QUASAR Front Terminal Batteries

Installation & Operating Guide

Safety Instructions

Carefully read this manual in all its parts upon receipt of Eternity Technologies QUASAR Front Terminal Batteries. Please refer to the latest edition of the battery room standards, effective at the moment of installation IEC 62485-2.

The QUASAR Front Terminal range are lead acid battery components of a system and although they are maintenance free, they require suitable precautions and behavioral norms to guarantee safe working conditions and to ensure maximum performance of the battery during its entire life. The Installation & Operating Guide supplies the necessary instructions for the correct care, handling, installation, use and maintenance of Eternity Technologies QUASAR FT Batteries.

The non compliance with the instructions given herein may cause injury to personnel and damage to equipment as well as poor operation and performance of the battery. Any repairs made without authorisation, for example, opening the valves, may render the warranty void.

Store this manual in close proximity to the batteries at all times and ensure it is accessible to the relevant personnel.

No naked flames

Corrosive

Wear safety goggles

Read instructions

First aid / medical assistance

Keep away from children

Explosive

Caution

Electric shock risk

Wear protective clothing

Wear protective gloves

Battery charging

Risk of fire, explosion, or burns.
Do not disassemble, heat above 55°C, or incinerate.

Observe the following precautions at all times

Observe the operating instructions - work on the battery should be carried out by qualified personnel only.

Exposed metal parts of the battery carry a voltage and are electrically live with the risk of short circuits.

Avoid any electrostatic charge; before starting work on the battery, first discharge any possible electricity from yourself by touching an earth-connected part; repeat this action occasionally until work is complete.

Use protective equipment, such as protective clothing, rubber gloves and goggles.

Use insulated tools.

DO NOT place or drop metal objects on top of the battery.

DO NOT wear rings or bracelets.

Remove any articles of clothing with metal parts that might come into contact with the battery terminals.

DO NOT smoke and DO NOT use open flames or create electric sparks.

Take all precaution when using the main supply.

Make sure that the first aid kits and fire extinguishers are easily accessible.

Used batteries contain recyclable materials. They must not be disposed with household waste but as a special waste. Methods of return and recycling must conform to the regulations in operation at the site where battery is located. If in doubt please contact Eternity Technologies.

2. Introduction

Eternity Technologies range of QUASAR FT Monobloc 12V batteries are designed for cyclic and float applications. Examples of these applications are listed below:
a) Telecom Base Stations – accessible and remote
b) Solar and wind sites
c) Utility and switchgear
e) Back-up power systems
f) Traffic Systems
g) Oil & Gas
h) Data Centers
i) UPS System
j) Emergency Lightning
k) Hybrid System

Eternity Technologies range of QUASAR FT 12V Monobloc batteries utilize patented Carbon Nano Tube Fluid Liquid in a specific battery pasting process.

It creates a network of individual nanotubes allowing for electrons to flow with minimal resistance, as well as reinforcing the plates, adding lasting strength and durability.

Results of this innovation are:
- Enhances Consistency of Performance
- Improves Charge Acceptance
- Increases Cycle Life
- Enables Partial State of Charge Operations (PSOC)
- Improves Thermal Operational Ranges

The gelled electrolyte is maintenance free throughout the life of the product, so no maintenance is ever required.

3. Delivery, unpacking and storage

Unpack the batteries as soon as they are delivered. Verify that the equipment has been delivered in good condition. Immediately inform Eternity Technologies of any missing or damaged items.

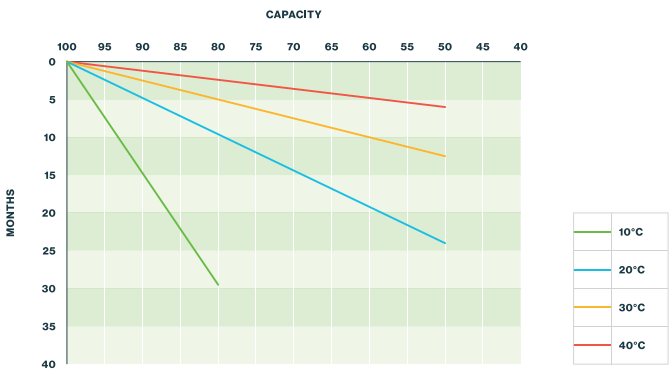
The details on the label should be read carefully and the following points to be observed:

- Monobloc Type
- Monobloc Voltage
- Capacity
- Float charge voltage
- Operating Temperature

If the battery cannot be immediately installed, store it in a dry, cool and clean place with adequate air flow. Temperature should be between 10-30°C.

