



FT SERIES

TECHNICAL MANUAL



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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

02

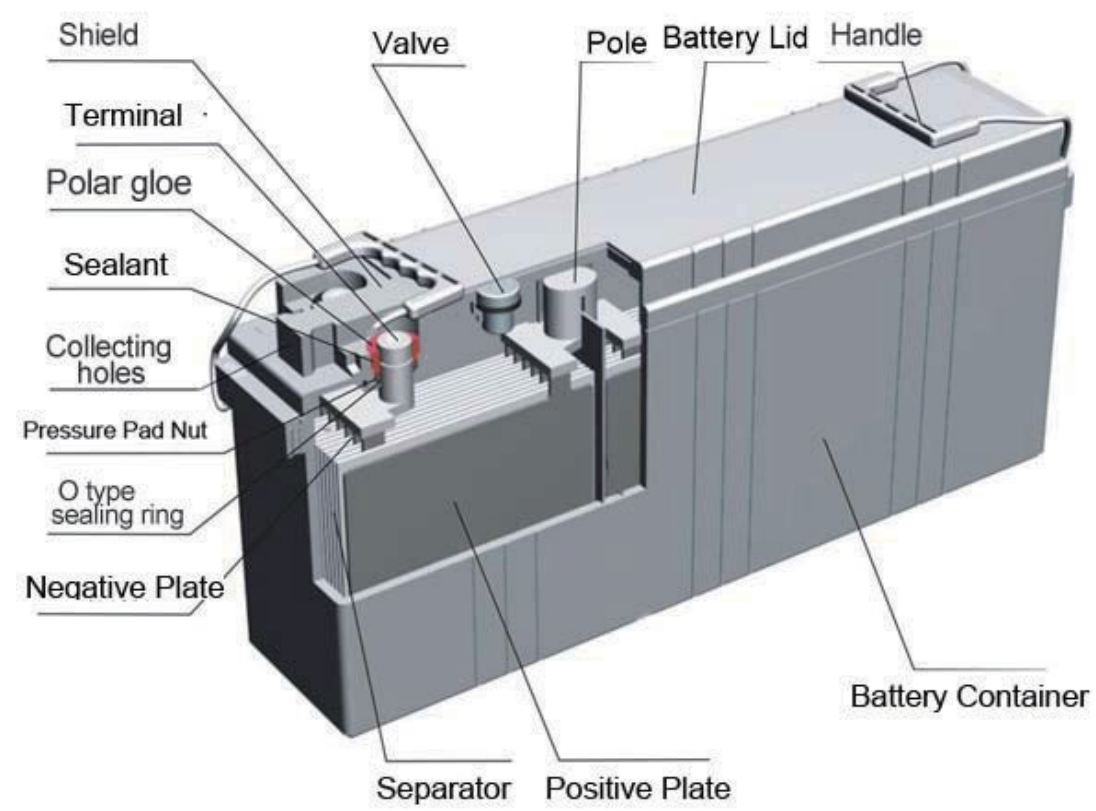
Product Introduction

- ⊗ Specially designed for 19 and 23 cabinet of power supply cabinet system
- ⊗ Designed floating life: 12 years.
- ⊗ Narrow structure design, front terminal is convenient for installation connection and maintenance, saving space.
- ⊗ Terminal protective cover avoiding short circuit, inspection hole is available for voltage measurement.
- ⊗ Front centralized exhaust system ensuring equipment normal function.
- ⊗ Excellent cycle performance, good over-charged endurance and recovery ability after over-discharged.
- ⊗ High quality AGM separator and lead-calcium-tin multi-element alloy are adopted. Adopt
- ⊗ gas recombination technology, there is no need to add water for maintenance. High
- ⊗ purity raw material ensuring low self-discharge rate, it is $\leq 1.5\%$ per month (25°C)
- ⊗ Battery container adopt high intensity ABS plastic (FV0 class ABS plastic is optional)
- ⊗ Applicable operation temperature range is -15°C - 50°C , recommended operation temperature is $25\pm 5^{\circ}\text{C}$.
- ⊗ For key production equipment, key raw material and product inspection and other quality ensuring measurement, equipments and instruments of first class in worldwide are adopted.

