecommunications equipment, UPS systems, emergency lighting and security systems. It accommodates a range of installation environments and is more environmentally friendly than conventional batteries.

Small Sealed Series

NP SERIES

The NP Small Sealed Series comprises standby batteries with a 20-hour rate capacity of ≤30 Ah. A specially formulated Pb-Ca-Sn-Al alloy grid and active-material formulation provide resistance to overcharge and overdischarge, long storage and service life, and very low self-discharge. Precision manufacturing and stringent quality control ensure excellent consistency for both single-battery use and series or parallel battery configurations in different applications. The fully sealed, maintenance-free construction requires no upkeep during use.

The MS Small Sealed Series comprises standby batteries with a 20-hour rate capacity of ≤30 Ah. A specially formulated Pb-Ca-Sn-Al alloy grid and active-material formulation provide resistance to overcharge and overdischarge, long storage and service life, and very low self-discharge. Precision manufacturing and stringent quality control ensure excellent consistency for both single-battery use and series or parallel battery configurations in different applications. The fully sealed, maintenance-free construction requires no upkeep during use.



Application Areas













Product Features

Specially formulated Pb-Ca-Sn-Al alloy grid
Precision manufacturing; excellent consistency
Suitable for single-battery use or series/parallel configurations in various applications

Ampere-Hour:
3.4 Ah–30 Ah

Voltage: 6 V–12 V

NP SERIES

Small Sealed Series

Battery model	Nominal voltage (V)	Rated capacity (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type	Approx. weight (kg)
				L	W	H	TH		
NP1.3-6	6	1.3	20	97	24	51	55	F1	0.62
NP3.2-6	6	3.2	20	125	33	60	64	F1	0.63
NP3.3-6	6	3.3	20	134	34	60	64	F1	0.65
NP4-6B	6	4.0	20	70	47	100	106	F1/F2	0.68
NP4-6	6	4.0	20					F1/F2	0.70
NP4-6A	6	4.0	20					F1/F2	0.71
NP4.5-6B	6	4.5	20					F1/F2	0.71
NP4,5-6	6	4.5	20					F1/F2	0.73
NP4.5-6A	6	5.0	20					F1/F2	0.75
NP5-6B	6	5.0	20					F1/F2	0.78
NP5-6	6	5.0	20					F1/F2	0.80
NP5-6A	6	5.0	20					F1/F2	0.83
NP6-6	6	6.0	20	85	47	100	106	F1/F2	1.02
NP6-6A	6	6.0	20	85	49	112	118	F1/F2	1.06
NP7-6B	6	7.0	20	151	35	94	100	F1/F2	1.13
NP7-6	6	7.0	20					F1/F2	1.17
NP7-6A	6	7.0	20					F1/F2	1.18
NP9-6B	6	8.4	20					F1/F2	1.25
NP9-6	6	8.6	20					F1/F2	1.33
NP12-6B	6	12.0	20	151	50	94	100	F1/F2	1.65
NP12-6	6	12.0	20					F1/F2	1.75
NP12-6A	6	12.0	20					F1/F2	1.85
NP14-6	6	14.0	20	108	71	140	140	+F1-F2	2.10
NP1.2-12	12	1.2	20	97	46	52	57	F0/F3	0.57
NP1.3-12	12	1.2	20	97	45	52	57	F0/F3	0.57
NP2.2-12	12	2.2	20	70	48	99	102	F0/F3	0.76
NP2.3-12	12	2.3	20	179	35	61	66	F0/F3	0.92
NP2.7-12	12	2.7	20	80	56	99	103	F1	1.05
NP2.9-12	12	2.7	20					F1	1.20
NP3.3-12	12	3.3	20	134	67	61	66	F1/F2	1.30
NP3.5-12	12	3.5	20					F1/F2	1.33
NP3.6-12	12	3.6	20	90	70	101	105	F1/F2	1.31
NP3.8-12	12	4.0	20					F1/F2	1.35
NP4-12L	12	4.0	20					F1/F2	1.38
NP4-12B	12	4.0	20					F1/F2	1.40
NP4-12	12	4.0	20					F1/F2	1.41
NP4.5-12B	12	4.5	20					F1/F2	1.43
NP4.5-12	12	4.5	20					F1/F2	1.45

Battery model	Nominal voltage (V)	Rated capacity (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type	Approx. weight (kg)
				L	W	H	TH		
NP4.5-12A	12	4.5	20	90	70	101	105	F1/F2	1.48
NP5-12B	12	5.0	20					F1/F2	1.52
NP5-12	12	5.0	20					F1/F2	1.55
NP5-12A	12	5.0	20					F1/F2	1.60
NP5-12H	12	5.0	20					F1/F2	1.66
NP6-12	12	6.0	20	151	51	94	98	F1/F2	1.82
NP5-12L	12	5.0	20	151	65	94	98	F1/F2	1.71
NP6-12	12	6.0	20					F1/F2	1.83
NP6.5-12	12	6.5	20					F1/F2	2.00
NP7-12B	12	7.0	20					F1/F2	2.05
NP7-12	12	7.2	20					F1/F2	2.10
NP7.2-12	12	7.5	20					F1/F2	2.15
NP7.2-12A	12	7.5	20					F1/F2	2.20
NP7.5-12B	12	7.5	20					F1/F2	2.25
NP7.5-12	12	7.5	20					F1/F2	2.30
NP7.5-12A	12	7.5	20					F1/F2	2.35
NP8-12	12	8.0	20					F1/F2	2.40
NP9-12B	12	8.4	20					F1/F2	2.45
NP9-12	12	9.0	20					F1/F2	2.55
NP9-12A	12	9.0	20					F1/F2	2.65
NP10-12	12	10.0	20	151	65	110	115	F1/F2	3.10
NP12-12B	12	12.0	20	151	98	94	98	F1/F2	3.30
NP12-12	12	12.0	20					F1/F2	3.40
NP12-12A	12	12.0	20					F0/F3	3.60
NP13-12	12	12.0	20					F0/F3	3.70
NP17-12B	12	17.0	20	181	77	167	167	T1/B1	4.70
NP17-12A	12	18.0	20					T1/B2	5.00
NP18-12	12	18.0	20					T1BI	5.10
NP20-12	12	18.0	20					TI/B1	5.40
NP20-12A	12	20.0	20					T1/B1	5.70
NP22-12	12	22.0	20					T1/B1	6.20
NP24-12H	12	24.0	20	165	126	174	174	T3/B2	7.20
NP26-12H	12	26.0	20					T3/B2	7.50
NP28-12H	12	28.0	20					T3/B2	8.30
NP21-12W	12	18.0	20	175	166	125	125	T3/B2	6.40
NP24-12W	12	18.0	20					T3/B2	7.00
NP26-12W	12	26.0	20					T3/B2	7.20
NP28-12W	12	28.0	20					T3/B2	7.90
NP30-12W	12	30.0	20					T3/B2	8.20



Medium VRLA Batteries

Medium VRLA batteries feature sealed construction for high safety and stability and are widely used wherever reliable backup power is required. Applications include backup power for telecom facilities and data centres; uninterruptible power supply (UPS) systems; renewable energy systems such as solar and wind power; railway and rail-transit signalling and control; medical equipment backup power; industrial control and automation; offshore and oil-platform power support; and emergency power for government, military and municipal infrastructure. Long service life and low maintenance requirements provide these critical applications with a stable power supply.

Medium Sealed Series

NP SERIES

The NP Medium Sealed Series comprises standby batteries with a 20-hour rate capacity of 31–250 Ah. A high-tin Pb-Ca-Sn-Al quaternary alloy and lead paste containing 4BS crystal seeds, combined with a special curing process, deliver an exceptionally long service life and very low self-discharge. Precise capacity and voltage testing and matching ensure suitability for both centralised large equipment rooms and distributed small base stations. The fully sealed, maintenance-free construction requires no upkeep during use.



Medium VRLA Batteries

Application Areas













Product Features

High-tin Pb-Ca-Sn-Al quaternary alloy grid
Lead paste with 4BS crystal seeds
Special curing process

Ampere-Hour:
31 Ah–250 Ah

Voltage: 12 V

NP SERIES

Medium Sealed Series

Battery model Model	Nominal voltage (V)	Rated capacity (Ah) (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type Terminal	Approx. weight (kg)
				L	W	H	TH		
NP30-12E	12	31	10	194	133	169	169		9.0
NP33-12E	12	33	10	196	133	161	179		9.5
NP36-12E	12	36	10	194	133	169	169		10.0
NP34-12	12	34	10	196	165	170	170		10.5
NP38-12	12	37.5	10						11.5
NP40-12	12	40	10	196	165	168	168		12.5
NP42-12	12	40	10						13.5
NP48-12	12	45	10	196	165	170	170		13.8
NP50-12E	12	50	10	230	137	210	215		15.0
NP55-12E	12	55	10						16.0
NP60-12	12	60	10	350	167	174	174		17.5
NP65-12	12	65	10						18.5
NP65-12E	12	65	10	260	167	213	216		19.0
NP70-12E	12	70	10						20.2
NP75-12E	12	75	10	260	167	216	216		21.0
NP80-12E	12	80	10	260	167	213	216		22.5
NP90-12E	12	90	10	305	167	210	213		26.5
NP100-12E	12	100	10						27.5
NP90-12	12	90	10	330	173	217	220		26.5
NP100-12B	12	100	10						28.0

Battery model Model	Nominal voltage (V)	Rated capacity (Ah) (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type Terminal	Approx. weight (kg)
				L	W	H	TH		
NP100-12	12	100	10	330	173	217	220	B5/T14	28.5
NP100-12A	12	100	10					B5/T14	29.0
NP100-12L	12	100	10	406	173	236	236	B5/T14	29.5
NP105-12L	12	105	10					B5/T14	30.5
NP110-12L	12	110	10					B5/T14	31.5
NP120-12L	12	120	10					B5/T14	35.5
NP140-12	12	140	10	486	171	243	243	B5/T14	39.0
NP150-12	12	150	10					B5/T14	41.0
NP150-12	12	145	10					B5/T14	42.0
NP135-12H	12	135	10	341	172	283	286	B5/T14	42.0
NP150-12H	12	150	10					B5/T14	44.5
NP180-12	12	180	10	523	240	219	223	B5/T14	52.0
NP190-12	12	190	10					B5/T14	54.0
NP200-12	12	200	10					B5/T14	56.0
NP200-12A	12	200	10					B5/T14	60.0
NP210-12	12	210	10	521	269	203	206	B5/T14	62.0
NP220-12	12	220	10					B5/T14	63.0
NP230-12	12	230	10					B5/T14	64.0
NP240-12	12	240	10	520	269	220	224	B5/T14	67.0
NP250-12	12	250	10					B5/T14	69.0



Stationary VRLA Batteries

Stationary VRLA batteries are typically used where stable power is required over long periods, such as telecom base stations, UPS systems and renewable energy storage systems. Designed for high capacity and long service life, they are normally installed in a fixed location to supply backup power and keep critical systems operating during outages. These batteries are commonly installed upright and offer high energy density.

