




VRLA battery user safety instructions

 Danger	Means extreme danger. Improper usage will cause serious injury or even death.
 Warning	Means urgent danger. Improper usage will cause the possibility of death, serious injury and light injury or facility damage.
 Caution	Means ordinary danger. For improper usage, the possibility of serious injury is less, but may cause light injury or facility damage.

1.Using environments and conditions

Danger

- (1) Please do not store the battery in a closed environment, shall keep it away from fire sources. If not tend to cause an explosion, fire, facility damage and body injury.
- (2) Please use a specialized charger to charge the battery, and follow the specified charging terms. Charging under different conditions will cause the battery to leak fluid, heating and emit hydrogen even cause explosion.

Warning

- (1) When battery is used for medical applications, please install extra standalone backup units, which can prevent human injury when battery fails.
- (2) When battery needs to set up inside the metal products. Please use insulated material that has acid-resist and heat-resist between battery and metal container. Not using insulated materials may cause fire or an explosion by leaking.
- (3) Do not install batteries close to fire or any objects (switch, fuse) what spark may occur. Battery may emit flammable gas, which may cause fire or explosion.

Caution

- (1) The temperature ranges for batteries usage are listed as below:
Usage outside the following ranges will shorten battery life and lower its performance level, and may cause acid leakage, fire and explosion.
During discharging(Machine running) : -15°C~45°C During charging : -15°C~45°C
During storage : -15°C~45°C

- (2) Please do not use the batteries near transformers or heat resources, it will cause acid leakage, heating and explosion.
- (3) Please do not use the battery in a moist environment or immerse it in water, doing this will cause battery acid leakage, electric shock and fire.
- (4) Never use/store the batteries under direct sunlight, near heater, fire or in any other spaces of high temperature. All of these will cause acid leakage, heating and explosion.
- (5) Do not use the battery in the place where is a lot of dust, or it may cause short circuit. Please always check and clean if it is necessary to place the battery in dust area.
- (6) When using batteries in a series, connections should be made between the batteries before charging or underload. The positive terminal of the battery must connect to the positive side of the charger of the load. If connection error occurs, it may cause explosion, fire, personnel or equipment damage.
- (7) Be care of the fallen of the battery, it may crush foot that cause severe damage.
- (8) Do not use the battery out of its maximum current of the datasheet, or it may cause leaking, heat or fire.
- (9) Do not use the battery in extremely high reliability applications listed as below or other applications.
 - (9-1) Submarine Machines (Submarine repeater, Sea operation machines etc.)
 - (9-2) Control machines for moveable objects (Precise control instrument for automobiles, Airplanes, Railroad, Vessels... etc.)
 - (9-3) Medical machines (Life sustaining devices, Dialysis machine, etc.)
 - (9-4) Machines for nuclear, or national defense.

Suggestions

- (1) Do not let battery be crushed, fallen, and strong impact. Do not use the battery in strong vibrations environment, or it may cause crack of battery.
- (2) Please Please make sure the lifespan of the actual loading. Lifespan may substantially change by different re/discharging conditions.

2. Applications

Danger

- (1) Metal tools like adjustable wrench or etc., please use PVC(insulation) tapes for insulation before application, or short circuit may be occurred, which would bring heat or sparks that cause battery crack, fire, even explosion.



- (2) Please do not store the battery in a closed environment and fire sources, or it may cause explosion, fire, facility damage and body injury. Besides, battery may emit hydrogen gas.
- (3) Do not mix different kinds of battery such like Ni-MH, Ni-Cd batteries, or it may cause battery leakage, heat, explosion, and human damage.

Warning

- (1) Do not let the insulated wire or soft PE wrap which have plasticizer. Besides, do not use any organic solvent or detergent like gasoline, banana oil, white gas, lubricant, and etc., or it may crack the container that leads to acid leakage and fire.
- (2) Do not let the acetic acid approach the battery, it may cause battery crack.
- (3) Before using the battery, please wear insulated gloves and boots, or it may cause electric shock, burn, or fire.
- (4) Do not place the battery in the area where may be soaked by water, or it may cause fire and electric shock by electricity leakage.

Caution

- (1) Please carry the battery carefully when opening the package. Otherwise, battery would damage by accident impact. Besides, please check the battery of crack or acid leakage.

(2) The battery should be installed in easily check, configure, and replacement position to the facility. It is better to install in the bottom of facility because safety valves may leak liquid, which would cause explosion, fire, and etc..

Battery can be installed under 90 degrees like below.



