



SACRED SUN

SPG SERIES
TECHNICAL MANUAL



contents











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Security Instruction

Please read these instructions carefully in order to make correct, safe, and effective operation. This manual provides you with very important installation and operation guidelines, which will guarantee your equipment an optimal performance and longer service life.

- ▲ For your safety, please do not open battery by yourself, only professionals shall be allowed to open and maintain the battery;
- ▲ Due to battery be potential harmful to the environment and health, battery shall be replaced by manufacturer's service center. If there is need to replace and maintain, please contact after-sale service center.
- ▲ Used battery is recyclable, and improper disposal of battery may be great harmful to the environment and health. So, used battery shall be proper disposed following relative regulations and law or shall be returned to our company for disposal.
- ▲ Please choose the batteries of the same model for replacement, and batteries produced by different manufacturers shall be strictly forbidden for connecting in one system.

Notices

				
Warning	Electricity shock	Protecting eyes	With adults custody	No short circuit
				
No flame and spark	Recycled	Proper disposal	Read instructions	UL certificate

Chapter One Product Introduction

Product Characteristics

⚙️ **Basic Characteristics**

AGM valve regulated technology, high-tin-low-calcium multielement special alloy, poor electrolyte design, negative adsorptive theory, restrain hydrogen separate out effectively, reduce the electrolyte loss during usage, there is no need to add electrolyte among battery service life.

⚙️ **Reliable sealing technology**

Patent multi-layer electrode pole sealing structure ensure sealing safety and reliability, except upside down, any other installation orientation is allowed.

⚙️ **Long service life**

Patent grid structure design preventing grid prolongation, special 4BS lead paste technology and tight assembly and container formation technology prolong battery service life.

⚙️ **Low self-discharge rate**

High purity raw material, clean production environment, ensure low self-discharge rate of battery.

⚙️ **Good consistency**

During plate production, cell assembling and finished products test, one homogenization procedure added in each process, thus ensure battery quality consistency.

⚙️ **Applicable for wide temperature range**

Special electrolyte formula and special active substance formula, enhance good high and low temperature performance.

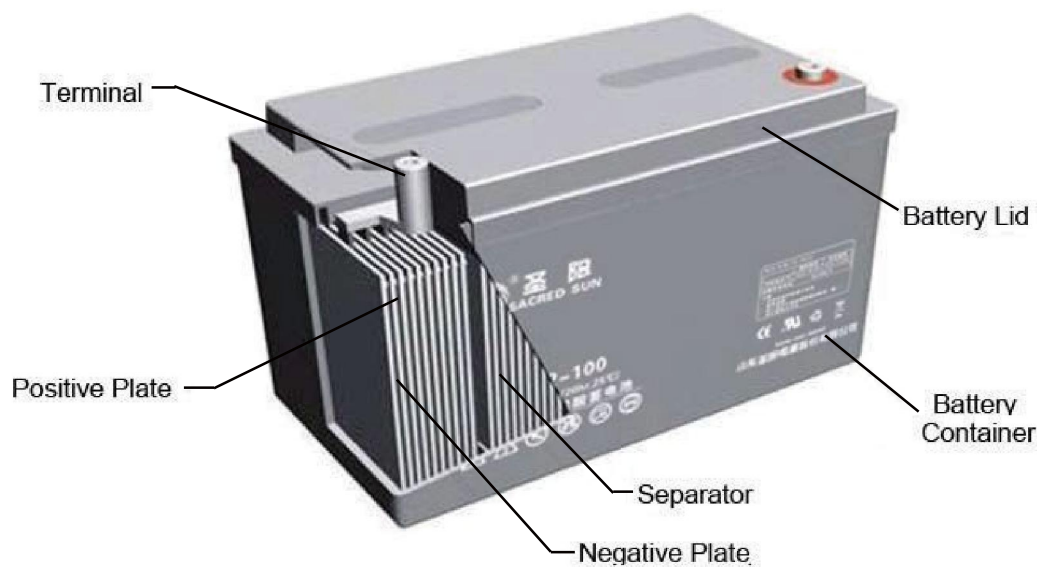
⚙️ **SPG series**

Compared with SP series, SPG is with radial grid design, special paste formula and active substance matching, resulting in high specific energy, low internal resistance, excellent high-rate discharge performance.