Front-terminal VRLA Batteries

Front-terminal VRLA batteries have terminals at the front for easy installation and maintenance. They are particularly suitable for space-constrained locations such as equipment cabinets, data centres and telecom equipment racks. Their design allows quick connection and replacement, making them well suited to high-density installations. Front-terminal batteries are generally compact, yet provide efficient power in limited space.

Stationary VRLA Series

NP SERIES

The NP Stationary VRLA Series comprises 2 V batteries with a 20-hour rate capacity of 50–3,000 Ah. A curved grid structure, high-tin Pb-Ca-Sn-Al quaternary alloy and lead paste containing 4BS crystal seeds are combined with special high-temperature, high-humidity curing and a unique electrolyte formulation. This delivers high capacity and a design float service life of over 15 years. Precision manufacturing and stringent quality control ensure excellent battery consistency.



Product Models

Battery model Model	Nominal voltage (V)	Rated capacity (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type	Approx. weight (kg)
				L	W	H	TH		
ML50-2	2	50	10	161	50	166	175	T17	3.3
ML100-2	2	100	10	170	72	205	228	T18	5.9
ML150-2	2	150	10	172	102	208	223	T18	8.6
ML200-2	2	200	10	170	110	334	365	B5	13.4
ML250-2	2	250	10	117	151	340	365	B5	18.2
ML300-2	2	300	10					B5	19.5
ML350-2	2	350	10					B5	20.5
ML400-2	2	400	10	210	175	334	365	B5	27
ML450-2	2	450	10	240	173	338	365	B5	30
ML500-2	2	500	10					B5	31
ML500H-2	2	500	10					B5	34.5
ML600-2	2	600	10	300	175	335	365	B5	38.5
ML800-2	2	800	10	410	175	331	365	B5	53.2
ML1000-2	2	1000	10	474	173	329	366	B5	61.5
ML1500-2	2	1500	10	398	350	341	383	B5	97
ML2000-2	2	2000	10	490	350	342	381	B5	129
ML2500-2	2	2500	10	712	353	341	382	B5	171
ML3000-2	2	3000	10					B5	188

Product Features

High-tin Pb-Ca-Sn-Al quaternary alloy grid
Lead paste with 4BS crystal seeds
Float service life of 15+ years

Ampere-Hour:
50 Ah–3,000 Ah

Voltage: 2 V



Front-Terminal Series

NP SERIES

The NP Front-terminal Series comprises slim batteries with a 20-hour rate capacity of 50–180 Ah. A high-strength ABS housing and elongated structure improve heat dissipation and resistance to degradation. Centralised venting keeps the installation footprint small. A design float service life of over 12 years helps reduce the cost of use.

Product Models

Battery model	Nominal voltage (V)	Rated capacity (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type	Approx. weight (kg)
				L	W	H	TH		
MR50-12	12	50	10	291	106	223	230	B3	17.0
MR75-12	12	72	10	562	115	187	194	B4	19.5
MR75-12B	12	80	10					B4	26.0
MR100-12B	12	100	10	394	110	286	286	B5	30.0
MR100-12	12	100	10					B5	33.0
MR100-12A	12	100	10	507	110	223	238	B5	34.0
MR105-12	12	105	10					B5	32.0
MR105-12A	12	105	10					B5	31.8
MR110-12	12	110	10	394	110	286	286	B5	33.0
MR125-12	12	125	10	545	105	315	315	B5	40.2
MR155-12	12	155	10	551	110	288	288	B5	48.5
MR170-12	12	170	10	561	125	316	316	B5	51.0
MR180-12	12	180	10					B5	53.8

Product Features

High-strength ABS material
Centralised venting for rapid heat dissipation
Slim structure for efficient use of space

Ampere-Hour:
50 Ah–180 Ah

Voltage: 12 V



Ultra-High-Rate VRLA Batteries

Ultra-high-rate VRLA batteries are specifically designed to deliver high power over short periods. They are typically used for starting, emergency power and equipment requiring an instantaneous high current, such as generator starting systems, UPS emergency power and high-power electric tools. They combine high short-duration power output with a good cycle life and strong resistance to overdischarge.

Deep-Cycle / Deep-Cycle Gel Batteries

Deep-cycle batteries and deep-cycle gel batteries are designed for frequent charging and discharging in applications requiring a stable long-term power supply, such as solar energy storage, electric vehicles and UPS systems. Deep-cycle batteries maintain a long service life after deep discharge. Deep-cycle gel batteries use a gel electrolyte for better high-temperature performance, vibration resistance and maintenance-free operation, making them suitable for more demanding conditions.



Product Models

Battery model	Nominal voltage (V)	Rated capacity (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type	Approx. weight (kg)
				L	W	H	TH		
HR1223W	12	23W/Cell	15Min	90	70	101	105	F1/F2	1.83
HR1225W	12	25W/Cell	15Min	151	51	94	98	F1/F2	1.95
HR1236W	12	36W/Cell	15Min	151	65	94	98	F1/F2	2.65
HR1251W	12	51W/Cell	15Min	181	77	167	167	T1/B1	4.00
HR1270W	12	70W/Cell	15Min					T1/B1	5.70
HR12105W	12	105W/Cell	15Min	175	166	125	125	T3/B2	8.70
HR12175W	12	175W/Cell	15Min	196	165	170	170	B4/T11	14.60
HR12220W	12	220W/Cell	15Min	350	167	174	174	B5/T14	23.50

Product Features

35% higher energy-to-weight ratio than conventional batteries
High-rate discharge performance
Fully sealed, maintenance-free design

Ampere-Hour:
23 W/Cell – 220 W/Cell

Voltage: 12 V



Deep-Cycle Series

NP SERIES

The NP Deep-cycle Series comprises batteries with capacities of 38–250 Ah. Premium materials and refined design provide good recharge recovery after deep discharge and an exceptionally long cycle life. Curved grids increase plate contact area during charging and discharging, improving charge acceptance and making recharging easier. Excellent consistency in open-circuit voltage and capacity helps maintain a long battery-bank service life when batteries are used together.

Product Models

Battery model	Nominal voltage (V)	Rated capacity (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type	Approx. weight (kg)
				L	W	H	TH		
MN45-12	12	45	10	196	165	170	170	B4/wire leads	14.2
MN50-12	12	50	10	230	137	210	215	B4/wire leads	16.3
MN65-12	12	65	10	350	167	174	174	B5/wire leads	23
MN80-12	12	80	10	260	167	213	216	B4/wire leads	26
MN100-12	12	100	10	330	173	217	220	B5/wire leads	32
MN120-12	12	120	10	406	173	236	236	B5/wire leads	37
MN150-12	12	150	10	486	171	243	243	B5/wire leads	46.5
MN200-12	12	200	10	523	240	219	223	B5/wire leads	64

Product Features

Good recharge recovery after deep discharge

Curved grids increase contact area and improve charge acceptance

Excellent battery consistency maintains service life in battery banks

Ampere-Hour: 45 Ah–200 Ah

Voltage: 12 V

Deep-Cycle Gel Series

NP SERIES

The NP Deep-cycle Gel Series comprises deep-cycle gel batteries with capacities of 38–250 Ah. It uses a specialised gelling agent imported from Germany. In addition to good deep-discharge and recharge performance, these batteries perform well at low temperatures and operate normally even at −35 °C. A special grid structure improves charge acceptance, allowing normal charging even when low sunlight reduces solar-panel output.



Product Models

Battery model	Nominal voltage (V)	Rated capacity (Ah)	Rated discharge rate (Hr)	Dimensions (mm)				Terminal type	Approx. weight (kg)
				L	W	H	TH		
MMG45-12	12	45	10	196	165	170	170	B4/wire leads	14.2
MMG50-12	12	50	10	230	137	210	215	B4/wire leads	16.3
MMG65-12	12	65	10	350	167	174	174	B5/wire leads	23.0
MMG80-12	12	80	10	260	167	213	216	B4/wire leads	26.0
MMG100-12	12	100	10	330	173	217	220	B5/wire leads	31.0
MMG120-12	12	120	10	406	173	263	236	B5/wire leads	37.0
MMG150-12	12	150	10	486	171	243	243	B5/wire leads	46.5
MMG200-12	12	200	10	523	240	219	223	B5/wire leads	64.0

