VALVER REGULATED SEAL LEAD ACID BATTERY

GFM 12V Series

OPERATION MANUAL

Version：V1.5

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Security Instructions

Please read this manual! It provides very important information for security, installation and operation. The information will allow your equipment give a better performance and longer service life.

■ Do not try to take apart batteries. The spare parts are not inside the battery. Maintenance works should be done by professionals.

■ The replacement should be made or supervised by professionals with suitable protection. The batteries for replacement should be same as the old ones in model and type.

■ Warning——Do not smoke or use fire near batteries.

■ Warning——Do not use any organic cleanser to clean batteries.

■ Warning——Do not put the batteries on fire, or they will explode

■ Warning——Do not cut open the batteries. They contain electrolyte which is toxic to skin and eyes.。

■ Warning——Batteries may cause shock and short. Please remove the watch and jewelry such as rings when replace the battery. Also please operate with insulating tools.

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. Features

1.1. Long life

1.1.1. 4BS paste technology

1.1.2. Special Paste Formula

1.1.3. Special Patented grid alloy

1.1.4. Thick Plate Design

1.2. Reliable Seal Technology

1.2.1. High precise ABS heat heal technology;

1.2.2. The seal recombination efficiency reaches up to 99.0%;

1.2.3. Reliable post seal structure;

1.2.4. Integrated valve design to ensure precise and reliability.

1.3. Excellent high rate discharge performance

1.3.1. Through-the-portion Welding and low internal Resistance.

1.3.2. Radical Grid Design.

1.3.3. Patented Paste Technology.

1.3.4. Silver Coated Flexible Connector

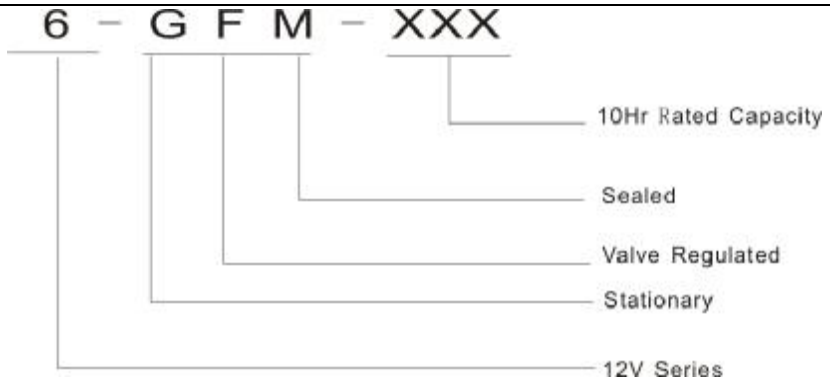
2. Main Applications

2.1. Communication System

2.2. UPS

2.3. Electricity Power System

3. Indication of type



4. Types and Dimensions

Tab.1-1 Types and Dimensions

Type	Normal Voltage （V）	Rated Capacity C10(Ah)	Dimensions(mm)				WT (Kg)
			L	W	H	T.H	
6-GFM-33	12	33	195	130	156	180	10.5
6-GFM-38	12	38	196	130	176	176	12.9
6-GFM-50	12	50	260	133	203	203	16.2
6-GFM-65	12	65	330	173	168	174	21
6-GFM-70	12	70	330	173	168	174	22.6
6-GFM-85	12	85	330	173	216	222	26.5
6-GFM-100	12	100	330	173	216	222	30
6-GFM-120	12	120	412	173	209	237	35
6-GFM-150	12	150	483	170	241	241	43
6-GFM-200	12	200	200	522	240	210	60

5. Working Principal

$$Pb + PbO_2 + 2H_2SO_4 \underset{CHA}{\overset{DCH}{\rightleftharpoons}} 2PbSO_4 + 2H_2O$$

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

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

$$2H_2O \longrightarrow H_2\uparrow + O_2\uparrow \qquad A$$

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

GFM 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 prevent 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 B and C:

$$2Pb + O_2 \rightarrow 2PbO \qquad \text{B}$$

$$PbO + H_2SO_4 \rightarrow PbSO_4 + H_2O \qquad \text{C}$$

So it is possible to build GFM battery in sealed structure.

Chapter Two Technical Characteristics

1. Charge Characteristics Curve

Fig. 2-1 Recharge characteristics curve of with initial 0.1C10A current and limit voltage 2.40V/cell (25).The fully discharged battery can be charged 110% capacity after 24 hours.

