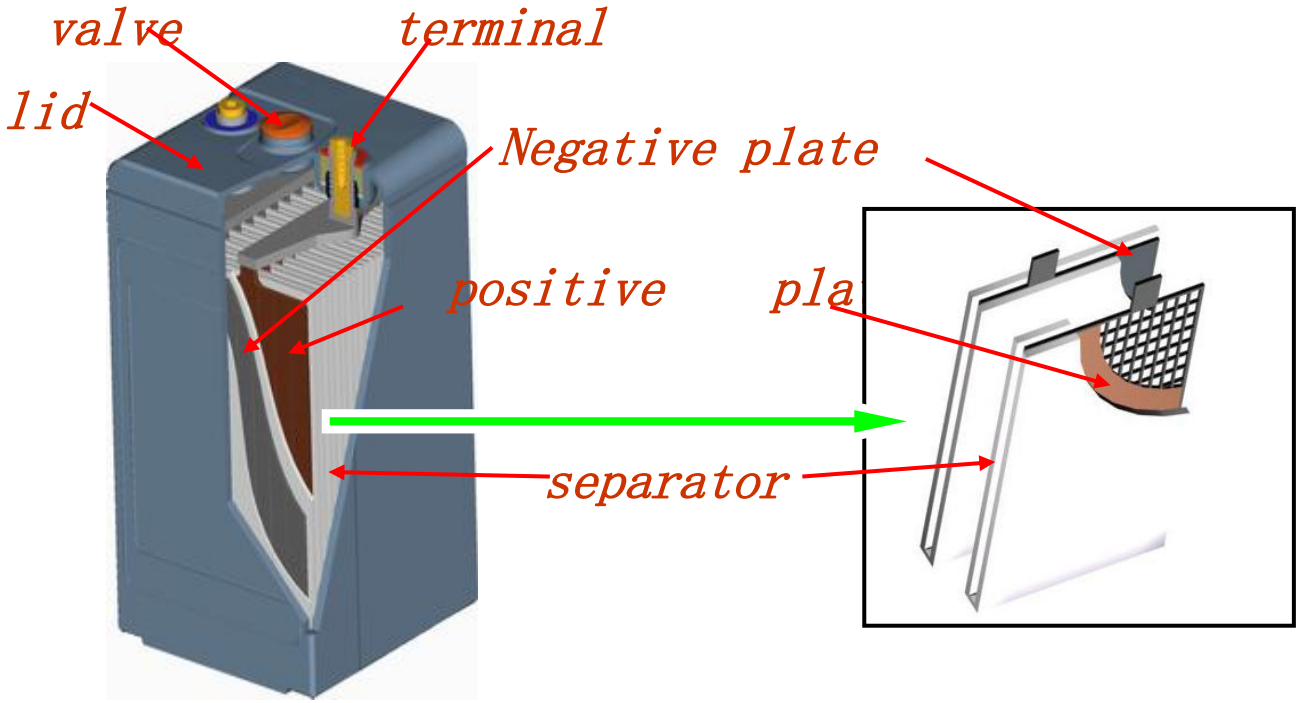
GasTon

VRLA Battery Technical supports

Topics

- Battery theory and structure
- Parameter setting
- Storage and installation
- Maintenance and test

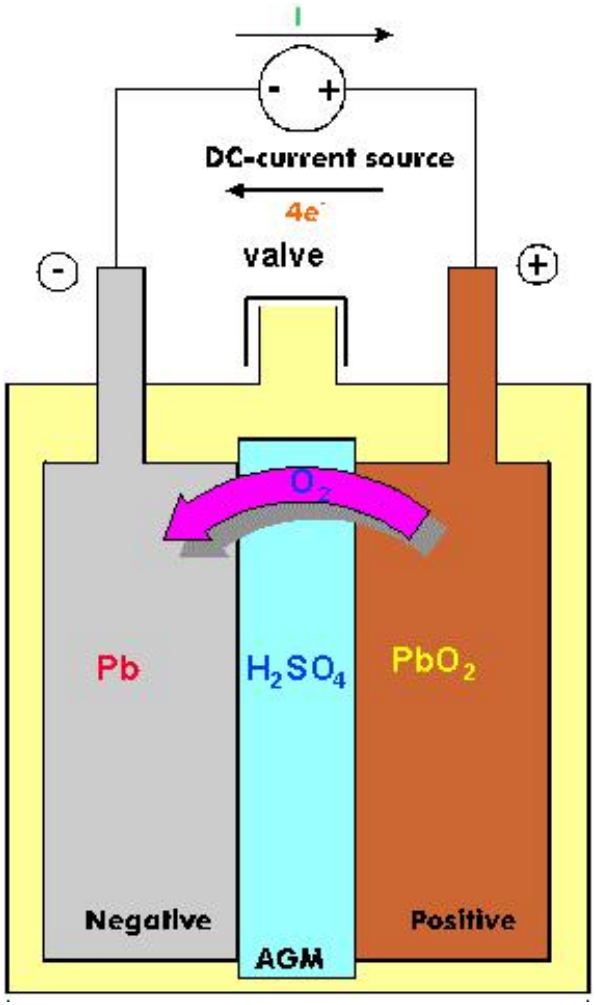
Battery theory and structure – battery structure