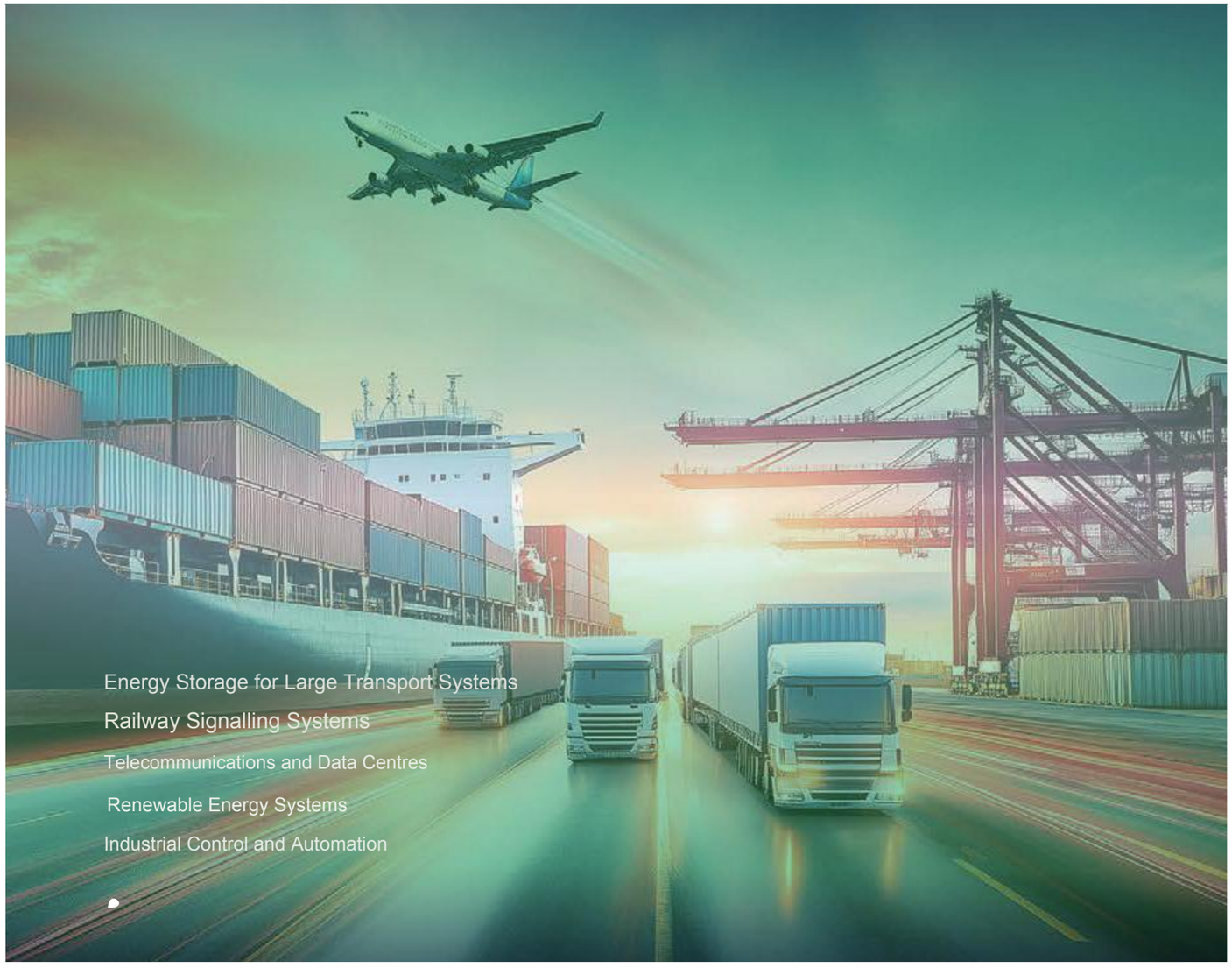
Product Features

Gelling agent imported from Germany
Normal operation at −35 °C
Special grid design for easier charging

Ampere-Hour: 45 Ah–200 Ah

Voltage: 12 V





OPZV | OPZS VRLA BATTERY

Large Tubular VRLA Batteries

As industry-leading valve-regulated sealed lead-acid batteries, OPzV and OPzS each offer distinctive advantages in energy storage.

OPzV batteries are known for excellent deep-cycle performance and an exceptionally long service life. They are designed for applications requiring frequent charging and discharging and high durability, such as solar energy storage systems and wind energy storage stations, ensuring a continuous, stable energy supply.

OPzS batteries are known for high energy density and outstanding performance, providing greater energy output within limited space. They are an ideal choice for backup power in data centres, telecom base stations and critical facilities. Stable voltage output and rapid response help keep equipment running continuously.



Product Models

Model Model	Voltage (V)	Capacity (Ah)	Dimensions (mm)				Terminal type	Terminal position	Weight (Kg) ±5%
			(L) ±15	(W) ±10	(H) ±20	(TH) ±20			
OPzV200	2	200	103	206	355	390	F15	7	18.2
OPzV250	2	250	124	206	355	390	F15	7	22.4
OPzV300	2	300	145	206	355	390	F15	7	26.4
OPzV350	2	350	124	206	471	506	F15	7	29.0
OPzV420	2	420	145	206	471	506	F15	7	34.5
OPzV490	2	490	166	206	471	506	F15	7	39.0
OPzV600	2	600	145	206	646	681	F15	7	48.0
OPzV800	2	800	191	210	646	681	F15	8	65.0
OPzV1000	2	1000	233	210	646	681	F15	8	78.5
OPzV1200	2	1200	275	210	646	681	F15	8	93.0
OPzV1500	2	1500	275	210	796	931	F15	8	115
OPzV2000	2	2000	397	212	772	807	F15	12	155
OPzV2500	2	2500	487	212	772	807	F15	9	192
OPzV3000	2	3000	576	212	772	807	F15	9	228

Model Model	Voltage (V)	Capacity (Ah)	Dimensions (mm)				Terminal type	Terminal position	Weight (kg) ±5%		
			(L) ±15	(W) ±10	(H) ±20	(TH) ±20			Dry	Gross	Acid
OPzS200	2	200	103	206	355	410	F16	7	12.9	17.4	4.5
OPzS250	2	250	124	206	355	410	F16	7	15.4	20.4	5.0
OPzS300	2	300	145	206	355	410	F16	7	17.8	23.8	6.0
OPzS350	2	350	124	206	471	526	F16	7	21.3	28.3	7.0
OPzS420	2	420	145	206	471	526	F16	7	24.5	32.7	8.2
OPzS490	2	490	166	206	471	526	F16	7	28.2	38.0	9.8
OPzS600	2	600	145	206	646	701	F16	7	33.4	45.4	12.0
OPzS800	2	800	191	210	646	701	F16	8	46.9	62.9	14.0
OPzS1000	2	1000	233	210	646	701	F16	8	57.4	77.4	20.0
OPzS1200	2	1200	275	210	646	701	F16	8	67.7	91.7	24.0
OPzS1500	2	1500	275	210	796	851	F16	8	83.8	113.8	30.0
OPzS2000	2	2000	397	212	772	827	F16	12	110	150	40.0
OPzS2500	2	2500	487	212	772	827	F16	9	139.4	189.4	50.0
OPzS3000	2	3000	576	212	772	827	F16	9	164.8	224.8	60.0

Product Features

Imported PVC-SiO_2 separators

Exceptionally long service life

Good recharge recovery after deep discharge

Ampere-Hour:
200 Ah–3,000 Ah

Voltage: 2 V



Product Models

Model Model	Voltage (V)	Capacity (Ah)	Dimensions (mm)			
			(L) ±15	(W) ±10	(H) ±20	(TH) ±20
3-EVF(J)-180	6	180	260	180	270	275
3-EVF(J)-200	6	200	260	180	270	275
4-EVF(J)-150	8	150	260	180	280	285
6-EVF(J)-24	12	24	165	126	175	175
6-EVF(J)-32	12	32	222	93	175	175
6-EVF(J)-38	12	38	196	165	174	174
6-EVF(J)-50A	12	50	260	168	212	218
6-EVF(J)-50B	12	50	229	138	212	216
6-EVF(J)-60	12	60	262	165	169.5	169.5
6-EVF(J)-65	12	65	260	168	212	218
6-EVF(J)-70	12	70	260	168	212	218
6-EVF(J)-80	12	80	329	172	214	218
6-EVF(J)-100	12	100	330	176	214	218
6-EVF(J)-120	12	120	407	174	209	218
6-EVF(J)-140	12	140	483	170	240	240
6-EVF(J)-150	12	150	483	170	240	240
6-EVF(J)-200	12	200	522	240	219	224

Application Areas

Power for electric cars, electric tricycles, electric forklifts, electric pallet trucks, electric stackers, golf carts, sightseeing vehicles, street patrol vehicles, mini trucks and other vehicles.

Applicable Standards

GB/T 18332.1-2009, Lead-acid Batteries for Electric Road Vehicles

Performance Overview

The products fall into two main categories: lead-acid and gel. Gel batteries offer particular advantages in usability, durability and safety.
① Strong starting and hill-climbing capability ② Long driving range ③ Low self-discharge
④ Good low-temperature performance ⑤ Long service life ⑥ Environmentally friendly



Product Models

Model Model	Voltage (V)	Capacity (Ah)	Dimensions (mm)			
			(L) ±15	(W) ±10	(H) ±20	(TH) ±20
6-EVF-24	12	24	165	126	175	175
6-EVF-32	12	32	222	93	175	175
6-EVF-38	12	38	196	165	174	174
6-EVF-50	12	50	229	138	212	216
6-EVF-60A	12	60	260	168	212	218
6-EVF-60B	12	60	262	165	169.5	169.5
6-EVF-65	12	65	260	168	212	218
6-EVF-80A	12	80	329	172	214	218
6-EVF-80B	12	80	260	168	212	218
6-EVF-100	12	100	329	172	214	218
6-EVF-120	12	120	407	174	209	218
6-EVF-140	12	140	483	170	240	240
6-EVF-150	12	150	483	170	240	240

Application Areas

Motive-power batteries for electric pallet forklifts, electric warehouse handling vehicles, electric stackers and similar vehicles.

Power for electric vehicles, electric tricycles, electric forklifts, electric pallet trucks, electric stackers, golf carts, sightseeing vehicles, street patrol vehicles, mini trucks and other vehicles.

Applicable Standards

GB/T 18332.1-2009, Lead-acid Batteries for Electric Road Vehicles; IEC 60896-21/22

GB/T 18332.1-2009, Lead-acid Batteries for Electric Road Vehicles

Performance Overview

1. Vibration resistance: Reinforced vibration-resistant construction allows use in electric forklifts without vibration-damping systems.
2. Good recovery: A unique active-material formulation provides resistance to deep discharge and excellent capacity recovery.
3. Sealed and maintenance-free: High oxygen-recombination efficiency eliminates water top-ups and acid-mist emissions, preventing equipment corrosion.
4. Good high-current discharge: Low-resistance materials reduce internal resistance and provide good charging efficiency.
5. High- and low-temperature tolerance: A wide operating temperature range suits indoor and outdoor use in diverse conditions.
6. Long service life: Cadmium-free, multi-element rare-earth alloy grids provide strong corrosion resistance. Nanoscale fumed silica is used as the electrolyte gelling material, preventing stratification and leakage.

The products fall into two main categories: lead-acid and gel. Gel batteries offer particular advantages in usability, durability and safety.
① Strong starting and hill-climbing capability ② Long driving range ③ Low self-discharge
④ Good low-temperature performance ⑤ Long service life ⑥ Environmentally friendly



Product Models

Model	Voltage (V)	Capacity (Ah)	Dimensions (mm)			
			(L) ±15	(W) ±10	(H) ±20	(TH) ±20
YT7	12	7	151	87	94	94
12N7L	12	7	136	76	126	126
12N7-3B	12	7	149	60	129	129
12F7	12	7	113	70	130	130
12N9	12	9	136	76	133	133
12V6.5A	12	6.5	139	66	102	102
12N5A	12	5	120	61	131	131
YT5A	12	5	113	70	100	100
YT4A	12	4	113	70	89	89
12N2.5A	12	2.5	80	71	104	104
12N3A	12	3	98.5	56	109	109
12N12A	12	12	152	88	147	147
12N14A	12	14	152	88	163	163

• Applicable Standard

GB/T 23638—2009, Lead-acid Batteries for Motorcycles

• Performance

① Vibration resistance: Reinforced vibration-resistant design for motorcycle starting applications.

② Excellent recovery: A proprietary active-material formulation provides deep-discharge tolerance and excellent capacity recovery.

③ Sealed and maintenance-free: High oxygen recombination efficiency eliminates water top-ups and acid mist emissions, protecting equipment from corrosion.

④ High-current discharge: Low-resistance materials reduce internal resistance and support efficient charging.

