



VALVE REGULATED SEALED LEAD ACID BATTERY

2V Series

OPERATION MANUAL

Version: V1.0

SUNPAL POWER CO.,LIMITED

Content

Safety and warning	3
 Chapter One Introduction to the Product	
1. Product Characters.....	4
2. Main application domain.....	4
3. Construction.....	5
4. Types and Dimensions.....	6
5. Working Principal.....	7
 Chapter Two Technical characteristic	
1. Discharge Curve.....	8
2. Charge Performance.....	6
3. Discharge characteristic	9
4. Internal resistance and short circuit current.....	12
 Chapter Three Operation and Maintenance	
1. Parameters.....	13
2. Capacity and Influence Factor.....	14
3. Ambient temperature Vs. Battery.....	14
4. Requirement for Charge.....	16
5. Choose battery.....	16
6. Storage.....	17
7. Maintenance.....	18
 After- sale Service	20
Annex 1	21

Safety and warning

Please read this manual! It provides very important direction for fix and operation, which can make best capability for the equipment, and elongate the using life.

- For your safety, please do not try to open it, equipment does not contain spare part. The maintain work can only be done by our trained woke servitors
- As a result of the battery's latent endanger to heath and environment, they should be only changed in our authorization service center. If you need to change the battery or maintain the equipment, please call the nearest service center.
- Batteries can be reclaimed, if it could not be carefully handled, it would bring a lot of endangers to environment and heath. Please check laws to get the validity ways or send the equipment to service center.
- The changer of battery can only be done by Person who knows well about the danger and the prevention. When changing the battery, please use the same model and type sealed lead acid battery.

 Warning—do not smoke or use fire near batteries.

 Warning—do not use organic solvent to wash batteries

 Warning—dot not put batteries into the fire, or it may bombed.

 Warning—do not open batteries, it contains electrolyte, which can hurt the skin and eyes.

Please take care of the following marks in using

				
Warning	Electricity danger	Protecting your eye	Watch Short-circuits	With adults custody
				
Read the manual	Fire forbidden	Circle use	Do not put batteries into dustbin	The product has past the UL Safe authentication

Chapter One Product introduction

1. Product Characters:

- Design life is above 15 years in float application and cycle life is above 1200 times in 80% DOD (Depth of Discharge) term

Grid alloy with special patented formula

Special patented negative paste formula

4BS paste technology

Extra-thick plate design

- Reliable seal performance, no acid spillage, recombination efficiency reach 99.9%

Patented post sealing structure

“Labyrinth” patented security valve

High precise ABS sealing technology

- Initial capacity above 100%, the remaining capacity above 94% when storage for 3 months (25°C)

- Remarkable high rate discharge performance. Low internal resistance
Patented grid design. Large section copper structure

- Supply the Unique flexible connectors made of rubber wrapped with copper wires with Patented silver-coated ends and another option is copper bar connector.

Assure the good connections of post and connectors and low connection resistance

Combination of suppleness and rigidity for more flexible connections

Monitor hole designed

- Flexible and convenient installation, slinky outside looking

Shockproof blocking assembling

Satisfy customer's individual requirements and provide up to 8-class shockproof

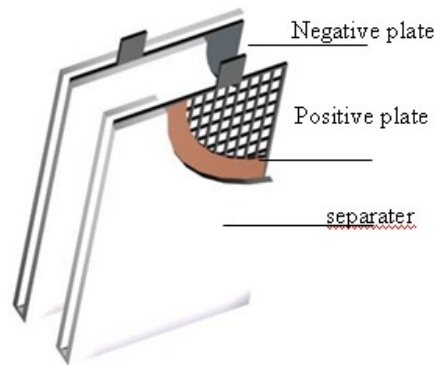
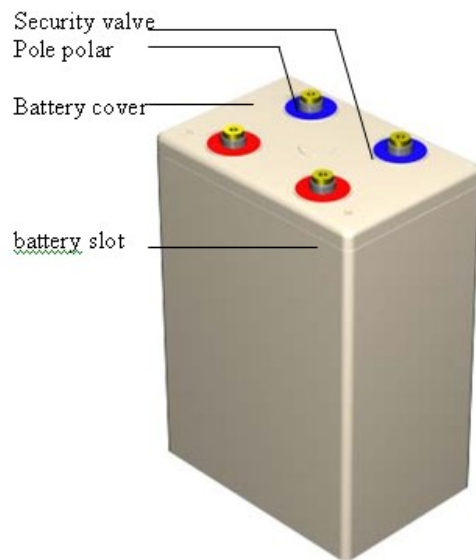
Streamline and dime-light battery outside-looking design.

