



magellan energy storage solutions

Residential, Commercial and Utility Scale Energy Storage



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Introducing Magellan Energy Storage Range 3

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A quick glance at your latest electricity bill will show you the price for using power is higher than ever before – with no signs of slowing. Wouldn't it be ideal then to be able to harness the free energy created by the sun and wind and use it when it is most needed?

Introducing the Magellan Energy Storage Range.

Energy Storage is the solution for cutting bills and carbon emissions. Whether you are looking for a solution at home, business or industrial project – Magellan Energy Storage offers outstanding value.

Why do we need it?

There is an inherent inefficiency in the generation and consumption of electric power. Be it from conventional fossil fuel or renewable energy sources, without storage, electricity has to be consumed at the time of production. Any discrepancy in the generation/consumption equation will lead to waste and quality problems. Furthermore inconsistency in the rate of consumption also obligates the generation and distribution providers to provide excess capabilities to cope with the variation when it is needed.

Now things have changed...

The rapid decline of cost of PV power and high penetration of PV power into the grid should have solved a lot of the above problems but generation is only part of the solution. In many cases renewable energy is produced at the time that is it not needed the most. Energy needs to be stored and used when needed.

Advancement in the field of power electronics, digital controls and battery technology has enabled electrical energy to be generated by PV and wind generators and safely stored to be used at the time of need; thereby drastically reducing the cost of energy whilst improving the quality of available power.

After years of research into battery technology, and continual innovations in the field of power electronics, Magellan is at the forefront of the Energy Storage and Renewable Energy wave.

The Energy Storage solutions designed and manufactured by Magellan Powertronics include the Residential Energy Storage System for use in the home, the Commercial scale Energy Storage System for business use, and the Utility Scale Energy scale Storage System for use by utilities and industry.





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Australian Made Residential Energy Storage Solutions

10kVA - 30kVA and 9.2 kWh - 13.8kWh



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Take control of your own power

Introducing the Magellan Residential Energy Storage System RES1 and RES3.

Installed under the eaves by the side of your house, the system stores solar generated electricity within its lithium batteries to use when you need it. The lithium batteries are similar to those used in electric vehicles, and give excellent cycle life and lifetime. The system helps you save on your electricity bill, and puts the control of energy costs firmly back into your hands. No more shocks at bill time – the Magellan Residential Energy Storage will significantly cut your electricity bills, and reduce carbon emissions.

The Magellan Residential Energy Storage utilises ruggedized Australian-Made Bidirectional inverters combined with Lithium Iron Phosphate batteries to provide a state-of-the-art Energy Storage Solution for residential applications.

True Four-Quadrant ruggedized IGBT-based Bidirectional Inverter design.

Can be used with existing solar infrastructure.

Time-of-day programmable including night tariff charging.

Rugged design for the Australian environment.

Fully automatic functionality.

Integrated data logging.

Outdoor enclosure.

Emergency power mode.

AS4777 Certification

Optional Features

Solar Input.