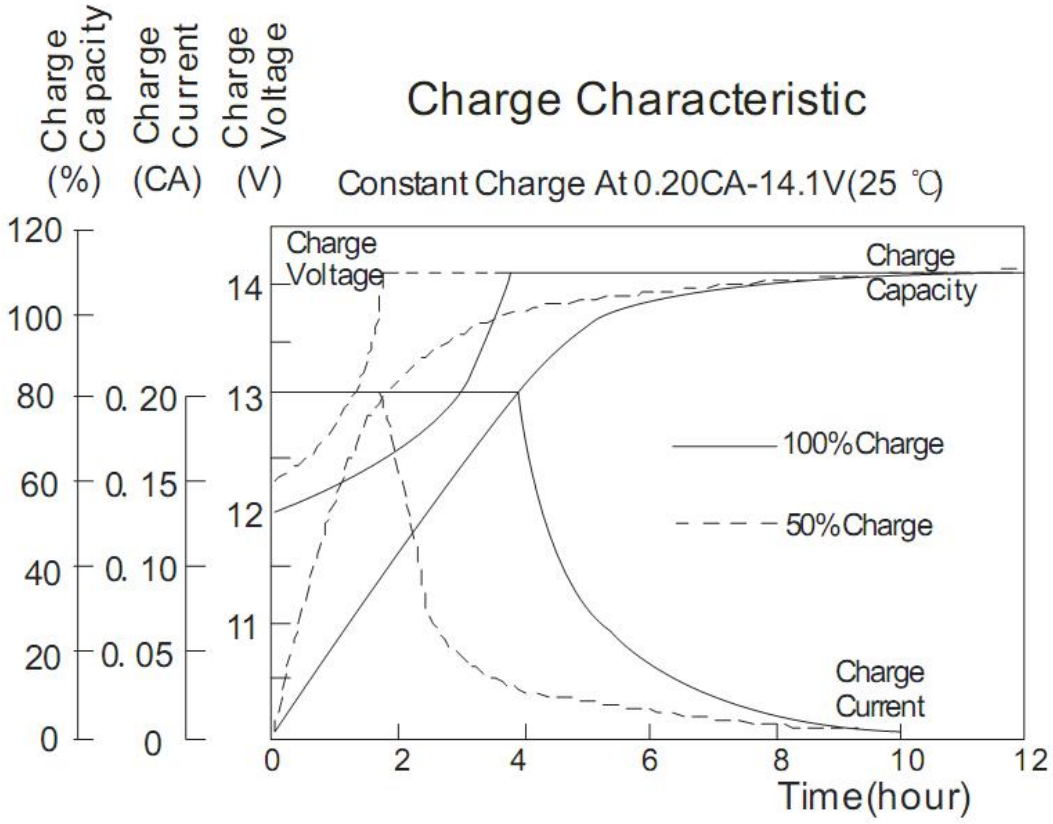


Figure 2.1 Costant Voltage Limited Current Charge Curve

2. Discharge Characteristics Curve

Fig.2-2、 2-3 are the discharge performance curves with different current （0.1C10～1.0C10） at 25 ℃. The end voltage is 1.75V/cell.

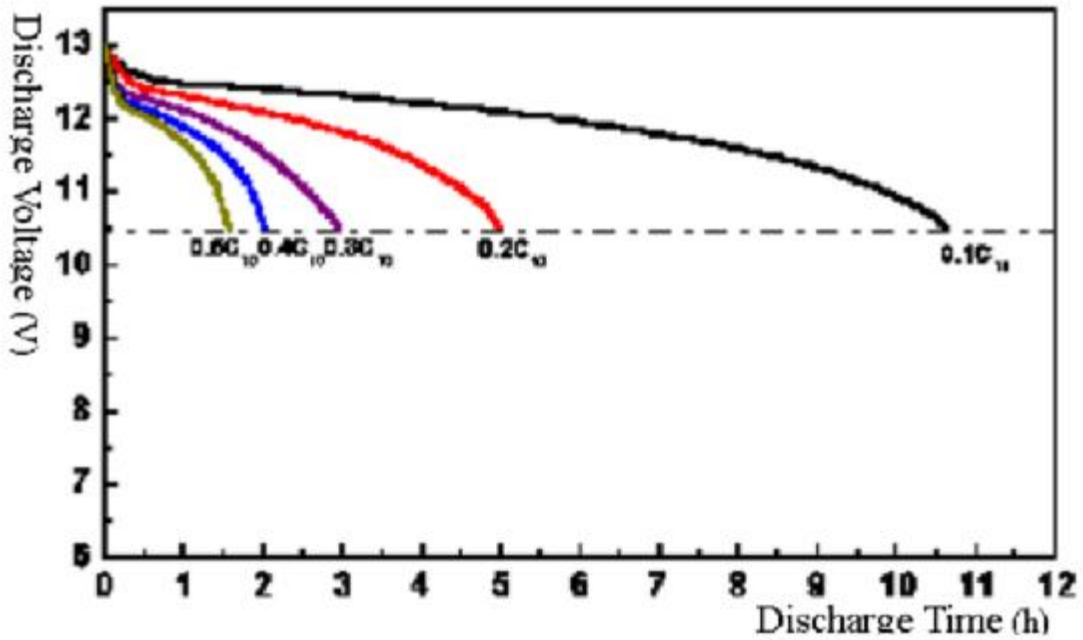


Fig. 2-2 Discharge Curve with the current of 0.1 C10～0.5 C10A（25℃）

Explanation for fig. 2-1：let us make 6-GFM-100 battery as an example. The C10 of 6-GFM-100 is 100Ah，so when discharge with 0.2C10 , i.e.0.2×100＝20A，The discharge voltage and discharge time is shown by 0.2C10 curve.

