GasTon

VALVE REGULATED SEALED LEAD ACID BATTERY

Marathon Purpose(F, M) Series

OPERATION MANUAL

Version:V3.0

GASTON BATTERY INDUSTRIAL LTD

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Chapter One Product Introduction

1. Features

1.1 Basic Characteristics

1.1.1 Adopt the design of barren electrolyte and utilizes AGM (microporous glass fiber) separator. Thus there is an oxygen path existing between the positive and the negative plates. Also non-antimony grid is chosen to increase hydrogen evolution over-potential on the negative plate, which prevents generation of hydrogen, and as a result, no water loss. So during the service life, there will be no need to add acid and water, nor to adjust the density of the solution.

1.1.2 Reliable seal performance, no acid spillage to cause equipment erosion.

1.1.3 The design life of 10 years and low self-discharge.

1.1.4 Compact structure, shock-proof and high specific energy design.

1.2 Reliable Seal Technology

1.2.1 Container and lid made of reinforcing ABS plastic. Adopt new-type glue which can combine to ABS strongly. The glue conquers epoxy’s weaknesses of aging and brittleness. And ensures no leakage of solution between container and lid.

1.2.2 Explosive proof valve with an acid filtering structure. If the pressure inside the battery exceeds a certain value, the safety valve will automatically open to decrease the pressure. And it will not close until the pressure is normal. The acid filtering structure in the safety valve prevents emission of acid mist when the safety valve opens.

1.2.3 The patented post seal technology ensures the reliability of post seal..

1.3 Excellent high rate discharge performance

1.3.1 Adopt side posts with large sectional area, and this construction made internal resistance very low

1.3.2 Superior design grid construction, raise the high rate discharge performance.

1.4 Unique Construction Design Created by Gaston in China (12-100F, GT12-155F,GT-200M)

1.4.1 Long and narrow construction design, good heat dispersing ability

1.4.2 Both positive and negative post are in one side of the battery, easy for monitoring and maintenance.

1.4.3 Flexible connectors

2. Indication of Type

GT 12 - XXX F(M)------------ Front terminal (Marathosan Purpose)