Main Applications

- ⊗ Applicable to international standard 23 and 19 power supply cabinet;
- ⊗ Access Network Equipment of Communication System;
- ⊗ Power supply system of special network or local area network;
- ⊗ UPS/EPs back up power.

Battery Structure



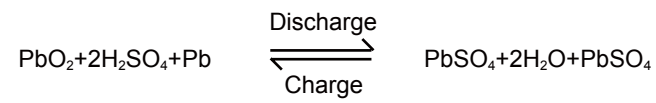
Type and Dimensions

■ Table 1-1 battery type and dimensions

Battery Type	Rated Voltage (V)	Rated Capacity (Ah)			Dimensions (mm)				Weight (kg)
		C ₁₀	C ₃	C ₁	Length	Width	Height	Total Height	
FTB12-55	12	55	42.9	33.3	277	106	222.5	222.5	17.0
FTB12-80	12	80	65.7	49.2	395	110	288	288	27.5
FTB12-95	12	95	74.4	62.8	395	105	270	270	28.5
FTB12-100	12	100	82.2	64.6	395	110	288	288	32.0
FTB12-105	12	105	86.4	64.6	508	110	238	238	35.4
FTB12-125	12	125	95.7	77.1	551	110	288	288	38.5
FTB12-150	12	150	114.6	88.9	551	110	288	288	44.5
FTA12-100	12	100	83.7	70.0	558	125	230	230	36.3
FTA12-125	12	125	99.6	80.7	558	125	270	270	45.2
FTA12-150	12	150	119.4	93.0	558	125	311	311	52.7
FTA12-175	12	175	139.2	110.0	558	125	311	311	54.0
FTA12-190	12	190	149.1	117.9	546	125	323.5	323.5	58.0

Working Principle

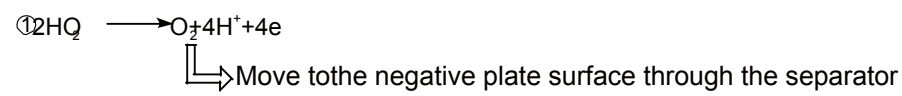
⊗ The electrochemical reaction of batteries in charge and discharge process as follows:



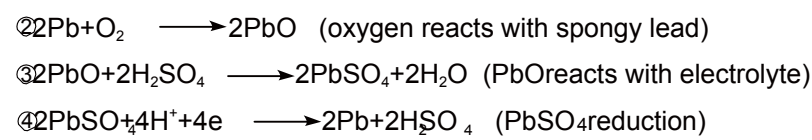
final stage of charge process, active substance in positive plate transformed to lead dioxide, negative plate has not reached fully charged stage, the process of active substance in negative plate transformed to spongy lead has not finished, oxygen gas generated in positive plate reaches the negative plate through separator pores and reacts with active substance in negative plate, resulting in a 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: $\textcircled{2} + \textcircled{3} + \textcircled{4} \quad \text{O}_2 + 4\text{H}^+ + 4\text{e}^- = 2\text{H}_2\text{O}$

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

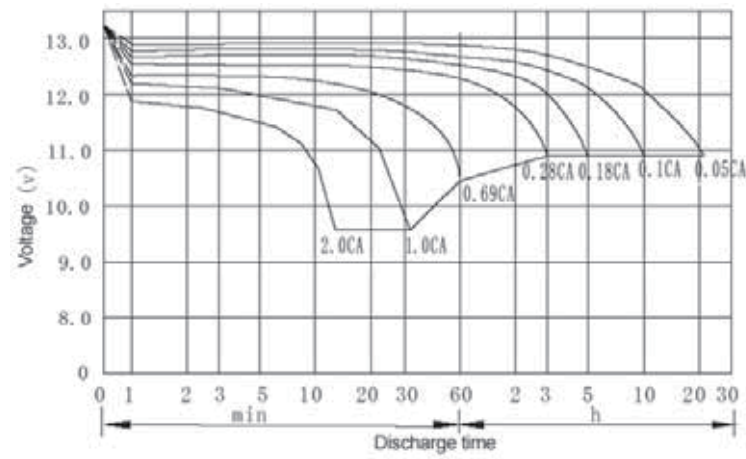
In general, in the charging process, oxygen gas generated in the positive plate could quickly reach the negative plate and recombine into water through reaction with active substance in the negative plate, no gas escape and water loss, achieving the sealing.