Main Applications

- ⊗ UPS/EPS
- ⊗ Telecommunication and power supply equipment
- ⊗ Security system
- ⊗ Alarm system
- ⊗ Medical treatment
- ⊗ Electrical tool
- ⊗ Portable instrument
- ⊗ Signal light
- ⊗ Solar and wind energy storage

Battery Structure



Type and Dimensions

SPG series

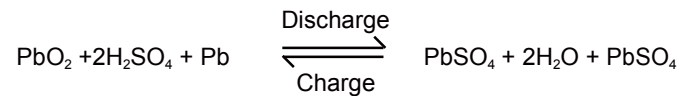
Table 1-1 SPG series battery type and dimensions

Model	Rated Voltage (V)	Rated Capacity(Ah)		Dimensions				Weight
		20hr	10hr	Length	Width	Height	Total Height	
		1.80V/cell	1.80V/cell	mm	mm	mm	mm	kg
SPG12233W	12	48.4	45	196	165	165	170	14.0
SPG12280W	12	60	55	228	138	209	214	17.2
SPG12310W	12	70	65	350	167	179	179	22.0
SPG12320W	12	75	70	261	171	209	217	21.8
SPG12350W	12	82	75	261	171	209	217	24.0
SPG12375W	12	90	86	350	167	179	179	24.6
SPG12440W	12	95	90	305	168	207.5	212.5	26.6
SPG12470W	12	110	100	330	174	217	226	29.9
SPG12535W	12	130	120	407	173	222	231	37.2
SPG12620W	12	148	135	345	172	275	280	41.7
SPG12650W	12	160	150	483	171	219	227	45.7
SPG12830W	12	220	200	522	234	218	223	62.5
SPG121000W	12	270	250	534	271	225	233	77.2

Customed series

Working Principle

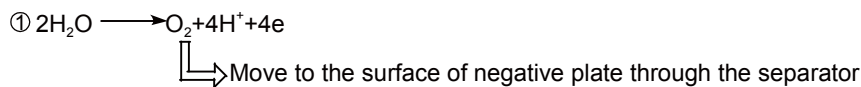
⚙️ The electrochemical reaction of batteries in charge and discharge process as follows:



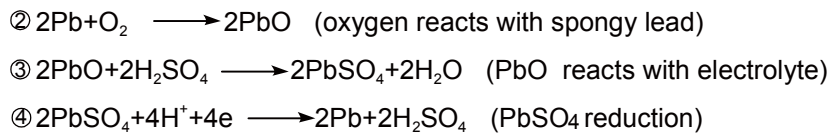
In the final stage of charge process, active substance in positive plate transformed to lead dioxide, negative plate has not reached fully charged stage, the process of active substance in negative plate transformed to spongy lead has not finished, oxygen gas generated in positive plate reaches the negative plate through separator pores and reacts active substance in negative plate, resulting depolarized state in negative plate, and restraining the generation of hydrogen.

⚙️ The working principle of electrochemical reaction to realize sealing as follows:

- The reaction in positive plate (oxygen generated)



- The reaction in negative plate (oxygen absorbed)



- The whole reaction in the negative plate is: $\textcircled{2} + \textcircled{3} + \textcircled{4} : \text{O}_2 + 4\text{H}^+ + 4\text{e}^- = 2\text{H}_2\text{O}$

The final production returns to $\textcircled{1}$, and recycles like this.

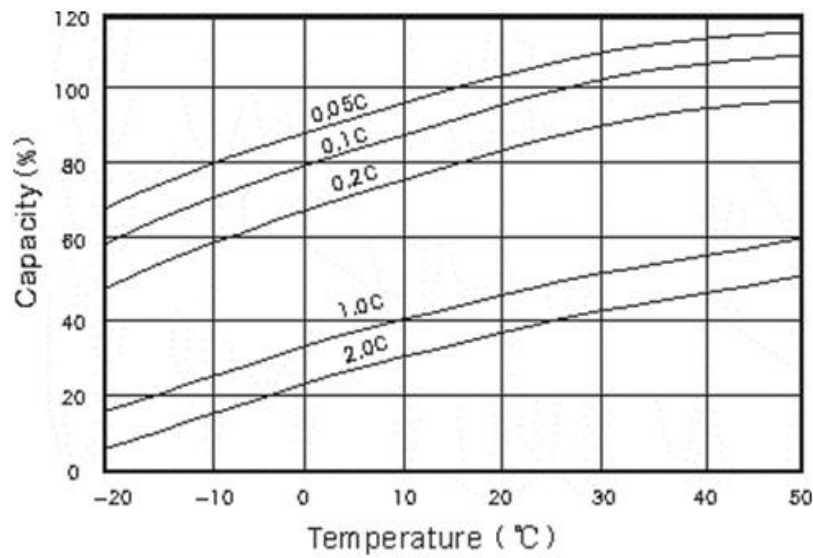
In general, in charging process oxygen gas generated in positive plate could quickly reach the negative plate and recombine into water through react with active substance in negative plate, no gas escape and water loss, achieving the sealing.

