SACRED SUN

GFMJ SERIES
TECHNICAL MANUAL

contents

SecurityInstruction

Pleasereadtheseinstructionscarefullyinordertomakecorrect,safe,andeffectiveoperation.This manualprovidesyouwithveryimportantinstallationandoperationguidelines,whichwillguarantee your equipment an optimal performance and longer service life.

- For your safety,pleasedo 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,pleasecontact after-sale service center.
- Usedbatteryisrecyclable, andimproperdisposalof batterymaybegreatharmfultothe environment and health.So,used battery shall be proper disposed following relative regulations and law or shall be returned to our company for disposal.
- Pleasechoosethebatteriesofthesamemodelforreplacement,andbatteriesproducedby 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	ULcertificate

Chapter OneProductIntroduction

ProductCharacteristics

- **Floatingdesignlife**
  Floating design life is 15 years for2V series batteries, 12 years for12V series batteries.
- **Gelelectrolyte**
  HighpuritygasphaseSiO$_2$importedfromGermanyusedforGelelectrolyteensuringeven distribution inside battery and no acid stratification.
  Extra electrolyte acid filling system which ensure quantity of gel electrolyte is correctly filled over the plates and separators,perfectheat dispersion, prevents thermal runaway caused by water loss, and the plate-coating gelatin protects active materials from shedding off.
- **Specialseparator**
  AMERSILPVC-SiO$_2$micro-porousseparatorensureslowinternalresistance,highporosity, intense absorption ofgel electrolyte and long cycle life.
- **Patent safety valve**
  Patent labyrinth type two-layer and explosion-proof acid filter valve design, sensitive open andclose,acidfilterinvalvepreventing acidfogescape andpreventing outflameinwhen depression.
- **Longservice life**
  Thegridismadeoflead-calcium-tinalloywithcorrosionproofcharacter,andtakegas recombination technology.
  Low density ofgel electrolyte reduce corrosion ofplate grids.
  Platescuredbyhigh-temperatureandhigh-moistureprocessforminglonglife4BScrystal structure;
  Efficient formation process, guarantee for the plates quality;
- **Deep discharge performance**
  Withexcellentdeepdischargeproofperformance,thebatterycanbeconnectedinloadafter 100%dischargeandrecovertheoriginalcapacityafter4weeks.Strongrechargerecovering ability afterbattery deep discharge, excellent long cycle endurance performance.
- **Lowself-discharge rate**
  Thegridismadeofheavyloadlead-calcium-tinmulti-elementalloy,lowself-dischargerate,itis ≤2% per month;
  HighpurityGelelectrolyte;storageatambienttemperature25℃fortwoyears,therestcapacity

remains more than 50%.

- **Reliablesealingperformance**
  Electrodepolessealingadoptmulti-layer”O”typehighpressuresealingring,noterminal electrolyte leakage.
  Excellentgasrecombinationperformance,noacidfogescapeinoperationandbatterycouldbe installed together with equipment.
- **Applicablefor widetemperature range**
  Extraelectrolytedesignensuresitcanworkinhightemperatureoroverdischargecondition, preventing dry up ofthe battery.
  ThickABScontainerandcoverwithhighimpactproof,vibrationproof,preventsleakageand container bulging.

MainApplications

- Cable communication station and exchange station
- Wireless communication station and distribution base station
- Electricity power,army and other special network telecommunication base station
- Data andTVsignal transmission system
- EPS/UPS;
- Wind,solar energy and wind solar hybrid power generation
- Cycle application