⑤ High- and low-temperature resistance: A wide operating temperature range suits indoor and outdoor use in varied environments.

⑥ Long service life: Cadmium-free, multi-element rare-earth alloy grids resist corrosion. Nanoscale fumed silica gels the electrolyte, preventing stratification and leakage.

CHARGING CHARACTERISTICS

1

Float voltage must be maintained at an appropriate level to offset self-discharge and keep the battery fully charged. At the normal operating temperature of 25 °C, the optimum float voltage is 2.25–2.30 V/cell. Where the grid supply is unstable, the optimum equalisation voltage at 25 °C is 2.40–2.50 V/cell. Avoid prolonged equalisation; less than 24 hours is preferable.

2

The charging curves show constant-current charging at 0.1 CA and constant-voltage charging at 2.23 V/cell following discharge of 50% and 100% of the 10-hour rated capacity. Time to full charge varies with discharge depth, initial charging current and temperature. A fully discharged battery charged at 25 °C with a constant current of 0.1 CA and a constant voltage of 2.23 V/cell can recover 100% of its discharged capacity within 24 hours. The initial charging current is 0.1 CA–0.3 CA.

3

For valve-regulated lead-acid batteries, use constant-voltage and constant-current charging.

A: Charging for Float Service

Charging voltage: 2.23–2.30 V/cell (25 °C); recommended setting: 2.25 V/cell

Maximum charging current: 0.3 CA

Temperature compensation: −3 mV/°C/cell (25 °C)

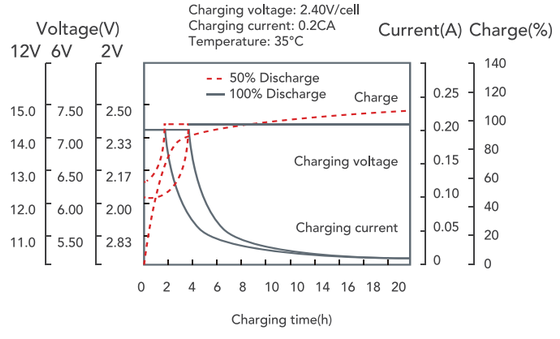
B: Charging for Cyclic Service

Charging voltage: 2.40–2.50 V/cell (25 °C); recommended setting: 2.45 V/cell

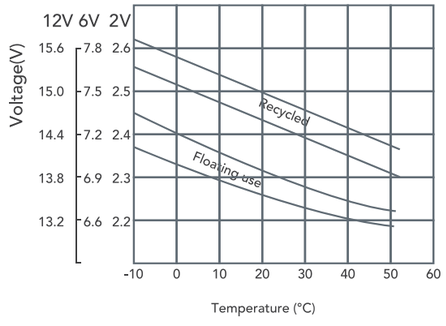
Maximum charging current: 0.3 CA

Temperature compensation: −5 mV/°C/cell (25 °C)

Charging Curves



Charging Voltage vs. Temperature



Charging Characteristics

Float voltage must be maintained at an appropriate level to offset self-discharge and keep the battery fully charged. At the normal operating temperature of 25 °C, the optimum float voltage is 2.25–2.30 V/cell. Where the grid supply is unstable, the optimum equalisation voltage at 25 °C is 2.40–2.50 V/cell. Avoid prolonged equalisation; less than 24 hours is preferable.

The charging curves show constant-current charging at 0.1 CA and constant-voltage charging at 2.23 V/cell following discharge of 50% and 100% of the 10-hour rated capacity. Time to full charge varies with discharge depth, initial charging current and temperature. A fully discharged battery charged at 25 °C with a constant current of 0.1 CA and a constant voltage of 2.23 V/cell can recover 100% of its discharged capacity within 24 hours. The initial charging current is 0.1 CA–0.3 CA.

Charge valve-regulated sealed lead-acid batteries at constant voltage with current limiting:

A: Charging for Float Service

Charging voltage: 2.23–2.30 V/cell at 25 °C (recommended setting: 2.25 V/cell)

Maximum charging current: 0.3 CA

Temperature compensation: −3 mV/°C/cell (25 °C)

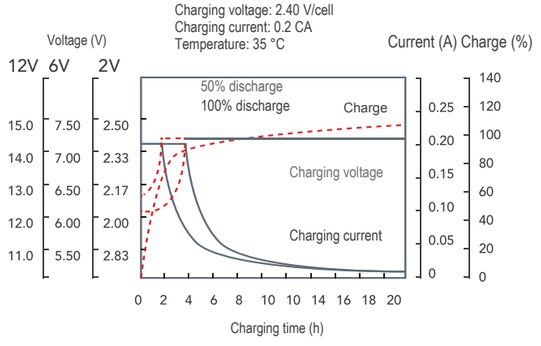
B: Charging for Cyclic Service

Charging voltage: 2.40–2.50 V/cell at 25 °C (recommended setting: 2.45 V/cell)

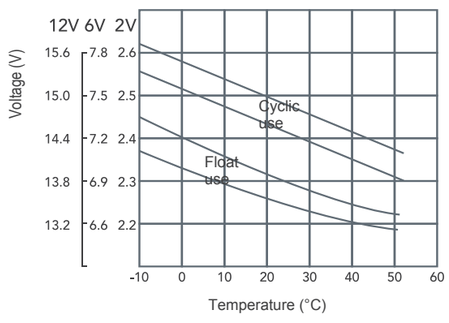
Maximum charging current: 0.3 CA

Temperature compensation: −5 mV/°C/cell (25 °C)

Charging Curves



Charging Voltage vs. Temperature

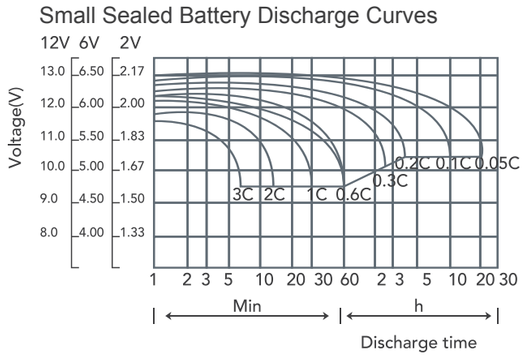


DISCHARGE CHARACTERISTICS

Discharge Capacity

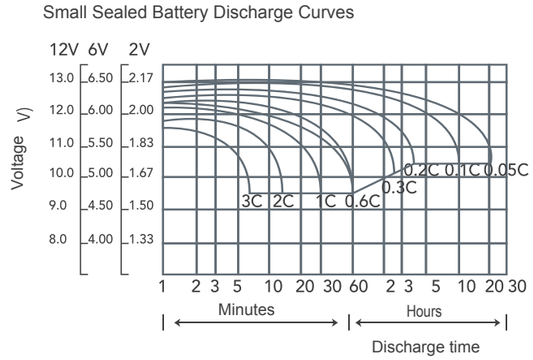
Discharge Capacity

The chart on the right shows the battery discharge curves. Discharge capacity varies with discharge current (rate): lower current delivers more capacity, while higher current delivers less.



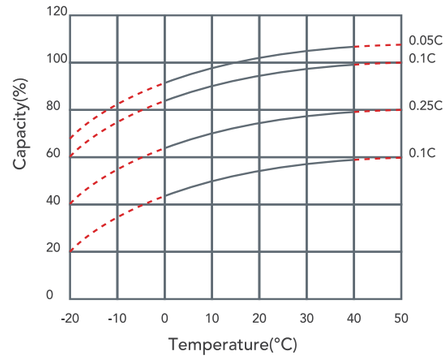
Discharge Capacity

The chart on the right shows the battery discharge curves. Discharge capacity varies with discharge current (rate): lower current delivers more capacity, while higher current delivers less.



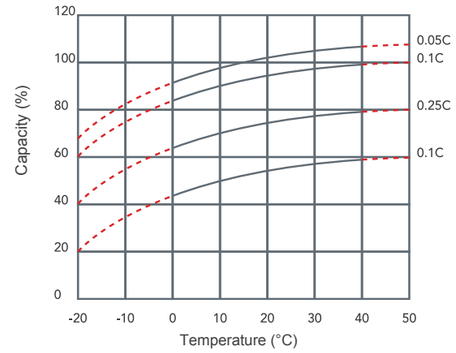
Effect of Temperature on Capacity

The chart on the right shows how temperature affects battery capacity. Discharge capacity increases as temperature rises and decreases as temperature falls.



Effect of Temperature on Capacity

The chart on the right shows how temperature affects battery capacity. Discharge capacity increases as temperature rises and decreases as temperature falls.



Discharge Current and End Voltage

In general, the end-of-discharge voltage is set lower for high-current discharge. Prolonged discharge at low current forms lead sulfate on the plates, which may cause active material to deform or shed and the plates to bend. Set a higher end voltage for small sealed batteries to protect them. Avoid discharging below the end voltage (overdischarge); it yields very little additional capacity and may damage the battery.

Recommended End-of-discharge Voltages

Discharge current	End voltage
< 0.1Ca	≥1.75V/cell
0.11~0.25Ca	≥1.70V/cell
0.26~1.0Ca	≥1.60V/cell
> 1.1Ca	≥1.40V/cell

Discharge Current and End Voltage

In general, the end-of-discharge voltage is set lower for high-current discharge. Prolonged continuous discharge at low current forms a denser lead-sulfate layer, which can cause plate growth, distortion and shedding of active material, and deformation of the plates. A higher end voltage is therefore required to protect small sealed batteries.

Avoid discharging below the end voltage (overdischarge) wherever possible. As noted above, overdischarge yields very little additional capacity but may damage the battery.

Recommended End-of-discharge Voltages

Discharge current	End voltage
< 0.1Ca	≥1.75V/cell
0.11~0.25Ca	≥1.70V/cell
0.26~1.0Ca	≥1.60V/cell
> 1.1Ca	≥1.40V/cell

BATTERY LIFE

Battery Life

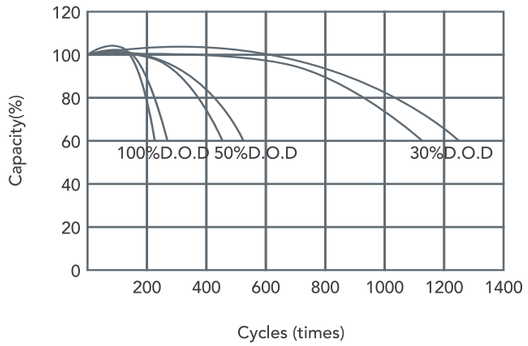
- Float service life is affected by discharge frequency, depth of discharge, float voltage and the operating environment. As described above, the negative plates absorb gases generated inside the battery and recombine them into water at the normal float voltage. This prevents capacity loss caused by electrolyte depletion.