XXX — 10H Rated Capacity

12 — 12V

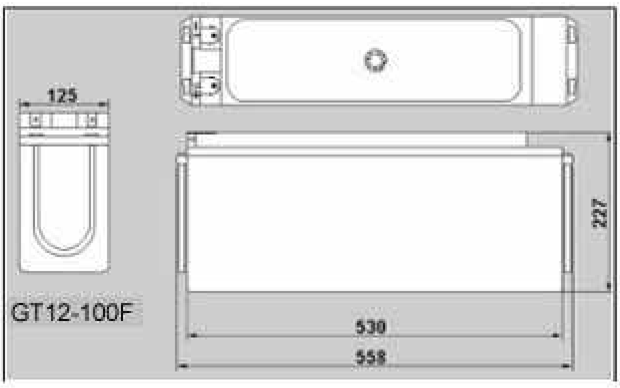
GT — GASTON

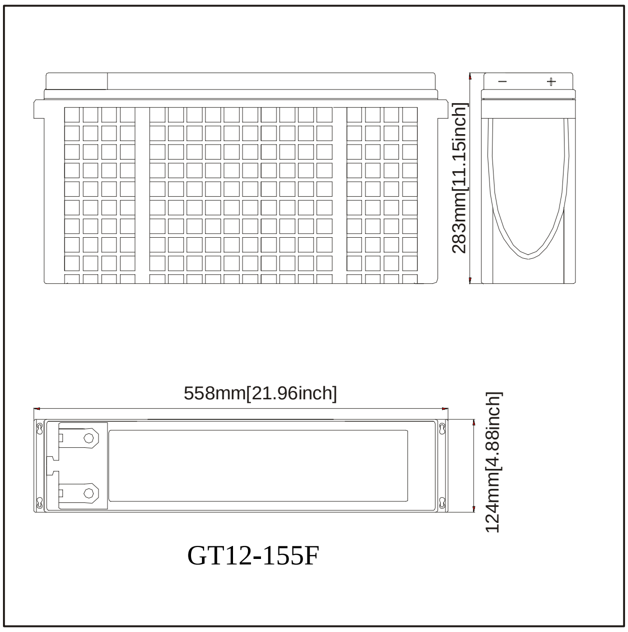
3. Types & Dimensions

Table 1-1 Capacity and Weight

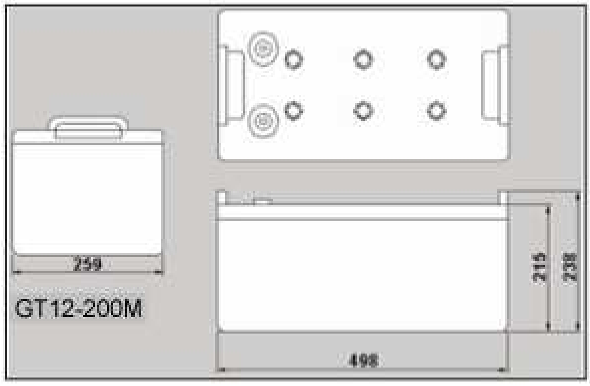
Type	Rated Voltage(V)	Rated Capacity C_{10} (Ah)	Dimension(mm)			Weight (Kg)
			Length	Width	Height	
GT12-100F	12	100	558	125	227	39
GT12-155F	12	160	558	124	283	54
GT12—200M	12	200	498	259	238	74.5

4. Outline of the battery



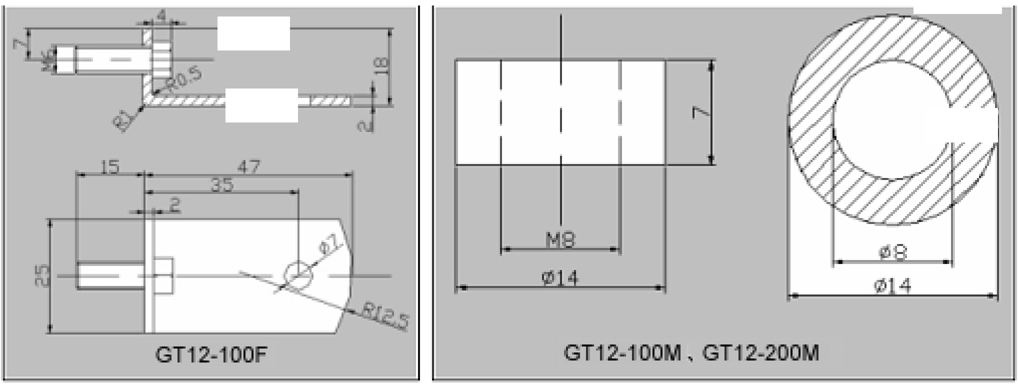


GT12-155F



GT12-200M

5. Terminals



GT12-100F
GT12-100M、GT12-200M

Chapter Two   Technical Characteristics

1. Capacity and influence factors

1.1 The capacity of battery is the capacity that battery can be discharged under certain 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 please see Table 1-1. The Actual Capacity is the product of the discharge current and the discharge time, the unit is Ah.

1.2 The Influence Factor of Actual Capacity

The actual capacity is mainly related with the battery's construction, manufacturing process and operation circumstance. During operation, the factors that influence the actual capacity are discharge rate, end voltage, ambient temperature and discharge time.

1.2.1 Discharge Rate

If the discharge rate (hour rate) is smaller, the discharge current is larger, and the discharge time is shorter, then the capacity which can be discharged is less. For example, the discharge current of 3 hours rate is larger than that of 10 hours rate; and the capacity of 3 hours rate is smaller than that of 10 hours rate.

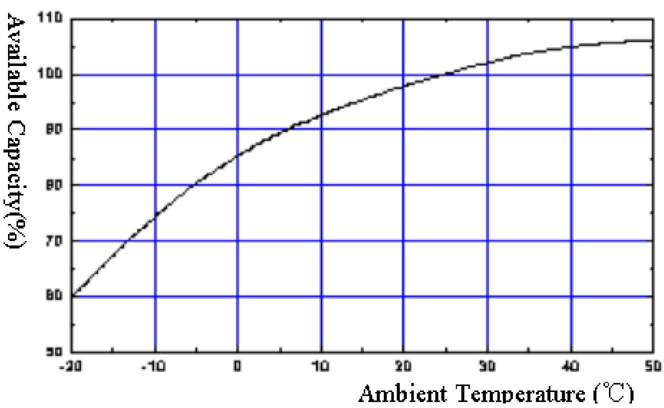
1.2.2 End Voltage

The end voltage is the lowest working voltage below which the battery cannot be discharged any more. Usually the end voltage of (F&M) battery is 10.5V per piece. The capacity cannot be discharged more even if the end voltage drops, because of the characteristics of lead acid battery. The lower end voltage will harm the battery, especially when the voltage drops to 0V and the battery cannot be recharged in time. This will shorten life of the battery greatly.