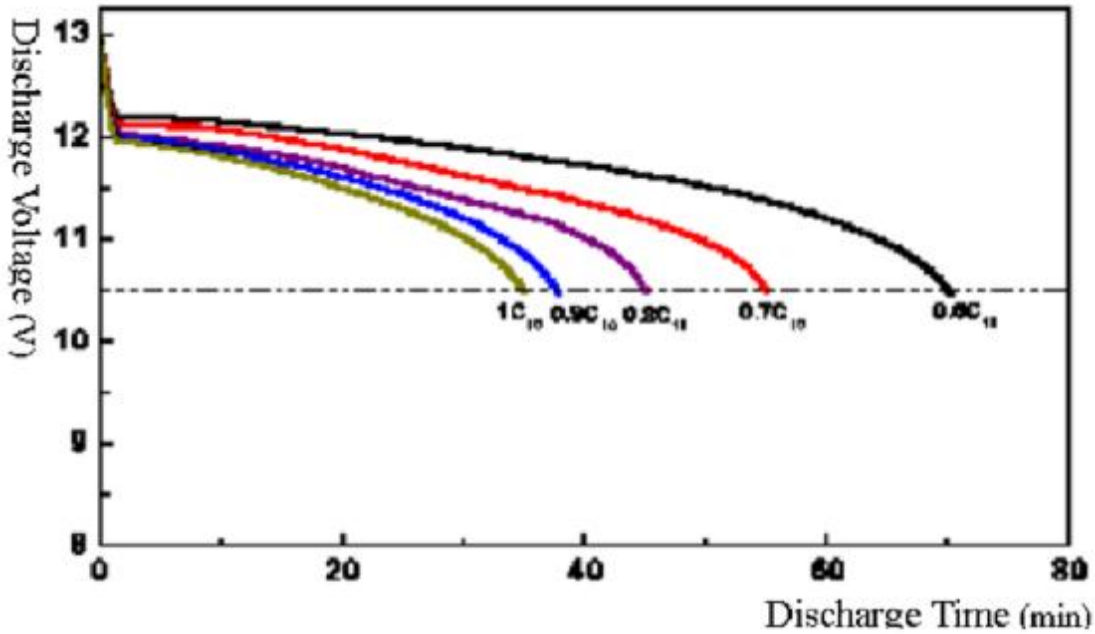


Fig. 2-3 Discharge Curve with the current of 0.6 C10～1.0 C10A（25℃）

Explanation for fig. 2-3：let us make 6-GFM-100 battery as an example. The C10 of 6-GFM-100 is 110Ah，so when discharge with 0.8C10 , i.e.0.8×100＝80A，The discharge voltage and discharge time is shown by 0.8C10 curve.

Fig.2-4 are the curves at different discharge rate (20～50 hours rate) at 25℃. The end