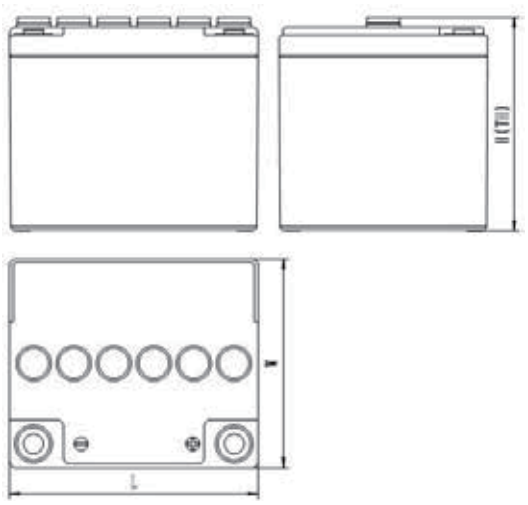
Chapter TwoTypeandDimensions

ProductSeries

- **Table2-1 battery type anddimensions**

Battery Type	Voltage (V)	Capacity C_{10}(Ah)	Dimensions								Weight		Short Circuit Current (A)	Reference Internal Resistence (mΩ,25℃)	Terminal
			Length		Width		Height		TotalHeight						
			mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs			
6GFMJ-33	12	33	198	7.80	166	6.54	170	6.69	170	6.69	14	30.87	1010	8.50	SP-27
6GFMJ-50	12	50	276	10.87	174	6.85	169	6.65	198	7.79	21	46.3	1525	7.64	GFM-24
6GFMJ-65	12	65	310	12.20	174	6.85	209	8.23	236	9.29	30	66.1	1540	7.35	GFM-24
6GFMJ-85	12	85	414	16.30	174	6.85	218	8.58	228	8.98	37	81.6	2060	5.85	GFM-24
6GFMJ-100	12	100	513	20.20	163	6.42	218	8.58	228	8.98	44	97.0	2950	3.91	GFM-24
6GFMJ-120	12	120	513	20.20	232	9.13	218	8.58	228	8.98	52.3	115.3	2980	3.86	GFM-24
6GFMJ-150	12	150	513	20.20	232	9.13	218	8.58	228	8.98	63.8	140.7	3020	3.65	GFM-24
6GFMJ-200	12	200	513	20.20	296.5	11.67	218	8.58	228	8.98	82.8	182.6	3050	3.20	GFM-24
GFMJ-200	2	200	171	6.73	107	4.21	334	13.15	344	13.54	14.8	32.6	2800	0.68	GFM-22
GFMJ-300	2	300	171	6.73	151	5.94	334	13.15	344	13.54	21.3	47.0	3600	0.54	GFM-22
GFMJ-400	2	400	211	8.31	175	6.89	334	13.15	344	13.54	30	66.1	4350	0.45	GFM-22
GFMJ-500	2	500	243	9.57	174	6.85	334	13.15	344	13.54	35.5	78.3	5020	0.39	GFM-22
GFMJ-600	2	600	302	11.89	177	6.97	334	13.15	344	13.54	44	97.0	5860	0.33	GFM-22
GFMJ-800	2	800	410	16.14	175	6.89	334	13.15	344	13.54	60	132.3	6900	0.28	GFM-22
GFMJ-1000	2	1000	478	18.82	175	6.89	334	13.15	344	13.54	71	156.5	8000	0.24	GFM-22
GFMJ-1200	2	1200	346	13.62	310	12.20	335	13.19	357	13.78	85.5	188.5	9600	0.165	GFM-22
GFMJ-1500	2	1500	401	15.79	351	13.82	340	13.39	350	13.78	107	235.9	12000	0.184	GFM-22
GFMJ-2000	2	2000	490	19.29	350	13.78	340	13.39	350	13.78	140	308.4	16000	0.12	GFM-22

BatteryandTerminalLayout



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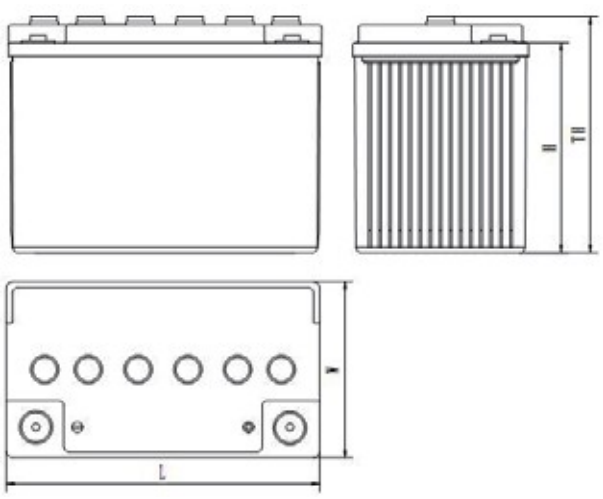

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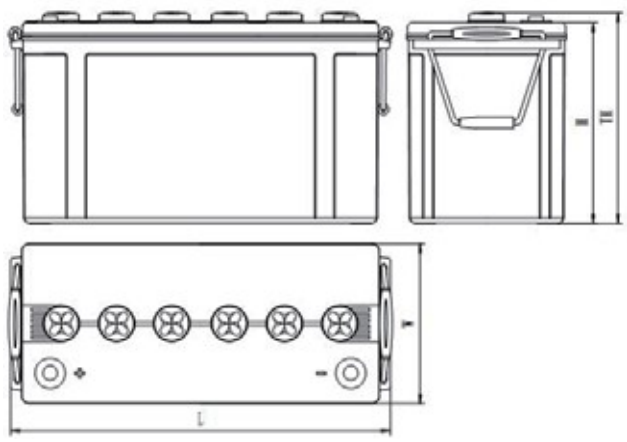