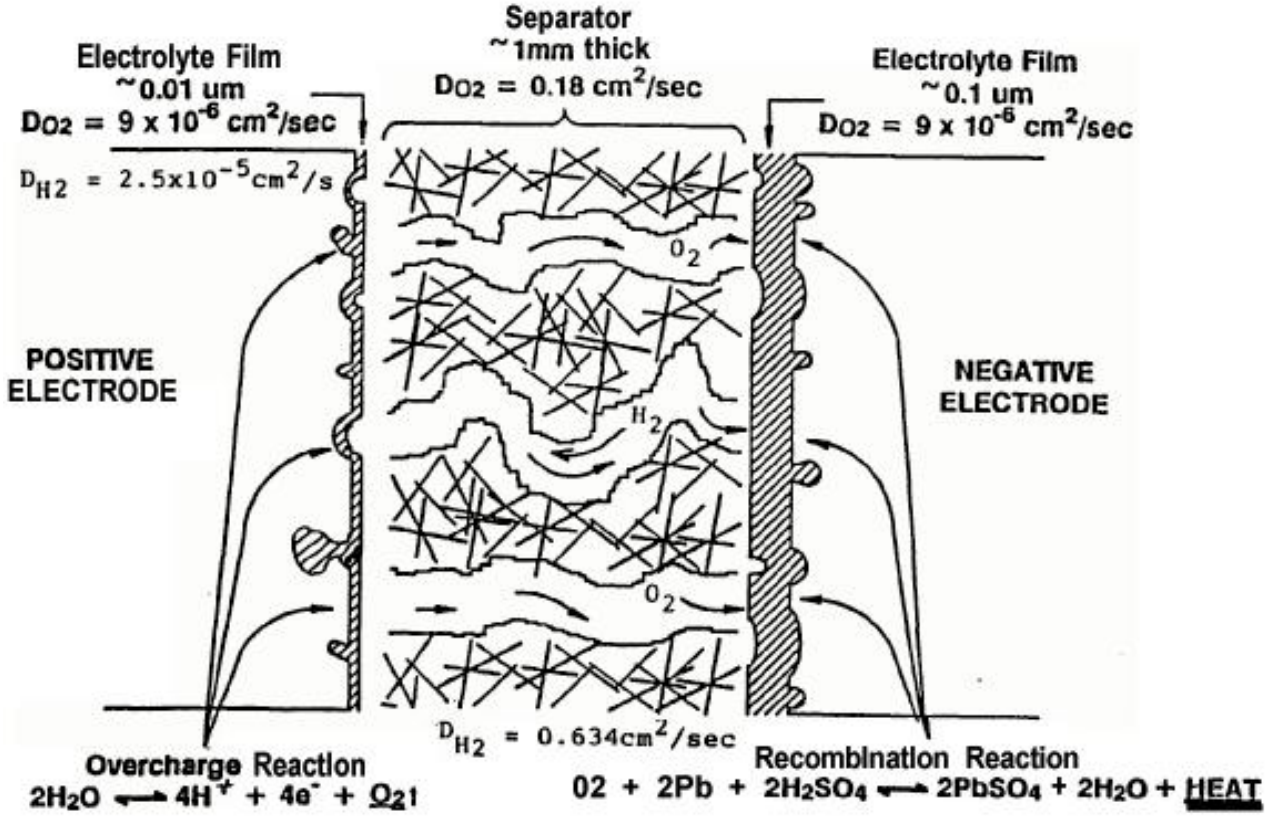
Battery theory and structure – working theory

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

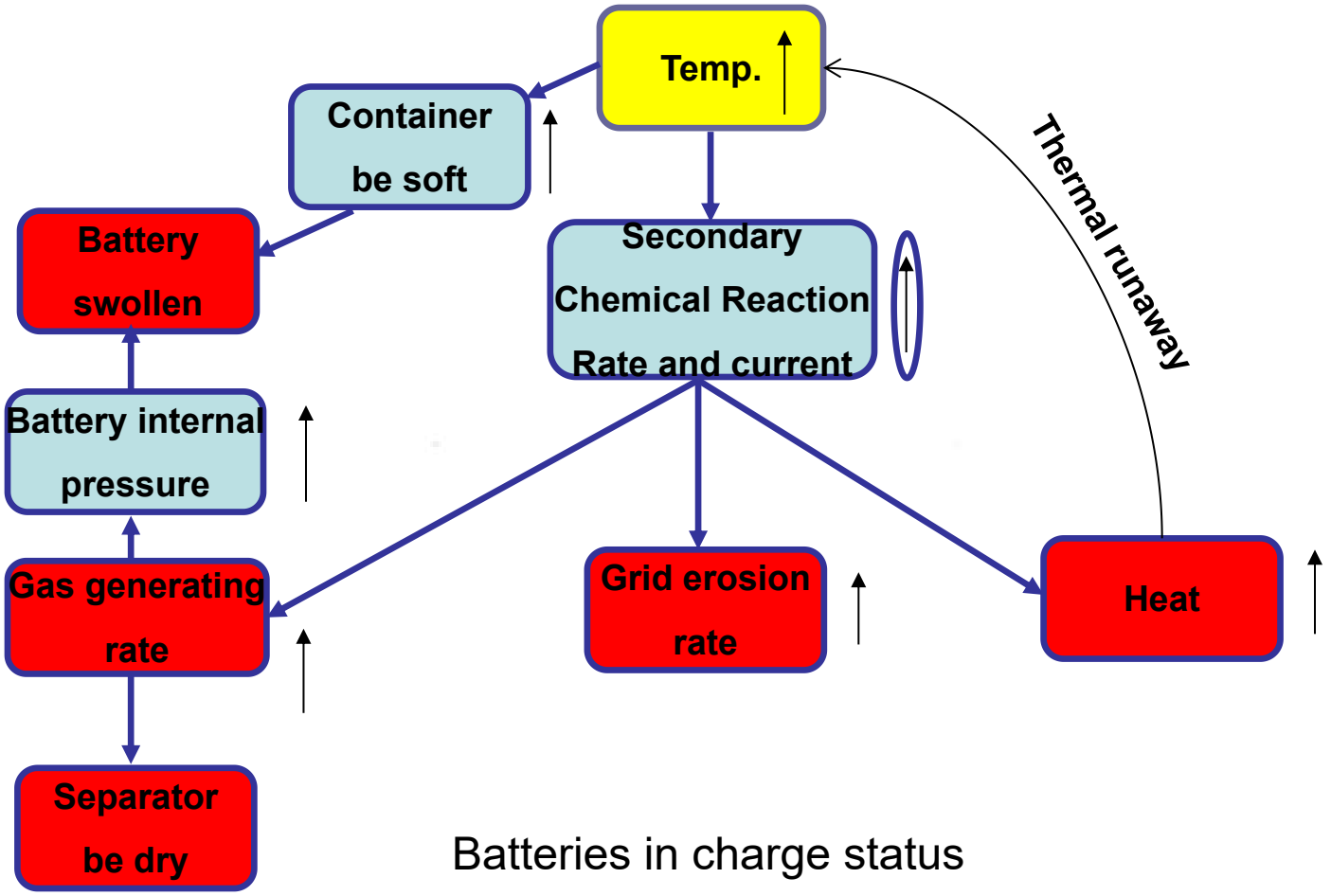
Battery theory and structure – oxygen recombination



Battery theory and structure – oxygen recombination



Battery theory and structure – influence of Temp.