2. Main applications

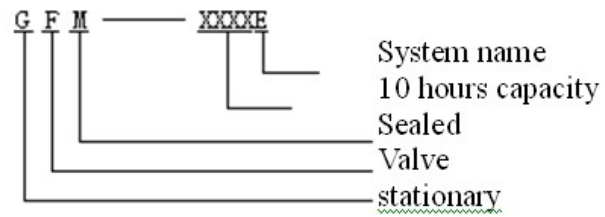
- Correspondence exchange and transmission system
- Mobile communication system
- Power plant and power transformer system

- Navigation aid signaling system
- Solar energy system
- Radio and broadcasting station
- Emergency lighting system
- Other standby, circulatory system

3. Configuration



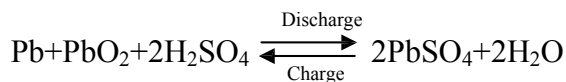
4. Types and Dimensions



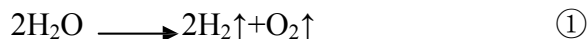
Model	Nominal voltage (V)	Rated Capacity (Ah)			Approx Dimension (mm)				Approx weight (kg)
		C ₁₀	C ₃	C ₁	length	width	height	Total Height	
GFM-100	2	100	75	55	171	68	332	348	8
GFM-200	2	200	150	110	172	112	332	351	15
GFM-300	2	300	225	165	176	155	332	341	20
GFM-400	2	400	300	220	175	211	332	342	26
GFM-500	2	500	375	275	243	175	335	341	32
GFM-600	2	600	450	330	301	175	335	342	41
GFM-800	2	800	600	440	412	175	330	335	53
GFM-1000	2	1000	750	550	480	175	341.5	341.5	65
GFM-1500	2	1500	1125	825	405	355	346	353	100
GFM-2000	2	2000	1500	1100	490	353	346	353	132

5. Working Principal

The chemical reaction-taking place in lead acid battery is as follows:



Following by-reaction ① takes place in ordinary lead acid battery:



This by-reaction makes water loss gradually and pure water need to be added regularly to keep the battery operate normally.

2V Series battery adopts design of barren-liquor and utilizes AGM (micro porous glass fiber) separator. Thus there is a path existing between the positive and the negative. Also special alloy grid is chosen to increase vent hydrogen over-potential gassing on the negative plate, which prevents generation of Hydrogen. Otherwise, the oxygen generated from positive diffuses through separator to the negative and the oxygen gas

reacts quickly and is recombined into water. The reactions are as follows::

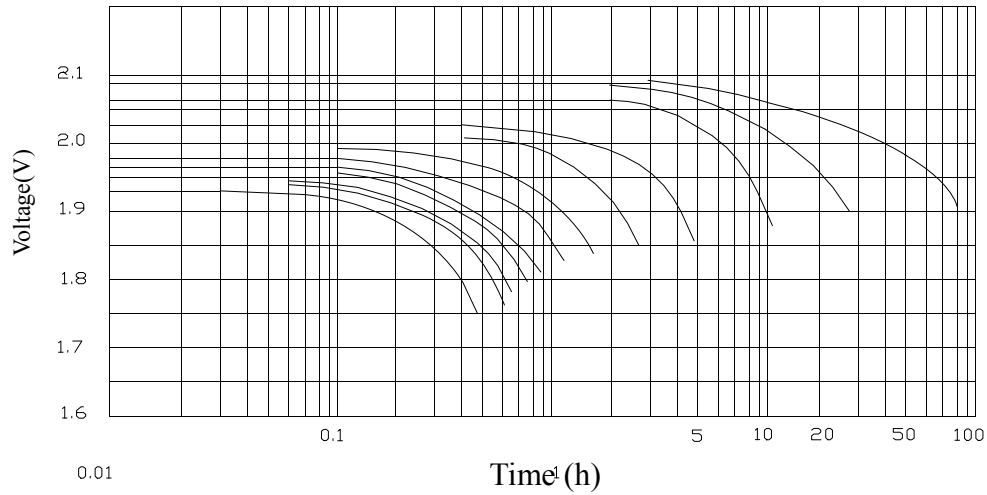


So it is possible to build 2V SERIES battery in sealed structure.

Chapter Two Technical characteristic

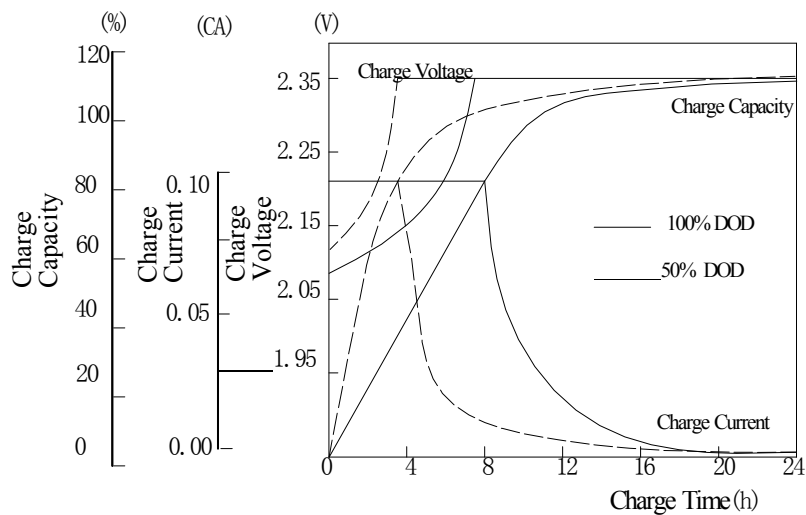
1. Discharge Curve

Fig. 2-1 Discharge Performance Curves at Different Discharge Rates (25°C)