Chapter Two Technical Characteristics

Discharge Curve

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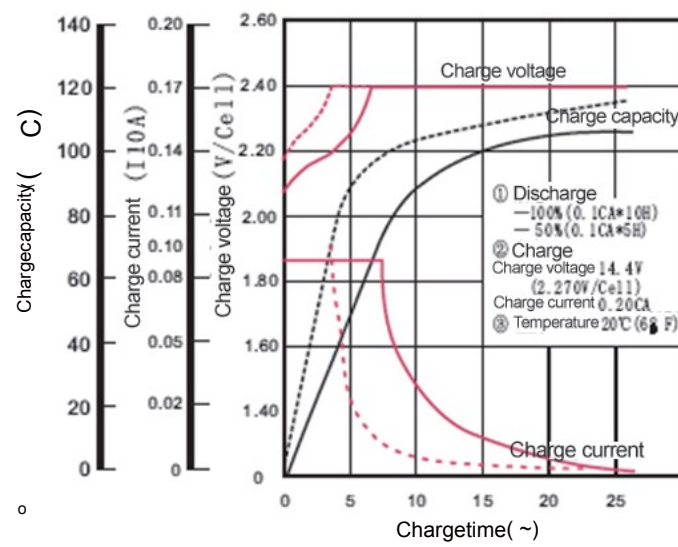
Discharge curve under different discharge rate (25°C)



■ Figure 2-1 Discharge curve under different discharge rate

Charge Curve

Charge curve under different depth of discharge (25°C)



■ Figure 2-2 Charge curve under different depth of discharge

Internal Resistance and Short Circuit Current

The internal resistance is a 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. Table 2-3 presents the internal resistance and short circuit current of the battery which the internal resistance is measured 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)
FTB12-55	8.5	1412
FTB12-80	5.2	2300
FTB12-95	4.8	2500
FTB12-100	4.5	2720
FTB12-105	4.1	2920
FTB12-125	4.0	3000
FTB12-150	3.6	3200
FTA12-100	4.25	2650
FTA12-125	4.0	3000
FTA12-150	3.6	3200
FTA12-175	3.3	3650
FTA12-190	4.1	3750

Chapter Three Operation and maintenance

Operation Conditions

Ambient temperature is $-15^{\circ}\text{C}\sim 50^{\circ}\text{C}$, the optimal operation temperature is $20^{\circ}\text{C}\sim 30^{\circ}\text{C}$, ambient humidity is $\leq 95\%$.

Factors Influencing Capacity

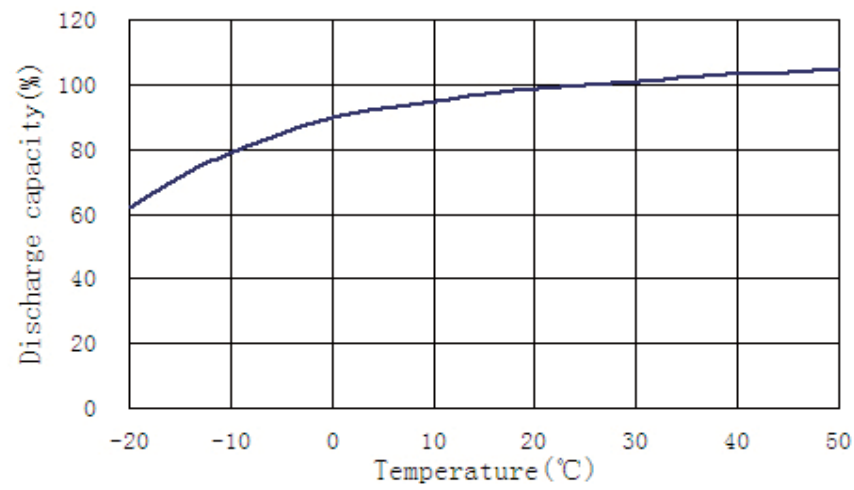
Battery capacity contains rated capacity and actual capacity, for FT series battery rated capacity please refer to Table 1-1. Actual capacity is fact quantity of electricity battery discharge under certain condition, it equal to discharge current multiply discharge time, unit is Ah. The battery capacity is directly related to the discharge current, end voltage and discharge temperature.