voltage is 1.85V/cell and 1.80V/cell

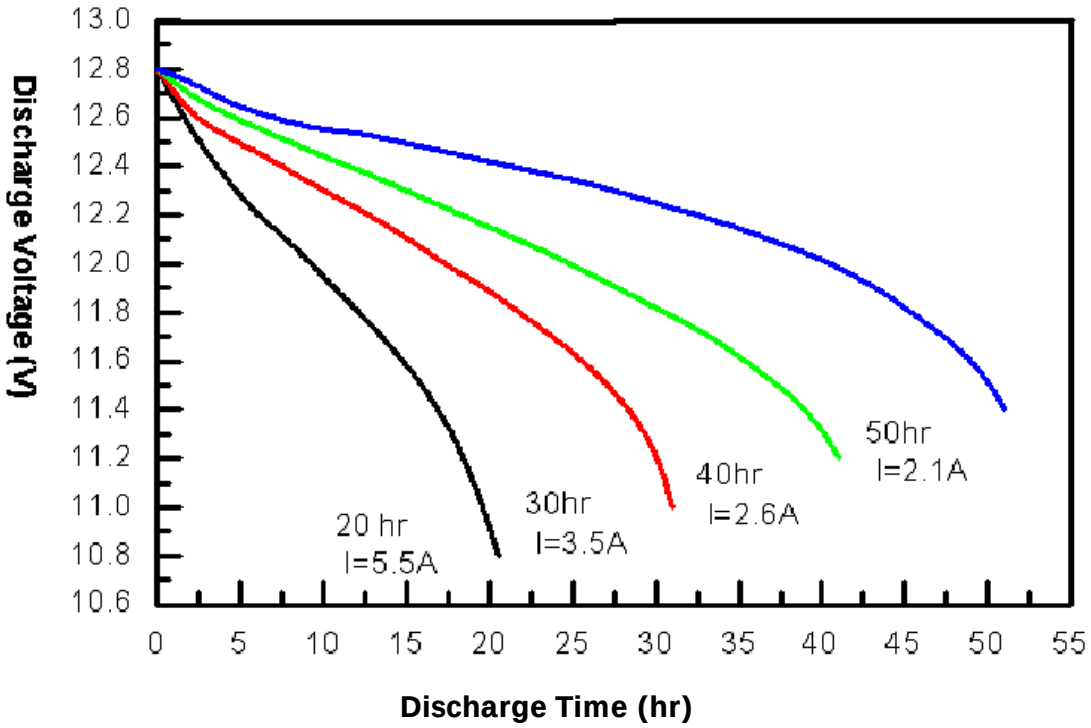


Fig.2-4 Discharge Curve at 20～50 hours rate（25℃）

Fig.2-5 are the discharge time curves at different discharge current (10A～5A) at -15℃. The end voltage is 1.75V./cell.

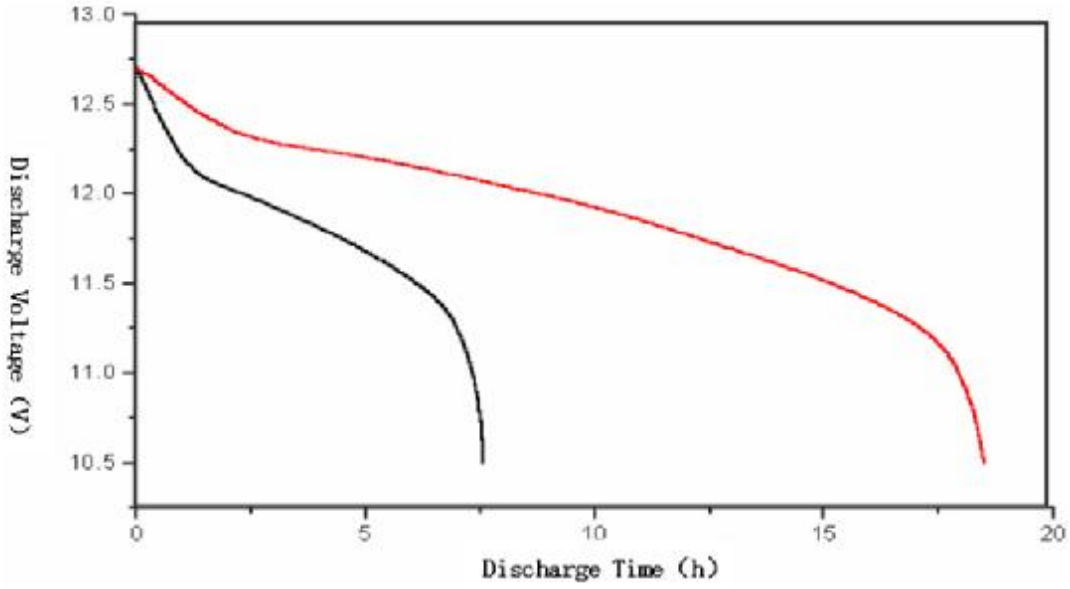


Fig.2-5. Discharge Curves with Current of 5A、10A at low temperature（-15℃）

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 2-1 shows the internal resistance and short circuit current in fully charged state

Type	Internal Resistance(mΩ)	Short Circuit Current (A)
6-GFM-33	10	850
6-GFM-38	9	900
6-GFM-50	7	1300
6-GFM-65	6	1365
6-GFM-70	6	1700
6-GFM-85	5	1800
6-GFM-100	4.5	2200
6-GFM-120	4	2400
6-GFM-150	3.7	2700
6-GFM-200	3.5	3300

Note: Short circuit current will decrease the voltage of the battery to 0V, and damage the internal components of the battery.