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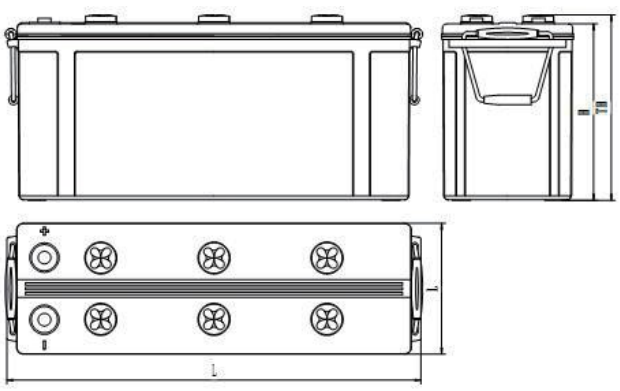
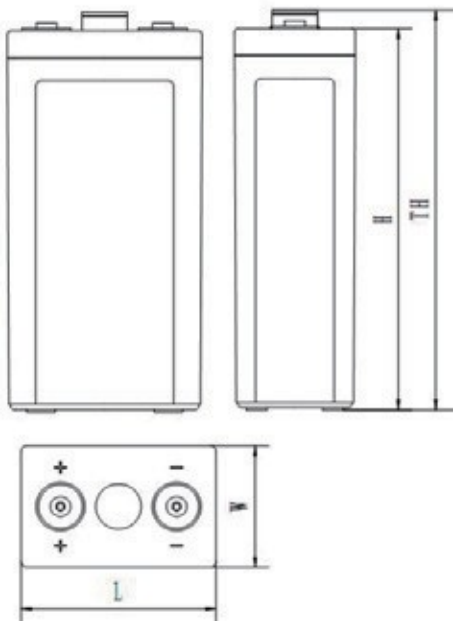
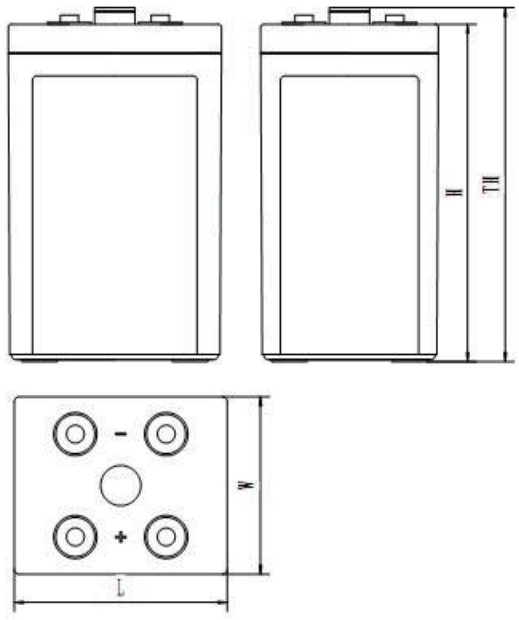


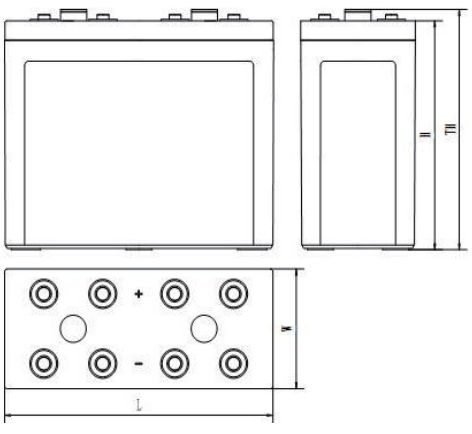
- 6GFMJ-100 120 150 200



■ GFMJ-200 300



■ GFMJ-400 500 600



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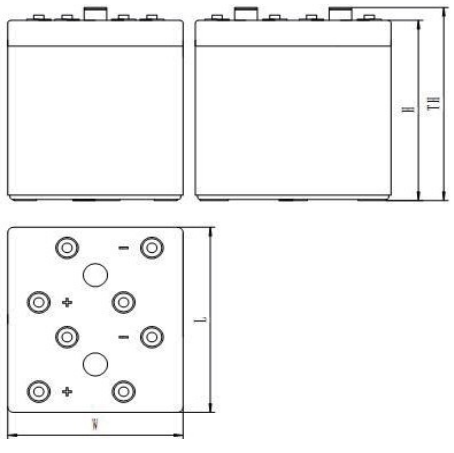

