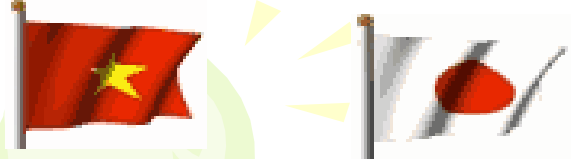


CONFIDENTIAL NOTES

- The following content is only use for training GSV distributors and customers.
- Please do not send this document to any third party.
- Please do not use photos or contents in this document for any other purpose.

List of abbreviations

- MCB: Motorcycle battery
- AMB: Automotive battery
- TB: Traction Battery
- IB: Industrial battery
- SAE: Society of Automotive Engineers
- OCV : Open Circuit Voltage
- NG: Not good



Confidential



GS BATTERY VIET NAM

***TECHNICAL MANUAL FOR CHECKING
WARRANTY MOTORCYCLE BATTERY***

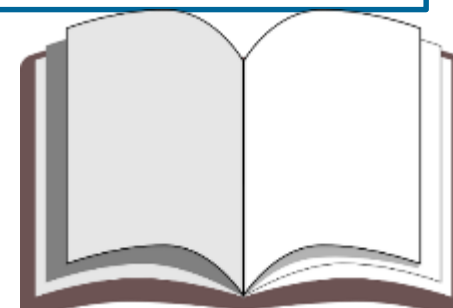




Content:



- 1. Company profile***
- 2. Structure of Battery***
- 3. Characteristics of the battery***
- 4. Manual guide and maintenance***
- 5. Warranty checking procedure***
- 6. Using fault and how to prevent them***



1. Company profile



Many *Factories & Sale Branches on over the World*

Northeast

Northwest

South

Southeast

FACTORY 3 (VĨNH PHÚC)

SALE BRANCH 2 (HÀ NỘI)

FACTORY 1 (HỒ BÌNH DƯƠNG)

FACTORY 2 (BÌNH DƯƠNG)

SALE BRANCH 1 (HCM)

IN Vietnam
03 *Factories*
02 *Sale Branches*

MCB.

AMB.