Upside down

Horizontal stand

Lie down

Vertical stand

(3) Do not grab the battery terminal or cable to shift its position, it would cause battery damage.

(4) Do not let battery be collided or dropped to the ground when carrying them, which may crack the batteries.

(5) Batteries are heavy, please carry or transport them correctly to prevent waist injury.

(6) Do not use plastic sheets to cover the batteries, which may generate static electricity to cause fire and explosion.

(7) Do not fasten the bolt out of specific torque range, or it may cause sparks and terminal crack.

Bolts and nuts fasten torque range table is showed below :

Bolt Diameter	Tightening Torque Nm(kgf.cm)
M 5	2.0 ~ 3.0 (20 ~ 30)
M 6	3.9 ~ 5.4 (40 ~ 55)
M 8	9.0 ~ 11.9 (92 ~ 122)
M 10	14.7 ~ 19.6 (150 ~ 200)

(8) Battery container may be cracked that cause acid leakage, which results in leakage circuit. When designing the circuit, please set insulating dividers or trays between batteries, facilities and mounting brackets.

(9) Please make sure all the connections between each terminal are correct when using batteries in series, and keep each battery heat dissipation distance at least 0.5cm.

⚠ Suggestions

- (1) Please contact well-trained and qualified experts to complete battery system installation. In some countries, electrical engineering experts must have qualification certificate from government.

3. Preparation before use**⚠ Danger**

- (1) Please use insulated materials to cover the terminal and connector, or it may cause electric shock, burn, fire, and explosion.

⚠ Caution

- (1) Battery charging must connect specific charger only, do not directly connect AC power sockets or cigarette lighter socket. If connected, it may cause battery acid leakage, heat, and explosion.
- (2) Please turn off power before connecting battery to charger or load.
- (3) If there is any corrosion, cracking, deformation, heat generation, or other abnormalities to the VRLA battery upon its first use after purchase, do not use it. Using the battery with an abnormality may cause acid leakage, heat or explosion.

⚠ Suggestions

- (1) For the initial use or if the battery has been stored for a long time, please recharge the battery full before using. The battery capacity would reduce by self-discharge and cannot approach the specific performance.
- (2) Stored temperature, recharging period, and recharging method are shown below. Due to higher temperature makes higher self-discharging, batteries should be stored that evade from high temperature and sunlight.

Here is stored temperature and recharging period:

Stored temperature	Recharging period	Recharging method
Lower than 25°C	Every 6 months	1. Limited current constant voltage recharge at the rate of 0.25C(A);2.275V / Cell for 2 to 3 days 2. Limited current constant voltage recharge at the rate of 0.25C(A);2.4V / Cell for 10 to 16 hours. 3. Constant current recharge at the rate of 0.1C(A) for 8 to 10 hours.
Lower than 30°C	Every 4 months	
Lower than 35°C	Every 3 months	
Lower than 40°C	Every 2 months	
Higher than 40°C	Shall not keep it	

※1. Current : "C" means rated capacity. When C=7AH ; $0.25 \times 7 = 1.75$ (A) .

※2. 12V battery $2.275V/Cell \times 6 = 13.65V$.

4.Out of application usage range

Caution

- (1) Do not use the battery out of its application usage range, or it may cause leaking, heat or fire.
- (2) Do not let battery get short circuit, which would cause battery leakage, fire, even explosion.

5.In use

Danger

- (1) Do not use any metal such as steel wire to connect positive and negative terminals on the battery, or it may cause heat, hydrogen gas that leads to battery leakage, fire, or explosion.
- (2) Do not keep and carry battery with metal tools, or it might damage the battery that cause acid leakage, heat, or explosion.

Warning

- (1) Do not burn the battery or throw it into a fire, which may cause acid leakage, fire, or explosion.
- (2) Please do not decompose, reconstruct or destroy battery that will cause acid leakage, heating and explosion.

