



INSTALLATION AND OPERATION INSTRUCTIONS



AMARA RAJA
Gotta be a better way

Ref No: ARB- MAN-Quanta-13-001

This document details procedures to be followed while installing and operating AMARON QUANTA™ SMF-VRLA batteries. The procedures herein described are meant for use by the customers of AmaraRaja Batteries.

This document is a part of the documentation system in AmaraRaja Batteries Limited and the procedures described in this manual are supportive to the quality manual.

Suggestions and recommendations on this manual may please be mailed to the National Service Manager Channel Service at mktg@amararaja.co.in

The technical details in this manual may be changed/modified without prior notice due to design improvements as per company's continuous improvement policy.

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Section 1 - General Information

1.0 AMARON QUANTA™ Batteries

In normal use, AMARON QUANTA™ Batteries will not generate or release hydrogen and oxygen gases, will not release acid mist and will not have acid leak. This is because AMARON QUANTA™ Batteries are designed differently from conventional lead acid batteries in order to provide maintenance - free operation. They are inherently safer than conventional lead acid batteries. However, there is a possibility that under abnormal operating conditions, or as a result of damage, misuse and/or abuse, these potentially hazardous conditions (gassing, acid mist, and leaking electrolyte) can occur. Thus AmaraRaja recommends that the instructions entitled "SAFETY PRECAUTIONS" be reviewed thoroughly and strictly followed when working with AMARON QUANTA™ Batteries.

Section 2 - Safety Precautions

2.0 Safety Alert



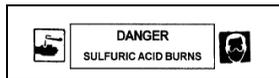
The safety alert symbol at the right appears throughout this manual. Where the symbol appears, obey the safety message to avoid personal injury.

CAUTION!



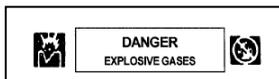
Before proceeding with the unpacking, handling, installation and operation of this AMARON QUANTA™ valve-regulated lead-acid storage battery, the following general information should be reviewed together with the recommended safety precautions.

2.1 Sulfuric acid burns



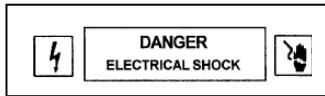
Batteries contain sulfuric acid, which can cause burns and other serious injuries. In the event of contact with sulfuric acid, flush immediately and thoroughly with water. Secure medical attention immediately. When working with batteries, wear a rubber apron, rubber gloves and safety goggles or other eye protecting equipment. These will help in preventing injury of contact is made with the acid.

2.2 Explosive gases



Under abnormal usage and excessive overcharging batteries can generate excessive gases, which will be released pressure thru the vent plugs / safety valves area and any contact with spark/fire will lead to excessive flames causing blindness and other serious injury. If the safety vent opens while the gases are being generate (i.e. in the event of the charger malfunction / over charge) these explosive gases will be released. Keep sparks flame and smoking materials away from the batteries area.

2.3 Electrical shock and burns



All installation tools should be adequately insulated / covered with vinyl electrical tape, or suitable non-conducting material to minimize possibility of shorting across connections.

Never lay tools or other metallic objects on modules as it may result in shorting of battery leading to explosions and personal injury.

Multi-battery systems attain high voltages therefore extreme caution must be exercised during installation of a battery system to prevent serious electrical burns or shock. Loose or dirty connectors / connection can cause battery fires. Keep all connectors / connections clean and torque at proper values. Keep the outside of batteries clean and dry Neutralize any acid corrosion with cloth moisture with a solution of baking soda and water, then wipe off all traces of soda.

Do not move or shift the cabinet once installed without first disconnecting load to the cabinet and all inter cabinet connections. Refer wiring diagrams for location of these connections.

Do not lift the Batteries by "L" terminal / posts. Do not tamper with post seals, protective covers pressure relief vents or other battery components.

Disconnect the DC circuits from the charging equipment & load before working on batteries. Ensure that the personnel who stand the risk of working with batteries are prepared and equipped to take the necessary safety precautions. These installation and operating instructions should be understood and followed. Assure that you have the necessary equipment for the work, including insulated tools, rubber gloves, rubber aprons, safety goggles and face protectors.