Do not expose the battery to direct sunlight, to avoid any damage to containers and lids.

IMPORTANT NOTE Storage time for charged monoblocs is limited. Please see the self-discharge rates at various temperatures below:



During the storage time, the open circuit voltage (OCV) must periodically be checked.

Monoblocs with OCV below 12.42 Volt or when the storage time is reached, must be given a refresh charge, providing constant voltage of 2.35 Vpc with current limitation of 1.5 x I10 (A), for 24 hours.

The OCV of a fully charged battery should result between 12.80V-13.00V.

Temperature (°C / °F)	Storage time	OCV Check Intervals
+10°C or +50°F	30 months	12 months
+20°C or +68°F	24 months	12 months
+25°C or +77°F	18 months	6 months
+30°C or +86°F	12 months	6 months
+40°C or +104°F	6 months	3 months

Failure to observe the above conditions may result in a greatly reduced capacity and service life or in permanent damage to the batteries.

4. Installation

PLEASE REFER TO THE LATEST EDITION OF THE BATTERY ROOM STANDARDS, EFFECTIVE AT THE MOMENT OF THE INSTALLATION OF THE BATTERY.
NORM REF. EN 62485-2

Check that local regulations are also being complied with.

WARNING

The monoblocs are already charged when delivered and should be unpacked with care. Avoid short circuiting terminals of opposite polarity.

Before installing the monoblocs, clean all parts. Remove the short circuit ABS covers from the lid and clean them with a soft and clean cloth. Before replacing old batteries ensure all electrical loads are switched off.

Battery Room - Points to Consider:

- Ensure the floor is structurally capable of carrying the battery load
- The floor should be resistant to Electrolyte (diluted sulphuric acid)
- There should be no ignitable sources near to the batteries
- Ensure there are no unauthorised access points to the battery room
- All rooms should have the correct fire-fighting equipment fitted in case of emergency
- The battery room/cabinet must have adequate ventilation to limit hydrogen accumulation. Batteries must be installed in accordance with the IEC 62485-2 standard and any other local/national laws and regulations. If not, make sure to install the venting tubes between the monoblocs using the T pieces and evacuate it outside the battery room/cabinet.

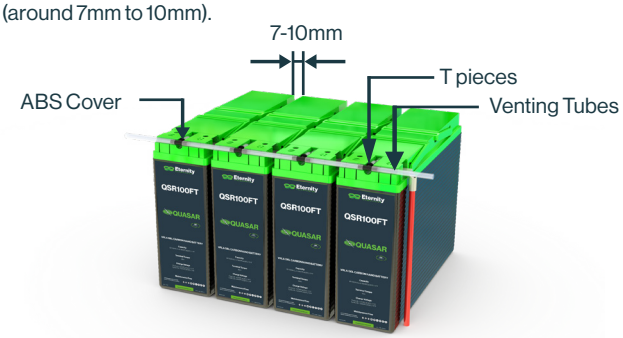
Checking the Voltage Spread

Before connecting the monoblocs in series, the voltage variation must be checked. If the voltage varies more than 0.15 V between the highest and the lowest monobloc voltage, the monoblocs should be charged individually before being connected in series.

Alternatively, the monoblocs may be matched in each string so that all the monoblocs with voltage spread less than 0.15V.

Putting the Batteries in Place

Place the monoblocs on the rack (or cabinet) and make sure that the spacing allows the accommodation of the inter-blocs connectors (around 7mm to 10mm).



For batteries to be installed on multiple tiers, start by placing the monoblocs on the lower tier. Any unused stand spaces should be on the upper tier.

Prepare the connectors by cleaning the contact surfaces with a soft and clean cloth.

Use insulated wrenches to tighten the parts firmly together, with torque setting of 8 Nm (71 in-lbs).

Pay special attention to avoid short-circuiting the blocs with any of the battery hardware.

Check tightness and cleanliness.

Connect the positive terminal of the battery to the positive terminal of the charger and the battery negative to the charger negative.