2. Charge Curve

Fig.2-2 Recharge characteristics of 100% DOD GFM-800 battery with current of $0.1C_{10}A$ and limit voltage of 2.35V/cell (25°C)



3. Discharge characteristic

Table2-1 Constant current discharge characteristic (A, 25℃)

GFM-200	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	333. 3	279. 1	206. 7	130. 7	77. 0	56. 5	38. 3	33. 1	26. 4	21. 9	9. 9
1. 65V	307. 9	260. 2	198. 0	123. 9	75. 2	55. 1	37. 4	32. 6	26. 0	21. 7	9. 8
1. 70V	287. 8	244. 0	182. 2	118. 4	72. 5	53. 5	37. 1	32. 2	25. 5	21. 3	9. 8
1. 75V	274. 3	231. 0	169. 3	112. 9	69. 9	51. 9	36. 0	31. 7	25. 2	21. 0	9. 7
1. 80V	263. 8	217. 8	158. 4	105. 7	66. 9	50. 3	35. 2	30. 9	24. 8	20. 6	9. 5
1. 83V	245. 4	204. 5	150. 8	99. 0	63. 9	48. 7	34. 4	30. 3	24. 3	20. 1	9. 3
1. 85V	233. 6	193. 1	141. 2	95. 4	60. 4	47. 7	34. 0	29. 9	24. 0	20. 0	9. 2
1. 88V	217. 2	176. 1	132. 7	91. 4	59. 1	46. 7	33. 7	29. 5	23. 8	19. 8	9. 1
1. 90V	200. 9	163. 3	121. 2	84. 7	56. 6	44. 7	32. 7	28. 8	23. 1	19. 3	9. 0
1. 94V	180. 7	145. 5	107. 3	75. 2	51. 2	41. 1	30. 3	26. 7	21. 6	18. 2	8. 7
GFM-300	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	500. 0	418. 7	310. 1	196. 0	115. 5	84. 8	57. 5	49. 6	39. 6	32. 8	14. 8
1. 65V	461. 9	390. 3	297. 0	185. 9	112. 9	82. 7	56. 1	48. 9	39. 0	32. 5	14. 7
1. 70V	431. 8	366. 0	273. 2	177. 6	108. 7	80. 3	55. 6	48. 3	38. 3	32. 0	14. 7
1. 75V	411. 4	346. 5	253. 9	169. 3	104. 9	77. 8	54. 1	47. 5	37. 8	31. 5	14. 5
1. 80V	395. 7	326. 7	237. 6	158. 6	100. 4	75. 4	52. 8	46. 3	37. 1	30. 8	14. 3
1. 83V	368. 1	306. 7	226. 2	148. 5	95. 9	73. 0	51. 6	45. 5	36. 5	30. 2	14. 0
1. 85V	350. 4	289. 7	211. 9	143. 2	90. 6	71. 6	51. 0	44. 8	36. 1	30. 0	13. 8
1. 88V	325. 7	264. 2	199. 0	137. 1	88. 6	70. 1	50. 5	44. 2	35. 6	29. 8	13. 7
1. 90V	301. 3	245. 0	181. 8	127. 1	84. 9	67. 1	49. 1	43. 2	34. 7	29. 0	13. 5
1. 94V	271. 0	218. 2	160. 9	112. 9	76. 7	61. 7	45. 5	40. 1	32. 4	27. 3	13. 1
GFM-400	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	666. 6	558. 3	413. 4	261. 4	154. 0	113. 0	76. 7	66. 1	52. 7	43. 8	19. 7
1. 65V	615. 9	520. 5	396. 0	247. 9	150. 5	110. 2	74. 8	65. 3	52. 0	43. 3	19. 6
1. 70V	575. 7	488. 0	364. 3	236. 8	144. 9	107. 1	74. 1	64. 4	51. 1	42. 7	19. 6
1. 75V	548. 6	462. 0	338. 6	225. 7	139. 9	103. 8	72. 1	63. 4	50. 5	42. 1	19. 3
1. 80V	527. 6	435. 6	316. 8	211. 5	133. 8	100. 6	70. 4	61. 8	49. 5	41. 1	19. 0
1. 83V	490. 8	409. 0	301. 6	198. 0	127. 8	97. 3	68. 7	60. 7	48. 6	40. 2	18. 6
1. 85V	467. 2	386. 3	282. 5	190. 9	120. 8	95. 4	68. 0	59. 8	48. 1	40. 0	18. 4
1. 88V	434. 3	352. 2	265. 3	182. 8	118. 1	93. 5	67. 3	58. 9	47. 5	39. 7	18. 2
1. 90V	401. 8	326. 6	242. 4	169. 5	113. 3	89. 5	65. 5	57. 6	46. 3	38. 6	18. 0
1. 94V	361. 3	290. 9	214. 5	150. 5	102. 3	82. 3	60. 7	53. 5	43. 2	36. 4	17. 4
GFM-500	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	833. 3	697. 9	516. 8	326. 7	192. 6	141. 3	95. 8	82. 7	65. 9	54. 7	24. 7
1. 65V	769. 8	650. 6	495. 0	309. 9	188. 1	137. 8	93. 5	81. 6	65. 0	54. 2	24. 6
1. 70V	719. 6	610. 0	455. 4	296. 0	181. 2	133. 8	92. 7	80. 5	63. 9	53. 4	24. 5
1. 75V	685. 7	577. 5	423. 2	282. 2	174. 8	129. 7	90. 1	79. 2	63. 1	52. 6	24. 2
1. 80V	659. 6	544. 5	396. 0	264. 3	167. 3	125. 7	88. 0	77. 2	61. 9	51. 4	23. 8
1. 83V	613. 5	511. 2	377. 0	247. 5	159. 8	121. 7	85. 9	75. 8	60. 8	50. 3	23. 3
1. 85V	584. 0	482. 8	353. 1	238. 6	151. 0	119. 3	85. 0	74. 7	60. 1	50. 0	23. 0
1. 88V	542. 9	440. 3	331. 7	228. 5	147. 7	116. 8	84. 2	73. 7	59. 4	49. 6	22. 8
1. 90V	502. 2	408. 3	302. 9	211. 9	141. 6	111. 9	81. 9	72. 0	57. 8	48. 3	22. 5
1. 94V	451. 6	363. 7	268. 1	188. 1	127. 9	102. 9	75. 8	66. 8	54. 1	45. 5	21. 8
GFM-600	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour

1. 60V	999. 9	837. 4	620. 1	392. 0	231. 1	169. 5	115. 0	99. 2	79. 1	65. 7	29. 6
1. 65V	923. 8	780. 7	594. 0	371. 8	225. 7	165. 4	112. 1	97. 9	78. 1	65. 0	29. 5
1. 70V	863. 5	732. 1	546. 5	355. 2	217. 4	160. 6	111. 2	96. 6	76. 6	64. 0	29. 3
1. 75V	822. 8	693. 0	507. 9	338. 6	209. 8	155. 6	108. 1	95. 0	75. 7	63. 1	29. 0
1. 80V	791. 5	653. 4	475. 2	317. 2	200. 8	150. 9	105. 6	92. 7	74. 3	61. 7	28. 5
1. 83V	736. 2	613. 5	452. 4	297. 0	191. 7	146. 0	103. 1	91. 0	72. 9	60. 4	27. 9
1. 85V	700. 8	579. 4	423. 7	286. 3	181. 2	143. 2	102. 0	89. 7	72. 1	60. 0	27. 6
1. 88V	651. 5	528. 3	398. 0	274. 2	177. 2	140. 2	101. 0	88. 4	71. 3	59. 5	27. 3
1. 90V	602. 6	489. 9	363. 5	254. 2	169. 9	134. 2	98. 2	86. 4	69. 4	58. 0	27. 0
1. 94V	542. 0	436. 4	321. 8	225. 7	153. 5	123. 4	91. 0	80. 2	64. 9	54. 6	26. 1
GFM-800	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	1158. 3	974. 6	792. 0	521. 9	320. 8	235. 5	154. 0	132. 7	103. 9	86. 0	39. 9
1. 65V	1086. 2	917. 4	722. 3	492. 6	311. 7	229. 2	152. 1	131. 1	103. 0	85. 5	39. 3
1. 70V	1020. 8	868. 1	660. 5	468. 1	301. 0	218. 9	148. 3	127. 9	101. 5	84. 2	39. 1
1. 75V	963. 0	817. 1	609. 0	441. 9	289. 9	213. 8	145. 7	126. 0	100. 1	83. 5	38. 8
1. 80V	909. 7	762. 0	570. 2	419. 8	281. 2	209. 1	142. 4	123. 6	98. 2	82. 4	38. 0
1. 83V	842. 6	701. 4	532. 2	396. 0	269. 3	202. 8	140. 2	122. 0	97. 6	82. 0	38. 0
1. 85V	781. 1	648. 2	501. 3	370. 7	253. 4	191. 8	133. 5	116. 8	94. 2	79. 0	36. 9
1. 88V	717. 1	586. 3	464. 1	336. 6	235. 6	180. 8	127. 2	111. 3	90. 8	76. 0	35. 8
1. 90V	639. 7	511. 8	416. 6	306. 5	211. 9	171. 3	120. 9	106. 0	85. 4	72. 0	34. 4
1. 94V	575. 8	465. 2	382. 5	275. 6	189. 1	146. 9	106. 3	93. 7	76. 6	65. 3	30. 6
GFM-1000	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	1447. 9	1218. 3	990. 0	652. 4	401. 0	294. 4	192. 5	165. 8	129. 8	107. 5	49. 8
1. 65V	1357. 7	1146. 7	902. 9	615. 8	389. 6	286. 4	190. 1	163. 8	128. 7	106. 9	49. 1
1. 70V	1276. 0	1085. 2	825. 7	585. 1	376. 2	273. 6	185. 3	159. 9	126. 8	105. 2	48. 9
1. 75V	1203. 7	1021. 4	761. 3	552. 4	362. 3	267. 3	182. 2	157. 5	125. 1	104. 3	48. 5
1. 80V	1137. 2	952. 5	712. 8	524. 7	351. 5	261. 4	178. 0	154. 4	122. 8	103. 0	47. 4
1. 83V	1053. 2	876. 8	665. 3	495. 0	336. 6	253. 4	175. 2	152. 5	122. 0	102. 5	47. 4
1. 85V	976. 3	810. 2	626. 7	463. 3	316. 8	239. 7	166. 8	146. 0	117. 8	98. 8	46. 1
1. 88V	896. 4	732. 9	580. 1	420. 8	294. 5	226. 1	159. 0	139. 1	113. 5	95. 0	44. 7
1. 90V	799. 6	639. 7	520. 7	383. 1	264. 8	214. 2	151. 1	132. 5	106. 8	90. 0	43. 0
1. 94V	719. 8	581. 5	478. 2	344. 5	236. 4	183. 6	132. 9	117. 2	95. 8	81. 7	38. 3
GFM-1500	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	2171. 8	1827. 4	1485. 0	978. 6	601. 4	441. 5	288. 7	248. 7	194. 7	161. 3	74. 7
1. 65V	2036. 6	1720. 1	1354. 3	923. 7	584. 3	429. 7	285. 1	245. 8	193. 1	160. 4	73. 7
1. 70V	1914. 0	1627. 7	1238. 5	877. 6	564. 3	410. 4	278. 0	239. 8	190. 3	157. 9	73. 4
1. 75V	1805. 5	1532. 1	1142. 0	828. 6	543. 5	401. 0	273. 2	236. 3	187. 7	156. 5	72. 7
1. 80V	1705. 7	1428. 8	1069. 2	787. 1	527. 2	392. 0	267. 0	231. 7	184. 1	154. 4	71. 2
1. 83V	1579. 8	1315. 2	997. 9	742. 5	504. 9	380. 2	262. 8	228. 7	183. 0	153. 7	71. 2
1. 85V	1464. 5	1215. 4	940. 0	695. 0	475. 2	359. 6	250. 2	219. 0	176. 7	148. 1	69. 1
1. 88V	1344. 6	1099. 3	870. 2	631. 1	441. 8	339. 1	238. 5	208. 6	170. 2	142. 6	67. 1
1. 90V	1199. 4	959. 5	781. 1	574. 7	397. 2	321. 3	226. 6	198. 7	160. 2	135. 0	64. 5
1. 94V	1079. 7	872. 2	717. 3	516. 8	354. 5	275. 3	199. 4	175. 7	143. 6	122. 5	57. 4
GFM-2000	5min	15min	30min	60min	2hour	3hour	5hour	6hour	8hour	10hour	24hour
1. 60V	2895. 8	2436. 6	1980. 0	1304. 8	801. 9	588. 7	384. 9	331. 7	259. 6	215. 0	99. 7
1. 65V	2715. 4	2293. 4	1805. 8	1231. 6	779. 1	572. 9	380. 2	327. 7	257. 4	213. 8	98. 2
1. 70V	2552. 0	2170. 3	1651. 3	1170. 2	752. 4	547. 1	370. 7	319. 8	253. 7	210. 5	97. 8
1. 75V	2407. 4	2042. 8	1522. 6	1104. 8	724. 7	534. 6	364. 3	315. 1	250. 2	208. 7	96. 9