Temperature VS battery capacity

Temperature affect battery capacity. Figure 3-1 is capacity (C_{10}) and temperature curve, for example, temperature fall from 25°C to 0°C , capacity will be 90% of rated capacity, meanwhile, low temperature will cause long term charge shortage, negative plate will be vitriolization, finally, battery can not be normal used.

Along with temperature rise, battery capacity will be larger among certain range, for example, temperature rise from 25°C to 50°C , capacity will be about 105% of rated capacity, but temperature continue rise, capacity rise will be slow, finally, capacity will maintain no change.

■ Figure 3-1 battery discharge capacity and temperature curve



⚙ Floating charge

FTseries batteries could be used in floating and cycle application.

Floating operation is the best operation condition for battery. In floating operation, the battery keep fully charged state, under this condition, battery could reach the longest service life. Under the temperature of 25°C, recommended floating charge voltage setting value is 2.27V/cell, in such method, it take about 72~96h for battery fully charged. For achieving better performance, the floating charge voltage should be suitable lead just according to ambient temperature.

Table 31 Floating charge voltage under different temperature

Ambient Temperature(°C)	Floating Charge Voltage (V/cell)
0	2.36
5	2.34
10	2.32
15	2.31
20	2.29
25	2.27
30	2.25
35	2.24
40	2.22
45	2.20
50	2.18

Recharge

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

Charge the battery with constant current of no more than $0.2C_{10}$ (A), until the battery voltage rises to 2.38~2.42V/cell, then change to constant voltage charge of 2.38~2.42V/cell until the charge is completed. Any of the following two items can be regarded as the fully charged symbol.

- Refer to the required time as table 3-2.
- In constant voltage case, the charge current keep unchanged for 3 hours in the final stage of charge.

Charge voltage shall be adjusted according to the ambient temperature, temperature compensation coefficient is $-3.5\text{mV}/^{\circ}\text{C}/\text{cell}$.



Table3-2 Required charge time in different depth of discharge

Depth of discharge(%)	Charge current of constant current charge(A)	Time for changing constant current charge to constant voltage charge(h)	Charge voltage of constant voltage charge(V/cell)	Charge time(h)
20	0.1C ₁₀	1.6	2.40	12
	0.15C ₁₀	1.2	2.40	10
50	0.1C ₁₀	4.3	2.40	18
	0.15C ₁₀	3.3	2.40	16
80	0.1C ₁₀	6.8	2.40	20
	0.15C ₁₀	5.5	2.40	18
100	0.1C ₁₀	8.7	2.40	24
	0.15C ₁₀	6.8	2.40	22

Temperature and Battery Service Life

High temperature will speed up the 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 increases by 10°C, for example, service life is 10 years at 25°C, but the service life will be shortened to 5 years if ambient temperature is always 35°C. Refer to the following formula:

$$t_{25^{\circ}\text{C}} = t_T \times 2^{(T-25)/10}$$

Note:

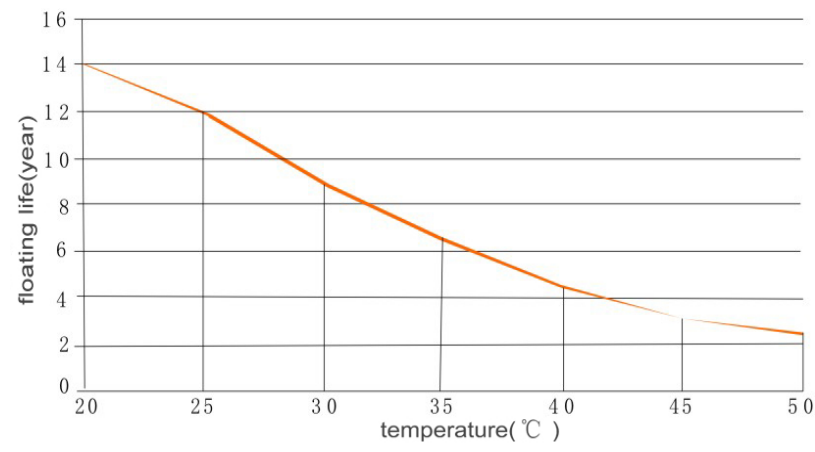
T-Ambient temperature.

t_T-Service life at temperature of T.

t_{25°C}-Service life at temperature of 25°C.