- An appropriate float voltage is essential. Higher temperatures accelerate corrosion and may shorten battery life; higher charging currents further accelerate corrosion. Set the float voltage to 2.25 V/cell and use a charger with voltage accuracy of 2% or better.

A Cycle life:

Cycle life depends on depth of discharge (DOD): the lower the DOD, the longer the cycle life.

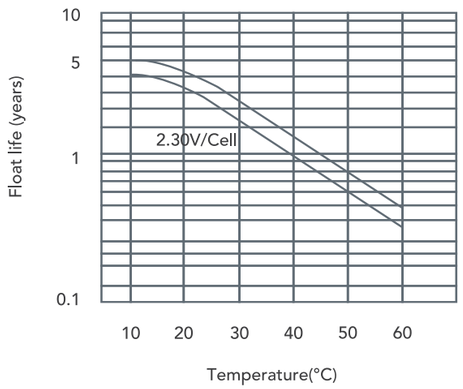
Cycle-life curves are shown below:



B Standby life:

Float service life depends on temperature: the higher the temperature, the shorter the service life. The specified float design life is based on 20 °C.

Small sealed battery service-life curves:



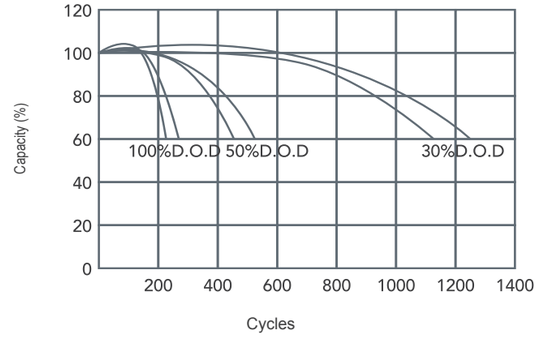
- Float service life depends on discharge frequency, depth of discharge, float voltage and the operating environment. At the normal float voltage of 2.23 V/cell, internal gas recombination allows the negative plate to absorb gases generated inside the battery and reduce the active material, supporting normal float service life.

- Higher temperatures accelerate corrosion and may shorten battery life; higher charging currents further accelerate corrosion. An appropriate float voltage is therefore essential. Set the float voltage to 2.25 V/cell and use a charger with voltage accuracy of ±2% or better.

A: Cycle Life

Cycle life depends on depth of discharge (DOD): the lower the DOD, the longer the cycle life.

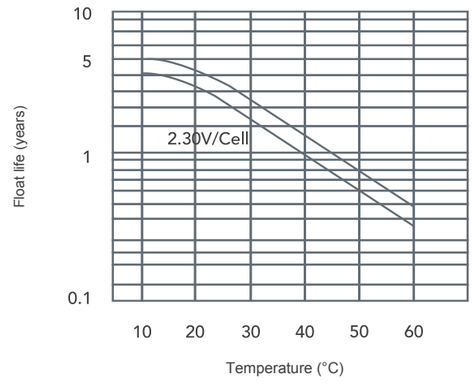
Cycle-life curves are shown below:



B: Float Service Life

Float service life depends on temperature: the higher the temperature, the shorter the service life. The specified float design life is based on 20 °C.

Small sealed battery service-life curves:



STORAGE INSPECTION

Storage:

Batteries are fully charged before shipment. Before installation, note the following:

A

The battery may emit flammable gases. Provide adequate ventilation and keep it away from sparks and open flames.

B

On arrival, check the packaging for damage. Open it carefully to avoid damaging the battery.

C

Unpack near the installation location. Support the base when lifting the battery; do not lift it by the terminals. Caution: Moving the battery by force applied to the terminals may crack the sealant.

D

After unpacking, check the quantity and appearance of accessories.

Inspection:

A. After checking that the battery has no abnormalities, install it in the designated location, such as a battery room.

B. In a battery room, position batteries as low as practicable and maintain a gap of at least 15 mm between batteries.

C. Always install batteries away from heat sources, such as transformers.

D. Batteries may generate flammable gas. Keep them away from devices that may produce sparks, such as fuses.

E. Before connecting, clean the battery terminals until the metal surfaces are bright.

F. When using multiple batteries, connect them correctly to one another first, then connect the battery bank to the charger or load.

Connect the battery positive terminal to the positive terminal of the charger or load, and negative to negative. Incorrect connection can damage the charger, so take care to avoid reversed polarity. Tighten every connecting nut and bolt to the torque specified below:

Applicable Bolts	Torque requirement
M5	2.0~4.0N*m(20~40kgf*cm)
M6	4.5~8.0N*m(45~80kgf*cm)
M8	11~13N*m(110~130kgf*cm)

Storage

Batteries are fully charged before shipment. Before installation, note the following:

A

The battery may generate small amounts of hydrogen or oxygen. Provide adequate ventilation and keep batteries away from sparks and open flames.

B

On arrival, check the packaging for damage. Open it carefully to avoid damaging the battery.

C

Unpack near the installation location. Support the base when lifting the battery; do not lift it by the terminals. Caution: Moving the battery by force applied to the terminals may crack the sealant.

D

After unpacking, check the quantity and appearance of accessories.

Inspection:

A. After checking that the battery has no abnormalities, install it in the designated location, such as a battery room.

B. In a battery room, position batteries as low as practicable and maintain a gap of at least 15 mm between batteries.

C. Always install batteries away from heat sources, such as transformers.

D. Batteries may generate flammable gas. Keep them away from devices that may produce sparks, such as fuses.

E. Before connecting, clean the battery terminals until the metal surfaces are bright.

F. When using multiple batteries, connect them correctly to one another first, then connect the battery bank to the charger or load.

Connect the battery positive terminal to the positive terminal of the charger or load, and negative to negative. Incorrect connection can damage the charger, so take care to avoid reversed polarity. Tighten every connecting nut and bolt to the torque specified below:

Bolt size	Specified torque
M5	2.0~4.0N*m(20~40kgf*cm)
M6	4.5~8.0N*m(45~80kgf*cm)
M8	11~13N*m(110~130kgf*cm)

CHARGING CHARACTERISTICS

A Clean the battery with a damp cloth. Keep it away from organic solvents such as petrol, and do not use cloths containing these substances. Avoid vacuum cleaners and dry cloths, especially synthetic-fibre cloths, as static electricity may create a hazard.

B Batteries generate flammable gas. Keep them away from open flames and do not short-circuit them.

C Do not dismantle the battery. If mechanical damage causes sulfuric acid to contact skin or clothing, rinse immediately with water. If it enters the eyes, flush with plenty of clean water and seek hospital treatment immediately.

D Do not throw batteries into a fire; they may rupture.

E Provide a vent when operating a battery inside a container or bag. Ensure adequate ventilation in battery rooms and enclosures.

F Touching conductors may cause electric shock. Always wear rubber gloves before inspection or maintenance.

G Apply corrosion protection to battery connectors.

H The operating temperature range is −20 °C to 50 °C. Operation below 15–25 °C is recommended for longer service life.

I Contact us before connecting 4 or more batteries in parallel.

J Mixing batteries with different capacities, production dates or manufacturers may damage the batteries or equipment. Contact us if this is required.

MAINTENANCE

To prevent battery problems, inspect batteries regularly as follows and keep records.

Monthly Inspection			
Item	**Method**	**Acceptance criteria**	**Corrective action**
Total battery voltage during float charge	Measure total voltage with a voltmeter.	Float charge voltage* number of batteries	Adjust to float voltage × number of batteries.
Six-monthly Inspection			
Total battery voltage during float charge	Measure total battery voltage with a voltmeter of accuracy class 0.5 or better.	Total voltage = float voltage × number of batteries	Adjust if the voltage is outside the specified range.
Individual battery voltage during float charge	Measure total battery voltage with a voltmeter of accuracy class 0.5 or better.	Within 2.25±0.1V/cell	Consult us for corrective action. Repair or replace any battery outside the permitted limits.
Appearance	Check the case and cover for damage or acid leaks.	Replace with a case and cover free of damage and acid leaks.	Identify the cause of leakage. Replace batteries with a cracked case or cover.
	Check for dust or other contamination.	No dust or contamination.	Clean contamination with a damp cloth.
	Check racks, connector plates, cables and terminals for rust.	Racks, connector plates, cables and terminals free of rust.	Clean, apply corrosion protection and touch up paint.
Annual Inspection (include the six-monthly checks and the following)			
Connecting parts	Tighten bolts and nuts.	Check connecting nut and bolt torque.	

Charging Characteristics

A Clean the battery with a damp cloth. Keep it away from organic solvents such as petrol, and do not use cloths containing these substances. Avoid vacuum cleaners and dry cloths, especially synthetic-fibre cloths, as static electricity may create a hazard.

B Batteries generate flammable gas. Keep them away from open flames and do not short-circuit them.

C Do not dismantle the battery. If mechanical damage causes sulfuric acid to contact skin or clothing, rinse immediately with water. If it enters the eyes, flush with plenty of clean water and seek hospital treatment immediately.

D Do not throw batteries into a fire; they may rupture.

E Provide a vent when operating a battery inside a container or bag. Ensure adequate ventilation in battery rooms and enclosures.

F Touching conductors may cause electric shock. Always wear rubber gloves before inspection or maintenance.

G Apply corrosion protection to battery connectors.

H The permitted operating range is −15 °C to 45 °C. Operation below 15–25 °C is recommended to extend service life.

I Contact us before connecting four or more battery banks in parallel.

J Mixing batteries with different capacities, production dates or manufacturers may damage the batteries or equipment. Contact us if this is required.

Maintenance Tips

To prevent battery damage, inspect batteries regularly as described below and keep records.

Monthly Inspection			
Item	**Method**	**Acceptance criteria**	**Corrective action**
Total float voltage	Measure total voltage with a voltmeter.	Float voltage × number of batteries	Adjust to float voltage × number of batteries.
Six-monthly Inspection			
Total float voltage	Measure total voltage with a voltmeter of accuracy class 0.5 or better.	Total voltage = float voltage × number of batteries	Adjust the voltage if it is higher than normal.
Cell voltage during float service	Measure each cell voltage with a voltmeter of accuracy class 0.5 or better.	Within 2.25 ± 0.1 V/cell	Consult us for corrective action. Repair or replace any battery outside the permitted limits.
Appearance	Check the case and cover for damage or acid leaks.	Case and cover free of damage and acid leaks.	Replace if found.
	Check for dust or other contamination.	Battery free of dust and contamination.	Clean any contamination with a damp cloth.
	Check racks, connector plates, cables and terminals for rust or other abnormalities.	Racks, connector plates, cables and terminals free of rust.	Identify the cause, then clean, remove rust and repair.
Annual Inspection (include the six-monthly checks and the following)			
Connections	Tighten nuts and bolts.	Check connecting nut and bolt torque.	