 **Caution**

- (1) If there is any cracking, deformation, acid leakage or other damages on the appearance of the battery, please replace the new one. Using the battery with abnormal appearance may cause capacity decrease, electric leakage, smoke, or explosion.
- (2) If there is an observed unusual situation of charging voltage or discharge situations, please replace the battery.
- (3) Please follow the list below to ensure proper battery safety. Otherwise, it could cause a battery leakage, fire or cause an explosion and injury.
 - (3-1) Do not reverse the terminal connection between batteries to recharge.
 - (3-2) Do not weld directly on terminals, or please contact us if necessary.
 - (3-3) Do not mix different kinds, models, or date codes of batteries, or it may cause acid leakage, fire or explosion.
- (4) Appropriate bolts and washers screwing method is shown below:

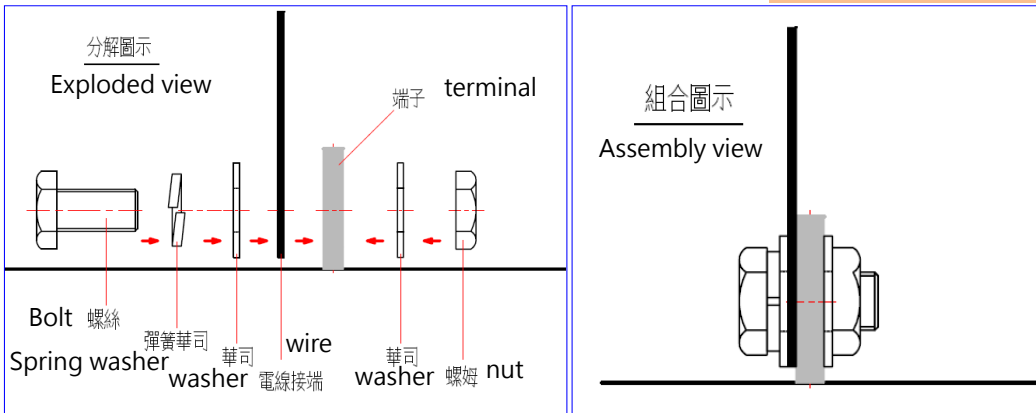
螺絲組裝位置示意圖 Bolt nut set installation

Type

型態	裝配順位 Installing priority
標準型	螺絲 + 彈簧華司 + 華司 + 電線接端 + (穿過 端子部) + 華司 + 螺母

Standard

Bolt + Spring washer + washer + wire + terminal + washer + nut

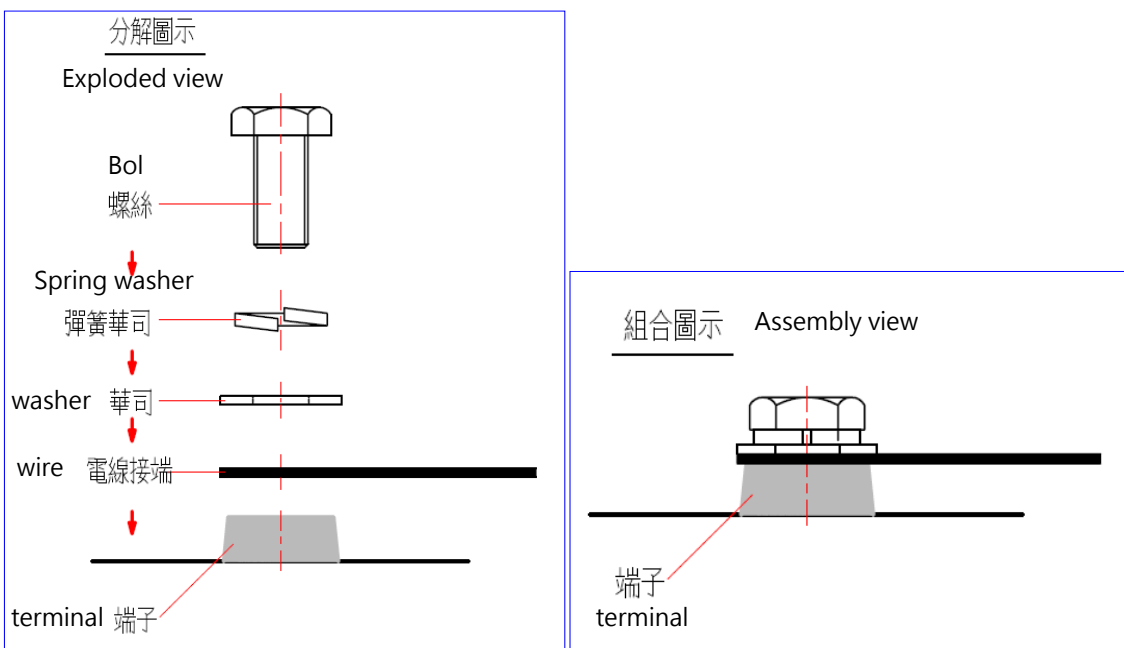


Type

型態	裝配順位 Installing priority
埋入式	螺絲 + 彈簧華司 + 華司 + 電線接端 + 端子部

Embedded

Bolt + Spring washer + washer + wire + terminal



⚠ Suggestions

(1) Final voltage is related to battery discharging current, which is written down in datasheet. Do not let battery discharge to a voltage lower than suggested final voltage, or it may cause heat, deformation when charging.