1. 80V	2274. 3	1905. 1	1425. 6	1049. 4	702. 9	522. 7	356. 0	308. 9	245. 5	205. 9	94. 9
1. 83V	2106. 4	1753. 6	1330. 6	990. 0	673. 2	506. 9	350. 5	304. 9	244. 0	204. 9	94. 9
1. 85V	1952. 6	1620. 5	1253. 3	926. 6	633. 6	479. 5	333. 6	292. 1	235. 6	197. 5	92. 2
1. 88V	1792. 8	1465. 8	1160. 3	841. 5	589. 1	452. 1	318. 0	278. 2	227. 0	190. 1	89. 4
1. 90V	1599. 2	1279. 4	1041. 5	766. 3	529. 7	428. 3	302. 1	265. 0	213. 6	180. 0	86. 0
1. 94V	1439. 5	1163. 0	956. 3	689. 0	472. 7	367. 1	265. 8	234. 3	191. 5	163. 4	76. 6

3. Internal resistance and short circuit current

The internal resistance of the battery is a dynamic nonlinear parameter that is continuously changed along with the temperature and discharge state. The internal resistance is the lowest when battery is fully charged. The table 2-2 shows the internal resistance and short circuit current of Sunpal battery in fully charged state according to the IEC60896 standard. Pay attention to the battery to short-circuit causes the battery voltage to reduce to 0V, and will cause the battery internal component damage.

Table2-3 Internal resistance and short circuit current (25℃)

MODEL	Internal Resistance (m Ω)	Short Circuit Current (A)
GFM-200	0.7	3084
GFM-300	0.6	3960
GFM-400	0.50	5089
GFM-500	0.33	6009
GFM-600	0.28	7178
GFM-800	0.20	9061
GFM-1000	0.18	10696
GFM-1500	0.15	14068
GFM-2000	0.11	17217

Chapter Three Operation and Maintenance

1.Parameters

The 2V series battery in $-15^{\circ}\text{C} \sim 45^{\circ}\text{C}$ environment, the recommendation is suitable the temperature is $15^{\circ}\text{C} \sim 25^{\circ}\text{C}$. Using under the high or low temperature, can reduce the battery life. The next table is taking the 48V system as an example. The switching power supply parameter reference establishment value, different uses electricity the environment battery electric discharge. Because of the frequently power cut in the environment in four kind and above four kinds, the battery discharges frequently punishes at the same time in the sufficient insufficient condition. Therefore needs to enhance the floating voltage and the charging current by cause the battery in the short time the sufficient electricity. The user acts according to the locus the power supply category comparative table 3-1.