CAUTION!



If the foregoing precautions are not fully understood, clarification should be obtained from your nearest AmaraRaja representative.

2.4 Important Message

The symbol at the left indicates an important message. If not followed, damage to and / or impaired performance of the battery may result.

Section 3 - Receipt of Shipment

3.0 Delivery Inspection

Upon receipt of shipment unload and store the batteries in covered area. Do not expose them to direct sun light, rain, dust, storm, etc. Immediately upon delivery, examine for possible damage caused in transit, damaged packing material could indicate rough handling. Make a descriptive note on the delivery receipt before signing. If battery damage is found, request an inspection by the carrier and file a damage claim immediately. Any battery with post or seal damage should be replaced.

3.1 Concealed Damage

Immediately upon receipt of shipment examine all the batteries and cabinets for concealed damage. If damage is noticed, immediately request an inspection by the carrier and file a concealed damage claim. Any delay in notifying carrier may result in loss or no right to reimbursement for damages.

Section 4 - Storage Prior to Installation

4.0 Storage Location



Do not locate batteries in places exposed to direct sun light, rain dust, storm etc. Such exposure will cause damage to plastic components and will reduce battery life drastically.

If the battery is not to be installed at the time of receipt, it is recommended that it to be stored indoors at a temperature of 15°C - 32° C, clean, dry location provided with a freshening charge intervals detailed in Section 4.1. Do not stack wooden crates or cases one above the other to prevent damage to the batteries.

4.1 Storage Interval



AMARON QUANTA™ batteries have a long shelf life provided that the following instructions are adhered to. During the storage interval (i.e. between date of shipment and date of installation) a freshening charge should be given once in every six - (6) months. Storage at elevated temperatures will result in accelerated rates of self-discharges. The table given below shows the storage interval at the various elevated temperatures before which a freshening charges is to be given.

CHARGING	INTERVALS	RECOMMENDED FRESHENING CHARGE VOLTAGE & DURATION		
AVERAGE AMBIENT TEMP°C	INTERVAL (MONTHS)	Charging Voltage – Volts		Duration (hrs) when charged with current limit of 25% of Ah capacity@C ₂₀ rate
<27	06	For Single Module	For Single Module	
27-32	4.5			
32-37	03			
37-42	2.25	13.5-Float	13.8-Boost	16-24
42-47	1.5			

Storage beyond these periods without charge can result in excessive sulphation of plates, which is detrimental to battery performance and life. Instruction on how to apply a freshening charge are detailed in 8.0

Note: All temperatures given in this Section should be considered as average temperatures for the entire duration of the storage interval.

Section 5 - General Installation Consideration

Prior to installation of the AMARON QUANTA™ battery system, a review of this section is strongly recommended.



5.0 Battery Location

It is recommended that the battery unit be installed in a clean, cool & dry location. Floor should be reasonably level and able to support the battery weight. A location having an ambient temperature of 27°C will result in optimum battery life and performance. Average ambient temperatures above 30°C will result in reduction of battery life. Continuous operation above 50°C is not recommended

DO NOT INSTALL BATTERIES IN LOCATIONS WITHOUT ANY VENTILATION. When selecting the location for installation of the battery, certain consideration must be followed. First, a designated aisle space should be provided to permit initial installations as well as for service and surveillance. After installation, any additional equipment installed should not compromise access to the battery system.

5.1 Ventilation



The AMARON QUANTA™ battery is a valve-regulated lead-acid battery, which is under normal recommended charging, in a stationary application, does not vent any gases. Tests have confirmed that more than 99% of gases generated are recombined within the battery. Under normal operating conditions, no special ventilation and / or battery room is required.

NEVER INSTALL BATTERIES IN AIR TIGHT ENCLOSURES. This is because, under abnormal operating conditions like misuse/malfunction of charger etc. there is a possibility that the battery gets excessively overcharged. When this happens the hazardous gases, hydrogen and oxygen are released from the battery and can cause water loss. Therefore, ensure proper ventilation is provided. Normal ventilation, sufficient for human occupation, is adequate to avoid hazardous conditions.