Batteries in charge status

Topics

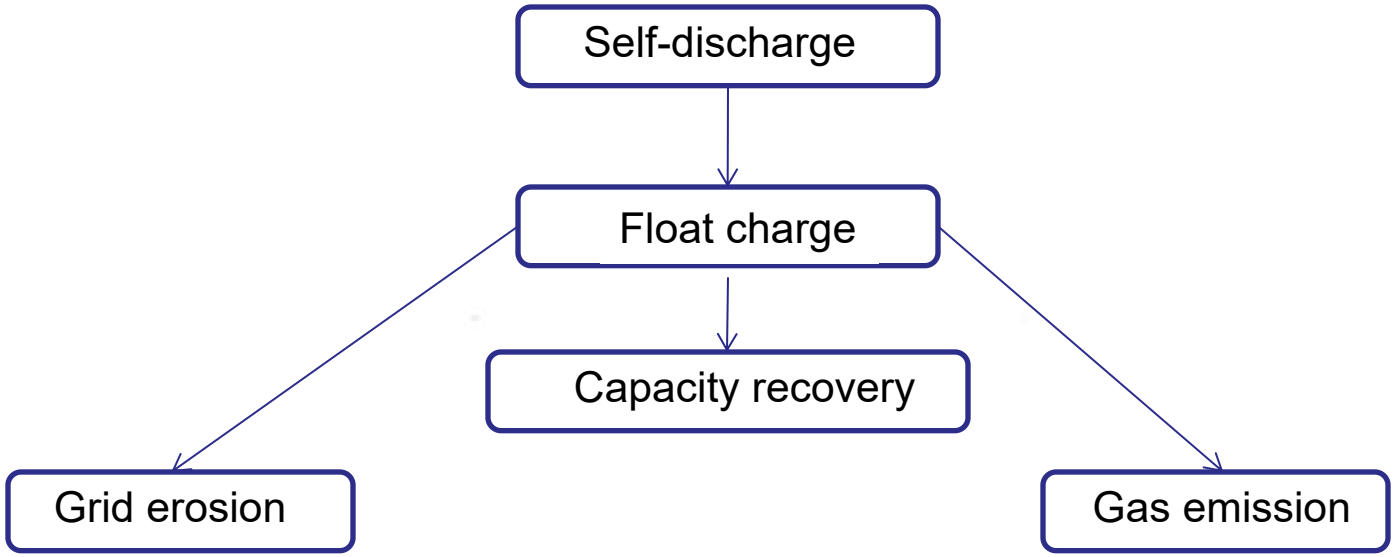
- Battery theory and structure
- Parameter setting
- Storage and installation
- Maintenance and test

Parameter setting – for 48V system

Parameters	Unit	Setting value
Float voltage	V	54
Boost voltage	V	56.4
Charge current	A	$0.1C_{10}$
Over current point	A	$0.20C_{10}$
Cyclic Boost interval	day	90
Cyclic Boost time	h	24
To boost capacity	%	80
To boost Current	A	$0.05C_{10}$
To float Current	A	$0.005C_{10}$

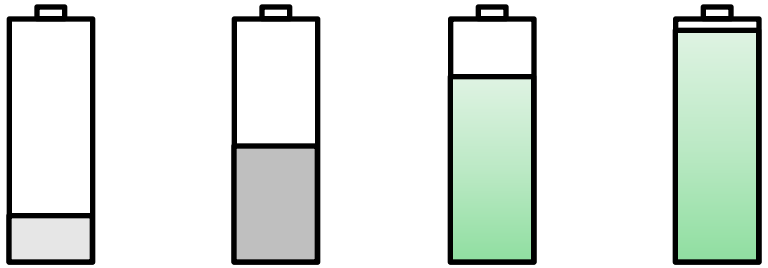
Parameters	Unit	Setting value
Float temp. compensation	V/℃	-0.072
Boost temp. compensation	V/℃	-0.12
LLVD voltage	V	45.6
BLVD voltage	V	44
LLVD recovery voltage	V	49
High voltage warning	V	57.6
Low voltage warning	V	46
High temperature warning	℃	35