Table4-3 Required charge time in different depth of discharge



Charge Requirement

Equalizing Charge

Equalizing charge is needed in the following cases:

When there are more than two batteries with voltage of lower than 2.18V/cell.

The battery is in floating operation more than 3 months.

Recommended charge method as follows:

Charge the battery with constant current of no more than 0.15C10(A), until the battery voltage rises to 2.4V /cell, then change to constant voltage charge of 2.4V /cell for about 24 hours.

Recharge

Recharge is needed in the following cases, the recharge method is same to above equalizing charge.

After battery is discharged.

After finishing battery system installation.

⚙️ The following item can be regarded as the fully charged symbol.

- In constant voltage case, the charge current keep unchanged for 3 hours in the final stage of charge.

Storage

The battery should be stored in clean and dry environment .

Storage time: battery is ex-work in fully charged, storage time should be limited, for ensuring battery performance, storage time please do not exceed following time:

- Under 25°C, six months
- Under 30°C, three months
- Under 40°C, six weeks

The state of charge can be confirmed by the testing result of open circuit voltage after storage for 24 hours at 25°C.

- Table 3-3 open circuit voltage at different charge state

Charge State	Voltage(V/cell)
100%	≥2.18
80%	≥2.15
60%	≥2.10
40%	≥2.07
20%	≥2.04

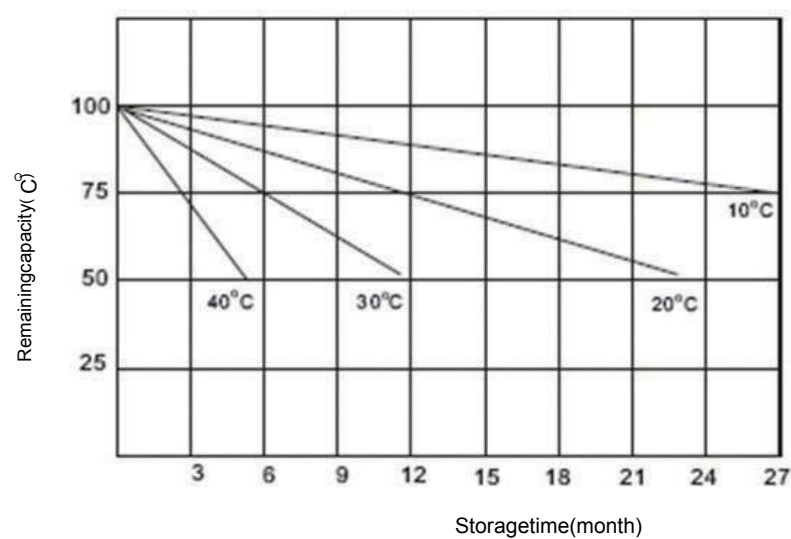
The battery recharge method during the storage is: charge battery with 2.38~2.42V/cell for 16 to 20 hours.

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

Testing of the open circuit with the storage battery can decide whether it shall be supplemental charged.

If the voltage drops to 2.15V/cell, the battery shall be supplemental charged in time. Improper maintenance will shorten the battery service life or decrease the service performance.

- Figure 3-3 Remain capacity curve at different temperature and different storage time



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 terminals temperature.
- Check battery cleanliness, terminal damage and heating track, container and lid damage and temperature.
- Measure and record the total voltage and floating current of the battery system.

⚙ Quarterly Maintenance:

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

Annually Maintenance

- Repeat every item of quarterly maintenance and inspection.
- Check whether the connector loose or not, please tight immediately once finding loose parts.
- Perform a discharge test to check the exact load every year, discharge 30%-40% of the rated capacity.

Three-year Maintenance:

- Carry out a capacity test (C_{10}) every three years and every year after six years of operation. If the capacity of the battery is lower than 60% of the rated capacity, the battery should be replaced.

Maintenance notes

- Please do not operate and store battery in inversion position or in horizontal position
- Check whether the battery installation is comply with design requirement or installation documents or not.
- Please use insulated tools when operation and maintenance, any metal object to be put on top of the battery shall be strictly prohibited;



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