AMARON QUANTA™ batteries can be installed in close proximity to electronic equipment provided that the heat generated by the electronic equipment is removed by ventilation.

5.2 Temperature Variations



Sources of heat or cold directed on portions of the battery can cause temperature variations within the strings resulting in cell voltage differences and eventual compromise on battery performance. Heat sources, such as heaters, sunlight or associated equipment can cause such temperature variations. Similarly, air conditioning or outside air vents should not directly influence portions of cell string temperatures. Every effort should be made to keep temperature variations to a minimum.

Average Ambient Temperature °C	Voltage Settings Volts Per Module (VPM)	
	Float	Boost
27 °C	13.5 VPM	13.8 VPM

5.3 Floor Loading

The floor of the area where the battery system is to be installed should have the capability to support the weight of the battery system, as well as any auxiliary equipment. The total battery weight will depend on the battery size, number of modules, as well as module configuration involved. Prior to installation, a determination should be made that the floor integrity is adequate to accommodate the battery system.



5.4 Floor Anchoring

Where seismic conditions are anticipated, floor anchoring should be provided. Such anchoring is responsibility of the end user.

Section 6 – Cabinet System - Installation

6.0 Cabinet Assembly Instructions



Check parts received against the packing note. Contact your local AmaraRaja representative if parts appear incomplete. Identify missing parts by part number and parts description. Do not assemble if all material is not at the installation site or parts do not comply with drawing.

Study the battery arrangement drawing for cabinet / rack assembly, then start assembly of parts like frames, tiers, module restraint plates etc.

6.1 Placement of Batteries

Study the battery arrangement drawing to determine the proper location of the positive and negative terminals of the battery and to determine the correct placement of the batteries in the cabinet. From the battery arrangement drawing determine the number of batteries to be placed in each row and tier. When installing modules in the cabinet, start on the back row of the lower tier for stability and safety reasons. Place modules in cabinet so that the positive (+) of one unit connected to the negative (-) of the next unit in accordance with the battery arrangement drawings. Standard spacing is 5 mm between modules.

Ensure that the Batteries to be installed always in vertical position only.

Section 7 - Electrical Installation Considerations

7.0 Connecting Cables

Cable size selection should provide the lowest voltage drop possible between the battery system and operating equipment. Excessive voltage drop will reduce the desired support time of the battery system. The maximum voltage drop in the cable between the system and operating equipment should not be more than 0.03V per meter length.

7.1 Paralleling



Where it is necessary to connect battery in parallel to obtain sufficient capacity, cable connections from the bus / load to each of the parallel strings is preferred rather than inter-string paralleling. Cables should be sized to minimize voltage drop and for proper current carrying capability. They should be as short as possible. However, the lengths of cables for all of the systems being paralleled to the load should be equal in length and size to provide proper load sharing on discharge, as well as satisfactory recharge with the same float voltage per string. Care should be taken to ensure overall resistance of connection between batteries and equipment - bus are consistent between strings.

7.2 Connection Preparation



Gently clean the contact surfaces only by using the brass brush / emery paper.

For mounting batteries into the cabinet refer to the battery arrangement drawings to determine the quantity and correct positioning of the inter-unit and inter-tier connections.

Caution: Do not use wire brushes of any other type for contact surface cleaning.

7.3 Connection Torque



After preparing contact surfaces, install all connectors. Hand tight to allow for final alignment of modules. Once final alignment is made all connections with hardware should be torque to 100 Lb-inch (or) 11 Nm and complete all the connection of modules by installing the inter-tier & module connections.

Caution: Do not make connections to the load at this time.

7.4. Connections



7.4.1 General

Battery terminal and inter-battery connections should be corrosion free and tight for trouble-free operation. Periodically these connections should be inspected to assure cleanliness and integrity.

Caution: Do not work on connectors with battery connected to charger or load.

If corrosion is present, disconnect the connector from the terminal. Gently clean the affected area using a brass brush or emery paper and follow all directions as specified in section 7.2 and 7.3

All terminals and inter-battery connections should be re-torquing at least once in every six months. It is recommended to keep one inter tire connector unconnected before connecting the end connections. After connecting the charger/end connection inter tire connection can be made.