Parameter setting – float charge

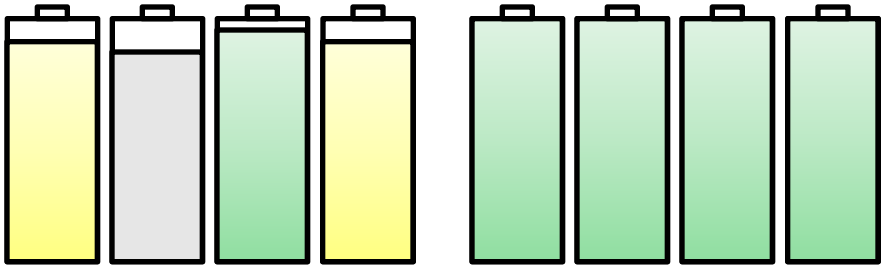


Parameter setting – boost charge

① Recharge battery

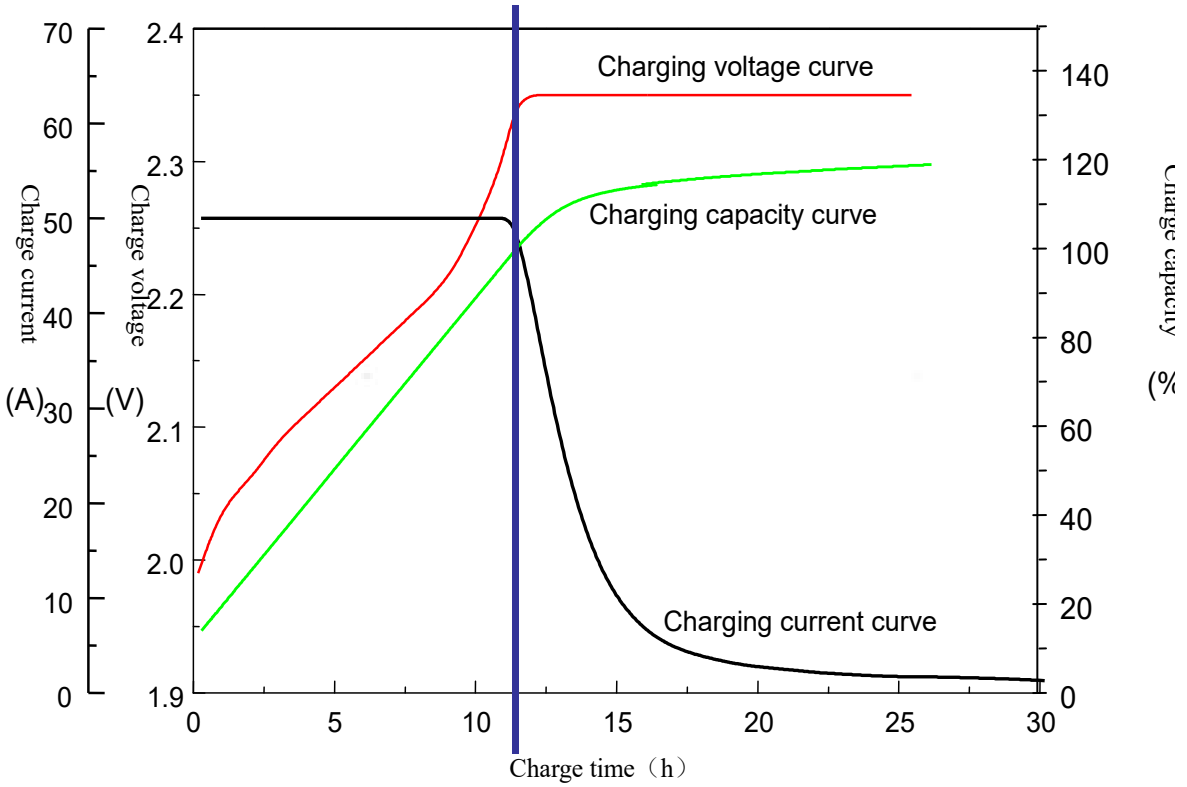


② Balance battery

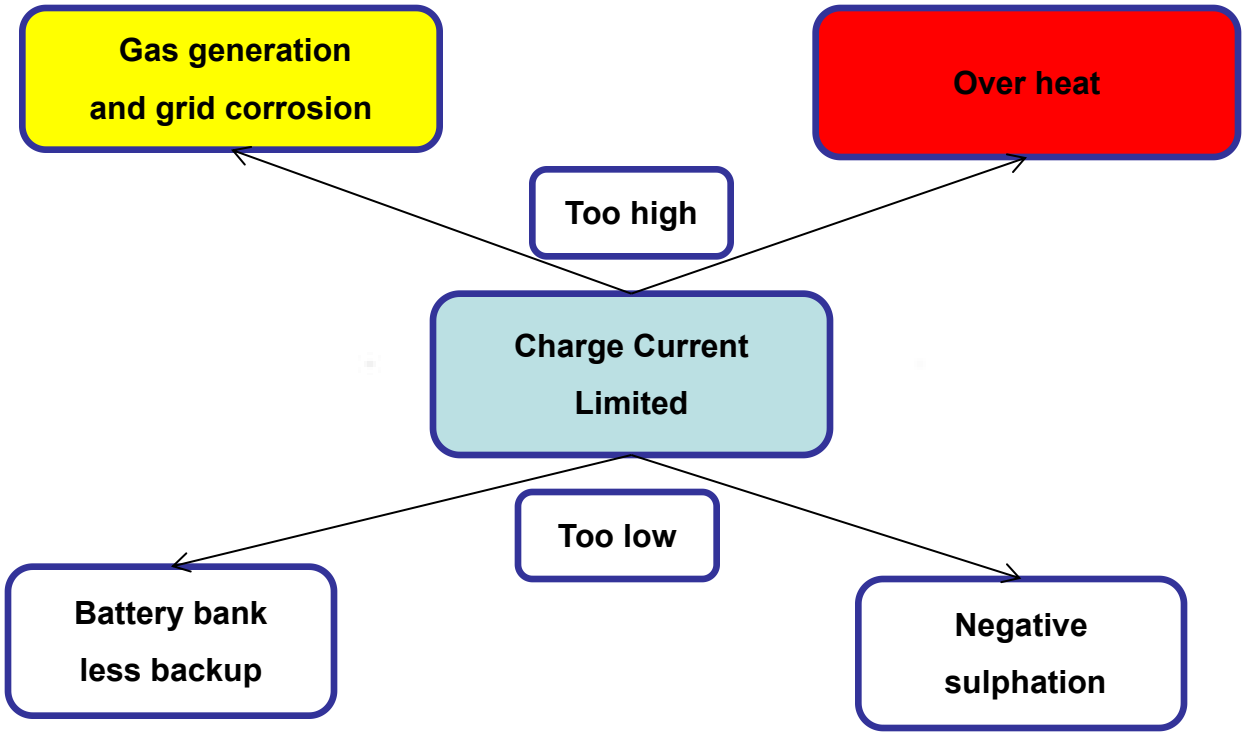


③ Activate battery

Parameter setting – charge current



Parameter setting – boost charge current limited

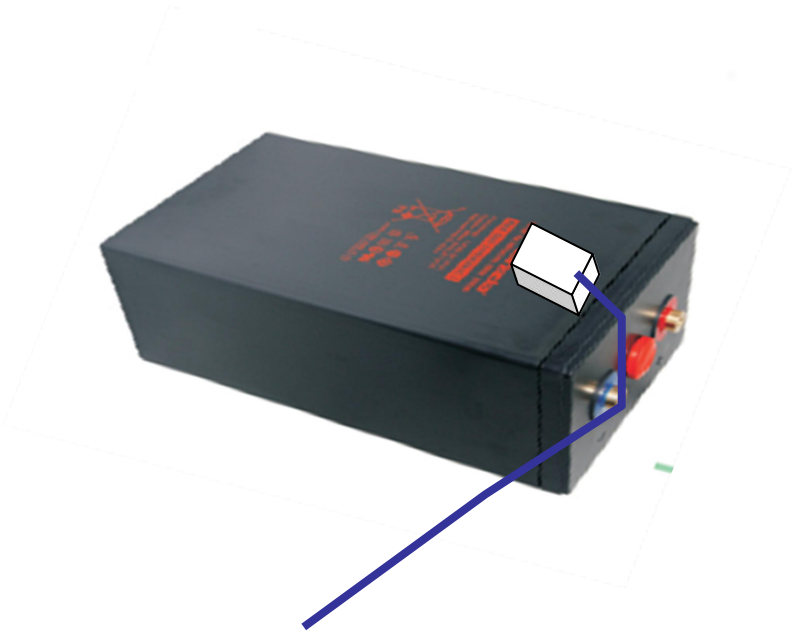


Parameter setting – boost charge time and frequency