4. The discharge data of GFM 12V series

Table 2-2 Constant current discharge characteristic Units: Amperes(25℃)

6-GFM-33

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	34.9	19.8	11.8	8.5	5.5	3.9	3.2	1.7
1.65V	35.8	19.8	11.8	8.5	5.5	3.9	3.2	1.7
1.70V	34.1	19.5	11.8	8.5	5.5	3.9	3.2	1.7
1.75V	33.8	19.3	11.6	8.3	5.6	3.9	3.1	1.7
1.80V	31.9	19	11.3	8	5.2	3.6	3.1	1.6
1.85V	29.4	19	11	7.7	5.2	3.3	3	1.6

6-GFM-38

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	40.2	22.8	13.6	9.8	6.3	4.4	3.7	2
1.65V	41.2	22.8	13.6	9.8	6.3	4.4	3.7	2
1.70V	39.3	22.5	13.6	9.8	6.3	4.4	3.7	1.9
1.75V	39	22.2	13.3	9.5	6.5	4.4	3.6	1.9

1.80V	36.7	21.9	13	9.2	6	4.1	3.5	1.9
1.85V	33.9	21.9	12.7	8.9	6	3.8	3.4	1.9

6-GFM-50

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	52.9	30	17.9	12.9	8.3	5.8	4.9	2.6
1.65V	54.2	30	17.9	12.9	8.3	5.8	4.8	2.6
1.70V	51.7	29.6	17.9	12.9	8.3	5.8	4.8	2.5
1.75V	51.3	29.2	17.5	12.5	8.5	5.8	4.8	2.5
1.80V	48.3	28.8	17.1	12.1	7.9	5.4	4.6	2.5
1.85V	44.6	28.8	16.7	11.7	7.9	5	4.5	2.5

6-GFM-65

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	68.8	39	23.3	16.8	10.8	7.6	6.4	3.4
1.65V	70.4	39	23.3	16.8	10.8	7.6	6.3	3.4
1.70V	67.2	38.5	23.3	16.8	10.8	7.6	6.3	3.3
1.75V	66.6	37.9	22.8	16.3	11.1	7.6	6.2	3.3
1.80V	62.8	37.4	22.2	15.7	10.3	7	6	3.2
1.85V	58	37.4	21.7	15.2	10.3	6.5	5.9	3.2

6-GFM-70

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	70.7	40.2	24.9	18.5	12.5	8.7	7.4	4.3
1.65V	69.8	39.6	24.5	18.3	12.3	8.6	7.3	4.3
1.70V	68.8	39.1	24.2	18	12.1	8.5	7.2	4.2
1.75V	67.9	38.5	23.9	17.8	12	8.4	7.1	4.1
1.80V	66.9	38	23.5	17.5	11.8	8.3	7	4.1
1.85V	66	37.5	23.2	17.3	11.6	8.1	6.9	4

6-GFM-85

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	85.9	48.8	30.2	22.5	15.1	10.6	9	5.2
1.65V	84.7	48.1	29.8	22.2	14.9	10.5	8.9	5.2
1.70V	83.6	47.4	29.4	21.9	14.7	10.3	8.7	5.1
1.75V	82.4	46.8	29	21.6	14.5	10.2	8.6	5
1.80V	81.3	46.1	28.6	21.3	14.3	10	8.5	4.9
1.85V	80.1	45.5	28.2	20.9	14.1	9.9	8.4	4.9

6-GFM-100

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	101.1	57.4	35.5	26.4	17.8	12.5	10.6	5.7

1.65V	99.7	56.6	35.1	26.1	17.6	12.3	10.4	5.6
1.70V	98.3	55.8	34.6	25.7	17.3	12.1	10.3	5.5
1.75V	97	55	34.1	25.4	17.1	12	10.1	5.4
1.80V	95.6	54.2	33.6	25	16.9	11.8	10	5.3
1.85V	94.2	53.6	33.1	24.6	16.6	11.6	9.9	5.2

6-GFM-120

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	121.3	68.8	42.6	31.7	21.4	15	12.7	6.8
1.65V	119.6	67.9	42.1	31.3	21.1	14.8	12.5	6.7
1.70V	118	66.9	41.5	30.9	20.8	14.6	12.3	6.6
1.75V	116.4	66	40.9	30.4	20.5	14.4	12.2	6.5
1.80V	114.7	65.1	40.3	30	20.2	14.2	12	6.4
1.85V	113.1	64.3	39.8	29.6	19.9	14	11.8	6.2

6-GFM-150

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	151.6	86	53.3	39.6	26.7	18.7	15.9	8.6
1.65V	149.5	84.9	52.6	39.1	26.4	18.5	15.6	8.4
1.70V	147.5	83.7	51.9	38.6	26	18.2	15.4	8.3
1.75V	145.4	82.5	51.2	38	25.7	18	15.2	8.1
1.80V	143.4	81.3	50.4	37.5	25.3	17.7	15	8
1.85V	141.4	80.4	49.7	37	24.9	17.4	14.8	7.8

6-GFM-200

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	202.1	114.7	71.1	52.9	35.6	24.9	21.1	11.4
1.65V	199.4	113.1	70.1	52.1	35.2	24.6	20.9	11.2
1.70V	196.7	111.6	69.2	51.4	34.7	24.3	20.6	11
1.75V	193.9	110	68.2	50.7	34.2	23.9	20.3	10.8
1.80V	191.2	108.4	67.2	50	33.7	23.6	20	10.6
1.85V	188.5	107.1	66.3	49.3	33.2	23.3	19.7	10.4