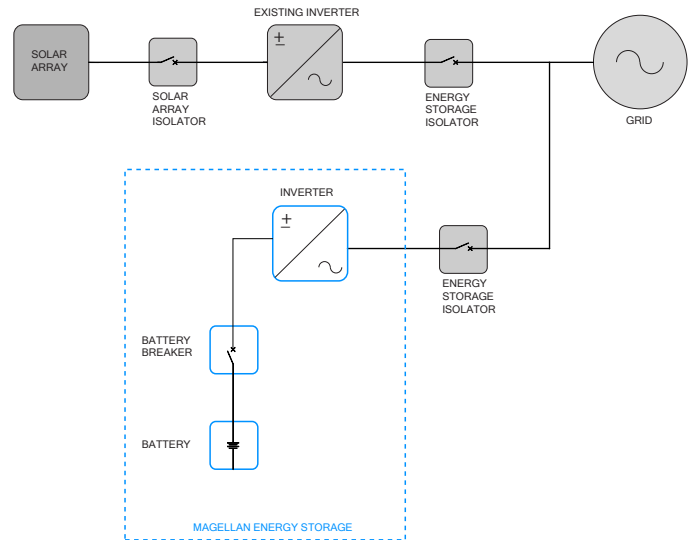


Figure 1 Energy Storage with existing solar installation

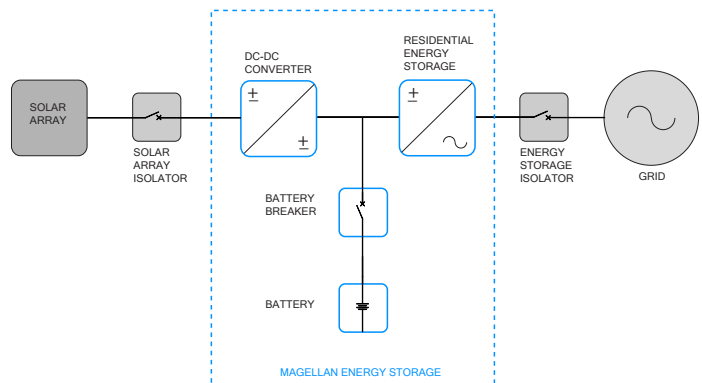
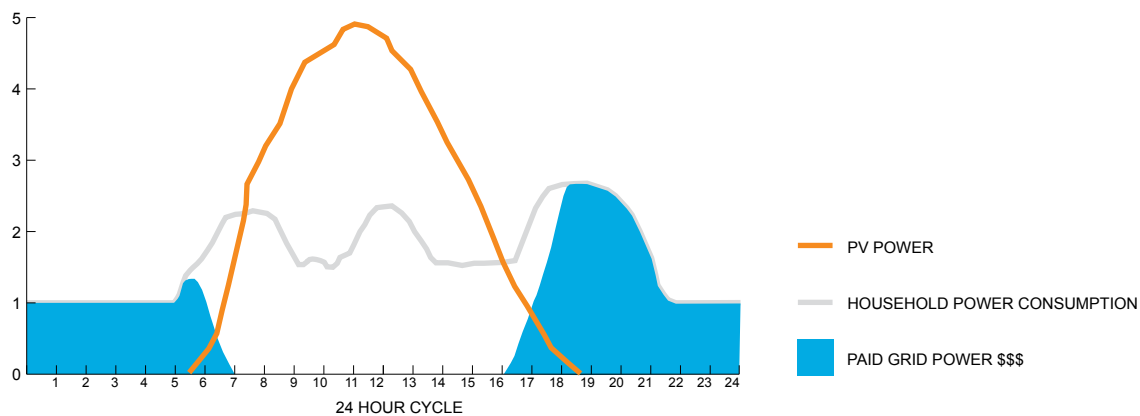


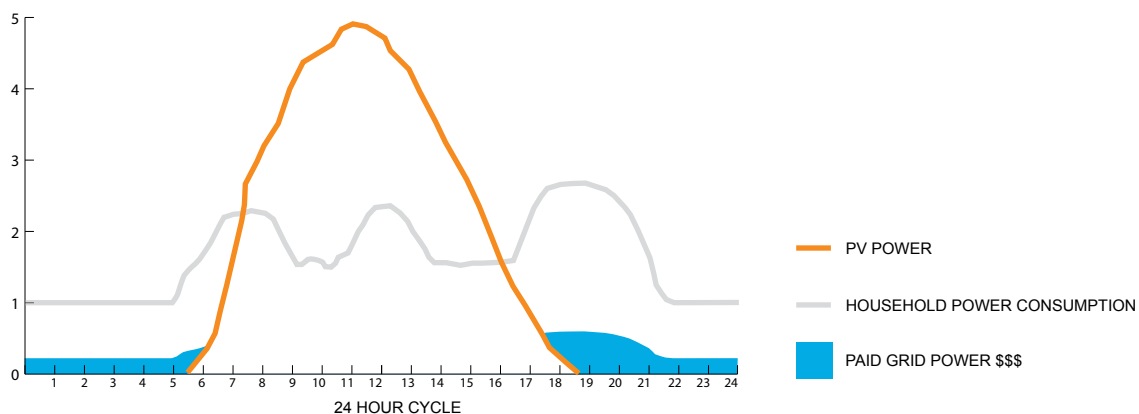
Figure 2 Energy Storage with solar input (optional)

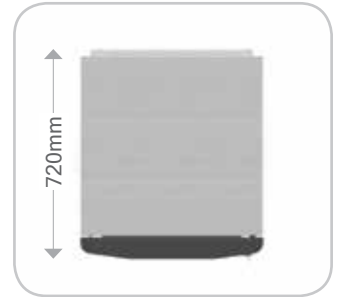


Household Power Consumption with Solar Power, without Energy Storage.