- (2) Please use time or capacity controlling charger when battery in cycle (cyclic dis/recharging) use. Besides, please recharge in specified time or when charge finished indicator off. If charging terminates accidentally, it might shorten the battery lifespan.
- (3) Do not charging in parallel when cycle use, which may lose discharging balance that shorten the lifespan.
- (4) If the equipment will not be in use for a long period, please remove and recharge the battery from the equipment then store in a dry area. If storage condition is poor, it may cause battery performance, lifespan decrease, and corrosion.

6.Maintenance and checking

Warning

- (1) Please use damp cloth with moisture to clean the battery, do not use any dry fabric, feather duster or other materials, or it may cause static electricity that leads battery on fire.
- (2) Replace the battery at or before the time indicated on the battery or in the user's manual. Usage beyond the required time of service would cause short circuit, container deformation that leads acid leakage, fire, or explosion.

Caution

- (1) Do not use any organic solvent or detergent like gasoline, banana oil, white gas, and etc., or it may crack the container that leads to acid leakage and fire.

Suggestions

- (1) Please make regular inspection on the battery. If inspection result does not meet the standard in user' s manual, please follow the steps according to user' s manual. Keep using under standard battery would cause cracked.
- (2) Please keep terminals clean when using battery. If terminals are dirty, it would make poor connection that cannot recharge the battery.

7.Procedure when abnormality

Danger

- (1) If there is any corrosion, cracking, deformation, or other abnormalities to the battery, please do not use it. Using abnormal battery may cause acid leakage, fire or explosion.
- (2) Procedure after earthquake or disaster:
 After an earthquake or disaster, please check the tightness and each connection to avoid spark or crack of battery.
 After an earthquake or disaster, please inspect each battery container to make sure that there are no cracks or any abnormalities. If keep using abnormal battery, it would cause acid leakage, fire, or explosion.

Warning

- (1) Battery contains diluted sulfuric acid. If the acid leaks out and gets onto your skin or clothing, please wash it off immediately with clean water. Additionally, if the acid splashes into your eyes, please wash them with large volume of clean water and get immediate medical retreatment. If acid splashes into your eyes, which may cause the loss of eyesight, and when it gets on your skin, it would cause burned on your skin.

Caution

- (1) If there is any corrosion, cracking, deformation, or other abnormalities to the battery, please do not use it. Using abnormal battery may cause acid leakage, fire or explosion.

8.Battery storage

Caution

- (1) Do not use any metal such as steel wire to connect terminals and avoid falling objects, please follow the storage methods to store the battery in safety area.
- (2) Do not let rain wet the battery, it would corrode the terminals.
- (3) Battery should be horizontal stand stored, and avoid vibration and impact on it, or which may be cracked or deteriorated.
- (4) When storing the battery, please take off battery from facility, cut down power or load. Then store the battery avoid direct sunlight and any other spaces of high temperature or moisture. All of these will cause less lifespan and terminal corrosion.

Suggestions

- (1) When storing the battery, please recharge it every 6 months(under 25°C). If keep discharging when storing for a long period, it cannot reverse full capacity even recharged.
- (2) If the battery is stored for more than a year without any recharging, its lifespan will be shortened.

- (3) Please make full charge on battery before storing, or it would shorten the battery lifespan.
- (4) Battery should be in use as fast as possible because battery performance would gradually decline, and hard to restore capacity even recharge it.

9. Disposing the battery

Caution

- (1) There has the policy about disposing battery or facilities in some countries, please obey the laws.
- (2) When recycling the used battery, please insulate the tape on terminals because used battery still has electricity. If terminals are not insulated, it may cause explosion and fire. Contact us or authorized resellers about recycling.

10. Battery Toxic or hazardous substances and elements

Suggestions

- (1) Toxic or hazardous substances and elements

Part name		Lead (Pb)	Mercury(Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Terminals	Fastons	×	○	○	○	○	○
	Lead terminals	×	○	○	○	○	○
Container		○	○	○	○	○	○
Internal elements		×	○	○	○	○	○

This table follows Restriction of Hazardous Substances Directive(RoHS) standard.

○ : Indicates that this hazardous substance contained in all homogeneous materials of this part is below the limit requirement in RoHS.

× : Indicates that this hazardous substance contained in at least one of the homogeneous materials of this part is above the limit requirement in RoHS.