05

Chapter 5 Advanced Batteries



The Solid-state Era. Power Born Anew.

Advanced Solid-state and Semi-solid-state Batteries

TO-U GLOBAL’s advanced battery business focuses on solid-state and semi-solid-state technologies. The portfolio includes anode-free quasi-solid-state batteries, high-energy-density power-type semi-solid-state batteries, high-safety semi-solid-state batteries for a wide temperature range, and ultra-fast-charging high-rate semi-solid-state batteries. Energy densities range from 220 to 550 Wh/kg, with continuous discharge rates of 4C–10C, a wide operating temperature range of −40 °C to 60 °C, no ignition in nail penetration testing at full charge, and cycle life up to ≥2,000 cycles. Applications include drones, unmanned vessels, industrial robots, electric two-wheelers, golf carts, hybrid construction machinery and autonomous logistics vehicles, providing advanced battery solutions for high specific energy, safety and power.





01 INFINITY SERIES

450 Wh/kg + Anode-Free Quasi-Solid-State Battery

- Ultra Light, Ultra Power
- Volumetric Energy Density: ⩾1000 Wh/L
- Energy Density: Up to 600 Wh/kg
- Power Density: Up to 16000 W/kg

Ultra High Energy Density Anode-Free Battery

Type	Product Model	Dimensions (mm)	Nominal Voltage (V)	Weight (g)	Energy Density (Wh/kg)	C-Rate	Peak Discharge Rate
High-Energy Base Model	AEP5474172-22.4Ah	5.4*74*172	3.75	186	450	0.2C/1C	5C (30s)
	AEP7574250-52.2Ah	7.5*74*250	3.75	412	475	0.2C/1C	4C (30s)
High-Energy Ultra Model	AUP6274172-30Ah	6.2*74*172	3.82	207	550	0.2C/1C	4C (30s)
	AUP8074250-60Ah	8.0*74*250	3.82	405	565	0.2C/1C	3C (30s)
High Power Density Model	ARP534670-4.3Ah	5.3*46*70	3.85	46	359	0.2C/20C	60C (10s)
	ARP4674172-16Ah	4.6*74*172	3.85	155	397	0.2C/10C	40C (10s)
	ARP6274172-22Ah	6.2*74*172	3.85	205	410	0.2C/7C	40C (10s)

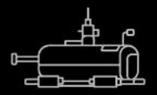
*Typical product specifications
Custom dimensions available upon request

All Solid-State Battery for Ultra-High Temperature Applications

Product Model	Typical Capacity (Ah)	Dimensions (mm)	Nominal Voltage (V)	Continuous Operation at 150°C
LSR60100	13.5	60*100	3.5	25°C~150°C



Unmanned Aerial Vehicles



Unmanned Surface Vehicles



Oil & Gas Drilling



Solar Vehicles





02 SOARING SERIES

300 Wh/kg + High-Energy & High-Power Hybrid Solid-Liquid Battery

- High Specific Energy, Long Cycle Life
- Cycle Life: Up to 1200 Cycles
- Energy Density: Up to 370 Wh/kg
- Operating Temperature: -40°C~60°C

Type	Product Model	Dimensions (mm)	Nominal Voltage (V)	Weight (g)	Energy Density (Wh/kg)	C-Rate	Peak Discharge Rate
High-Energy Base Model	EBP10674172-25.5Ah	10.6*74*172	3.58	305	311	1C/5C	7C (10s)
	EBP11087188-35.5Ah	11.0*87*188	3.58	412	317	1C/5C	7C (10s)
	EBP110105230-50Ah	11.0*105*230	3.58	595	313	1C/5C	7C (10s)
Extended Driving Range	ECP10674172-28Ah	10.6*74*172	3.6	316	325	1C/5C	7C (10s)
	ECP11087188-39Ah	11.0*87*188	3.6	430	335	1C/5C	7C (10s)
	ECP105105230-52Ah	10.5*105*230	3.6	583	330	1C/5C	7C (10s)
High Specific Energy	EDP10674172-30Ah	10.6*74*172	3.5	305	356	0.5C/2C	5C (10s)
	EDP8887188-30Ah	8.8*87*188	3.5	325	334	1C/3C	7C (10s)

*Typical product specifications
Custom dimensions available upon request



Industrial UAVs



Smart Robotics



Heavy-Duty Electric Trucks



Electric Off-Road Motorcycles





03 MYRIAD SERIES

Ultra-Fast Charging & High-Power Hybrid Solid-Liquid Battery

- Ultra-Fast Charging, Long Cycle Life, Wide Temperature Range
- Cycle Life：Up to 10,000 Cycles
- Charge/Discharge Rate：5C Charge/10C Discharge
- Operating Temperature：-40°C~60°C

Product Model	Dimensions (mm)	Nominal Voltage (V)	Weight (g)	Energy Density (Wh/kg)	C-Rate	Peak Discharge Rate
FAP9890192-20Ah	9.8*90*192	3.75	376	209	5C/10C	20C (10s)
FAP102136180-30Ah	10.2*136*180	3.75	554	210	5C/10C	20C (10s)
FAP100105230-30Ah	10.0*105*230	3.75	533	218	5C/10C	20C (10s)
FAP107105265-38Ah	10.7*105*265	3.75	660	222	5C/10C	20C (10s)
FAP102136260-45Ah	10.2*136*260	3.75	810	213	5C/10C	20C (10s)

*Typical product specifications
Custom dimensions available upon request

Hybrid Construction Machinery
Garden Power Tools
Autonomous Logistics Vehicles
Agricultural Protection Drones



04 SUNHIGH SERIES

High Safety Hybrid Solid-Liquid Battery

- Ultra-Fast Charging, Long Cycle Life, Wide Temperature Range
- Cycle Life：Up to 2000 Cycles
- Ultra Safe: Passes Nail Penetration Test at Full Charge
- Energy Density：Up to 270 Wh/kg

Product Model	Dimensions (mm)	Nominal Voltage (V)	Weight (g)	Energy Density (Wh/kg)	C-Rate	Peak Discharge Rate
PCP9690192-20.5Ah	9.6*90*192	3.7	345	225	2C/3C	5C (30s)
PCP103105230-30.5Ah	10.3*105*230	3.7	516	222	2C/3C	5C (30s)
PCP101136260-45Ah	10.1*136*260	3.7	770	219	2C/3C	5C (30s)
PCP93161260-50.5Ah	9.3*161*260	3.7	845	223	2C/3C	5C (30s)
PCP93161260-58Ah	9.3*161*260	3.72	852	255	1C/3C	5C (30s)

*Typical product specifications
Custom dimensions available upon request

Golf Carts
Electric Two-Wheelers
Express Delivery Vehicles
Electric Motorcycles

06

Chapter 6 Unmanned Warehousing



Warehousing Without Limits. Moving the Future.

Hardware and Integrated Solutions for Unmanned Warehousing

With unmanned warehousing as its core application, TO-U GLOBAL offers a complete hardware system covering vertical transport, station conveying, external loading, door controls and safety protection. Vertical conveyors combine permanent-magnet synchronous drives, wire-rope or chain traction, guide rails and multiple safety devices for smooth lifting and lowering. Pallet, tote and non-standard stations work with roller, chain and slat-chain conveyors for efficient material flow. External loading supports manual and semi-automatic operation, as well as automatic docking with AGVs and forklifts. Door options include fire shutters, automatic swing doors and flame-retardant high-speed doors. The system can work alongside photovoltaic, energy storage and traction battery systems to provide safe, stable and continuous vertical transport and material handling for unmanned warehouses, smart factories and logistics centres, putting the integrated solution into operation.





Part
01

Project Product Overview

Product Information



• Advantages • Safety and Stability

• Much longer service life than conventional chain-driven lifts.

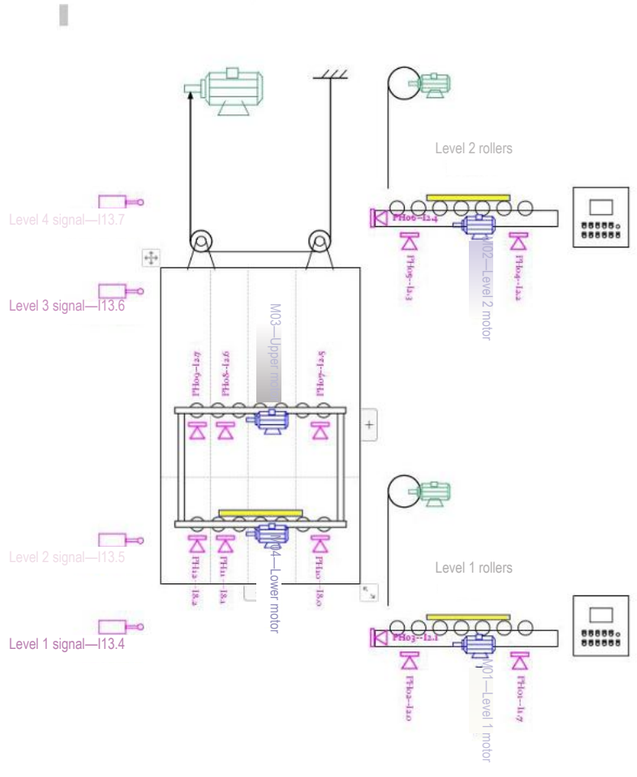
• Safety protection meets the same national standards as passenger and goods lifts.

• Safety factors meet the same standards as nationally accepted goods lifts.

• Counterweighted traction provides more stable operation.

• The main drive uses a permanent-magnet synchronous machine, offering better energy efficiency, environmental performance and exceptionally quiet operation compared with conventional geared machines. Major equipment components have the relevant national type-test reports.

1. I/O Layout



MCK Series Permanent-magnet Synchronous Gearless Traction Machines



• The traction machine comprises a permanent-magnet synchronous motor, traction sheave and braking system.

• High-performance permanent magnets and a specialised motor design provide low-speed, high-torque operation.

• The MCK Series uses an external-rotor design and a block-type brake. The traction sheave and brake wheel are rigidly connected on the same axis and mounted directly on the motor shaft extension.

• A microswitch monitors the brake. When the brake opens, the microswitch's normally open contact closes.

• Operating principle: The motor delivers torque through the traction sheave on the shaft extension. Friction between the sheave and wire ropes drives the lift car. When the lift stops, the normally closed brake applies its brake shoes, holding the car stationary even when power to the traction machine is lost.