Household Power Consumption with Solar Power and Energy Storage.





RESIDENTIAL SCALE ENERGY STORAGE SPECIFICATION

MODEL	RES1	RES3	NOTES
Nominal Inverter Capacity	5-10kVA	30kVA	Continuous rating @ 50°C
Input / Output Phases	Single Phase	Three Phase	
Inverter Efficiency	>93% At rated load, nominal input voltage		
Switching Devices	Industrial Trench IGBT		
Nominal DC Voltage	230VDC		Nominal
Nominal AC Grid Voltage	240V	415V	NSW is 230V
AC Grid Voltage Range	205V – 265V	380V - 456V	
AC Grid Frequency Range	47Hz – 52Hz		As per AS4777
Standards	As per AS4777, AS3100, AS62040		
AC Current THD	< 5%		As per AS4777
Operating temperature	0 to 50 Deg C		
Maximum Humidity	95% R.H.		Non Condensing
Cooling	Forced air with Temperature Controlled Cooling Fans		
Enclosures	IP45		Indoor (Outdoor Optional)
Finish	Epoxy powder coated		

INDICATIONS

Monitored System Parameters	Battery State-of-Charge, Current, Cell Voltage & Temperature Inverter Voltage, Current, Watts, VARs & Temperatures Mains Voltage, Current, Watts, VAR, Power Factor & Frequency
System Indications	Off / Bulk Charge / Absorb Charge / Float Charge / Standby / Grid Export/ Load Following Profile
Inverter Indications	Off/ Inverting / Synchronising / AC Interactive
Mimic Indications	Graphical overview of system and status, showing power flow directions and contactor positions
Inbuilt Diagnostic System	Periodic Data Logging into Non-Volatile Memory Battery SOC, Cell Voltage, Current, Power & Temperature Mains Voltage, Power & VARs, Power Factor Inverter Voltage, Temperature, Power & VARs Min & Max Cell Voltage Fault Event Recorder Data accessible via Communications Ports
Monitoring & Diagnostic Download Software	“Access Facility” PC Software OPTION

COMMUNICATIONS

Communication Ports	Isolated USB-B Connector Ethernet RJ45 Connector
Communication Protocols	Modbus RTU (USB) Modbus TCP (Ethernet) DNP3 (Ethernet) Inbuilt Website (Ethernet) PVOU & Logging (Ethernet) Portal

SUPERVISORY CONTROL SCHEDULING

Scheduling Algorithm	Triggered from Inbuilt Time-of-Day Clock and pre-programmed times or via Communications Interfaces. Load profile following with optional triggered charging/discharging at pre-programmed times via communication interfaces.
AC Charge Control	Conventional three-stage charger with programmable parameters Programmed at two possible Charging Current Levels Automatically started or paused via Scheduled Events Terminated by battery full condition.
AC Export Control	Automatically started via Scheduled Event Programmed at one possible Export Power Levels Terminated by low battery state of charge

BATTERY SPECIFICATION

Model	6 x 12 x 40Ah or 60Ah battery modules with integrated BMS	
Chemistry	LiFePO4	
Nominal Battery Capacity	9.2kWh or 13.8kWh	
Battery Cycle Life	>2000 - 5000 cycles	2000 at 80% Depth-of-Discharge
Discharging Temperature Range	-10 to 55 Deg C	Cell Temperature
Enclosure	1980mm H x 720mm W x 780mm D	Outdoor
Approx. Weight	510kg Complete System Weight 370kg Enclosure Without Batteries	



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Australian Made Commercial Scale Energy Storage Solutions

50kVA - 100kVA and 50kWh - 500kWh



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Stores unused power for when it is needed

For a business, focus is often on keeping running costs at a minimum, and this includes electricity. To have solar power stored in a battery system for later use is an ideal way to save on escalating electricity bills. In the past, such systems have been out of reach for many Australian businesses, but now the time has come to reduce dependence on the grid.

Energy Storage systems are now more affordable due to the falling cost of PV power and advancing battery technology.

The Australian designed and manufactured Magellan Commercial Scale Energy Storage System is designed for business use. It helps businesses break away from relying on the traditional power supply and associated costs, becoming more efficient and in control of their power use and spending.