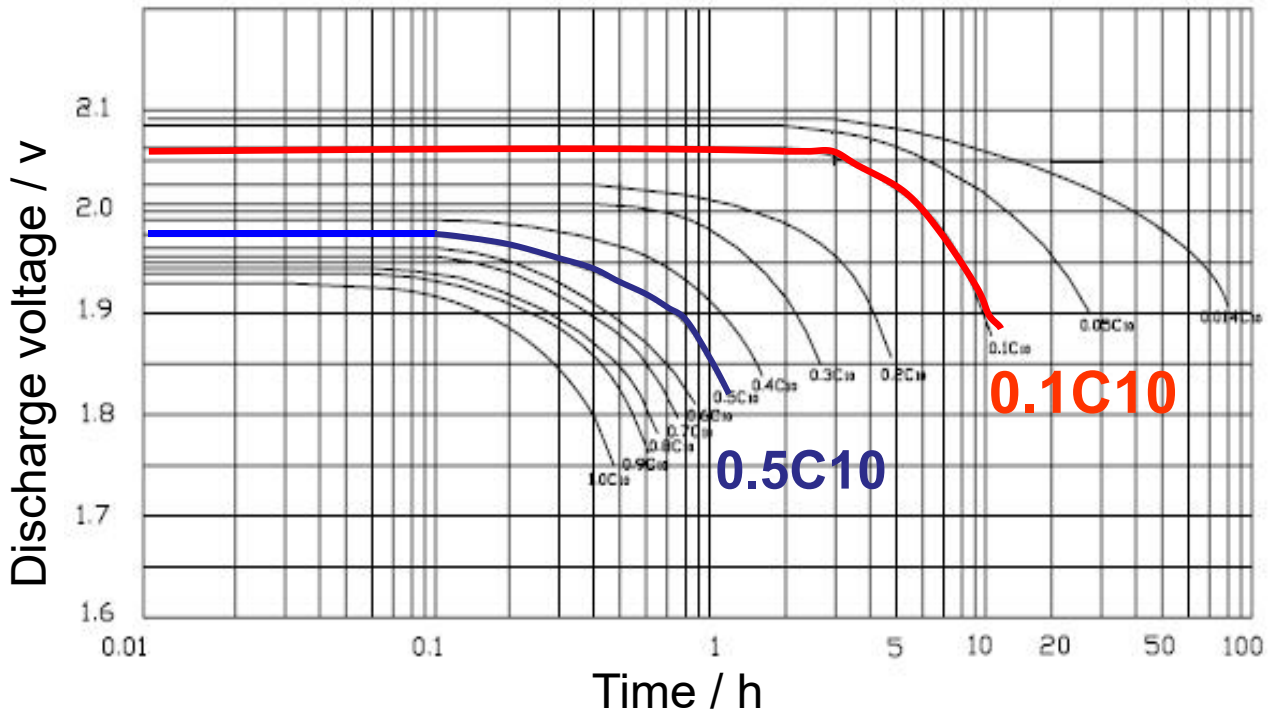
Parameters	Unit	Setting value
Charge current	A	$0.1C_{10}$
Over current point	A	$0.20C_{10}$
Cyclic Boost interval	day	90
To boost capacity	%	80
To boost Current	A	$0.05C_{10}$
Cyclic Boost time	h	24
To float Current	A	$0.005C_{10}$

Parameter setting – temperature compensation

Parameters	Unit	Setting value
Float temp. compensation	V/℃	-0.072
Boost temp. compensation	V/℃	-0.12