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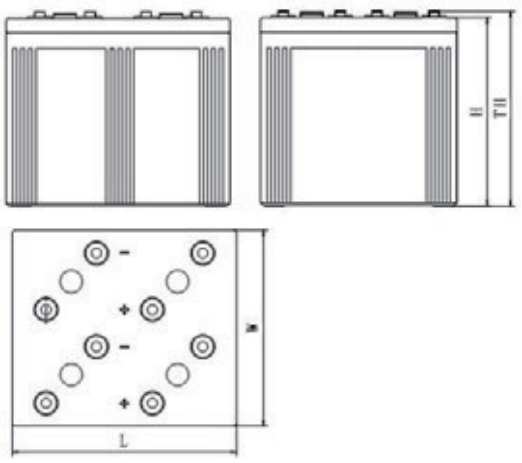
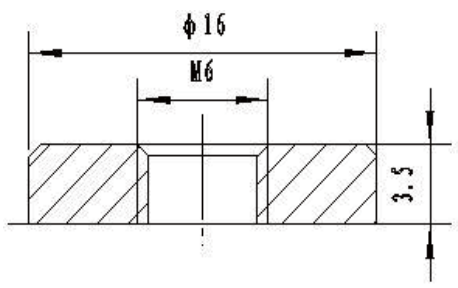
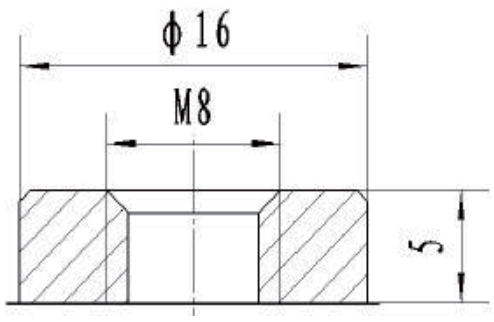


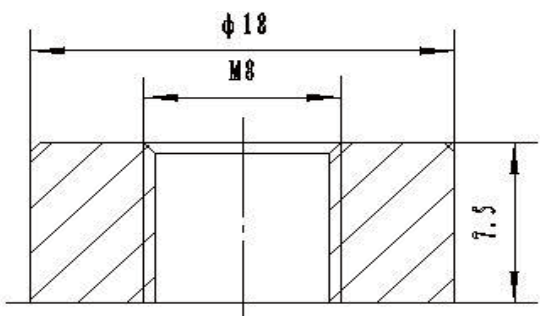
- GFMJ-1500 2000



- TerminalSP-27



- TerminalGFM-24



- TerminalGFM-22

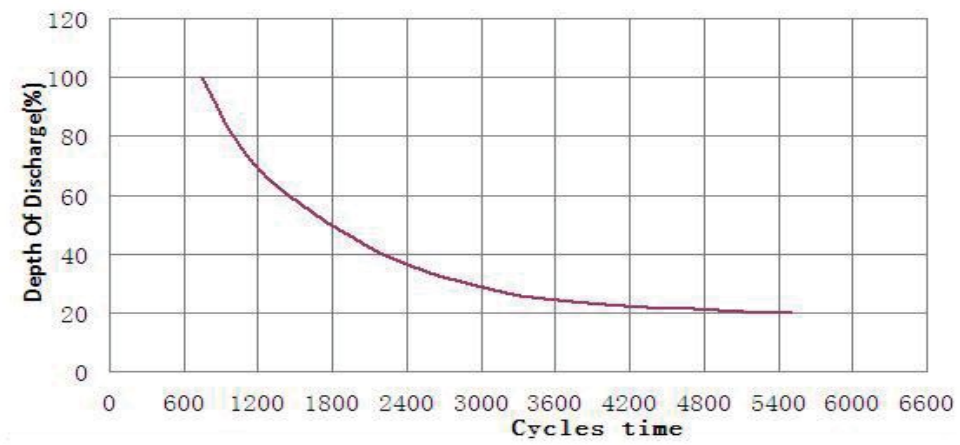
Chapter ThreeTechnicalCharacteristics

Performance Curve

Cycle performance curve (25℃)