Chapter Two Technical Characteristics

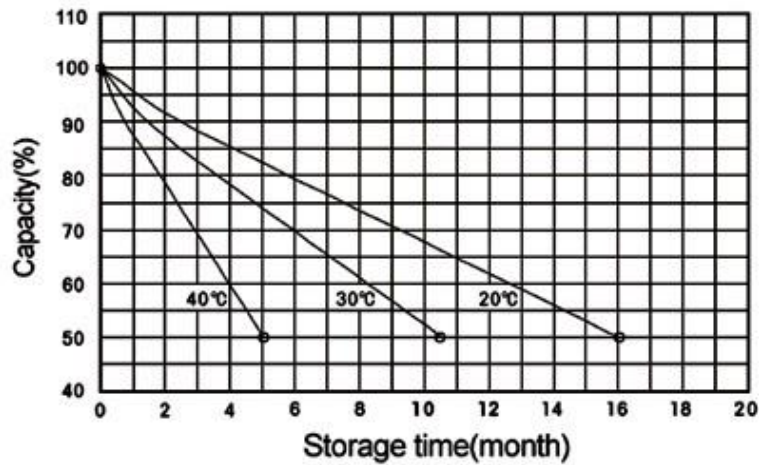
Discharge Curve

⊗ All series common curves

- Figure 2-1 Floating service life curve under different temperature

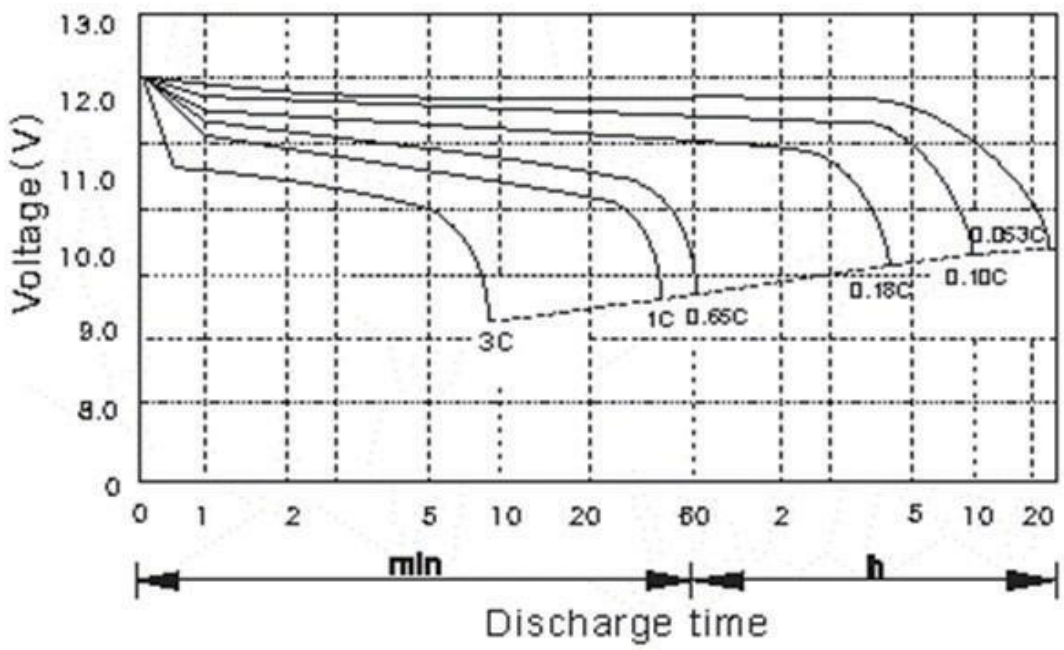


- Figure 2-2 Floating service life and storage time curve



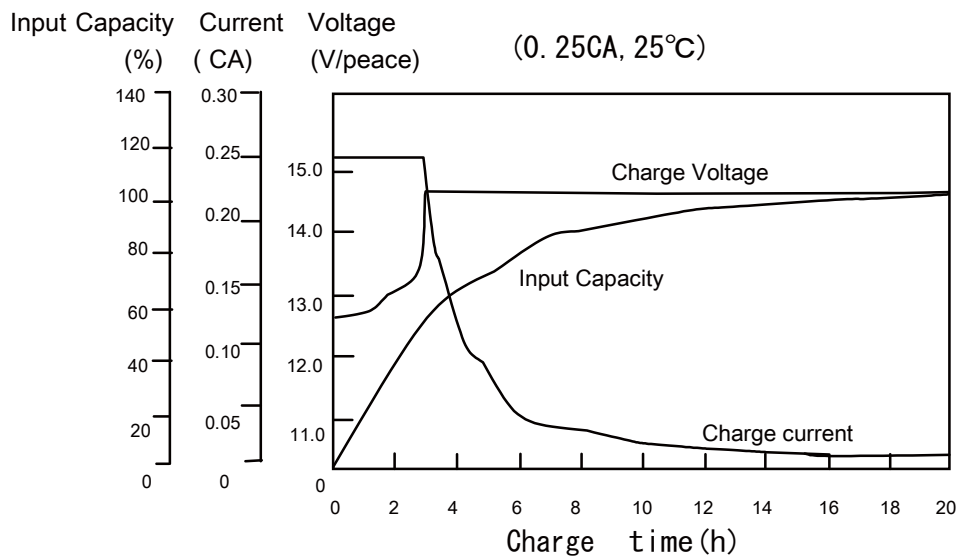
⊗ All series characteristic curves

■ Figure 2-3 Discharge characteristic curve under different discharge rates(25°C)

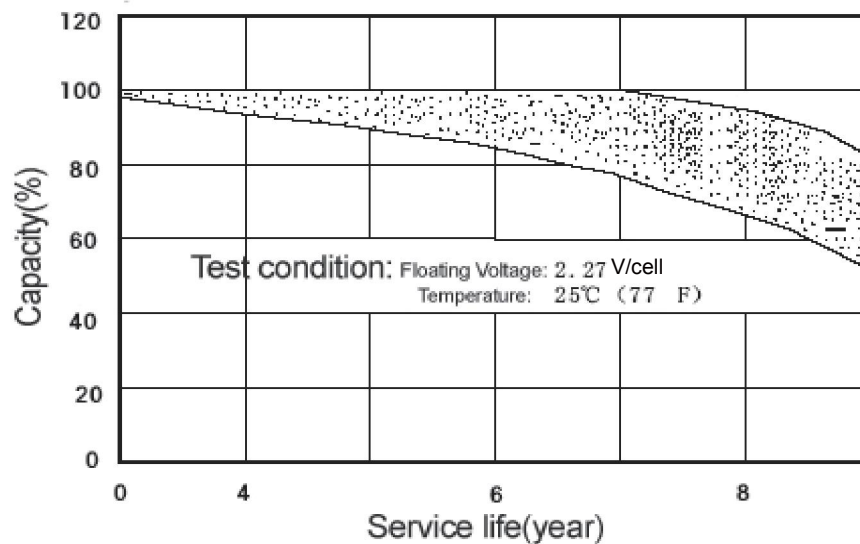


Charge Curve

■ Figure 2-4 Charge characteristic curve



■ Figure 2-5 Floating charge service life characteristic curve



Internal Resistance and Short Circuit Current

The internal resistance is dynamic nonlinear parameter, it continuously varies with the temperature, charge state and service duration. The internal resistance is the lowest when the battery is fully charged.

Below tables present the internal resistance and short circuit current of the battery which the internal resistance is measured by HIOKI 3551 BATTERY HITESTER resistance tester at an ambient temperature of $25 \pm 5^\circ\text{C}$, in the fully charged state.

■ Table 2-3 The internal resistance and short circuit current (25°C)

Battery Type	Reference Internal Resistance (mΩ)	Short Circuit Current (A)	Battery Type	Reference Internal Resistance (mΩ)	Short Circuit Current (A)
SPG12233W	6.5	1800	SPG12470W	4.2	2850
SPG12280W	6.3	1900	SPG12535W	3.8	3150
SPG12310W	4.7	2500	SPG12620W	3.6	3300
SPG12320W	6.3	1900	SPG12650W	2.9	4100
SPG12350W	4.5	2600	SPG12830W	2.7	4400
SPG12375W	4.4	2700	SPG121000W	2.0	5200
SPG12440W	3.95	3000			

Chapter Three Operation and maintenance

Parameters

Ambient temperature is -15°C - 45°C and the optimal operation temperature is $25 \pm 5^{\circ}\text{C}$

Ambient humidity less than RH92%

Altitude less than 4500m,if operation altitude more than 4500m,please make special reminder when confirm order.