7.4.2 Connections Check

Visually check to see that all modules are connected positive (+) to negative (-) throughout the battery string. Measure the total open circuit voltage from positive string termination to negative string termination and also record the individual module voltages. For the fully charged battery, the voltage should be 12.90 + 0.3 Volts

If the value for a battery is less than 12.60 Volts, contact your nearest AmaraRaja representative.

The bank voltage shall be equal to the sum of individual battery voltage

7.5 Battery to UPS - Charger Connection

The Positive (+) terminal of the battery should be connected to the positive (+) terminal of the UPS charger and the negative (-) terminal of the battery to the negative (-) terminal of the UPS charger.

Section 8 - Freshening Charge



8.0 Constant Voltage Method

Batteries lose some capacity during shipment as well as during the period prior to installation. A Battery should be given a freshening charge prior to installation.

Constant voltage is the only charging method allowed. Most of the modern UPS chargers are of the constant voltage type.

Freshening charge of the batteries should be done in the Boost Charge mode for 24 hrs. with a current limited to maximum of 25% of the rated capacity, selecting a charging voltage of 2.3V multiplied by number of modules i.e. 13.8V for 12V module.

The maximum charging current under normal operation should be limited to 25% of the rated capacity of the battery at the C20 rate (for an 100 Ah battery @ 20 Hr rate, the maximum charging current should be 25A). The duration of charge should be twenty four (24) hours.

Section 9 - Operation

9.0 Float Charge

In this type of operation, the battery is connected in parallel with a constant voltage charger and the critical load circuits. The charger should be capable of maintaining the required constant voltage at the battery terminals and also of supplying the normal load where applicable. This sustains the battery in a fully charged condition and also makes it available to resume the emergency power requirements in the event of an AC Power interruption or charger failure.

9.1 Float and Boost Voltages

Following are the Float and Boost Voltages recommended for the AMARON QUANTA™ Battery system. However in both the float and boost voltage the max charging current is limited to 25% of the battery capacity as shown in the enclosed 'TECHNICAL SPECIFICATIONS' table.

Mode	Recommended voltage settings for float cum boost charging @27°C		Current limit set (Amp)
	4 Modules	Single Module	
Float	54.0V	13.5V	25% of battery Ah capacity
Boost	55.2V	13.8 V	

Following recommended surveillance procedures will assist in obtaining consistent service ability and optimum life. After the battery has been given a freshening charge, the charger should be adjusted to provide the recommended float voltage at the Battery Terminals.

Do not float batteries at voltages higher or lower than those recommended which will be resulted reduced capacity or loss of battery life.

After completion of the freshening charge and with the battery floating at float voltage for a minimum of 72 hours, the minimum open circuit voltage should be:

Model	Voltage
12 Volt Configuration	13.2V

9.2 Recharge

All batteries should be recharged as soon as possible, following a discharge, with constant voltage chargers. However, to charge in the shortest period of time, raise the charger output voltage to boost mode, i.e. 2.3 VPC. The charger used should incorporate a current limit feature. The maximum recommended charge current for the AMARON QUANTA™ battery is limited to 25% of the rated capacity of the battery at the C_{20} rate.

9.3 Test Discharge

The batteries are shipped at 90% of the rated capacity; the same will be delivered 100% capacity after 5-6 charge / discharge cycles @ C_{20} capacity or 6 months in float service. However the boost charge is mandatory for minimum of 24 hours prior to conduct capacity test.

Section 10 - Equalization

10.0 Equalizing Charge

Under normal operating conditions, an equalizing charge is not required.

An equalizing charge is a special charge given to a battery when non-uniformity in voltage has developed between modules. It is given to restore all modules to a fully charged condition. Use a charging voltage higher than the normal float voltage i.e., 13.8 VPM for a maximum period of 24 hours.