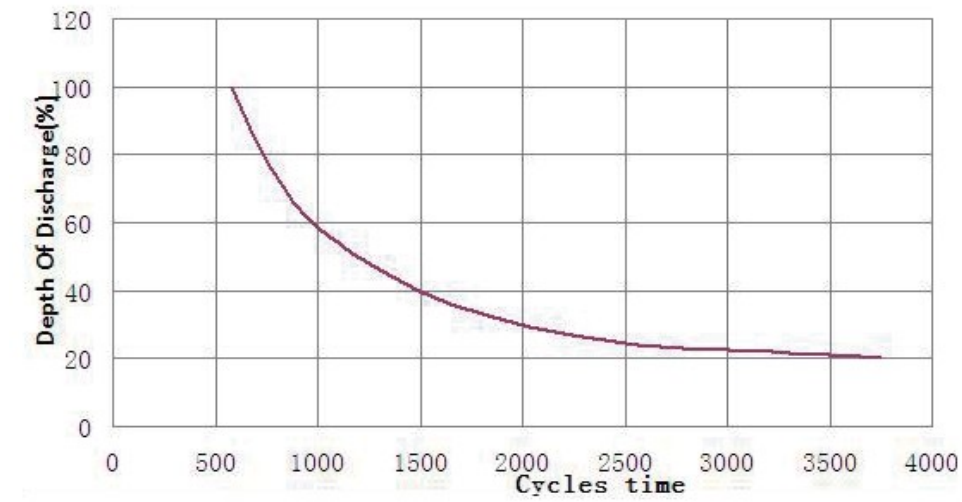
- GFMJ2Vseries

Figure 3-1 GFMJ2Vseries battery cycle times curve atdifferent depth ofdischarge



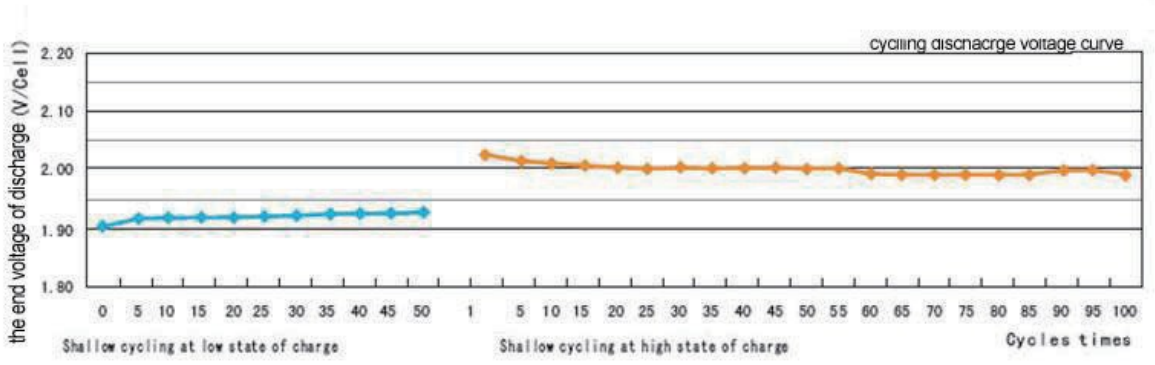
- GFMJ12Vseries

Figure 3-2 GFMJ12Vseries battery cycle times curve atdifferent depth ofdischarge



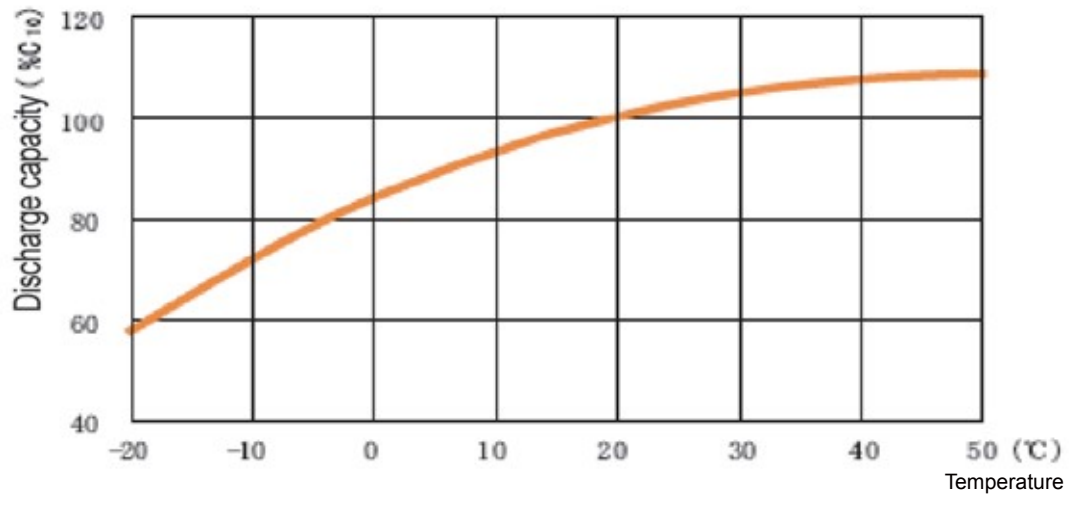
Voltagecurve ofsimulationwindenergy system cycle application