TRUCK, BUS, BOAT

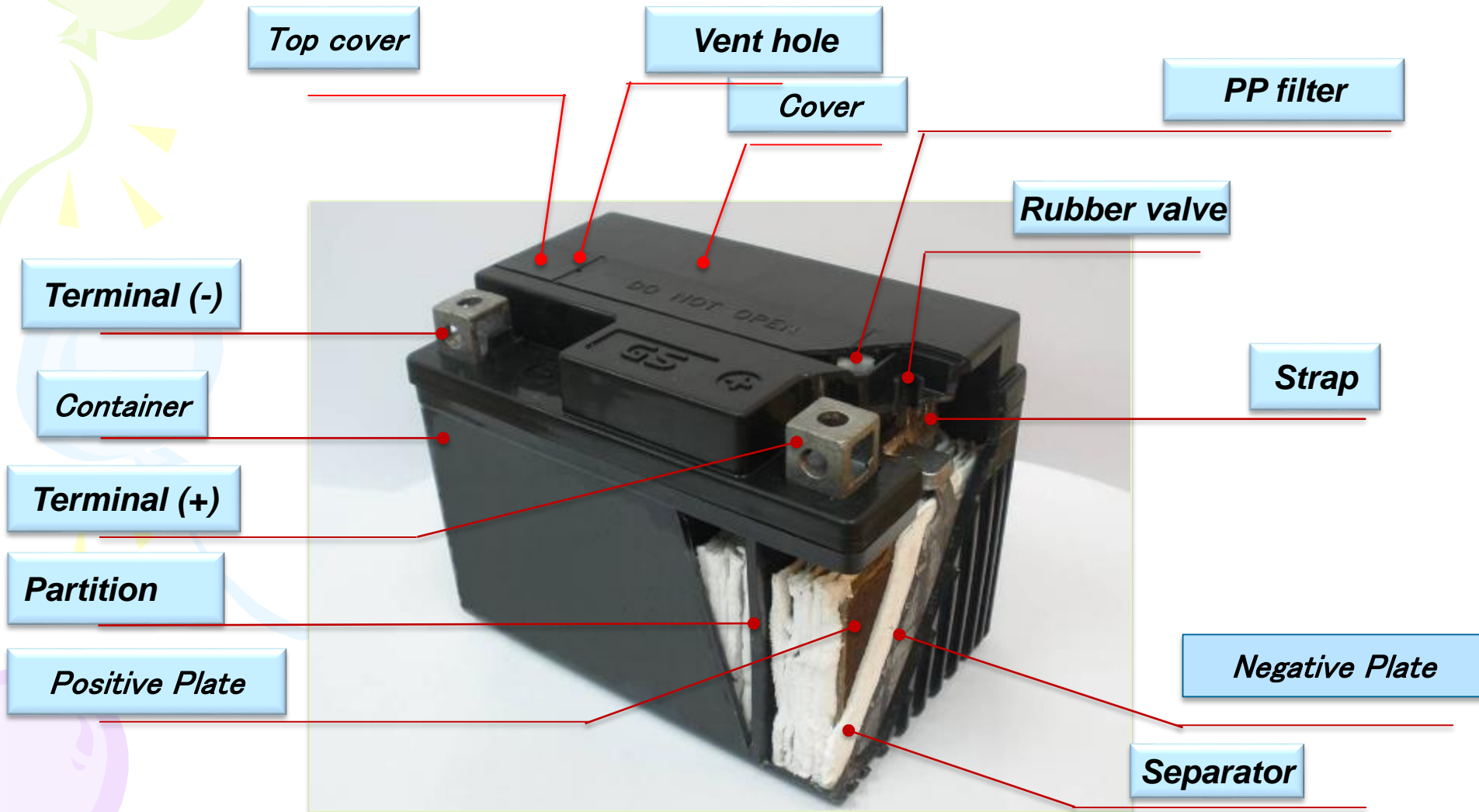
TB

IB

We will focus on valve regulated lead-acid (VRLA) battery for motorcycle

Customers: *Yamaha, Honda, Toyota, Hyundai, Thaco ...*

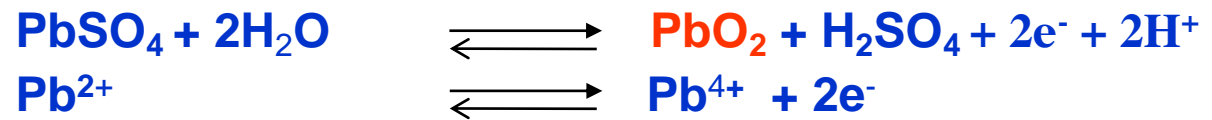
2. Structure of Battery



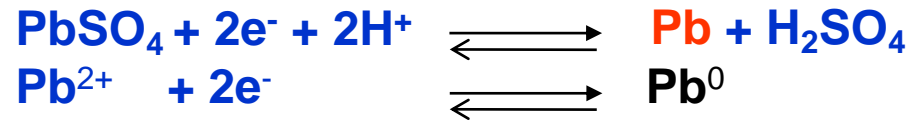
2.18 VOL X 6 CELL = 13.1 VOLTS (For reference)