5. Charging

a) Commissioning Charge
Batteries lose charge while in transit or during storage. For this reason, the battery must be given a commissioning charge.
The batteries should be charged using constant voltage with a minimum charge current of 0.1C10 Amps with no load connected to the battery.
Either of the following methods can be used:
- Charge for 7 days at the recommended float voltage of 2.25Vpc at 25°C (77°F). Or...
- 12 hours at constant voltage of 2.35 Vpc at 25°C (68°F) {Current limitation 1.5 x I10 Amps} temperature compensation.

Temperature (°C / °F)	Charging Voltage (Vpc)
+0°C or +32°F	2.44 Vpc
+5°C or +41°F	2.42 Vpc
+10°C or +50°F	2.40 Vpc
+15°C or +59°F	2.39 Vpc
+20°C or +68°F	2.37 Vpc
+25°C or +77°F	2.35 Vpc
+30°C or +86°F	2.33 Vpc
+35°C or +95°F	2.32 Vpc
+40°C or +95°F	2.30 Vpc

Maintaining the battery at floating voltage for 24 hours before any discharge test.

b) Float Charge
To maintain the battery in fully charged condition during normal battery operation or, after a discharge. A recommended float charge has to be applied.

The recommended float voltage settings are as follows:
Constant voltage 2.27Vpc at 20°C (68°F) 2.25Vpc at 25°C (77°F) {Current limitation 2xI10 Amps}.

c) Equalizing / Boost charge (Fast Charging)

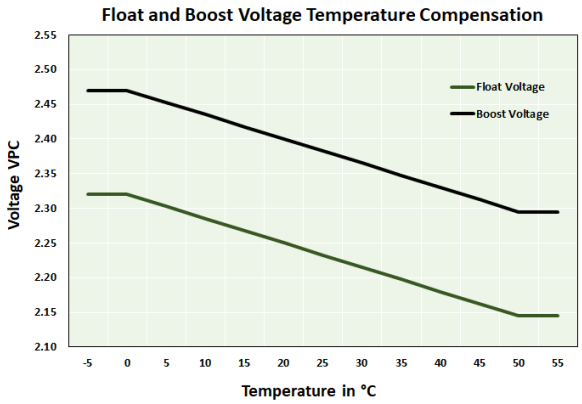
To maintain the battery ready for the next outage in case of unstable grid, it is recommended to boost the battery in order to fully charge in a short time.

The boost charge voltage is 2.35 to 2.4Vpc at 25°C (77°F) for a maximum duration of 48 hours. It can be turned off earlier though if the current has decreased to a value lower than 0.05 x I10.

Chargers usually have two adjustable charging voltages: one for the "floating" charge and one for the "equalizing" charge (also known as "boost", "Absorption" or "bulk").

The float, boost and equalization voltages values require a thermal compensation of -3.5mV/cell/°C for temperature increases. For each 01°C temperature decreases in the monobloc, the voltage should be increased by 3.5mV/Cell/°C. See graph below. Failure to change these values will lead to capacity problems and a reduction in operational life.
Example:

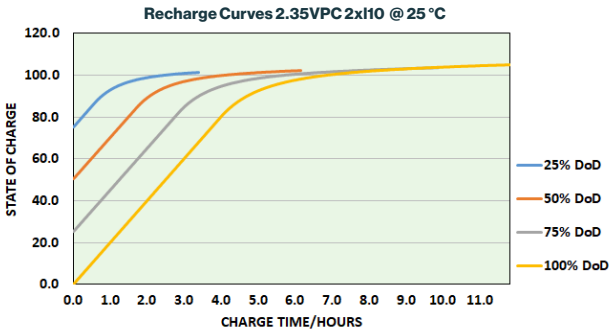
- 2.25Vpc +3.5mV per cell per °C below 20°C.
- 2.25Vpc –3.5mV per cell per °C above 20°C.



The equalizing charge is generally required:
- When the total voltage spread between the monoblocs is greater than 0.15V under float charging conditions
- After exhaustive discharges
- For fast recharging after a discharge
- When charging monoblocs in standby applications with frequent power outages
- For float charge using voltages below 2.25 Vpc

d) Charge current limit
The limit for the charging current using the float charge voltage after a discharge is limited to 4 x I10.

e) Charging Time
Use the graph below for to estimate typical charging times:



f) IU Charging Profile

The IU charge is the most common method for fast recharging or when batteries are charged in cyclic applications. It consists of two phases:

Bulk Charge / Phase 1
The charging current is set to a limit between 2-4 x I10 until it reaches a maximum voltage of 2.40Vpc.