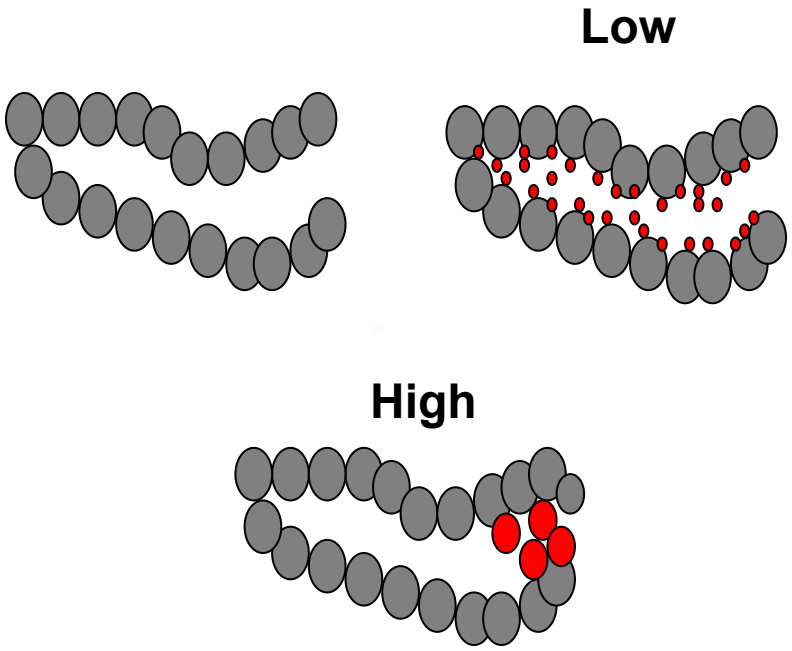


Parameter setting – discharge current



Parameter setting – discharge current

Plate structure like sponge



Influence of discharge current

Parameter setting – LLVD/BLVD

Load current (A)	LLVD (V)	BLVD(V)
$I < 0.025C_{10}$	47.5	47.3
$0.025C_{10} \le I < 0.05C_{10}$	46.3	46.1
$0.05C_{10} \le I < 0.1C_{10}$	45.6	44.9
$0.1C_{10} \le I < 0.2C_{10}$	45	44
$0.2C_{10} \le I < 0.5C_{10}$	44.5	42

Parameter setting – alarm

Parameters	Unit	Setting value
LLVD recovery voltage	V	49
High voltage warning	V	57.6
Low voltage warning	V	46
High temperature warning	℃	35

Topics

- Battery theory and structure
- Parameter setting
- Storage and installation
- Maintenance and test

Storage and installation – storage cautions

Capacity decreases because of **self discharge** even at open circuit storage, about 94% left after 3 months at 25 ℃ irreversible sulfation will decrease battery service life if batteries fail to be charged in time

- **Recharge** after storage for 3 months. The maximum storage time < 6 months
- **Storage environment**: ventilated, room temperature, dry and clean
- Implement **First-in First-out** stock keeping
- The batteries can **not be stored outside** at low temperature. The **container** becomes harden and fragile at extremely low temperature
- Narada recommend that do not store battery in the site for a long time after installation

Storage and installation – installation tools

- Have tools ready (hex-keys, torque wrench, voltmeter)
- To avoid dangerous shorts use only insulated tools
- Take off rings, metallic wristband watches, pendants
- Wear protective goggles
- Watch out when lifting heavy batteries

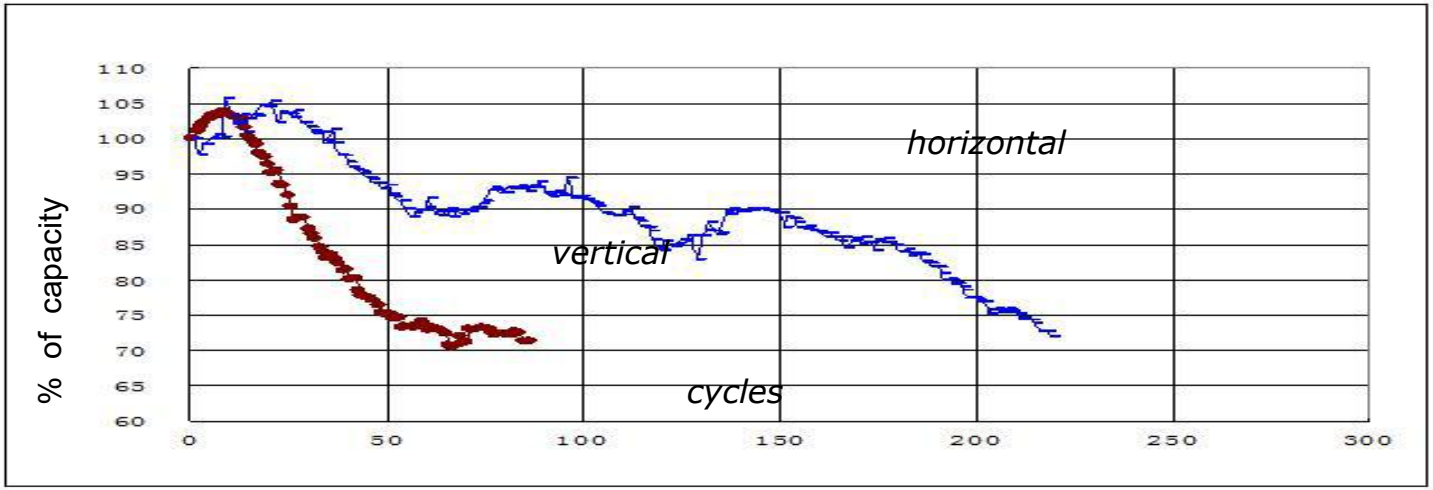
Storage and installation – installation procedure

- Step 1 Check voltage of each cell or monobloc supplied (V>2.04Vpc)
- Step 2 Switch-off rectifier/charger according to supplier instructions
- Step 3 Place all cells or monoblocs onto rack or tray
- Step 4 Check for proper polarity sequence + - + - + - and apply ID#
- Step 5 Take away terminal cover and install connectors
- Step 6 Tighten with proper torque terminal screws and replace cover
- Step 7 Verify for proper voltage and polarity of the string, for example 48V system the battery string voltage should be higher than 50V.
- Step 8 Connect cables and voltage sending leads to rectifier/charger and tighten screws
- Step 9 Switch on the rectifier according to supplier instructions
- Step 10 Verify cooling, ventilation and ventilation openings
- Step 11 Verify string voltage when in constant voltage charge state