Non-uniformity of battery voltages may result from low/high float voltage due to improper adjustment of the charger or error in panel voltmeter which leads to an incorrect lower/higher charging voltage

10.1 Equalizing Frequency

An equalizing charge should be given when the following conditions exist:



A. The float voltage of the pilot module is less than 13.20 volts.

B. A recharge of the battery is required in a minimum time following an emergency discharge.

Section 11 - Pilot module and Records

A pilot unit is selected in the series to reflect the general condition of all modules in the battery string. By measuring module voltage, it serves as an indicator of battery condition between scheduled overall individual module readings.

Complete recorded history of the battery operation is most desirable, and is helpful for maintaining satisfactory performance. Good records will also indicate when corrective action may be required to eliminate problems associated with charging, maintenance and environment the connections.

The following data should be read and permanently recorded for review, by supervisory personnel.

A. Upon completion of freshening charge and with the battery on float charge at the proper voltage for one week, read and record the following:

1. Individual battery voltages

2. Battery string terminal voltage

3. Ambient temperature

B. Every 12 months, a complete set of readings, as specified in paragraph A above must be taken and all individual battery to be re-torque.

C. Whenever the battery is given an equalizing charge, additional set of readings should be taken and recorded, as specified in paragraph A above.

Records must be prepared as specified in this Section in order to maintain the validity of the Warranty. For system protection and to suit local conditions or requirements, more frequent readings are desirable.

Section 12 – Tap Connections

Tap connections should not be used on a battery. This can cause overcharging of the unused batteries and undercharging of those batteries supplying at load thus reducing battery life.

If these instructions are not adhered to and any damage is caused to the batteries as a result of tap connections, the warranty issued at the time of supply of the battery will be treated as null and void.

Section 13 - Temporary Non-Use

An installed battery that is expected to stand idle for over 6 months should be treated as follows:

A. Give the battery an equalizing charge. Following the equalizing charge, open the connections at the battery terminals to remove charger and load from the battery.

B. Every six months temporarily connect battery to charger and given an equalizing charge.

C. To return the battery to normal service, re-torque all connections as per section 7.3 and then re-connect the battery to the charger and return the battery to float operation.

D. If the battery is standing at an elevated temperature, corrections to the time period to equalize charge should be corrected as section 4.1

Section 14 - Do's and Don'ts

DO'S

01. Upon receipt of shipment unload and store the batteries in covered area.
02. Read 'Installation and operating "instruction Manual" prior to installation of the batteries.
03. Clean the batteries as and when dust accumulates.
04. Provide sufficient ventilation, if the batteries are placed in cubicle.
05. The terminal bolt connection to be torque to 11 Nm (100 lb. Inch).
06. Re-torque the connections once in every six months.
07. Keep the batteries away from heat source, sparks, fire etc.
08. Charge the batteries once in every six months, if stored for long periods.
09. After a discharge recharge the batteries immediately.
10. Note down module voltage readings once in every month.

DON'TS

11. Do not keep the batteries in places exposed to direct sunlight, rain, dust, storm etc.
12. Do not add water or acid.
13. Do not attempt to dismantle the battery.
14. Do not over tighten the terminal bolts.
15. Do not allow any metal objects to rest on the battery or fall across the battery terminals.
16. Do not boost charge the batteries for more than 12 hrs. In regular operation / usage.
17. Do not mix the batteries of different capacities or makes.
18. Do not mix ordinary conventional / low maintenance batteries with AMARON QUANTA™ SMF Batteries.

Section 15 - Unit Cleaning

Periodically clean the battery covers to remove accumulated dust. If any unit or parts appear to be damp with electrolyte, or shows signs of corrosion, clean with a solution of backing soda and water, and re-examine within 14 days to determine if condition re-occurs. If so, contact your nearest AmaraRaja representative.

Caution

Do not clean plastic parts with solvents, detergents, mineral spirits, or spray type cleaners as these may cause crazing of the plastic materials.