Table 2-3 Discharge data with constant power Units: Watts per cell(25℃)

6-GFM-33

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	392.7	244.2	141.9	99	64.4	44.6	36.3	21.5
1.65V	379.5	242.6	140.3	99	64.4	44.6	36.3	21.5
1.70V	372.9	237.6	138.6	99	64.4	44.6	36.3	21.5
1.75V	353.1	236	135.3	97.4	64.4	42.9	36.3	21.5

1.80V	348.2	229.4	133.7	95.7	62.7	42.9	36.3	19.8
1.85V	325.1	214.5	128.7	92.4	59.4	39.6	34.7	19.8

6-GFM-38

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	452.2	281.2	163.4	114	74.1	51.3	41.8	24.7
1.65V	437	279.3	161.5	114	74.1	51.3	41.8	24.7
1.70V	429.4	273.6	159.6	114	74.1	51.3	41.8	24.7
1.75V	406.6	271.7	155.8	112.1	74.1	49.4	41.8	24.7
1.80V	400.9	264.1	153.9	110.2	72.2	49.4	41.8	22.8
1.85V	374.3	247	148.2	106.4	68.4	45.6	39.9	22.8

6-GFM-50

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	595	370	215	150	97.5	67.5	55	32.5
1.65V	575	367.5	212.5	150	97.5	67.5	55	32.5
1.70V	565	360	210	150	97.5	67.5	55	32.5
1.75V	535	357.5	205	147.5	97.5	65	55	32.5
1.80V	527.5	347.5	202.5	145	95	65	55	30
1.85V	492.5	325	195	140	90	60	52.5	30

6-GFM-65

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	773.5	481	279.5	195	126.8	87.8	71.5	42.3
1.65V	747.5	477.8	276.3	195	126.8	87.8	71.5	42.3
1.70V	734.5	468	273	195	126.8	87.8	71.5	42.3
1.75V	695.5	464.8	266.5	191.8	126.8	84.5	71.5	42.3
1.80V	685.8	451.8	263.3	188.5	123.5	84.5	71.5	39
1.85V	640.3	422.5	253.5	182	117	78	68.3	39

6-GFM-70

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	732	441	294	228	149	99	84	45
1.65V	723	438	292	227	148	98	83	45
1.70V	708	429	291	225	147	97	83	44
1.75V	692	419	290	224	146	96	82	44
1.80V	670	406	284	220	144	95	82	43
1.85V	641	389	275	215	140	94	81	43

6-GFM-85

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	889	536	357	277	181	120	102	55

1.65V	878	532	355	276	180	119	101	55
1.70V	860	521	353	273	179	118	101	53
1.75V	840	509	352	272	177	117	100	53
1.80V	814	493	345	267	175	115	99	52
1.85V	778	472	334	261	170	114	98	52

6-GFM-100

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	1046	630	420	326	213	141	120	64
1.65V	1033	626	417	324	211	140	119	64
1.70V	1011	613	416	321	210	139	119	63
1.75V	989	599	414	320	209	137	117	63
1.80V	957	580	406	314	206	136	116	61
1.85V	916	556	393	307	200	134	116	61

6-GFM-120

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	1255	756	504	391	255	170	144	77
1.65V	1239	751	501	389	254	168	142	77
1.70V	1214	735	499	386	252	166	142	75
1.75V	1186	718	497	384	250	165	141	75
1.80V	1149	696	487	377	247	163	140	74
1.85V	1099	667	471	369	240	161	139	74

6-GFM-150

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	1569	945	630	489	319	212	180	96
1.65V	1549	939	626	486	317	210	178	96
1.70V	1517	919	624	482	315	208	178	94
1.75V	1483	898	621	480	313	206	176	94
1.80V	1436	870	609	471	309	204	175	92
1.85V	1374	834	589	461	300	201	174	92

6-GFM-200

End Point Vol./Cell	30MIN	1H	2H	3H	5H	8H	10H	20H
1.60V	2091	1260	840	651	426	283	240	129
1.65V	2066	1251	834	649	423	280	237	129
1.70V	2023	1226	831	643	420	277	237	126
1.75V	1977	1197	829	640	417	274	234	126
1.80V	1914	1160	811	629	411	271	233	123
1.85V	1831	1111	786	614	400	269	231	123

Chapter Three Operation and Maintenance

1. Operation Condition

Ambient Temperature: -40℃～＋55℃(Best temperature 20℃～25℃)

Ambient Humidity: ≤95%

2. Capacity

2.1.Capacity of battery

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 GFM battery please see Table 1-1. The Actual Capacity is the product of the discharge current and the discharge time, the unit is AH.

2.2. The Influence Factor of the Actual Capacity

The actual capacity is mainly related with the positive and negative active materials and their utilization ratio. The utilization ratio of the materials is mainly influenced by the DOD, the structure of the battery and manufacture technology. In using process the factors that influence the actual capacity are discharge rate, depth of discharge, end voltage and temperature.