2. Ambient Temperature, Capacity and Life

VRLA batteries can be used in very low or high temperature (below-15C or above 45C). Yet all standard data (such as capacity, life, floating voltage) are measured under standard temperature of 20C-25C. The capacity will decrease under lower temperature as Fig. 2-1:

Fig.2-1: Ambient Temperature VS Available Capacity



We may see that the capacity will decrease if the temperature is too low. For example, if the temperature decrease 20C, the capacity will decrease 16%. Meanwhile, the low temperature will make the battery always in a less-charged state, then it may cause the battery fail to discharge and the active material in negative plates saltilize.

The capacity will increase when the temperature increases. The capacity will increase 6% when the temperature increase 10C. However, the high temperature will accelerate the corrosion of the grid and cause water loss inside the battery, thus shorten the life of the battery.

So it is important to strictly control the ambient temperature. Please keep the room ventilate and use airconditioner when the temperature is too high.

3. Charge Performance

3.1 The batteries should be recharged in time after discharge. The method is recommended as follows:

— The batteries first should be charged on the constant current of $0.15C_{10}$A till the average voltage of the batteries increases to 14.1V, then the batteries should be charged with constant voltage of 14.1V, till the charge is finished.

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

A. Please refer to the table 2-1 Depth of Discharge VS Charging time

Table 2-1 DOD VS Charging time

DOD (%)	Constant Current (A)	Constant Voltage (V)	Fully Charged Time (h)
20	$0.15C_{10}$	14.1V/Pc	10
	$0.20C_{10}$		8
50	$0.15C_{10}$	14.1V/Pc	15
	$0.20C_{10}$		12
80	$0.15C_{10}$	14.1V/Pc	16
	$0.20C_{10}$		14
100	$0.15C_{10}$	14.1V/Pc	20
	$0.20C_{10}$		18

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

Notes:

On special occasions, the batteries need to be fully charged immediately, then fast charge could be adopted: the value of limit current should not be larger than $0.30C_{10}$A, and the charge voltage should be 14.1-14.4V per unit. When the charging current and voltage is larger, the charge time is shorter. The ambient temperature should not be too high during fast charge.

4. Storage

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

4.1 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 Gaston batteries' storage environment is from 0C to 35C. The storage place must be clean, ventilated and dry.

4.2 An important parameter in storage is open circuit voltage, which is related with density of electrolyte. In order to avoid permanent damage to the plate caused by self-discharge, the batteries should be supplemental charged if they have been stored for three months. The equalization charge method should be adopted.

4.3 During storage, if the open circuit voltage is lower than 12.6V/Unit, the batteries should be supplemental charged before use. The equalization charge method should be adopted.

4.4 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 note the time when next necessary supplemental charge should be made.

5. Discharge Performance

The telecommunication customers please refer to: Fig.2-2; 2-3; 2-4; 2-5.

The power supply customers please refer to: fig.2-6; 2-7; 2-8; 2-9.

Fig.2-2; 2-3 are the discharge performance curves at different current ($0.1C_{10}$~$1.0C_{10}$) at 25C. The end voltage is 10.5V.