Section 16 - Trouble Shooting

Symptom	Check for	Cause	Remedy
Low back up	<ul style="list-style-type: none"> • Charger settings • Terminal tightness • State of charge 	<p>Lower setting</p> <p>Continuous charging at high voltages</p> <p>Loose</p> <p>Not fully charged</p>	<p>Re-adjust to 13.5V per Module</p> <p>Replace the battery</p> <p>Tighten to 11 N-m</p> <p>Charge the battery at 13.8 VPM for 24 Hrs</p>
Unequal voltages among the batteries	<ul style="list-style-type: none"> • Terminal tightness • External heat sources directed on few batteries • Tap connections • Boost charge 	<p>Loose in few modules</p> <p>External heat sources direct on few batteries</p> <p>Tap connections</p> <p>No boost charge once in three months</p>	<p>Check the terminals tightness for all the batteries. Tighten to 11 N-m</p> <p>Redirect the heat sources from the batteries/ reposition the batteries.</p> <p>Remove the tap connections</p> <p>Boost charge at 13.8 VPM for 24 Hrs</p>
Abnormal battery heating	<ul style="list-style-type: none"> • Ventilation • Ripple • Charger setting 	<p>Poor</p> <p>Very high ripple in the charger output.</p> <p>Continuous over charge</p>	<p>Provide adequate ventilation.</p> <p>Rectify the charger</p> <p>Replace the battery</p>

BATTERY MONITORING REPORT

Date:

Company _____

Address _____

No. of Modules _____

Serial No. _____

Date Installed _____

Model. No. of battery _____

Operating Parameters

Date: Time:

Charger Output (at UPS terminals) _____

Ambient Temp _____

Total Battery bank Voltage (at battery bank terminals) _____

Panel Meter Volts _____

Charging Current (at the time of reading) _____

Individual Unit Readings

Unit No.	Volts	Unit No.	Volts
1		31	
2		32	
3		33	
4		34	
5		35	
6		36	
7		37	
8		38	
9		39	
10		40	
11		41	
12		42	
13		43	
14		44	
15		45	
16		46	
17		47	
18		48	
19		49	
20		50	
21		51	
22		52	
23		53	
24		54	
25		55	
26		56	
27		57	
28		58	
29		59	
30		60	

Remarks and Recommendations _____

READINGS TAKEN BY _____

When advice is desired, please forward a duplicate of this report to your nearest AmaraRaja representative.

Note: - Use copies of monitoring format, if required.

TECHNICAL SPECIFICATIONS

MODEL	12AL007	12L010	12L012	12L018	12AL026	12AL042
AH Capacity @ 20 Hr rate at 27° C to 1.75 VPC	7.2	10	12	18	26	42
Nominal Voltage (V)	12	12	12	12	12	12
Weight (+/- 1Kg)	2.2	3.8	4.2	6.5	9	14
Physical Dimensions (LxWxH) mm	151X66X95	151X99X95	151X99X95	181X78X166	167X126X176	199X167X175
Recharging time from 0 to 90 % state of charge(SOC) (Hrs) in boost mode	8-10	8-10	8-10	8-10	8-10	8-10
Float Voltage @ 27° C	13.5	13.5	13.5	13.5	13.5	13.5
Boost Voltage @ 27° C	13.8	13.8	13.8	13.8	13.8	13.8
MODEL	12AL065	12AL070	12AL100	12AL130	12AL160	12AL200
AH Capacity @ 20 Hr rate at 27° C to 1.75 VPC	65	70	100	130	160	200
Nominal Voltage (V)	12	12	12	12	12	12
Weight (+/- 1Kg)	20	23.5	35	42	52	62
Physical Dimensions (LxWxH) mm	351X167X175	351X167X175	441X167X216	447X168X247	447X168X283	556X186X263
Recharging time from 0 to 90 % state of charge(SOC) (Hrs) in boost mode	8-10	8-10	8-10	8-10	8-10	8-10
Float Voltage @ 27° C	13.5	13.5	13.5	13.5	13.5	13.5
Boost Voltage @ 27° C	13.8	13.8	13.8	13.8	13.8	13.8

Charging Mode: Constant Potential with current limit.

- Note: 1. The charger should have protection against over charge and discharge beyond prescribed end cell voltages.
2. Deep discharges can cause permanent damage to the battery.
3. It is recommended that interconnecting cable between battery and load shall be selected to ensure a maximum drop of 30mV per meter length at the maximum rate of discharge.

(Note: All specifications are subject to change without prior notice).