Magellan Commercial Scale Energy Storage helps businesses to maximise the use of solar power, reduce reliance on the grid, avoid paying for peak power and to rely on their own power when the grid fails.

Stores power generated at weekends and holidays to be used when it is needed.

Allows the business to use peak power and only pay the standard rate for electricity.

Take advantage of cheap electricity at night.

Mitigate the effects of passing clouds through the use of a “solar smoother” function.

Improve grid power quality.

Provides uninterruptible power.

Energy Storage for a business makes strong financial sense.

**Back-up
your business
with no down
time**

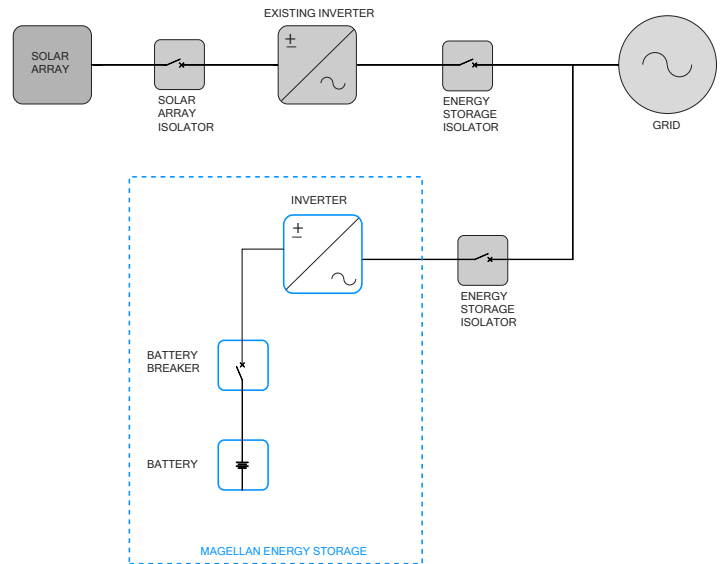


Figure 1 Energy Storage with existing solar installation

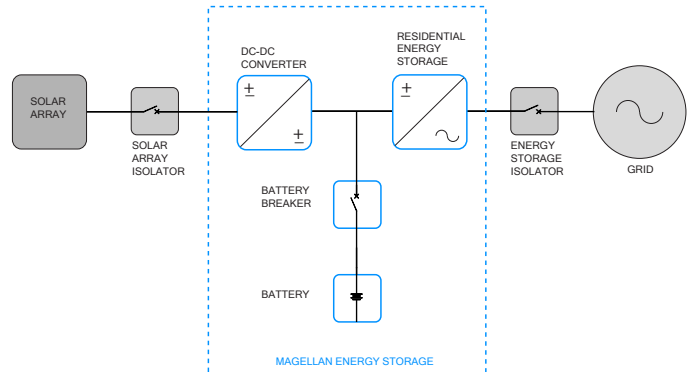


Figure 2 Energy Storage with solar input

INVERTER SYSTEM SPECIFICATION		
RATED POWER	50KVA - 100KVA / 3 PHASE	
Configuration	Bidirectional Conversion	
Housing	To suit equipment rating	
AC Output	Voltage Nominal	400V
	AC Grid Voltage Range	358V – 438V
	AC Grid Frequency Range	45Hz – 55Hz
	Voltage Regulation	±1%
	Frequency	50 or 60 Hz ± 0.1Hz
	Waveform	Sinusoidal
	THD	less than 5%
	Power Factor	0.9 lag to 0.9 lead
Phase	Three-phase, Four Wire	
Grid Support	Supports grid by providing reactive and active power compensation	
Standards	As per AS 62040, AS3100, AS4777	
Maximum Phase Imbalance	100%	
AC Current THD	Less than 5% as per AS 4777	
Communication Interface	Modbus RTU (RS232/RS485), USB Modbus TCP (Ethernet) Distributed Network Protocol 3 (Ethernet) Inbuilt Website (Ethernet)	
Ambient Temperature	0°C to +50°C	
Monitored System Parameters	Battery State-of-Charge, Current, Cell Voltage & Temperature Inverter Voltage, Current, Watts, VARs & Temperatures Mains Voltage, Current, Watts, VAR, Power Factor & Frequency	
In-built Diagnostic System	Periodic Data Logging into Non-Volatile Memory. (200 days of logged data at 15 minute intervals) (2 year of logged data at 1 hour interval) Battery SOC, Voltage, Current, Power & Temperature Mains Voltage, Power & VARs, Power Factor Inverter Voltage, Temperature, Power & VARs Min & Max Cell Voltage Fault Event Recorder	
Cooling	Forced air with Temperature Controlled Cooling Fans	
Maximum Humidity	95% R.H., Non Condensing	