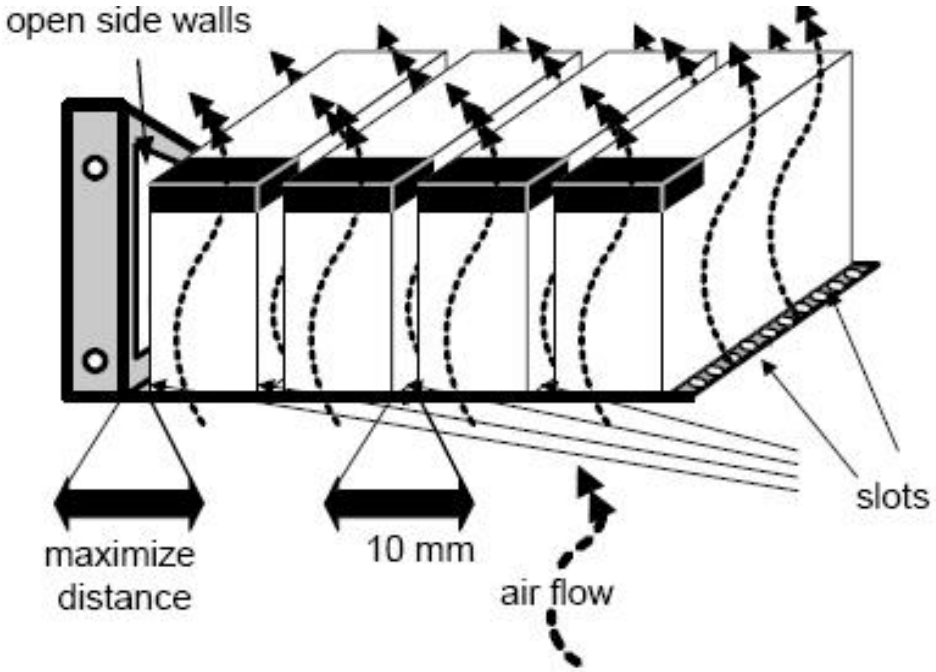
Storage and installation – horizontal/vertical installation

- **Horizontal** is recommended for 2V series, vertical for 12V series
- Vertical should be notified in advance

Service life of 500E under different installation

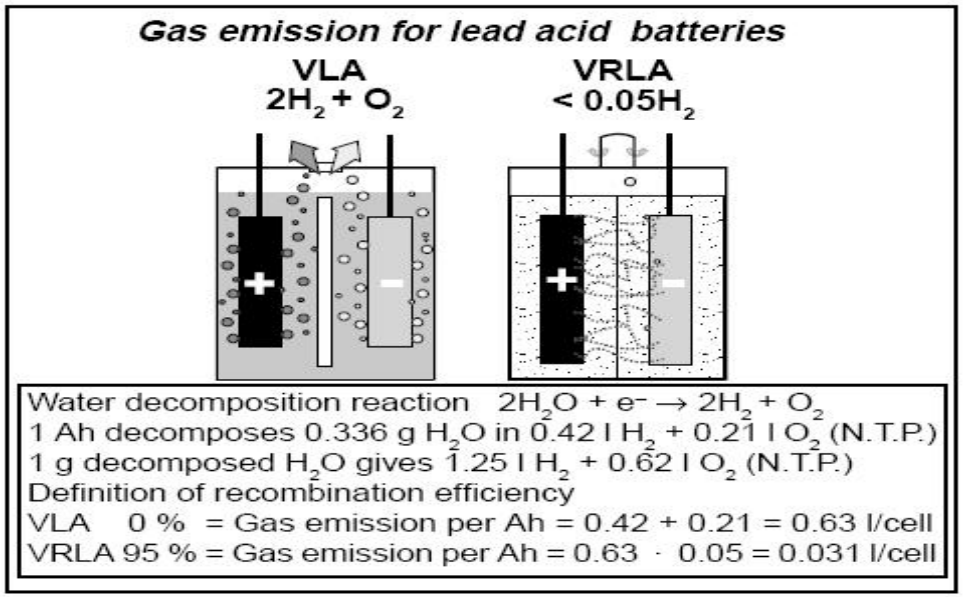


Storage and installation – ventilation



- Gap between each battery should be 10mm to make sure ventilation good. Too close would cause high temperature and hydrogen accumulation.

Storage and installation – ventilation



- All lead acid batteries generate hydrogen more or less, so it is important to keep ventilated.

Storage and installation – installation cautions

- Tighten the screw, or loose connection would cause fire.
- Gap between each battery should be 10mm to make sure ventilation good. Too close would cause high temperature and hydrogen accumulation.
- Install battery horizontally for 2V series, vertically for 12V series, which is strongly recommend by Gaston.
- Battery temperature difference will impact on the uniformity of battery performance and shorten service life. Avoid direct sunlight or other heat sources.

Topics

- Battery theory and structure
- Parameter setting
- Storage and installation
- Maintenance and test

Maintenance and inspection – precautions 1

- Battery system is the last defense of the power system, **reliability is always the most important**
- It is not advisable to turn off the switching power supply or A.C. to do the discharge test; There must be 1 bank battery on line during the test or replacement.
- **Guard against short circuit** Short circuit current is large due to the low internal resistance; potential safety hazard will be happened in case of short. Please use insulation tools and do not put metal tools on batteries.
- **Guard against reversed polarity during installation and replacement** otherwise the equipment will be damaged.
- **Fasten of the connectors screw** Very important, detect and fasten once a year

Maintenance and inspection – precautions 2

- Timely and sufficient of charge of batteries after discharge, equalization charge is recommended.
- Never clean the batteries with any organic solvents.
- Never try to open valves of sealed batteries or add any something into batteries.
- Do not smoke or use open fire near batteries.
- The batteries can be recycled so that right treatment of batteries necessary. Batteries contain lead, which will do harm to environment or human in case of badly disposal.
- Please look up for the right treatment method according to your local laws or send back to our service center for replacement or disposal.