2. Structure of Battery

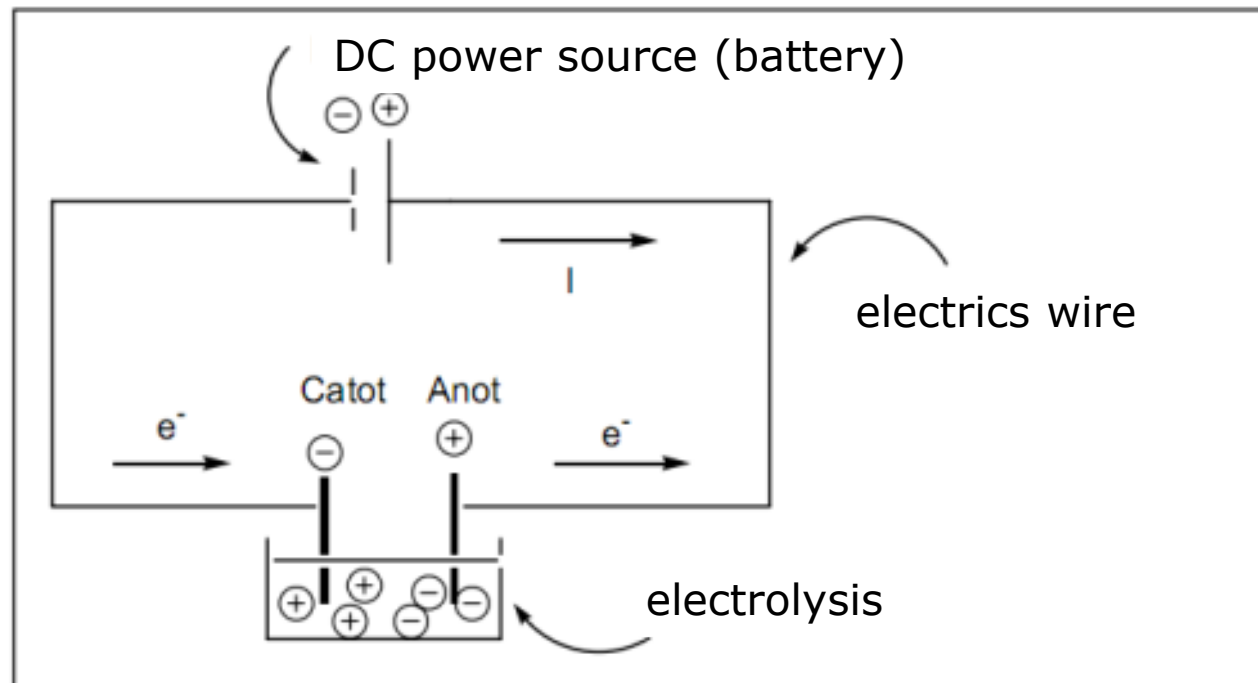
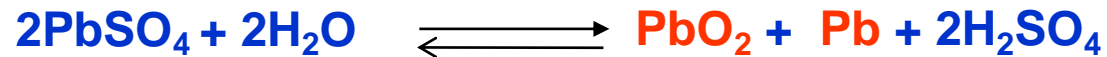
1. Positive Plate:



2. Negative Plate



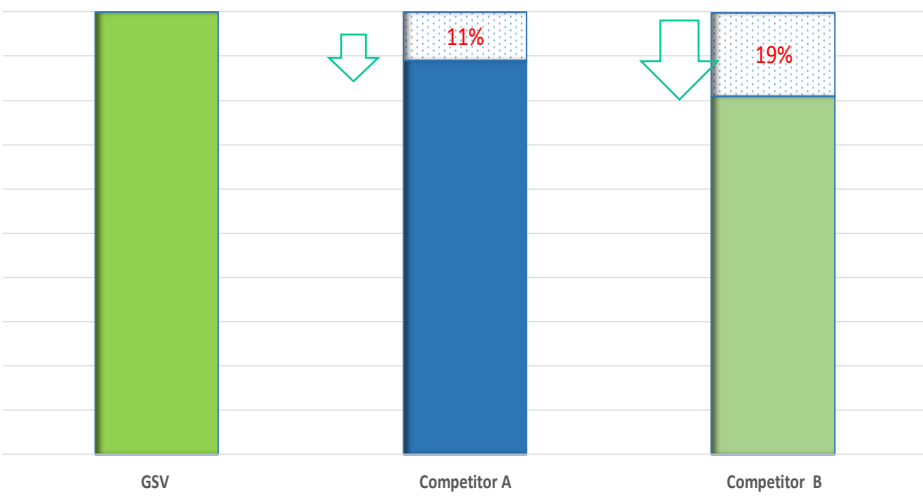
Reaction:



$$\text{Voltage 1 cell} = \text{Density} + 0.845$$

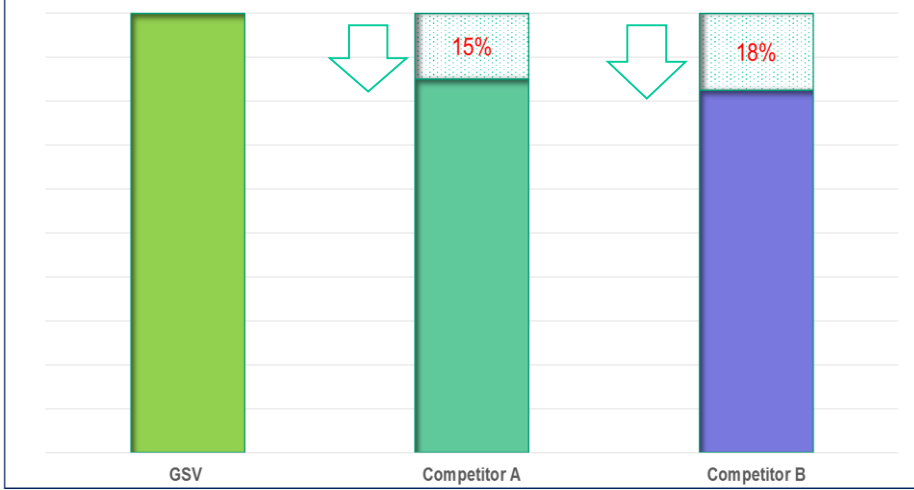
3. Characteristics of the battery

CCA TEST - GTZ6V

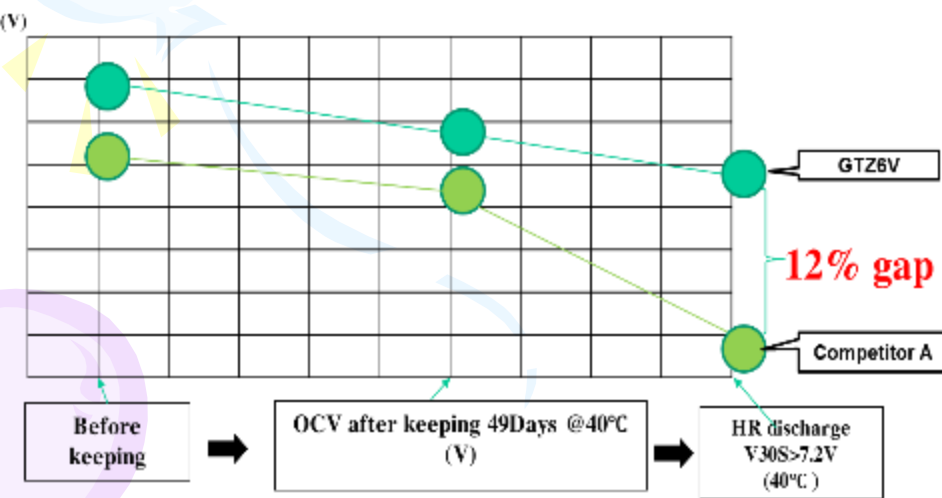


GSV battery is very strong for **starting power**

CAPACITY 10HR - GTZ6V

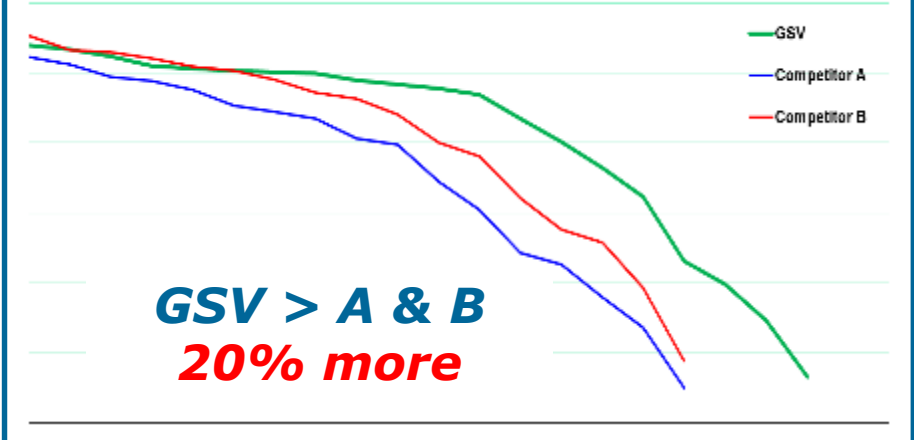


Capacity of GS battery is **much more** than others.