BATTERY SYSTEM SPECIFICATION		
DESCRIPTION	VALUE	NOTES
Rated Capacity	50-500kWh	
Cell Capacity	To suit equipment rating	
Minimum Voltage	339V	N/A
Nominal Voltage	362V	N/A
Maximum Voltage	412V	N/A
Max Continuous Charge Current	0.5C	
Peak Charge Current	1C	
Max Continuous Discharge Current	0.5C	
Duty Cycle	1 Cycle per day	
Round Trip Efficiency	>95%	@ 23 ± 3°C as a new product
Cell Cycle Life	>2000	@ 23 ± 3°C, 1C / 1C, 80% DoD
Operational Temperature	Charge	0 - 45°C
	Discharge	-20°C - 55°C
Storage	Long term (1 year)	-20°C - 20°C
	Short term (1 month)	-20°C - 45°C





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Australian Made Utility Scale Energy Storage

100kVA - 250kVA and 500kWh - 2MWh



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Electric power has to be used at the time of generation, and distribution itself puts constraint on the supply and degrades power quality. To take care of the varying demand and quality issues, electricity generators and distributors must have reserve power and infrastructure.

Magellan Utility Scale Energy Storage can provide localised peak power, improve power quality, offer solar smoothing function (mitigate the effect of passing clouds) and provide uninterruptible power when needed.

Inverter

State of the art four quadrant bi-directional IGBT based sine wave Inverter capable of Real and Reactive power control.



Batteries

Advanced, proven Lithium Polymer batteries with excellent energy density, high charge/discharge efficiency, and high cycle life.

Battery Management System (BMS)

The Battery Management System plays a crucial role in the safety and reliability of the storage battery. It monitors and logs all vital parameters (voltage, temperature and state of charge) of each cell of the battery bank.



INVERTER SPECIFICATION		
RATED POWER		100KVA-250KVA
Configuration		Bidirectional Conversion
Housing		Customized container
AC Output	Voltage Nominal	400V
	AC Grid Voltage Range	358V – 438V
	AC Grid Frequency Range	45Hz – 55Hz
	Voltage Regulation	±1%
	Frequency	50 or 60 Hz ± 0.1Hz
	Waveform	Sinusoidal
	THD	Less than 5%
	Power Factor	0.9 lag to 0.9 lead
	Phase	Three-phase, Four Wire
Voltage Transient (Step Load)	For 100% step load	±4%
Grid Support	Supports grid by providing reactive and active power compensation	
Inverter Efficiency	>95% At rated load, nominal input voltage	
Protections	As per AS 62040.1.1-2003 (R 2013)	
EMI	As per AS 62040.2-2008	
Switchboards	As per AS 3000	
Maximum Phase Imbalance	100%	
AC Current THD	Less than 5% as per AS 4777	
Communication Interface	Modbus RTU (RS232/RS485), USB Modbus TCP (Ethernet) Distributed Network Protocol 3 (Ethernet) Inbuilt Website (Ethernet)	
Ambient Temperature	0°C to +50°C	
Monitored System Parameters	Battery State-of-Charge, Current, Cell Voltage & Temperature Inverter Voltage, Current, Watts, VARs & Temperatures Mains Voltage, Current, Watts, VAR, Power Factor & Frequency	
In-built Diagnostic System	Periodic Data Logging into Non-Volatile Memory. (200 days of logged data at 15 minute intervals) (2 year of logged data at 1 hour interval) Battery SOC, Voltage, Current, Power & Temperature Mains Voltage, Power & VARs, Power Factor Inverter Voltage, Temperature, Power & VARs Min & Max Cell Voltage Fault Event Recorder	