- Figure 3-3 Voltagecurve ofsimulation wind energy systemcycle application



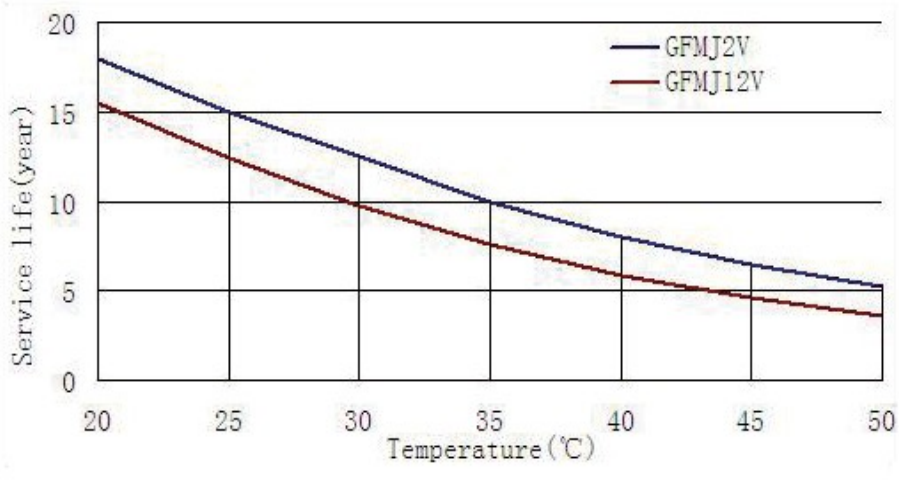
Discharge capacity andtemperature curve

- Figure 3-4 Discharge capacity curve under different temperature



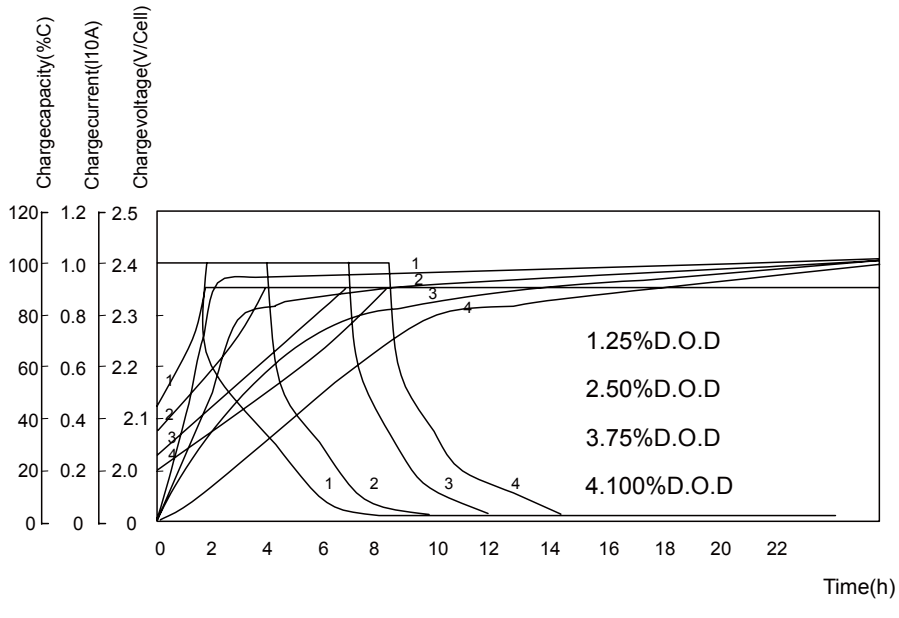
Service lifeandtemperature curve

- Figure 3-5 Floating service life curve under different temperature



Charge characteristic curve underdifferent depthofdischarge(25℃)

- Figure 3-5 Charge characteristic curve under different depth ofdischarge



Chapter FourOperation

Discharge

Endvoltagewithdifferentdischargeratemustbelessthanthespecifiedvalue.Chargethebattery as soon as possible after discharge.
Inordertoextendtheservicelife,thedepthofdischargeshouldbelessthan60%oftherated capacity.The discharge over 60% DOD is deep discharge and would shorten the service life.
Underthetemperatureof-25℃,dischargeover60%DODisprohibited,exceptprotectivemeasure is adopted such as raising temperature.