Long shelf Life → Reducing recharge times

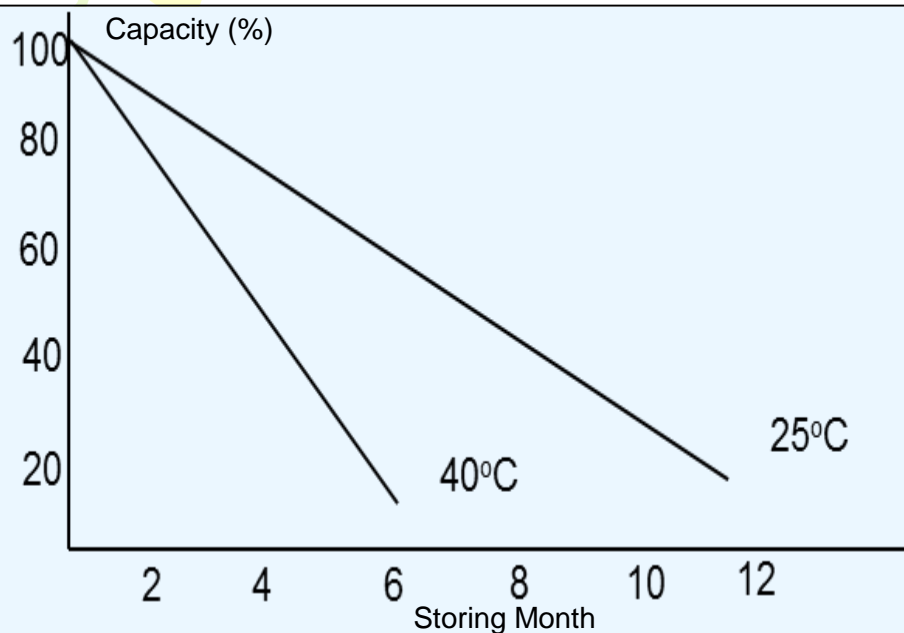
LIGHT LOAD TEST (SAE)



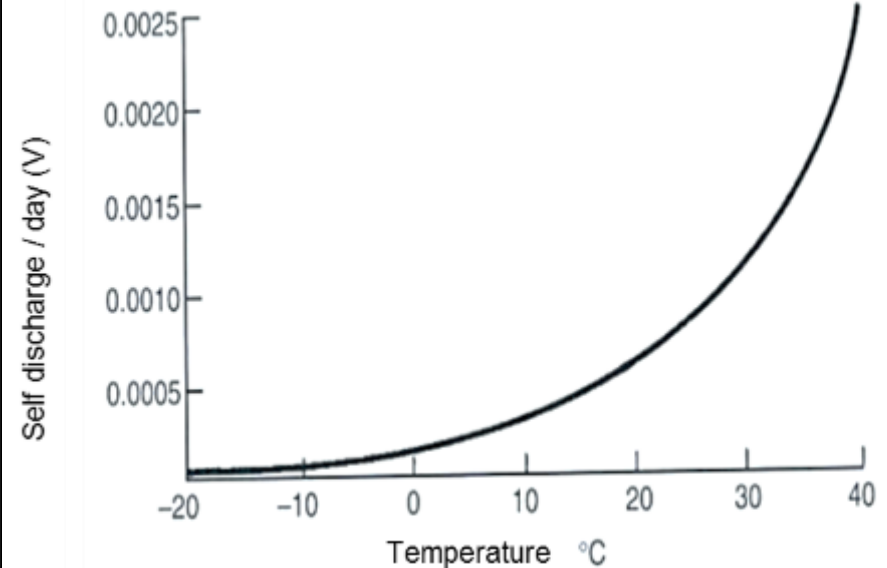
Capacity of GS battery is **Longer** than others.

3. Characteristics of the battery

Relation between Capacity & storing time



Self discharge follow Temperature



- Capacity reduce proportionally to storing time
- When storing for a long time need to check voltage 3 months/time , if < 12.4 V must recharge.