INVERTER SPECIFICATION		
Cooling	Forced air with Temperature Controlled Cooling Fans	
Real Power Control Method	Programmable Charge or Export Level depending on control mode	
Reactive Control Method	Programmable Voltage Proportional Controller or Fixed Reactive Power Injection, with priority given to Real Power.	
Maximum Humidity	95% R.H., Non Condensing	
Protections	Transient	Surge Diverters fitted to Grid input and DC Output (MOV)
	Circuit Breakers	Battery Input Grid Input DC Load Output Surge Diverter Circuit Breakers
	Grid Protections	Over Voltage Under Voltage Over Frequency Under Frequency Islanding Detection
	Inverter Protections	Inverter Over Voltage Monitoring Inverter Over Load Monitoring Inverter Current Limit Monitoring Inverter Over Temperature Monitoring AC Contactor Fault Sensing Feedback Fault Cooling Failure Automatic Timed Restart on Fault
	Battery Protections	Battery Cell Under / Over Temperature Monitoring Battery Cell Under / Over Voltage Monitoring Battery Cell Failure Battery Charge Imbalance Warning Battery Over Current Battery Magnetic Isolator DC Earth Leakage
	User Terminals	Battery Positive & Negative (To DC Load) Grid Active & Neutral Protective Earth (Optional MEN Link) Volt Free Relays: Grid Failure Battery Low Alarm

INVERTER SPECIFICATION		
Indications	User Interface	128x64 Graphical Blue LCD with White LED Backlight Membrane Keypad Green Mains OK LED Red Fault LED Yellow Buzzer Mute LED Alarm Buzzer
	Monitored System Parameters	Battery State-of-Charge, Current, Cell Voltage & Temperature Inverter Voltage, Current, Watts, VARs & Temperatures Mains Voltage, Current, Watts, VAR, Power Factor & Frequency Enclosure Temperature
	System Indications	Off / Standby / Bulk Charge / Absorb Charge / Float Charge / Grid Support
	Inverter Indications	Off/ Inverting / Synchronising / AC Interactive
	Mimic Indications	Graphical overview of system and status, showing power flow directions and contactor positions
	Inbuilt Diagnostic System	Periodic Data Logging into Non-Volatile Memory. (200 days of logged data at 15 minute intervals) (2 year of logged data at 1 hour interval) Battery SOC, Voltage, Current, Power & Temperature Mains Voltage, Power & VARs, Power Factor Inverter Voltage, Temperature, Power & VARs Min & Max Cell Voltage Fault Event Recorder Data accessible via Communications Ports
	Monitoring & Diagnostic Download Software	“Access Facility” PC Software
Supervisory Control Scheduling	Scheduling Algorithm	Triggered from Inbuilt Time-of-Day Clock and pre-programmed times or Digital Inputs or via Communications Interfaces
	AC Charge Control	Conventional three-stage charger with programmable parameters Programmed at two possible Charging Current Levels Automatically started or paused via Scheduled Events Terminated by battery full condition.
	AC Export Control	Automatically started via Scheduled Event Programmed at two possible Export Power Levels Terminated by low battery state of charge
	Standby Mode	Low-power consumption mode This is automatically triggered after batteries are fully charged.

BATTERY SYSTEM SPECIFICATION			
Description	Value	Remark	
Total Embedded Capacity	To suit application	@C/5 discharge 23 +	
Rated Capacity	To suit application	@C/2 discharge 23 +	
Cell Capacity	75Ah - 240Ah		
Minimum Voltage	$3.1 \text{ V} * 14 * 7 = 303\text{V}$	N/A	
Nominal Voltage	$3.7 \text{ V} * 14 * 7 = 362\text{V}$	N/A	
Maximum Voltage	$4.18 \text{ V} * 14 * 7 = 406\text{V}$	N/A	
Max Continuous Charge Current	0.5C		
Peak Charge Current		1C	
Max Continuous Discharge Current	0.5C		
Peak Discharge Current		2C	
Duty Cycle		1 Cycle per day	
Rest Time		N/A	
Round Trip Efficiency	>95%	@ 23 ± 3°C as a new product	
Cell Cycle Life	4,000	@ 23 ± 3°C, 1C / 1C, 80% DoD	
Operational Temperature Change	Charge	0~10°C	<0.3C
		10~35°C	≤2C
		35~45°C	<1C
	Discharge	-10~55°C	
Storage Temperature	1 Year	-20~25°C	@60±25% R.H. SoC 50 ±5%
	3 Year	25~40°C	
	<1 week	40~55°C	



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