Constant Voltage / Phase 2
Here the voltage is set to 2.40Vpc. During this phase the absorbed current will start to decrease and finally reach a value of 0.02A / Ah. At this point the battery is considered fully charged and the rectifier / charger system should be switched back to the relevant float voltage. The constant Voltage phase of the charge should be limited to a maximum of 10hrs.

g) IUI Charging Profile

The IUI charging method is perceived as the best method of charging lead acid batteries and will increase the cycle life of the monobloc. The charging method is similar to the above, but an additional constant current phase is added after the Constant voltage phase. The final constant current phase equalizes the charge over the individual monoblocs to ensure even finishing. This will help improve the battery efficiency and ultimately increase the cycle life.

Bulk Charge / Phase 1

The charging current is set to a limit between 2-4 x I10 until it reaches a maximum voltage of 2.35Vpc.

Constant Voltage / Phase 2

Here the voltage is set to 2.35Vpc. During this phase the absorbed current will start to decrease and finally reach a value of 0.02A / Ah. At this point the battery is considered fully charged and the rectifier / charger system should be switched back to the relevant float voltage. The constant Voltage phase of the charge should be limited to a maximum of 10hrs with maximum current of <1.2A/100Ah.

I Phase / Phase 3
The voltage is set to 2.35Vpc, but maximum current of <1.2A/100Ah for a duration of maximum 4 hours.

6. Discharge Rate

The discharge rate of the battery in Amps is calculated in I10.
I10 = current for 10hr discharge to 100% DOD. This will be the basis for all discharge rates across this brochure. For example:
Let's take the Eternity QUA170FT:
C10 capacity = 170Ah to an end of discharge voltage of 1.80V @ 25°C
1 x I10 = 1 x (10hr discharge)
1 x I10 = 1 x 17.0 = 17.0A
2 x I10 = 2 x 17.0 = 34.0A
5 x I10 = 5 x 17.0 = 85.0A

End of Discharge Voltage

Discharging too much capacity from the battery will lead to early failure so the user must ensure that measures are in place to prevent this. The recommended low voltage disconnect settings are mentioned below:

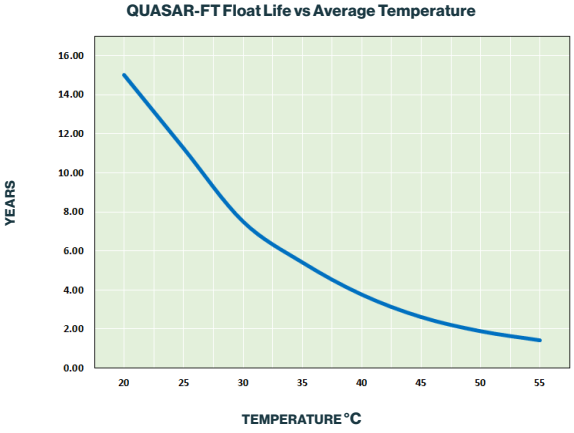
Back up time (h)	EODV (Vpc)
T discharge < 1.5 hrs	1,70
1.5 hrs < T discharge < 3 hrs	1,75
3 hrs < T discharge < 5 Hrs	1,77
5 hrs < T discharge < 10 Hrs	1,80
10 hrs < T discharge < 24 Hrs	1,83
24 hrs < T discharge < 48 Hrs	1,85
48 hrs < T discharge < 72 hrs	1,90
T discharge > 72 hrs	1,95

7. Temperature and Air Flow

Temperature effect on float life

Increased temperatures have a great effect on the life of a battery. When the battery is operated at increased temperatures, the corrosion of the positive terminal is accelerated which leads to early failure. When operated at 20°C, Eternity Technologies QUASAR-FT range of batteries will last for 15 years. For every 10°C increase in the average operating temperature, the battery's life is halved.

The graph below shows the effect of temperature on the float life of the battery.



Temperature effect on cycle life

Eternity Technologies recommends that the operating temperature range for QUASAR FT batteries be within the region of +10°C to + 30°C. Operating in higher temperatures will lead to decreased operational life, operating in lower temperatures will lead to a reduction in available capacity.