Maintenance and inspection – routine maintenance

- Monthly and quarterly maintenance

  check the cleanness, ambient temperature, float voltage

- Yearly maintenance

  repeat the quarterly maintenance

  check that whether there is loose connection

  discharge 30% of the rated capacity on actual load for capacity check for batteries of more than 3-year-operation

- 3-year maintenance

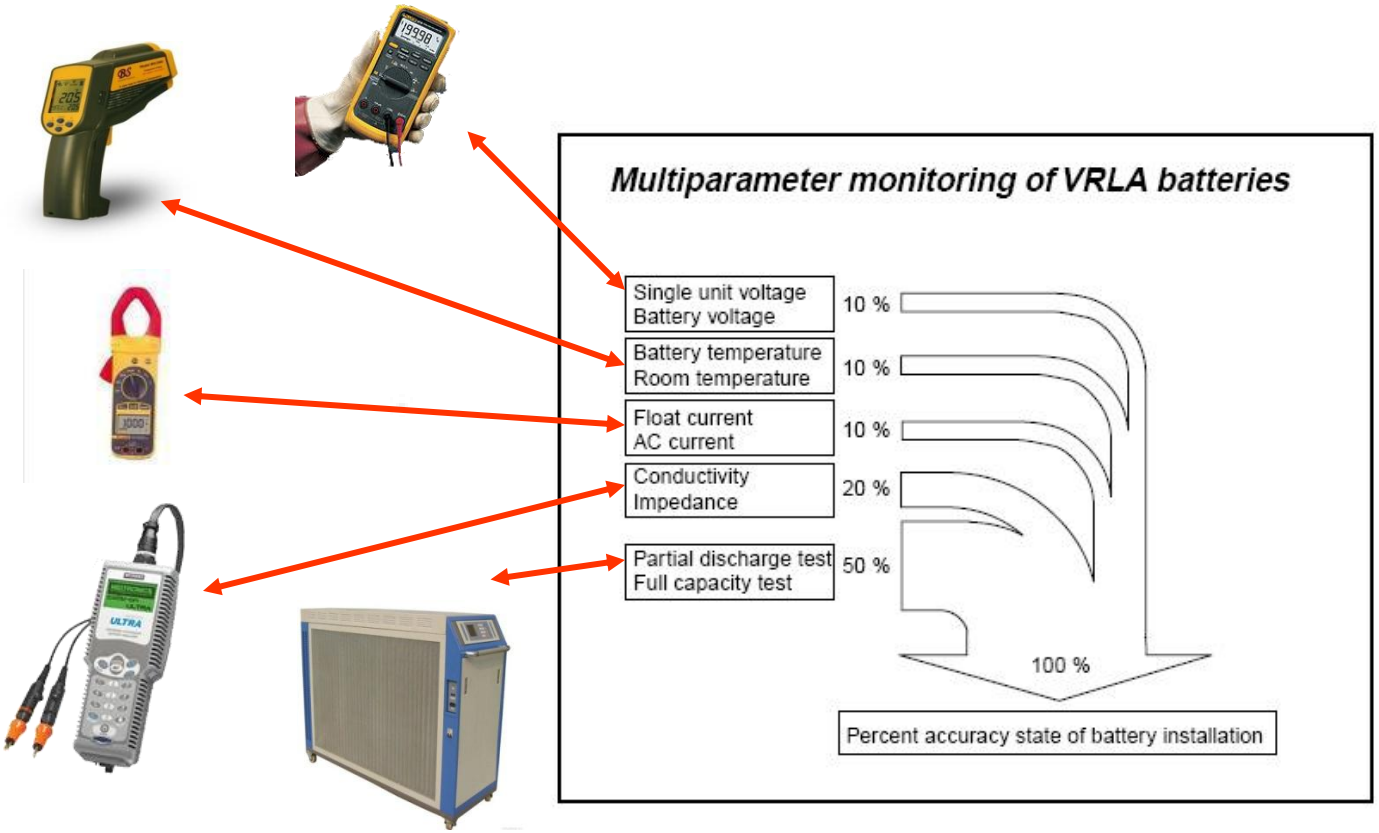
  carry out the capacity test every 3 years

  carry out the capacity test every year after 5-year-operation

Maintenance and inspection – healthy status monitoring

Parameter	*Frequency*
String voltage	After start-up and then every 6 to 12 monnths
Unit float voltage	After start-up every 6 to 12 monhs
Float current	After full charge every 6 to 12 months
Battery impedance, resistance or conductance	After start-up with the same equipment and at the same measuring point every 6 to 12 months
Battery temperature	Once in summer time or a needed
Battery status	Once a year for cleanliness
Battery capacity	Once a year with the operational load
Battery parameter records The collected data should be kept at the battery site and evaluated as function of their evolution in time. Significant deviations should be reported.	

Maintenance and inspection – healthy status monitoring



Maintenance and inspection – facility

- **Multi-meter**

  Common tool for voltage measurement

- **Intelligence load /dummy load**

  Common equipment for discharge test to precisely determine the capacity. Continuously adjustable intelligence load of 48V，0~150A discharge current for mobile site.

- **Internal resistance/conductance**

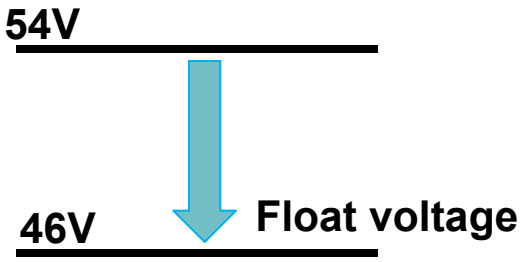
  Rapid, the determination of battery capacity can be served as reference.

- **Routine tools**

  Open spanner, screwdriver, inner-hexagon wrench for installation, replacement or daily maintenance.

- **clip-on ammeter**

Maintenance and inspection – discharge test



Online test

Dummy load

Intelligent load

Maintenance and inspection – conductance test

- **Nonlinear relationship between internal resistance and capacity**
- **The conductance difference between new batteries with ±10% Refer to the verification results for reference**
- **Detect the failure batteries**

  short circuit, open circuit, capacity < 40%
- **Analysis method**

Maintenance and inspection – feedback information

- **Photos**
- **Basic information**
- **Discharge test**
- **Parameter setting**
- **Alarm record**

Contact with us

Gaston technical support team

gaston@mailcentre.com.cn

gaston@gaston.com.hk

www.gaston.com.hk

Thank you

GasTon