- The higher temperature, the higher self-discharge rate
- Battery is faster self-discharge if placed in a high temperature environment

4. Manual guide and maintenance



Avoid direct
sunlight

***Self-discharge are strongly affected
by storing time and temperature, so
we should focus some point when
storage battery as bellow:***



Preserved in a
cool, dry place
($<35^{\circ}\text{C}$)



- Aranged and should be placed on pallets.
- Compliance: first in first out



When storing for a long
time need to check voltage
3 months/time , If < 12.4
V must recharge.

Safety warning when working with lead-acid batteries



***Use glass to
avoid
electrolyte gets
into eye***



***Read using
instruction
before handle
battery***



***Keep battery
away from
electric sparks
& flame***



***Keep out of
the reach of
children***



***Ignition
sources must
be kept away***



***Use glove to
avoid
electrolyte
gets into skin***

5. Warranty checking procedure

Check warranty condition
(Warranty card, using time)



NG

No warranty

Check appearance battery



NG

OK

OK

Check OCV and recharge

We can recharge battery by auto charger to prevent overcharge

If recharge by manual charger should recharge with current = 1/10 capacity, follow table :

OCV (V)	12.8 ~ 12.6	12.6 ~ 12.4	12.4 ~ 12.2	12.2 ~ 12.0	12.0 ~ 11.8	↓ 11.6
Charging time (hour)	3.5	5.5	7.5	9.5	11	13.5



NG

Battery does not accept charge current

Battery damaged
need to replace

Check by tester BT-M20

OK

Red

NG

Yellow

OK

Green

Battery is good, can use normally



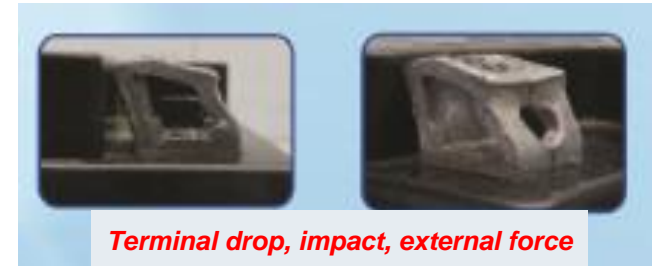
5. Warranty checking procedure

5. 1 Check appearance battery: for separate and refuse warranty with appearance fault as the following cases:

1. Battery is not as original situation (crack, broken, swollen...)



2. The terminal of battery is deformed



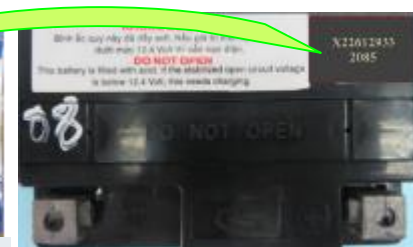
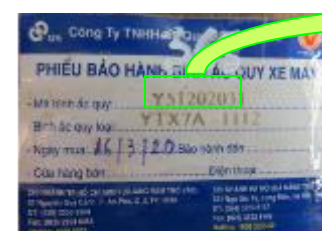
3. Fault due to external factors



4. Pry and repair



5. Warranty card invalid



5. Warranty checking procedure

5.2 Recharge for battery

Measure voltage of battery: If it $\leq 12.4V$ must recharge

Check charge acceptance to separate damaged battery before recharge

Clock needle
up \rightarrow good
battery



Clock needle
don't up \rightarrow
battery damaged



Remark: L10A charger is suitable for checking charge acceptance or boot charge for battery low voltage (0-1 V), It was not used for recharge battery because it can cause overcharge.