Temperature

Theoperationtemperaturerangeis-20℃~55℃.Alltheperformancedataismeasuredatambient temperatureof25℃.Theoptimaltemperatureis25℃±5℃,overhightemperaturewouldshortenthe servicelifeandoverlowtemperaturewouldlowerthecapacityavailable. Thehighestacceptable temperature is 55℃.

FloatingChargeandEqualizingcharge

Floatingcharge

Floatingoperationisthebestoperationconditionforbattery.Infloatingoperation,thebattery keepfullychargedstate,underthiscondition,batterycouldreachthelongestservicelife.Under thetemperatureof25℃,recommendedfloatingchargevoltagesettingvalueis2.23V/cell . Insuchmethod,ittakeabout24~36hforbatteryfullycharged. Forachievingbetter performance,thefloatingchargevoltageshouldbesuitableadjustedaccordingtoambient temperature,temperaturecompensationcoefficientis-3.5mV/℃/cell,fordetailspleasereferto Table 4-1.

- Table4-1 Floating charge voltage under different temperature

AmbientTemperature (℃)	Floating Charge Voltage (V/cell)
0	2.33
10	2.29
15	2.27
20	2.25
25	2.23
30	2.21
35	2.19

Equalizingcharge

Equalizing charge or supplementary charge is needed in the following cases:

- Afterfinishinstallation,beforethebatterysystemisputintooperation,thebatterybankshould be supplementary charged.
- The battery will be out ofwork beyond 6 months.
- Runninginfull-floatingoperationfor alongterm, butnotdischargeundermorethan40%C10 capacity, the batteries need an equalizing charge regularly and the equalizing charge cycle are 6 months toone year.

Recommended charge method as follows:

2.33V/cellwithlimitedcurrentof0.15C_{10}(A),chargefor8~12hours(noncontinuouschargeis allowed)

Chargevoltageshallbeadjustedaccordingtotheambienttemperature,temperature compensation coefficient is -3.5mV / cell / ℃,fordetails please refer to table 4-2.

- Table 4-2 Equalizing charge voltage under different temperature

AmbientTemperature (℃)	Equalizing Charge Voltage (V/cell)
0	2.43
10	2.39
15	2.37
20	2.35
25	2.33
30	2.31
35	2.29

Afterequalizingcharge,forbatterieswithvoltagelowerthan2.18V/cell,weshouldmake thebatterydischargedin0.1C10Afor4-6hours,andthenchargethebatterywithconstant voltage of2.33V /cell and limited current of0.15C_{10}A.

Recharge

Recharge the battery immediately after discharge according to the below method:

Chargethebatterywithconstantcurrentofnomorethan0.2C_{10}(A),untilthebatteryvoltagerises to 2.33~2.37V/cell,thenchangeto constantvoltagechargeof 2.33~2.37V/celluntilthecharge completed.Any ofthe following two items can be regarded as the fully charged symbol.

- Refer to the required time as table 4-3.
- Inconstantvoltagecase,thechargecurrentkeepunchangedfor3hoursinthefinalstageof charge.

Chargevoltageshallbeadjustedaccordingtotheambienttemperature,temperaturecompensation coefficient is -3.5mV/℃/cell.

- Table4-3 Required charge time in different depth ofdischarge

Depth of discharge(%)	Charge current of constant current charge(A)	Timefor changing constant current charge toconstant voltage charge(h)	Charge voltage of constant voltage charge(V)	Charge time(h)
20	$0.1C_{10}$	1.6	2.33	8
	$0.15C_{10}$	1.2	2.33	6
50	$0.1C_{10}$	4.3	2.33	14
	$0.15C_{10}$	3.3	2.33	12
80	$0.1C_{10}$	6.8	2.33	16
	$0.15C_{10}$	5.5	2.33	14
100	$0.1C_{10}$	8.7	2.33	18
	$0.15C_{10}$	6.8	2.33	16

Storage

The battery should be stored in clean and dry environment .
Storagetime:batteryisex-workinfullycharged,storagetimeshouldbelimited,forensuringbattery performance,storage time please do not exceed following time:

- Under 25℃,six months
- Under 30℃,three months
- Under 40℃,six weeks

The state of charge can be confirmed by the testing result of open circuit voltage after storage for 24 hours at25℃.