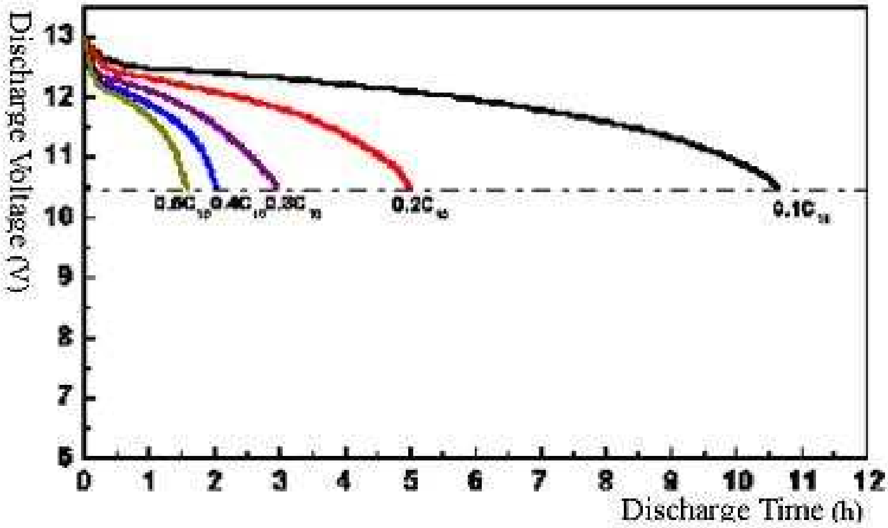
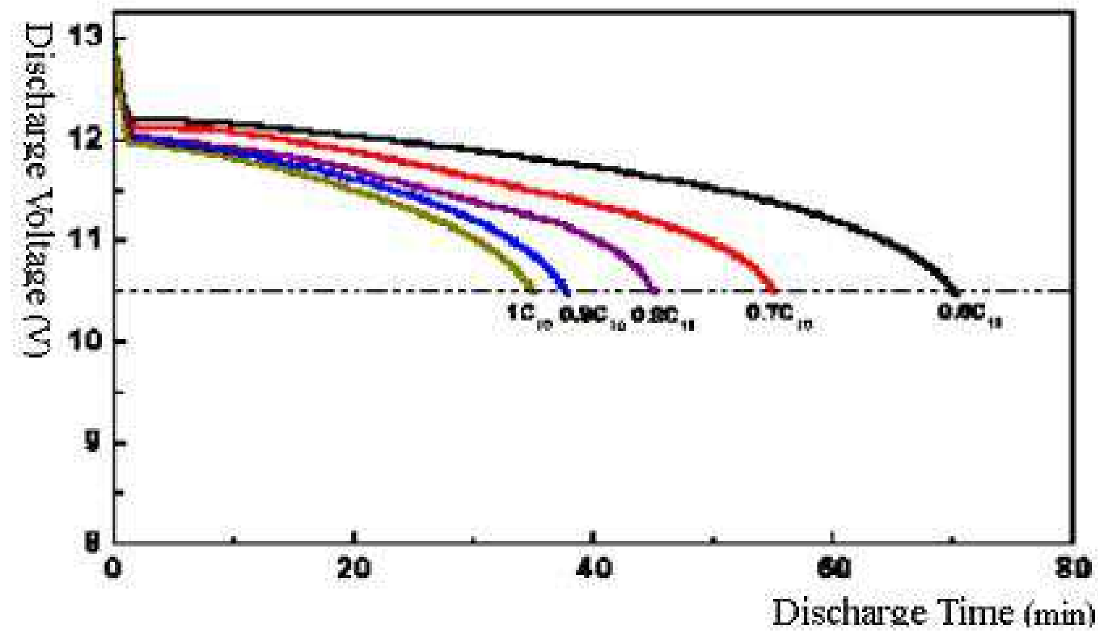


Fig. 2-2 Discharge Curve with the current of 0.1 C_{10}~0.5 C_{10}A (25C)



Explanation for fig..2-2: let us make GT12-100F battery as an example. The C_{10} of GT12-100F is 100Ah, so when discharge at $0.2C_{10}$, i.e.0.2 x100=20A, The discharge voltage and discharge time is shown by $0.2C_{10}$ curve.

Fig. 2-3 Discharge Curve with the current of 0.6 C_{10}~1.0 C_{10}A(25C)

Explanation for fig. 2-3:let us make GT12-100F battery as an example. The C_{10} of GT-100F is 100Ah, so when discharge at $0.8C_{10}$, i.e.0.8 x 100=80A, The discharge voltage and discharge time is shown by $0.8C_{10}$ curve.

Fig.2-4 are the curves at different discharge rate (20~50 hours rate) at 25C. The end voltage is 11.1V and 10.8V