2.3. Discharge Rate

The discharge rate is often described as hour-rate and multiple rates.

If the discharge rate is higher and the discharge current is larger, then the discharge time is shorter, and the capacity which can be discharged is less.

2.4. End voltage

The end voltage is the lowest working voltage below which the battery can't be discharged any more or it will harm the battery. Usually the 10hr rate end voltage of GFM battery is 1.80V/cell. The batteries are not able to discharge more capacity even if the end voltage is lower because of characteristics of lead acid battery, yet the low end voltage makes great harm to the battery. It will greatly shorten batteries' life especially to discharge the battery to 0V while not to recharge in time. Thus the end voltage

should not be lower than what is described in table 3-1, or it will cause over-discharge and make recharge fail after several times of over-discharge.

Table 3-1 Discharge End-voltage

Discharge Current（A）	Discharge End Voltage（V/Cell）
I＜0.2C	1.8
0.2C≤I＜0.5C	1.7
0.5C≤I＜1.0C	1.55
I≥1.0C	1.3

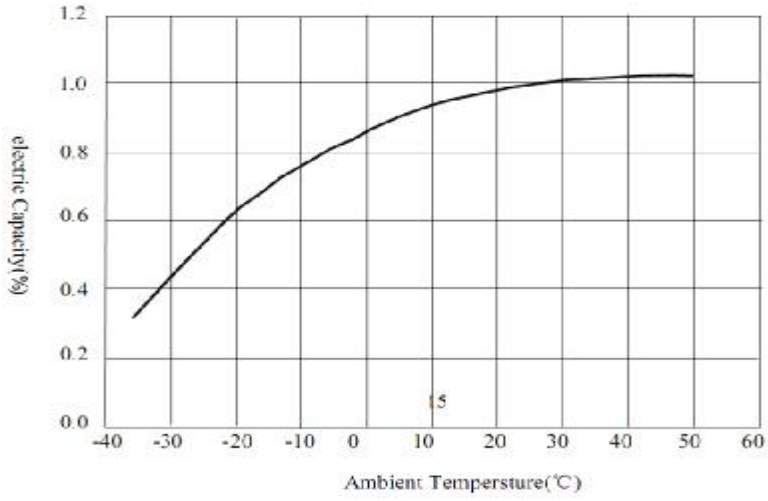
3. Temperature

3.1. Available Capacity Vs. Ambient Temperature

Temperature affects capacity of the battery. Fig. 3-1 is the available capacity curve vs. ambient temperature. if the temperature drops, the capacity will decrease, for example, the capacity will decrease to 80% of rated capacity if temperature decreases from 25℃ to 0℃; and too low temperature will cause battery long term insufficient charged, also will cause no discharge and negative plates sulfate.

Though VRLA battery can be operated at -15℃, the standard data is the test result at 25℃. The capacity will increase when temperature raises. For example the capacity will increase to 102% of rated capacity if temperature increase from 25℃ to 50℃. But it will quicken plates' corrosion and water loss if temperature raises, and shorten battery's life.

Fig.3-1 Available Capacity VS. Ambient Temperature



3.2. Temperature and Floating Voltage

The purpose of choosing proper floating voltage is to make the battery operate in a best condition. If the floating voltage is higher, then the floating current is also higher, it will accelerate corruption of the grid and shorten life of the battery. If the floating voltage is lower, the battery can't be kept in fully charged state; this will crystallize PbSO4, decrease the capacity, and also shorten the life of the battery.

At 25℃, the proper floating voltage for MP series is 2.25V/cell. And temperature compensate coefficient is -3mV/℃/cell.

The formula to calculate float voltage at different temperature:

VT=2.25-(T-25)×0.003

VT—Floating charge voltage at T temperature

Table 3-2 Floating charge voltage at different temperature

Ambient Temperature (℃)	Floating Voltage (V/Cell)
0	2.33
5	2.31
10	2.3
15	2.28
20	2.27
25	2.25
30	2.24
35	2.22
40	2.21

3.3. Temperature and equalization charge

VRLA battery needs equalization charge periodically to guarantee normal operation. At 25℃, the proper equalization voltage for MP series is 2.4V/cell. And temperature compensate coefficient is -5mV/℃/cell.