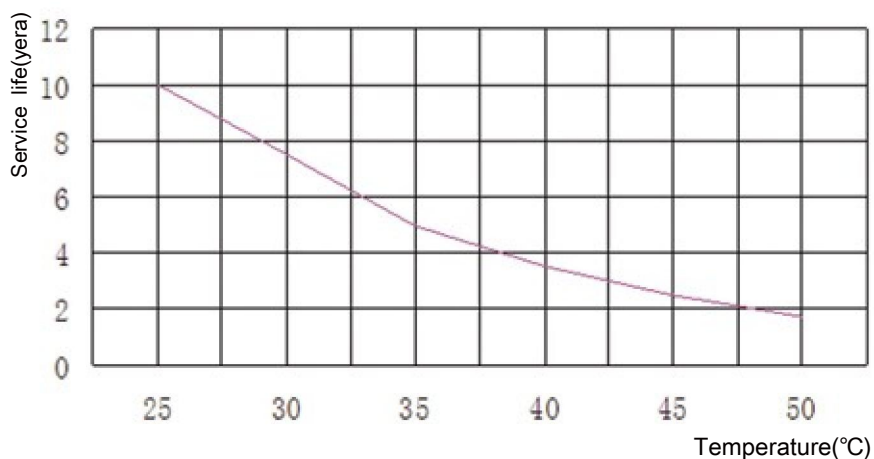
Factors Influencing capacity

Quantity of electricity battery discharge under certain condition is called battery capacity,symbol is C ,normal unit is Ampere Hour,in short is Ah.

Battery capacity contains rated capacity and actual capacity,for rated capacity please refer to Table 1-1.Actual capacity is fact quantity of electricity battery discharge under certain condition,it equal to discharge current multiply discharge time.

High temperature will speed up battery grid corrosion and water loss, thus greatly shorten the battery life, when the temperature is over 25°C , the service life of the battery will be shortened by half as the temperature increasing by 10°C . The optimal operation temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$, charge voltage should be adjusted according to ambient temperature.

Figure 3-1 Service life and temperature curve



Charge

⚙ Floating charge

Charge method: 2.27V / cell with limited current of 0.3 C₁₀ (A).

Charge voltage should be adjusted according to ambient temperature, temperature compensation coefficient is -3mV / cell /°C .

Floating charge voltage at different ambient temperature, as below table

Temperature (°C)	0	10	20	25	30	35
Floating charge volage (V/cell)	2.33~2.36	2.30~2.33	2.27~2.30	2.25~2.28	2.24~2.27	2.22~2.25

⚙ Cycle application

Charge method: 2.45V / cell with limited current of 0.25 C₁₀ (A).

Charge voltage should be adjusted according to ambient temperature, temperature compensation coefficient is -4mV / cell /°C .

When charged capacity is about 105-110 % of discharged capacity or constant voltage charge for about 3 hours keep charge current is the same, charge is ended.

Storage

The battery should be fully charged before storage, and then be stored in clean, ventilate and dry environment without corrosive gas or explosive gas nearby.

- Table 2-3 The internal resistance and short circuit current (25°C)

Storage Temperature	The interval of supplementary charge	Methods (choose either one)
Below 25°C	per 6 months	Charge with 0.25C ₁₀ A limited current and 2.27V/cell constant voltage for 2~3 days. Charge with 0.25C ₁₀ A limited current and 2.45V/cell constant voltage for 10-16 hours.
25~30°C	per 4 months	
30~35°C	per 3 months	
35~40°C	per 2 months	

Maintenance

To ensure the performance of battery, the battery should be correctly inspected and maintained. The maintenance methods are recommended as follows.

⚙ Monthly Maintenance:

- Measure and record the ambient temperature of the battery-room, battery container and electrode pole temperature.
- Check battery cleanliness, terminal damage track and temperature, container and lid damage and temperature.
- Measure and record the total voltage and floating current of the battery system.

⚙ Quarterly Maintenance:

- I Repeat every item of monthly inspection.
- I Measure and record the floating voltage of each on-line battery.

⚙ Annually Maintenance:

- I Repeat every item of quarterly maintenance and inspection.
- I Check whether connectors are loose or not.
- I Check whether safety valve is twisted tightly or not
- I Perform a discharge test to check the exact load every year, discharge 30%-40% of the rated capacity.

⚙ Three yearly maintenance:

- I After three years operation, battery capacity should be tested, if battery bank actual capacity is below 80% of rated capacity, battery bank is considered life over.



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