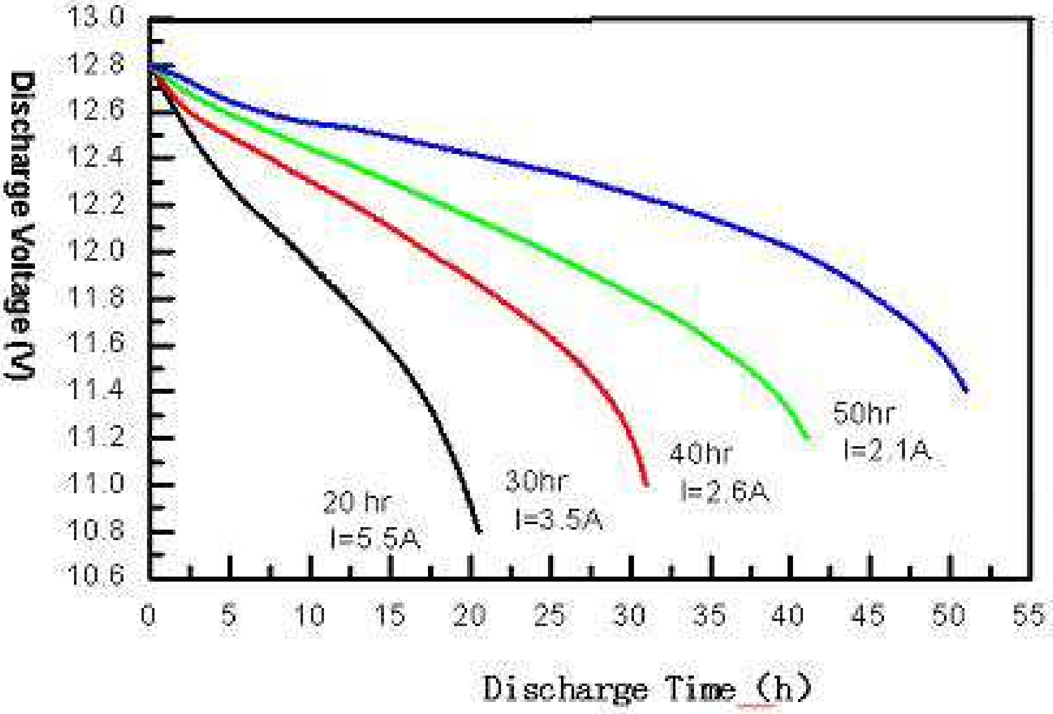


Fig.2-4 Discharge Curve at 20~50 hours rate (25C)

Fig.2-5 are the discharge time curves at different discharge current (10A~5A) at -15C. The end voltage is 10.5V.

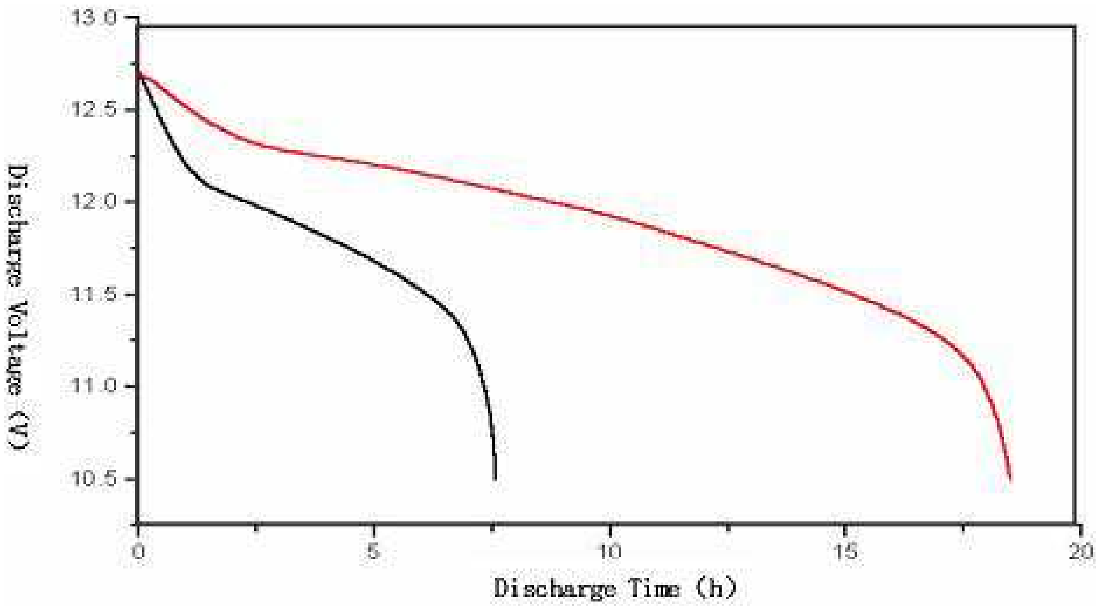
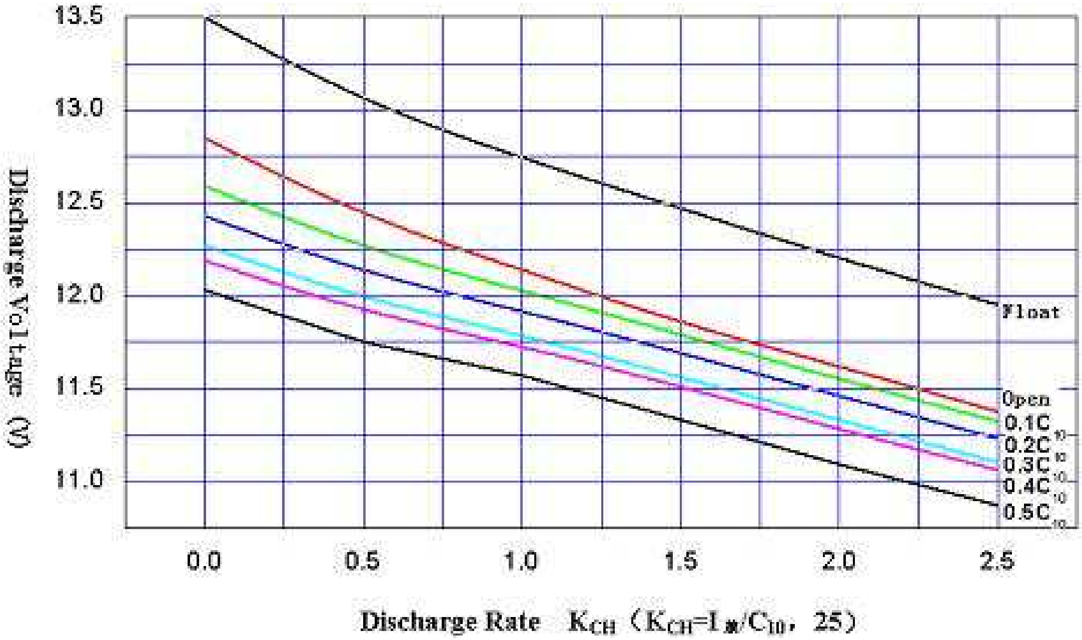