The formula to calculate equalization voltage at different temperature:

VT=2.4-(T-25)×0.005

VT—Equalization charge voltage at T temperature

Table 3-3 Equalization charge voltage at different temperature

Ambient Temperature（℃）	Equalization charge Voltage（V/Cell）
0	2.53
5	2.5
10	2.48
15	2.45
20	2.43
25	2.4
30	2.38
35	2.35
40	2.33

3.4. Ambient Temperature Vs. Battery Life

Higher temperature will harm the battery and reduce battery life. When temperature exceeds 25℃, the battery life will decrease half per 10℃ temperature raise. For example, the designed life of battery at 25℃ is 5 years, when battery operates at 35℃, the actual life is only 2.5 years.

t25＝tT×2（T－25）/10

Notes：T the actual ambient temperature;

tT is designed life at T ambient temperature

t25 is designed life at 25℃ ambient temperature

The heats disseminate performance of VRLA battery is bad, it's liable to cause thermal run away when heat accumulates. Please improve ventilation and temperature condition when room temperature is high. The distances between batteries should not be smaller than 10mm. Please also adjust the float voltage and equalization voltage according the manual.

4. Charge and discharge requirements

4.1. Equalization charge

Equalization charge is needed in following conditions:

— The voltage of at least two batteries are lower than 2.18V/cell

— Floating operation for more than three months

The method of equalization charge is: First charge the batteries on the constant current of not larger than 0.2C20A till the average voltage of the batteries increases to 2.40V/cell（25℃），then charge the batteries with constant voltage of 2.40V/cell, the time of equalization charge is 24 hours.

4.2. Charge

Charge the batteries in following conditions. The method is same as that of equalization charge.

— After discharge

— Finish installation

— Storage time is above three months and open circuit voltage is lower than 2.10V/cell.

If battery need to be fully charged as soon as possible, then fast charge method can be adopted: limit current less than 0.25C20A, charge voltage 2.40V/cell（25℃）. Whether the batteries are fully charged can be decided according to any one of two standards as follows:

— The charge time is 18-24 hours (the charge time can be shortened when the batteries were not deep discharged, e.g., the charge time of 20%DOD batteries can be shortened to 10 hours).

— On condition of constant voltage, the value of charge current hasn’t varied for continuous three hours.

5. Storage

All lead acid batteries experience self-discharge in open circuit. The result is that open circuit voltage decreases, and the capacity also decreases. During storage please note:

— The self-discharge rate is related with ambient temperature. The self-discharge rate is smaller when the ambient temperature is lower, otherwise is larger. The required temperature of MP batteries’ storage environment is from 0℃ to 35℃. The storage place must be clean, ventilated and dry.

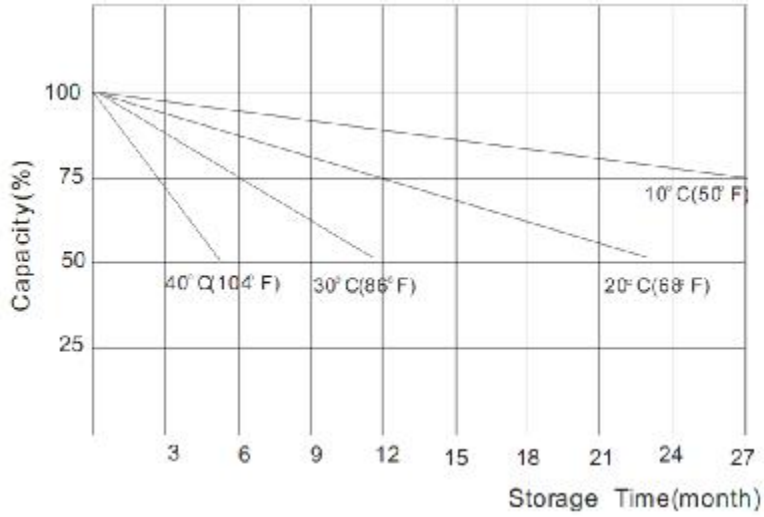
— An important parameter in storage is open circuit voltage, which is related with

density of the electrolyte. If the open circuit voltage is lower than 2.17V/cell, or have been stored for three months, the batteries should be supplemental charged to avoid damage caused by self discharge.

— All batteries, which are ready to store, should be fully charged before storage. It's suggested to record the storage time in the periodic maintenance record and record the time when another necessary supplemental charge should be made.

— The quality certificates and packages of MP batteries record the latest charge time of the batteries, next charge time can be calculated according to this charge time.

Fig. 3-2 Available Capacity VS. Storage Time at Different Ambient Temperature。



6. Maintenance

In order to assure service life, the batteries should be correctly inspected and maintained.

The maintenance methods of GFM batteries are recommended as follows

6.1. Monthly Maintenance

Implement following 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.

6.2. Quarterly Maintenance

— Repeat monthly inspection.

— Measure and record floating voltage of every on-line battery. If more than two cells' voltage is less than 2.17V/cell 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.

6.3. 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.

6.4. Three-year Maintenance

Make an 80% capacity test every year after three years' operation.

6.5. 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 1.80V/cell per block at 10h rate). 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.

— Put the battery aside after discharge

If the battery is put aside without charge for a long time after discharge, it will affect the capacity and life of the battery. Because some large size PbSO4 will create in the negative which are difficult to transfer to active Pb.

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