- Table4-4 open circuit voltage atdifferent charge

Charge State	Voltage(V)/cell
100%	≥2.16
80%	≥2.14
60%	≥2.10
40%	≥2.08
20%	≥2.04

Thebatterysupplementalchargemethodduringthestorageis:chargebatterywith2.35V/cellfor8 to12 hours.

It is necessary to limit the current, and the optimum limiting value is within 0.2C10(A).

Testingoftheopencircuitwiththestoragebatterycandecidewhetheritshallbesupplemental charged. If the voltage drops to 2.10V/cell, the battery shall be supplemental charged in time. Improper maintenance will shorten the battery service life or decrease the service performance.

UnnormalOperation Condition

Unmeantdeepdischarge,batterycannotbechargedfor alongterm withsmallcurrentwhichis lower than systemrequirement, or else,the battery capacity will fall down early.

Batteryis discharged fully.

Sulphuricacidisrunoutcompletely, onlywaterisleftinelectrolyte,underthisconditionrechargewill causeleadpine-treecrystal,it willresultthatseparatorispenetrated,thusshortcircuitisoccurred. Plate sulfating grade is highest,and internal resistance is largest.

Chapter FiveInstallation,Commissioningand Maintenance

Installation

Batteriesintegratedinequipmentshouldbecompliancewiththeinstallationinstructions,Battery which is separately installed on rack and cabinets should be connected by bolts tothe foundation.
Batteryracks or cabinets should be properly installed according toinstructions.

Connection

Beforeconnecting,makeaoverallcheckofallthebatteriesandconnectorstoseewhetherthereis hardware damage or manufacturing defects,and make sure the right polarity.
The charge equipmentsare in cut-offstateand without loads, then connect the positive and negative terminals tochargers.
Duringtheinstallationandtransitofthebattery,useinsultedtools,gloves,apronsandsafety glasses,avoiding battery is impacted, do not twist connecting terminals and safetyvalve in transit.
Placing tools and conductive articles on the battery is strictly prohibited.
Dustyconnectingterminalorlooseconnectionwillcausebatterysparkle,sopleasekeepthe connectingterminalscleanandtightentheconnectorsasperrequiredtorquevalue,butpleasedo not cause torsional stresstoterminals.

Commissioning

Assure battery operation in the clean environment.
Beforeoperation,batterychargevoltagemustbeadjustedasconstantvalueasperambient temperature.Suchas,at25℃,chargethebatterywith2.23V/cellfor16to24hours,orwith 2.33Vpc for8 to12 hours;
Ifthe storage condition is serious, adjust charge voltage is necessary.

Maintenance

Monthlymaintenance:

- Measureandrecordtheambienttemperatureofthebattery-room,batterycontainer and terminals temperature.
- Checkbatterycleanliness,terminaldamageandheatingtrack,containerandliddamageand temperature.
- Measure and record the total voltage and floating current of the battery system.
- Correct immediately once finding problem.

Quarterly Maintenance:

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

AnnuallyMaintenance:

- Repeat every item ofquarterly maintenance and inspection.
- Check whether the connector loose or not,please tight immediately once finding loose parts.
- Performadischargetest tocheckthe exactloadeveryyear,discharge30%~40%oftherated capacity.

Three-year Maintenance:

- Carryoutacapacitytest(C10)everythreeyearsandeveryyearaftersixyears ofoperation. If thecapacityof thebatteryislowerthan60%of theratedcapacity, thebatteryshouldbe replaced.

Maintenance notes

- Please do not operate and store battery in inversion position or in horizontal position
- Checkwhetherthebatteryinstallationiscomplywithdesignrequirementorinstallation documents or not.
- Pleaseuseinsulatedtoolswhenoperationandmaintenance,anymetalobjectstobeputon top ofthe battery shall be strictly prohibited;
- Please do not use any organic solvent toclean batteries;
- Please do not take down safetyvalve or add any substance into battery
- Please do not smoke or set out fire near batteries.
- Please keep battery fully charged within 24 hours afterdischarge,avoid capacity affected
- Stored battery performance could be in degeneration,please put the battery in operation early.
- Only professionals shall be allowed tomaintain the battery

SACRED SUN

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