Recharge for battery

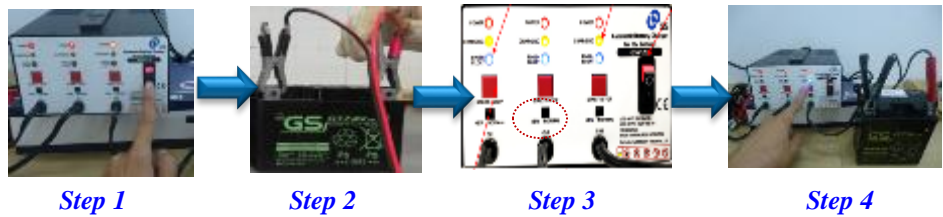


Should recharge by auto
charger to prevent
overcharge

Refer next page \rightarrow

Manual guide for using auto charger MB 2023

- Step 1: Turn power switch on*
- Step 2: Connect red clip with (+) terminal and black clip with (-) terminal of battery*
- Step 3: Selection of charging mode*
- + New mode: if recharge new battery
 - + Normal mode: If recharge the used battery
- Step 4: Turn on the start/stop button to start each charging source. Can charge 1 battery, 2 batteries, 3 batteries depending on usage needs*



Step 5: Check the charging status through the indicator light



Red light	Yellow light	Green light	Remark
Flash	-	-	Battery was clip reverse pole
Flash	Flash	Flash	Battery damaged
On	On	-	Battery charge normally
On	On	Flash	Adjust charging current suitable
On	Off	On	Battery full charge

- Quick check battery status base on the status of indicator light:*
- When connect charger with battery correctly If the red light is flash → **Battery damaged**
 - When connect battery turn on start /stop button but yellow light is not on → **Battery damaged**
 - During charge the battery is become very hot → **Battery damaged**
- After full charge:*
- + Turn off start/stop button
 - + Remove the battery standby 15 minutes then check the power

5. Warranty checking procedure

5. 3 Check the charging voltage of motorcycle by tester

I. Check the battery by BT-M20 tester



- Connect red clip with (+) terminal and black clip with (-) terminal of battery
- Press and release the "battery check" button, then the device will display the results: Green light: GOOD, yellow light: WEAK POWER, red light: DAMAGED
- After checking that the battery is still good, reinstall it in the motorcycle and check the charging voltage

II. Check the charging voltage of motorcycle

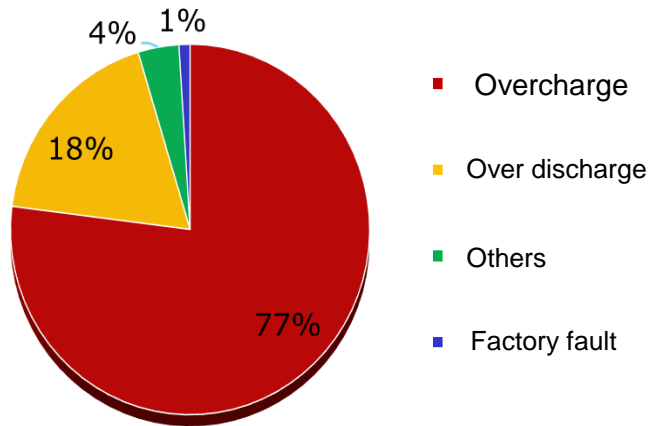


- Connect red clip with (+) terminal and black clip with (-) terminal of battery
- Start the engine and keep the throttle on medium (30km/h)
- Press and hold the motorbike charging check button, the device indicates Green light: GOOD CHARGE, yellow light: WEAK CHARGE, red light: HIGH CHARGE
- When the light indicates "WEAK" or "HIGH", need to check the charger.
- If there is no tester, customers can check the vehicle's charging voltage with a VOM meter (standard 13.5 → 14.2 V).

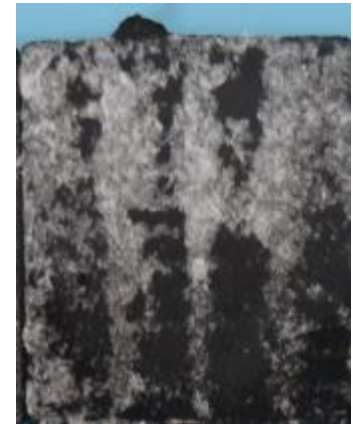
6. Using fault and how to prevent them

When teardown claim battery we found that the most popular fault are overcharge and over discharge.