Traction model	Supply voltage	Suspension ratio	Roping	Rated load	Lift speed	Sheave pitch dia.	Duty	Starts	Max. static shaft load	Weight	Brake*	IP rating	Insulation class
MCK100	380V	2:01	Single wrap	320–630kg	0.5–1.75m/s	320mm	S5–40%ED	240st/h	2500kg	200kg	DC110V2.8	IP41	F
MCK200	380V	2:01	Single wrap	630–1150kg	0.5–2.5m/s	400mm 450mm	S5–40%ED	240st/h	4000kg	330kg	DC110V2.8	IP41	F
MCK300	380V	2:01	Single wrap	1250–1600kg	0.5–2.5m/s	400mm 480mm	S5–40%ED	240st/h	6000kg	480kg	DC110V5.2A	IP41	F
MCK500	380V	2:01	Single wrap	1600–2000kg	0.5–2.5m/s	480mm	S5–40%ED	240st/h	10000kg	690kg	DC110V5.2A	IP41	F

SEW Gear Units



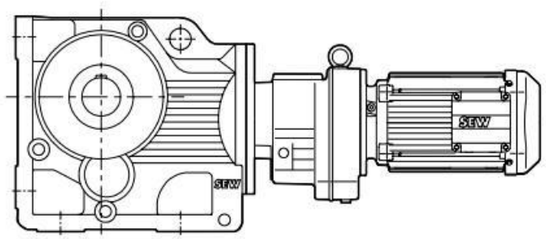
DRN.. Gearmotor Type Designation

The gearmotor type designation begins with the output-side components.

For example, a multi-stage helical-bevel gearmotor with a temperature sensor in the motor winding is designated as follows:

Example: K107R77 DRN100LS4/TF		
Gear unit type	K	1st gear unit
Size	107	
Gear unit type	R	2nd gear unit
Size	77	
Motor series	DR	Motor
Product line	N	
Size	100LS	
Number of poles	4	
Motor option: temperature sensor	/TF	Option

Example: DRN.. gearmotor



Touchscreen Monitoring

The Level 1 automatic screen has two main sections:

1. Operating status. Three indicators at the upper right show automatic, semi-automatic and manual modes. The indicator for the active mode turns green. On the left, the screen monitors system sensors and motor status. An unobstructed sensor is shown in green; an obstructed sensor is shown in red, indicating the position of the load. When a motor is running, its status indicator also turns green.

2. Controls. Four buttons are provided: [Send], [Receive], [Level 1] and [Level 2].



Roller Conveyor Overview

Galvanised Rollers with Dual Sprockets on One Side

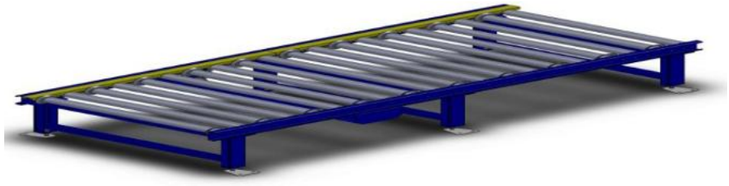
Frame: Made from cold-formed steel sections. Pallets are guided laterally by retaining rings welded to the roller shells.

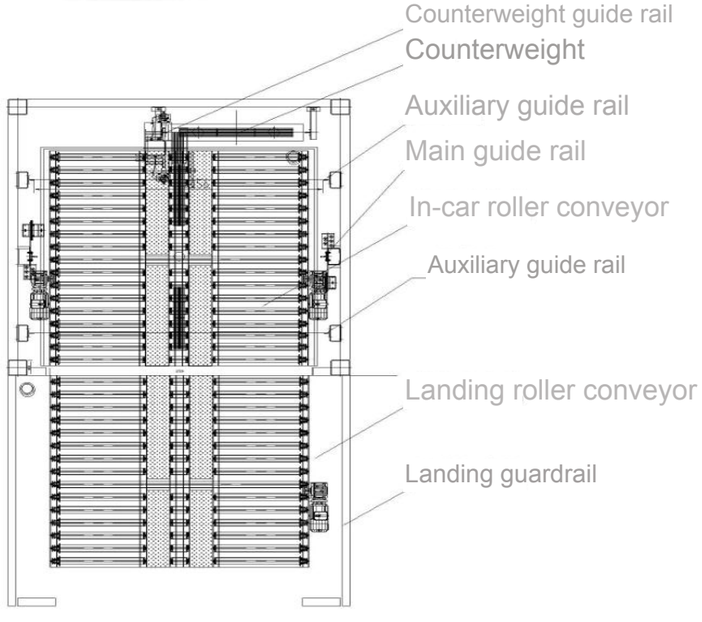
Drive chain: Meets the requirements of GB 1243.

Drive: A centre-drive arrangement with the gearmotor mounted on a bracket beneath the frame. A foot-mounted motor carries the drive sprocket. A chain connects the motor sprocket to the two adjacent roller sprockets; closed-loop chains then connect successive driven rollers.

Guards: Enclosed guards cover the roller-chain and motor-chain drives.

Powered roller conveyor: Driven by a three-in-one SEW gearmotor.



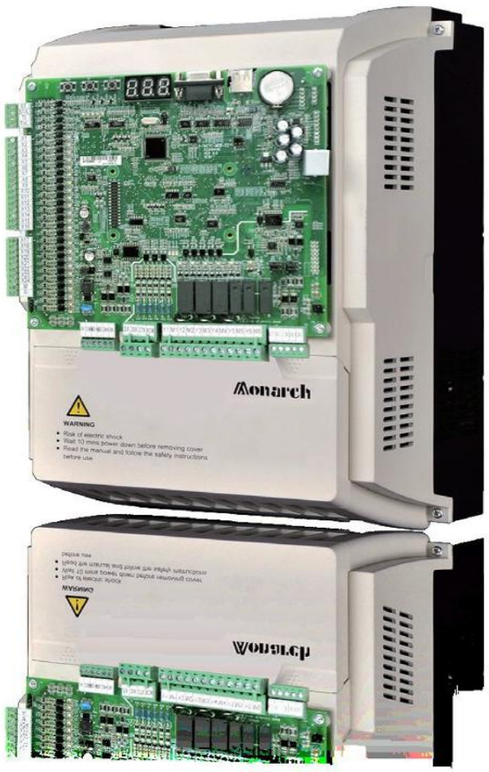


Controller Overview

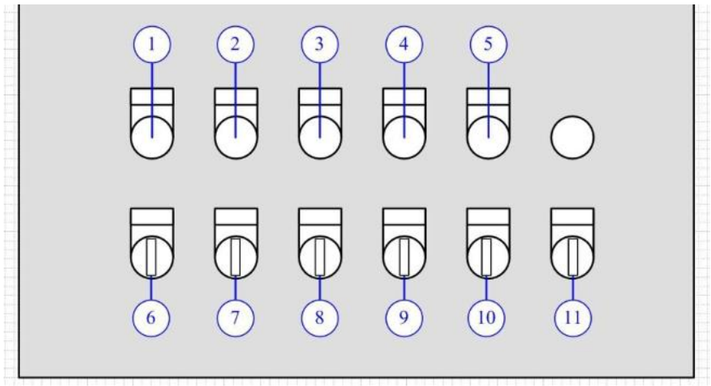
NICE3000new Integrated Controller

The NICE3000w integrated lift controller is an intelligent control system combining computer technology, automatic control, network communications and motor vector drives. It delivers internationally advanced performance:

1. More advanced
2. Easier to use
3. Safer and more reliable
4. Greater comfort
5. More economical



Control Panel



No.	Name	Description	Notes
1	Start	Automatic operation start button. Press [Start] first to enter automatic operation.	Set the Manual/Auto selectors on both control boxes to Auto.
2	Stop	Press [Stop] in automatic or semi-automatic mode to stop the system.	Does not control the lift.
3	Reset	Initialisation button. Before automatic operation, press [Reset] to initialise; otherwise automatic operation may not start correctly.	Set the Manual/Auto selectors on both control boxes to Auto.
4	Emergency stop	Emergency stop button. In an emergency, press [Emergency Stop] to stop the system immediately.	Does not control the lift.
5	Go to Level 2	No function.	The touchscreen [Level 1] and [Level 2] buttons provide the same function.
6	Raise/Lower Fast Door	High-speed door raise/lower button. In semi-automatic mode, [Raise/Lower Fast Door] opens or closes the door automatically. Inactive in automatic mode.	Raising the door is the forward motor direction.
7	Upper Car In/Out	Upper car roller conveyor start button. In semi-automatic mode, [Upper Car In/Out] runs the upper car rollers in or out. In manual mode, [Upper Car In/Out] jogs the upper car rollers in or out. Note: Inactive in automatic mode.	Loading into the car is the forward motor direction.
8	Lower Car In/Out	Lower car roller conveyor start button. In semi-automatic mode, [Lower Car In/Out] runs the lower car rollers in or out. In manual mode, [Lower Car In/Out] jogs the lower car rollers in or out. Note: Inactive in automatic mode.	Loading into the car is the forward motor direction.
9	External In/Out	External platform roller conveyor start button. Semi-automatic: [External In/Out] runs that level's external rollers in/out. Manual: [External In/Out] jogs the external rollers in/out. Note: Inactive in automatic mode.	External motor forward direction: towards the car.
10	Raise/Lower Car	Lift car raise/lower start button. In semi-automatic mode, [Raise/Lower Car] moves the lift up or down one level. Note 1: Jog the lift from its control cabinet. Note 2: Inactive in automatic mode.	
11	Manual/Auto	Manual/Auto selector switch. For automatic or semi-automatic operation, set both Level 1 and Level 2 control-cabinet selectors to Auto. In manual mode, set both Level 1 and Level 2 control-cabinet selectors to Manual.	