Table3-1 Switching power supply parameter establishment table

Parameter name	Below four kinds supplies power	Four kind and above four kinds supplies power
Floating Voltage (V)	54	54
Equalization Voltage (V)	56.4	56.4
Charging Current (A)	0.1C ₁₀	0.1C ₁₀
Limited Current For Charge (A)	0.20C ₁₀	0.20C ₁₀
Equalization Charge Cycle (day)	90	30
Equalization Charge Time (h)	24	24
Condition to Change Float Charge To Equalization Charge (mA/Ah)	>50	>50
Condition To Stop Equalization Charge (mA/Ah)	<5	<5
LVDS Broke Voltage (V)	44	45
LVDS Recover Voltage (V)	49	50
High Voltage Warning (V)	57.6	57.6
Low Voltage Warning (V)	46	47
Temperature Compensate Ratio With Floating Voltage (mV/°C per cell)	-3	-3
Temperature Compensate Rratio With Equalization Voltage (mV/°C per cell)	-5	-5
High Temperature Warning (°C)	35	35

2. Capacity and Influence Factor

The capacity of battery is the capacity that battery can be discharged on the established conditions, expressed as signal C. The usual unit of capacity is ampere-hour, shortened as AH.

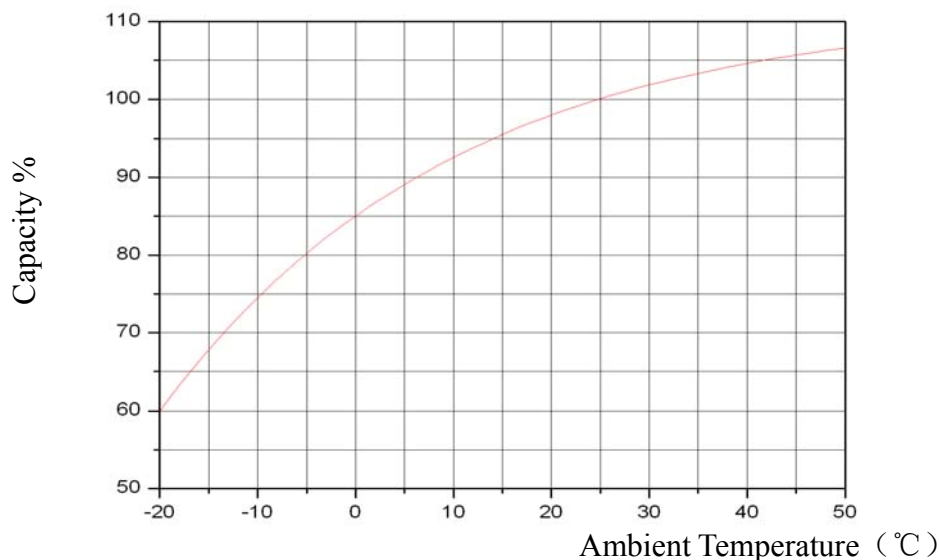
The capacity can be expressed in Rated Capacity or Actual Capacity. The Rated Capacity of 2V Series battery please see Table 1-1. The Actual Capacity is the product of the discharge current and the discharge time, the unit is AH.

3. Ambient temperature Vs. Battery

Temperature affects capacity of the battery. Fig. 3-1 is the available capacity (10h rate) curve vs. ambient temperature. From Fig. 3-1, if the temperature is too low, the capacity will decrease. for example, the capacity will decrease 20% if temperature decreases from 25 °C to 0°C; And too low temperature will cause battery long term insufficient charged, also will cause no discharge and negative plates sulfate.

The capacity will increase when temperature rises. For example the capacity will increase 5% if temperature raise 10°C. But it will quicken up plates' corrosion and water loss if temperature rises, shortens battery's life.

Fig.3-1 Available Capacity (10h rate) Curve VS. Ambient Temperature



Temperature and Floating Voltage, Equalization voltage

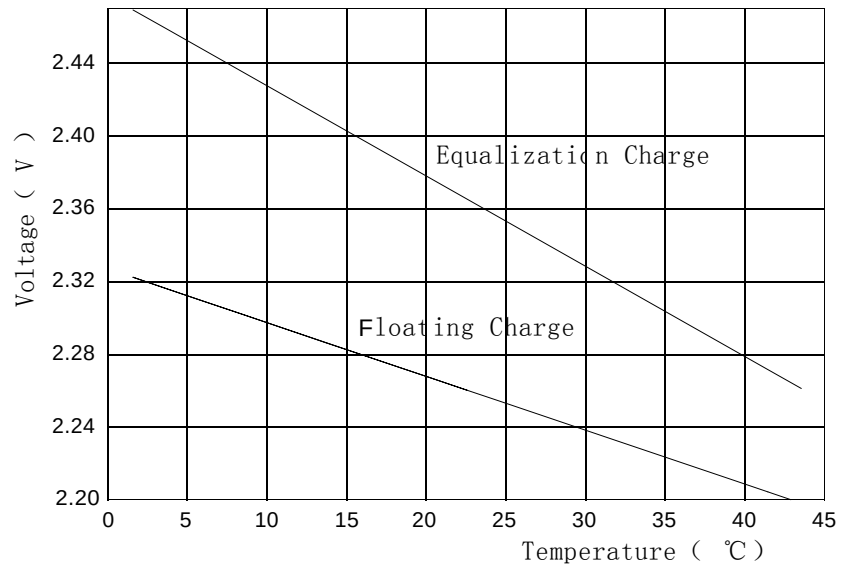
The purpose of choosing certain floating voltage is to reach the designed life and rated capacity of the battery. If the floating voltage is higher, then the floating current is also higher; it will accelerate the corruption the grid and shorten the life of the battery. If the floating voltage is lower, the battery can't be kept in fully charged state, this will crystallize PbSO_4 , decrease the capacity, and also shorten the life of the battery.