Claim analyzing result



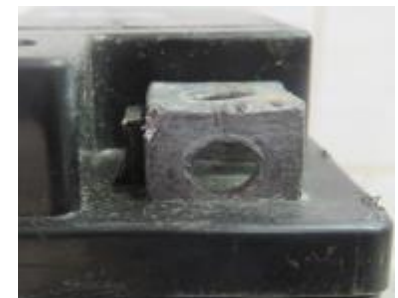
+ Overcharge is the highest ratio ~77%



+ Over discharge account for 18%



+ Apperance fault, reverse pole, using not right purpose... (~4%)



6. Using fault and how to prevent them

6.1 Overcharge

Phenomenon: Separator dried electrolyte, Positive plate was decayed.



Positive plate was decayed



Separator dried electrolyte

Cause

- Charge with a higher current or longer time than standard
- Use car charger to charge for motorcycle battery.
- Using unsuitable charger with a large charging current to recharge for the battery.

Picture



6. Using fault and how to prevent them

To prevent over charge

1. When recharging battery with a manual charger, must control the charging current and charging time according to the standards below

Voltage battery (V)	12.8 ~ 12.6	12.6 ~ 12.4	12.4 ~ 12.2	12.2 ~ 12.0	12.0 ~ 11.8	↓ 11.6
Charge current Standard	0.1C(A) x 3.5H	0.1C(A) x 5.5H	0.1C(A) x 7.5H	0.1C(A) x 9.5H	0.1C(A) x 11H	0.1C(A) x 13.5H

Noted: C is capacity of battery, GTZ6V the capacity C = 5Ah, charging current will be $0.1C = 0.5 (A)$. If this battery has initial voltage is 12.4 V --> The battery will be charged with current 0.5A in 5.5 hours

2. Using autocharger to recharge for battery

- Because auto chargers have function of automatically turning off when the battery is full, it can prevent overcharging better than manual chargers.
- Auto adjusting charging modes for many types of batteries with different capacities can extend battery life
- .It has a self-protection feature in case of overvoltage, electrical incidents... durably and safely for users

Introduce some auto charger of GSV has function prevent overcharge



5 line charger



GSV-23 charger



GSV-20 charger

6.2 Over discharge




Phenomenon:: Negative plate sulfated, positive plate has brown color



Negative
plate
sulfated



Positive plate
has brown
color

Cause	Picture	Preventive action
- Forgetting to turn off the key after use causes the battery low power		-Customers should turn off the lock and remove the key from the vehicle when not in use
- Attach more power devices to motorcycle creates leakage current		- Do not add more power devices to the Motorcycle
- Motorcycle has been left unused for a long time without being properly recharged		-If motorbike is left for a long time without being used, should restart the motorbike to let the engine operate for 15 minutes, do this every 2 weeks to prevent over-discharge

Survey and test after training

Please click on the link below or scan the QR code to take the quiz:

<http://portal.gsbattery.vn/GSVI/HoatDongGSV/LamBa?idhd=382bd18e-fc2b-49c4-a0d3-4ff5798c5401>



Instructions for logging into the testing system

A screenshot of a web form for logging into a testing system. The form has a header with the GSV logo and the tagline 'POWER FOR JOURNEYS'. Below the header, there are two tabs: 'Nhập thông tin' (selected) and 'Đăng nhập'. The main content area has a yellow background with the text 'Vui lòng nhập thông tin của bạn'. There are two input fields: 'Nhập số điện thoại của bạn' (with a red arrow pointing to it from instruction 1) and 'Nhập tên của bạn' (with a red arrow pointing to it from instruction 2). At the bottom, there is a blue button labeled 'GỬI THÔNG TIN' (with a red arrow pointing to it from instruction 3).

- 1 *Fill your telephone number*
- 2 *Fill the name of technician and distributor*
Example: Nguyễn Văn A- Tân Toàn
- 3 *Click here to to take the quiz*

Instructions for handling errors of not being able to access the test

If you have got the fault as below, please copy the link and past to your browser.



1 Copy link in here

2 Past the link to browser and press Enter.



DOCUMENT APPROVAL

This document will be updated to GSV's web site (<https://www.gsbattery.vn>). We will display the on web site the document "Guideline of battery technical" and attach "Battery technical and using instruction" as pdf file.

Prepared by	Checked by	Approved by	IT-Admin