Fig.2-5. Discharge Curves with Current of 5A; 10A at low temperature (-15C)

Fig.2-6 are shock discharge curves at different current after the batteries are predischarged for 1h



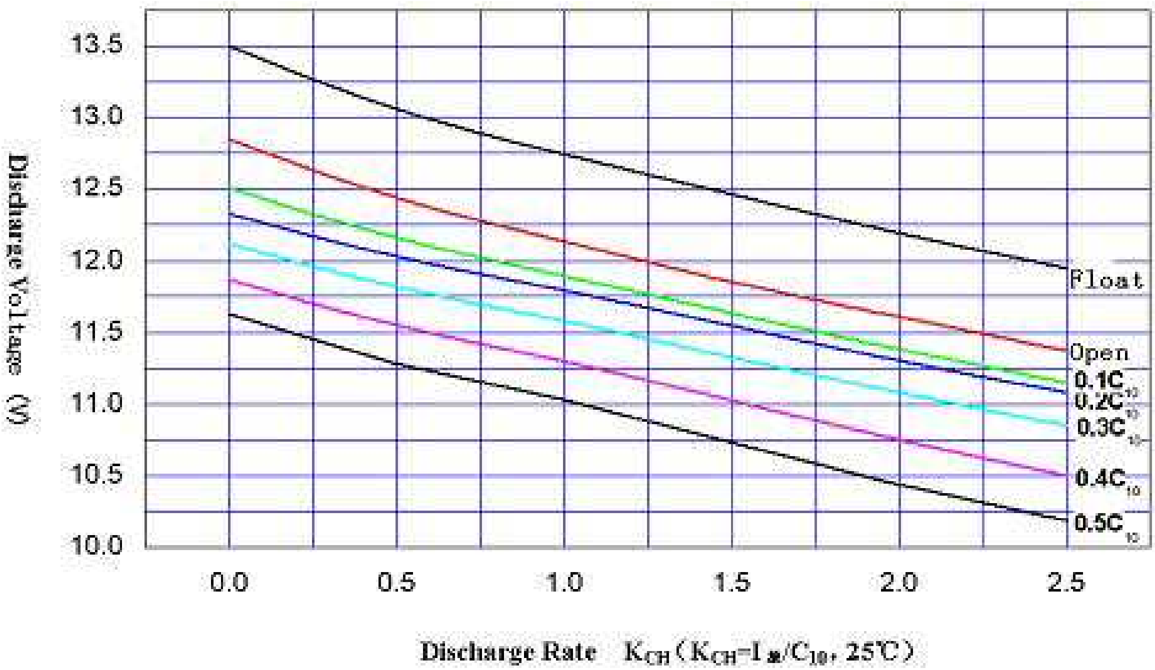


Fig.2-6 Shock Discharge Curves after the batteries are predischarged for 1h

Fig.2-7 are shock discharge curves at different current after the batteries are predischarged for 0.5h