At 25°C, if the floating voltage is 2.25V, In other degree, please adjust according to Table 3-2. Valve regulated sealed lead sealed lead acid battery need to carry the equalizing charge regularly, in order to guarantees the battery normal operation. At 25°C, Sunpal battery's Equalization voltage is 2.35V~2.40V. It need to be changed by ambient temperature, the temperature compensation coefficient is -5mV/°C /cell.

Table 3-2 Relationship of ambient temperature and voltage

Ambient Temperature (°C)	Float Voltage (V/cell)	Equalization voltage (V/cell)
5	2.31	2.45
10	2.3	2.43
15	2.28	2.4
20	2.27	2.38
25	2.25	2.35
30	2.24	2.33
35	2.22	2.3
40	2.21	2.28

Fig.3—2 The Voltage Setting Curve Vs. Ambient Temperature



Ambient temperature Vs. Battery Life

The heat disseminates performance of VRLA battery is bad, it's liable to cause heat run away when heat accumulates. When temperature exceeds 25°C, the battery life will decrease half per 10°C temperature raise.

$$L_{25} = L_T \times 2^{(T-25)/10}$$

Notes: T the actual ambient temperature;

L_T is designed life at T ambient temperature

L_{25} is designed life at 25°C ambient temperature

Ambient temperature elevating, also will accelerate the battery slab lattice corrosion and the battery moisture content loss, thus will greatly reduce the battery the life. So suppose to control the ambient temperature, after the quantity of heat accumulating to the certain degree can damage the battery, seriously will be able to cause hotly loses control. If indoor temperature reaches too high, improves the ambient temperature. The battery spacing cannot to be less than 10mm, at the same time according to handbook request regulating cell floating and Equalization voltage value.

4. Choose battery

If you choose Sunpal 2V Series battery, please refer to diagram 3-3 monomer lectotype curve for selecting battery capacity.

- 1) Firstly, confirm the end-of-discharge voltage. For example, end voltage for single battery is 1.80V.
- 2) Secondly, confirm the continuous working period of battery group and its discharge current. For example, it is required to reach 125A of constant flow output during the power supply period of battery group for continuous 3 hours; then according to the corresponding curve in diagram 2-3, the minimum capacity requirement will be GFM-500.
- 3) Lastly, confirm the ambient temperature. Room temperature at 25°C, please choose GFM-500; Otherwise, please refer to diagram 3-1 to confirm the temperature coefficient, i.e., if temperature bellows 0°C, the capacity will reach 80% while it is around 25°C, in that case, please divided by 0.8.
- 4) In order to assure the service life of battery, the depth of discharge should not reach too deep every time, that is to say, it's better not to exceed more than 80%. Especially for those areas that use electricity more frequently, there will always have spare capacity every time after discharge; it's more important to prevent the damage caused by long-term of lack of capacity.

5.Requirement for Charge

Equalization Charge

The battery needs an equalization charge floating operation over three months, and the voltage of at least two batteries are lower than 2.18V. The method of equalization charge is suggested as follows: Charge with 2.35V/Cell for 24 hours, limiting 0.1C₁₀A ~ 0.15C₁₀A, when the average voltage raise to Equalization

voltage, charge by Equalization voltage for 24 hours.

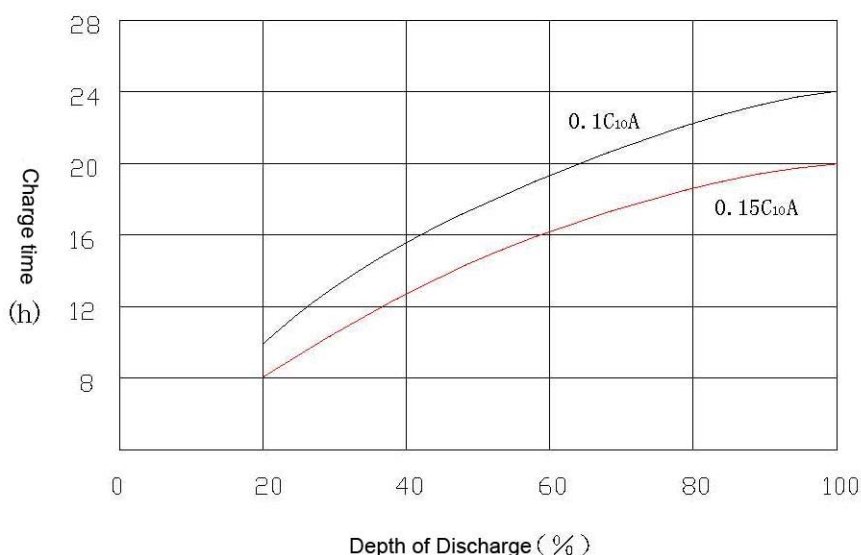
Charge

After discharge, the batteries should be charged in time. The method is recommended as Charge with 2.35V/Cell for 24 hours, limiting $0.1C_{10}A \sim 0.15C_{10}A$.