Part
02

Project References

Project References

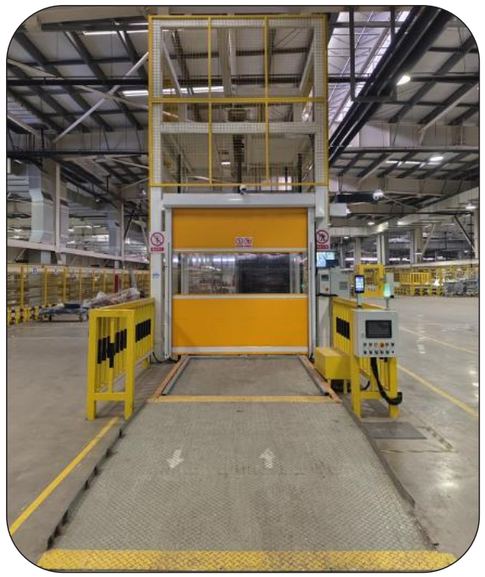
Intelligent Transfer and Handling Equipment for Fuling Zhacai

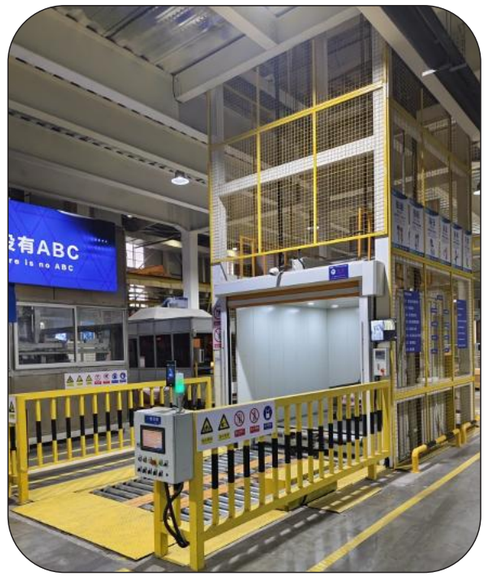


Intelligent Warehouse Retrieval Lift for JD.com



Central Air-conditioning Lift Project at Qingdao Sino-German Haier





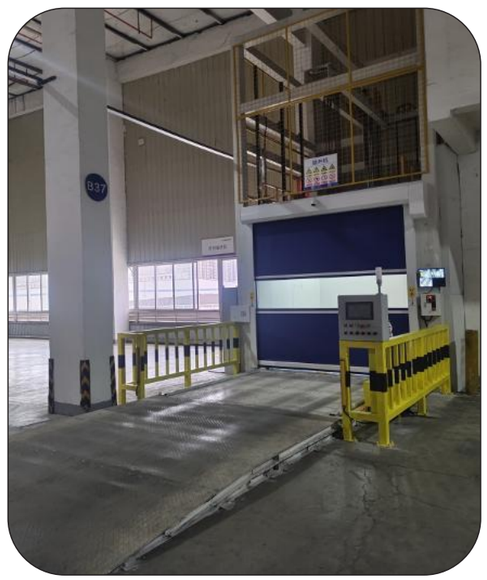
Intelligent Push-transfer Equipment for Fenjiu Group





Air-conditioning Lift Project for Haier, Chongqing





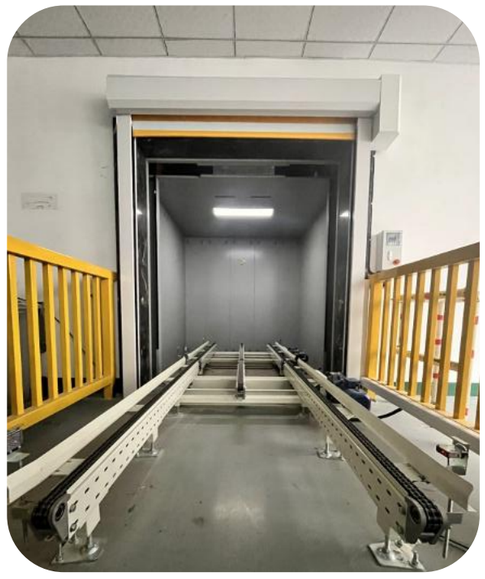
Project References

Central Air-conditioning Lift Project for Haier, Jiaozhou



Finished-goods Warehouse AGV Lift Project for Ningbo Yueli Group





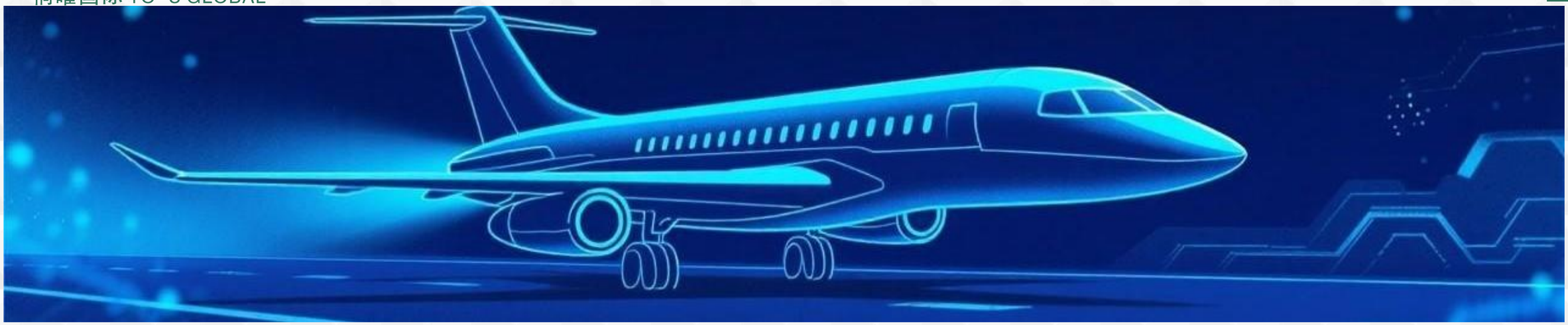
Intelligent Medical Lift Project for Midea Group's Swisslog





Partners

Partners listed in no particular order.



Part
03

Vertical Conveyors

Product Details



Drive Unit

Typically comprises a motor, gear unit and brake to provide power and control operating speed.

Traction System

Wire ropes, chains and pulleys transmit power and move the load carrier up and down.

Guide Rail System

Guides the load carrier smoothly in the vertical direction, preventing lateral movement or sway.

Control System

Electrical control cabinets, sensors and PLCs control starting, stopping and speed adjustment.

Load Carrier

Pallets, cargo boxes or lifting baskets carry the materials.

Safety Devices

Limit switches, overload protection and emergency brakes ensure safe operation.

Internal Safety Components



Overspeed governor



Safety gear



Buffer



Landing Safety Gate



Limit switch

Multiple internal safety components are essential to the safe operation of the vertical conveyor, including an overspeed governor, safety gear, buffers and guide rails. Working together, they ensure reliable protection during normal operation and emergencies.

External Safety Components



Guardrail



Surveillance System

External safety components provide another layer of protection during vertical conveyor operation, including guardrails and monitoring devices.

Machine Room Configurations



Heavy Duty

The machine room is usually located above the lift shaft. Equipment is grouped together for easy maintenance and repair. Housing the equipment separately keeps the shaft relatively clear. Suitable for medium- and high-rise buildings, especially where higher operating speeds and load capacities are required.



Light Duty

This modern lift design integrates equipment traditionally housed in a machine room, such as the traction machine and control cabinet, into the shaft or its headroom. Eliminating a separate machine room saves building space and reduces construction costs.

Shaft Configurations



C-type

The shaft has a C-shaped cross-section to save space and simplify installation. Its same-side entry and exit design places both openings on one side of the car, making it suitable for confined spaces or operations requiring a one-way workflow.

Z-type

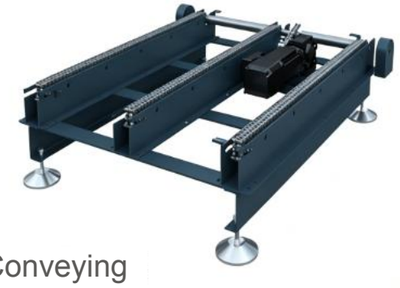
The key feature is a through-access design for rapid, straight-line movement of materials or people. Doors at the front and rear of the car create an efficient “in one side, out the other” flow, meeting the process needs of modern automated production lines.



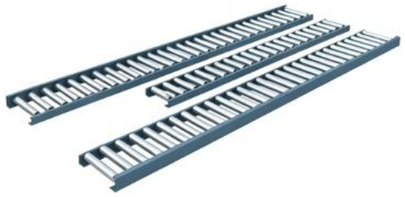
Station Configurations

Pallet Station

A pallet station uses standardised pallets in logistics or production to store, move and transfer large, heavy or bulk loads. A core part of modern warehousing, manufacturing and supply chains, it is especially suited to automated storage and retrieval systems (AS/RS), production-line material supply and freight transfer.



Chain Conveying



Roller Conveying

Non-standard Station

A non-standard station is a highly flexible logistics or production workstation with no fixed load-carrier format. Goods can be placed directly on a workbench, the floor or in temporary containers, with sorting, handling or processing performed manually or by flexible automation such as AMRs and robotic arms.



Flat-bed Conveying



Slat-chain Conveying

Tote Station

A tote station uses standardised totes for logistics or production. Designed for storing, sorting and transferring small to medium-sized standardised items, it combines modularity, automation and high-density storage, making it a core element of smart warehousing and flexible production.



Single-level Conveying



Two-level Conveying



Single-level, Dual-lane

In-car Roller Conveyors

Single-level Conveyor



A single-level conveyor is a simple, practical material-handling system widely used in manufacturing, logistics and food processing. Its simple construction, stable operation and lower cost make it suitable for light to medium loads, although conveying capacity is limited. Belt, chain or roller versions can be selected to suit the application.

Two-level Conveyor



A two-level conveyor provides efficient, flexible material handling, especially where space is limited and throughput is important. It offers high space utilisation, efficient conveying and multiple functions, but its more complex structure entails higher initial investment and maintenance costs. Belt, chain or roller versions are available to suit the application.

External Loading Methods

Manual Loading

In manual loading, operators directly handle and load materials. High flexibility, low cost and adaptability make this method particularly suitable for small-scale or experimental production and complex materials.



Electric Forklift



Hydraulic Pallet Truck

Automatic Loading

Automatic loading uses automated equipment to load materials without operator intervention. It offers high efficiency and precision, reduces physical workload and saves labour costs. It is particularly suited to large-scale standardised production and applications requiring high accuracy and efficiency.



Lift-type AGV



Underride AGV



Automated Guided Forklift

Door Configurations



Fire-rated Rolling Shutter

Multi-layer steel slats with a ceramic-fibre structure provide 4-hour fire resistance (EI240) and automatic temperature-triggered closure. Suitable for fire compartmentation in large spaces such as shopping centres and factories.



Automatic Swing Door

Automatic sliding fire doors

Stainless-steel or fire-resistant glass leaves open and close via microwave sensors (0.8–1.2 m/s). The door automatically switches to stored-energy mode during a power failure. Suitable for clean areas such as hospitals and laboratories.

Constructed with a stainless-steel frame and fire-rated glazing, with microwave sensor activation (0.8–1.2 m/s) and automatic switching to backup power. Designed for sterile areas in hospitals and laboratories.



Flame-retardant High-speed Door

Fire-rated high-speed door

An industrial door combining fire safetywit h efficient access. Flame-retardantmateri als and rapid opening and closing make it suitable for facilities with demanding fire-performance and logistics-efficiency requi rements.

Project References

01 Foshan Second People's Hospital



02 Shenzhen Qianhai Shekou Free Trade Zone Hospital



03 Qingdao Jiaozhou Refrigerator Industrial Park



04 Qingdao Sino-German Haier Industrial Park



05 Sanming First Hospital (Eco-New City Branch)



06 Cancer Hospital of Shantou University Medical College



07 Konghai Hospital, Bao'an District, Shenzhen



08 Longgang Maternity and Child Healthcare Hospital, Shenzhen