Fig.2-7 Shock Discharge Curves after the batteries are predischarged for 0.5h

Fig.2-8.is discharge performance curve for 1min

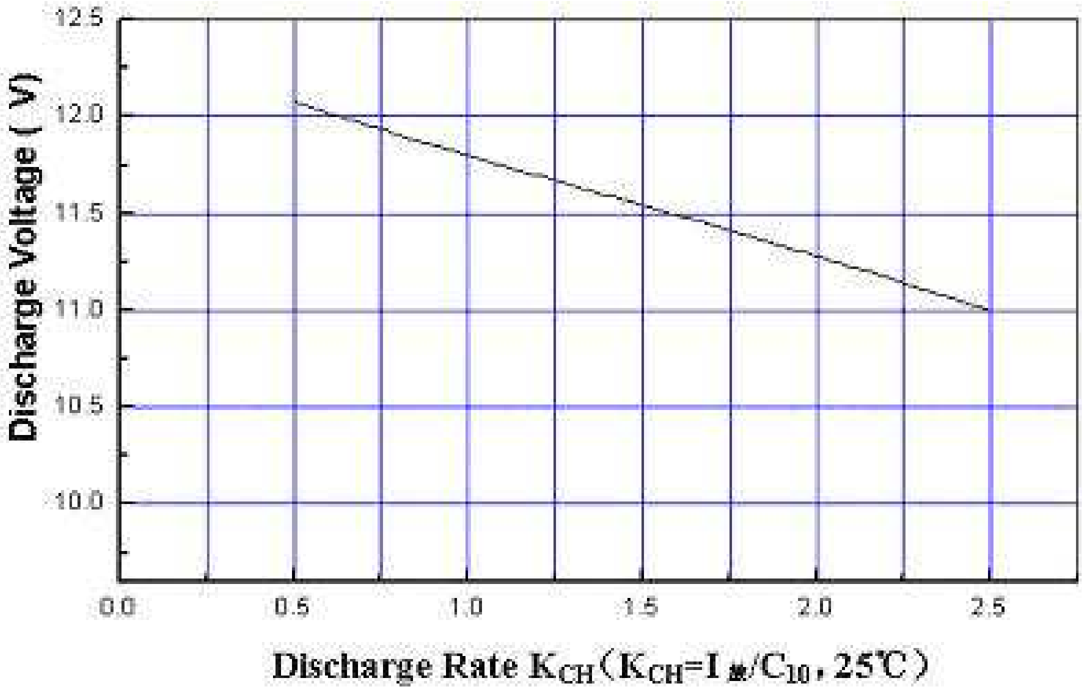


Fig.2-8.Discharge Curve for 1min

Fig.2-9.is discharge performance curve for 5S

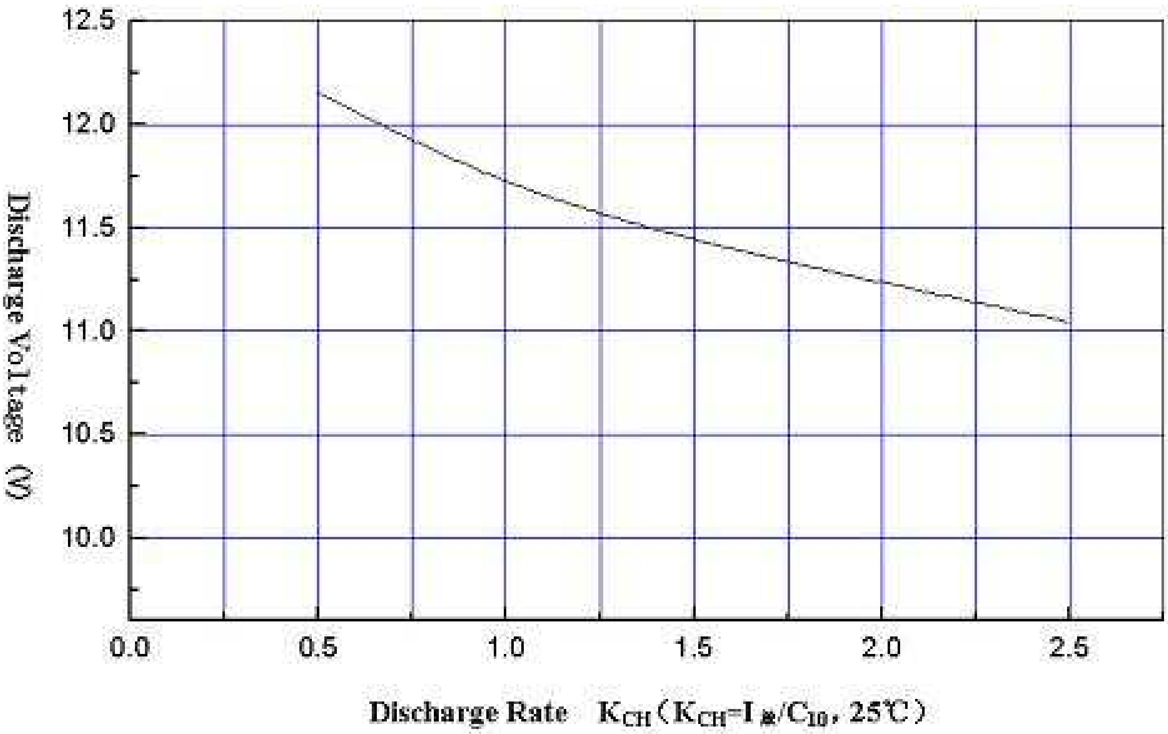


Fig.2-9. Discharge Curve for 5S

Table 2-2 Discharge current at different end voltage and different time (Amperes. 25C)

End Voltage	type	1 Min	5 Min	15 Min	30 Min	1h	2h	3h	4h	5h	8h	10h	20h
9.60V	GT12-100F	387	350	175	110	65	38	28	22	20	13	11	5.7
	GT12-155F	597	551	275	173	102	72	43	37	31	20.5	17.3	8.7
	GT12-200M	774	700	350	220	130	76	56	44	40	27	22	11.5
9.90V	GT12-100F	371	322	167	105	63	37.5	27	21.5	19.5	13.2	10.8	5.6
	GT12-155F	572	507	218	161	97.3	71.1	41.7	36	30.1	20.4	16.6	8.6
	GT12-200M	742	644	335	210	127	75	54	43	39	26.4	21.7	11.3
10.20V	GT12-100F	356	298	162	101	62	37	26	21	19	12.8	10.7	5.5