Whether the batteries are fully charged can be decided according to any one of two standards as follows;

1. See following table, table3-3 is in different discharge, the time need for $0.1C$ and $0.15CA$ battery.
2. On condition of constant voltage, the value of charge current hasn't varied for continuous three hours.

Fig .3-3 The relationship between DOD and charge time



6. Storage

All lead acid batteries lose capacity when standing on open circuit because self-discharge. The result is that the voltage of open circuit is decreased, and the capacity also decreased. During storage please note:

- The self-discharge rate is related with ambient temperature. The self-discharge degree is smaller when the ambient temperature is lower, otherwise is larger. The requirement temperature of Sunpal batteries' storage environment is from $0^{\circ}C$ to $35^{\circ}C$. The storage place must be clean, ventilated and dry.
- An important parameter in storage is open circuit voltage, which is related with density of the electrolyte. In order to avoid permanent damage to the plate caused by self-discharge, the batteries should be supplementary charged if they have been stored for three months. The equalization charge method should be adopted.
- During storage, if the open circuit voltage is lower than 2.10V/Cell, the batteries should be supplementary charged before use. The equalization charge method should be adopted.
- All batteries, which are ready to store, should be fully charged before storage.

It's suggested record the storage time in the periodic maintenance record and record the time when another necessary supplementary charge should be made. The quality certificates of Sunpal batteries record the latest charge time of the batteries, next charge time can be calculated according to this charge time.

7. Maintenance

In order to assure service life, the batteries should be correctly inspected and maintained. The maintenance methods of Sunpal batteries are recommended as follows:

Monthly Maintenance

Implement the under-mentioned inspection every month:

- Keep the battery-room clean.
- Measure and record the ambient temperature of the battery-room.
- Check each battery's cleanness; check damage and overheating trace of the terminal, container and lid.
- Measure and record the total voltage and floating current of the battery system.

Quarterly Maintenance

- Repeat monthly inspection.

Measure and record floating voltage of every on-line battery. If more than two cells' voltage is less than 2.18V after temperature adjustment, the batteries need to be equalization charged. If the problem still exists after adopting above-mentioned measures, the batteries need yearly maintenance or even three years' maintenance. If all methods are ineffective, please contact us

Yearly Maintenance

- Repeat quarterly maintenance and inspection.
- Check whether connectors are loose or not every year.

Make a discharge test to check with exact load every year, discharging 30-40% of rated capacity. Make a capacity test every three years and every year after six years' operation. If the capacity of the battery decreases to lower than 80% of rated capacity, the battery should be replaced.

Operation and Maintenance Precautions

Insufficient Charge

If the floating voltage is not set correctly (too low or not amend according to temperature), the battery system will in an insufficient charge state for a long period of time. When the electricity is out, the battery may not be able to work because the acid is satirized and the capacity is decreased.

Over Charge

Please do not neglect the performance of rectify to transfer floating charge to equalization charge. If the rectify cannot transfer charge modes because of its wrong performance or no adjustment, the battery system is always in an equalization charge state. Thus may cause serious problems for battery, such as water loss, life decrease, heat out of control, deformation, etc.

Too low or too high temperature

We have mentioned that too low temperature will affect the capacity of battery.

While too high temperature will also cause problems, such as water loss, life decrease, heat out of control, deformation, etc.

Too low end voltage

The end voltage is also an important parameter for battery. The battery shall stop discharge when reach a certain voltage (The normal end voltage is 1.8V). If the end voltage is too low, it will be difficult to recharge the battery and decrease the charge efficiency, thus reduce the life of battery.

Long time after discharge

If the battery is put aside without charge for a long time (2 hours above) after discharge, it will affect the capacity and life of the battery. Because some large size PbSO_4 will create in the negative which are difficult to transfer to active Pb.

After-sales Service / Customer Service Hotline

P.R. China:

Sunpal Power Co., Ltd.

Add:No. 398 Ganquan Road, Hefei, Anhui, China.

Tel:+86 551 6586 5992 Fax:+86 551 6586 5992

Email:info@sunpalpower.com

www.sunpalbattery.com

Annex 1

VRLA Battery Regular Maintenance Record

Type		Place	
Status		Number of battery	
Total Voltage (V)	Current (A)	Temperature	
No.	Voltage (V)	No.	Voltage (V)
1		13	
2		14	
3		15	
4		16	
5		17	
6		18	
7		19	
8		20	
9		21	
10		22	
11		23	
12		24	
Check by sight			
Result:			
Tester:		Date:	