	GT12-155F	550	469	255	156	95	68.7	40.1	35.5	29.4	19.7	16.5	8.4
	GT12-200M	712	598	324	202	124	74	52	42	38	25.7	21.5	11
10.50V	GT12-100F	312	266	150	98	60	36.8	25	20.8	18.5	12.5	10.5	5.3
	GT12-155F	482	411	232	152	93	65	38.7	32.7	28.5	19.3	16.2	8.1
	GT12-200M	624	532	300	196	120	74.6	50	41.6	37	25	21	10.6
10.80V	GT12-100F	278	240	142	95	55	36.5	24	20.5	18	12	10	5
	GT12-155F	429	370	219	149.6	86.6	63	38	32.2	27.8	18.5	16.0	7.7
	GT12-200M	556	480	284	190	110	73	48	41	36	24	20	10
11.10V	GT12-100F	240	212	133	90	50	35	23	20	17.6	11.5	9.6	4.7
	GT12-155F	370	327	205.	139	77	57.8	35.5	31.5	27.2	17.7	15.0	7.2
	GT12-200M	480	424	266	180	100	70	46	40	35.2	23	19.2	9.5
11.40V	GT12-100F	200	182	122	86	45	31	22	15	11.8	10.8	8.6	4.4
	GT12-155F	309	281	188	132	69.5	54.1	33.9	23.6	22.3	16.7	13.3	6.8
	GT12-200M	400	364	244	172	90	62	44	30	33.6	21.6	17.2	8.8

Explanation for Table 2-2: 6-GT12-200M discharge for 1min end voltage is 9.60V, the discharge current is 774A.