Air flow for cooling

When batteries are cycled, they generate heat. Eternity Technologies recommend a minimum gap of at least 7 to 10.0mm between monoblocs to allow for the heat to disperse from around the blocs. Where natural cooling is not enough to keep the temperature of the battery to a recommended level, a cooling system may be required. We can work out the size of the required cooling by calculation, please see below:

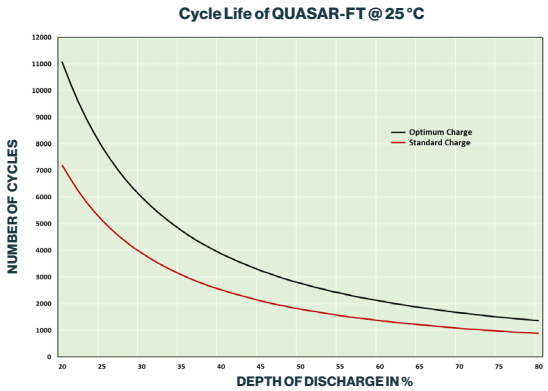
A 48V battery is discharged twice daily, delivering 3 hours back-up and 3kW of power

Heat loss from the battery = 2 (2 discharges/day) x 3kW x 3 hours x 0.15 (15%) = 2.7kWh = 2700Wh per day.

If we calculate the cooling power required to keep the room at a consistent temperature then we take 2700Wh and divide by 24 hours = 112.5W

8. Cycle Life

Please see the graph below showing our maximum number of cycles vs the depth of discharge. There are two lines on the graph. One line states the charging profile with IU charging profile. The other line shows the cycle life with an IUI charging profile. The graph is referenced to 25°C, operating at temperatures either side of this figure will result in a different number of cycles.



9. Hybrid Applications

Eternity Technologies QUASAR-FT batteries can be used in a hybrid system alongside a diesel generator where the batteries are used to decrease the running time of the generator. Charging is critical in this application and the user must ensure that the charging time is sufficient to fully charge the battery between cycles. Failure to do this will result in a reduced cycle life.

The charging criteria must comply with the figures set out in section 5 of this document.

10. Solar Applications

Batteries used without a generator and without mains power are classified as solar batteries. The important thing here is to limit the depth of discharge DoD.

When there is an abundance of sunlight, it is necessary to limit the charge and not overcharge the battery. When there are times of continuous darkness, it is important not to discharge the battery too much. Please use the end of discharge voltage recommendations in this brochure for guidance.

Failure to comply with this will result in reduced capacity and cycle life. It is recommended to perform an equalization charge every 1-3 months.

11. Maintenance

Eternity Technologies QUASAR FT monoblocs are sealed-maintenance free lead-acid batteries and need no water addition.

Cleanliness

The containers and lids must be kept dry and free from dust.
Cleaning must be done only with a damp cotton cloth.
Avoid static discharges generated during cleaning.

Voltages

Individual monobloc voltages will vary greatly when the monoblocs are first put into operation. This is expected and variation will start to decrease within the first 12 months. Monitor these as per below. If there isn't any significant change in the voltages after 12 months, an additional equalisation charge should be carried out.

Every month:
Measure the battery string voltage. If necessary, adjust the float voltage to the correct value (record all readings).

Every 6 months:
- Check for evidence of damage on the battery and equipment.
- Check and record the total battery float voltage, the voltage on pilot monobloc and temperature.

Once a year:
- Check and record individual monoblocs voltages.
- Perform a discharge test according to IEC 60896-11 standard until the battery shows signs of degradation and then every six months thereafter.

Keep a log book to record all maintenance and inspection operations, which will be helpful to monitor long-term changes of the battery condition.

Do not attempt to open the safety valve. Opening could cause damage to the battery.

Data Recording

It is recommended that as a minimum, the following information be recorded by means of regular data logging. The user must make available to Eternity to validate any warranty claim.
a) Records of the commission charge.
b) The number of cycles performed and the depth of discharge DoD of each cycle for the last 03 months.
c) The duration of each discharge and charge cycle, and the Ah in and out.
d) Full details of the recharge voltage/current profile for the last 60 cycles.
e) A full history of the ambient and battery surface temperatures, recorded at regular intervals throughout battery operation and life.
f) The time and date of each event as a battery deep discharge, the stop charging and the time, multiple daily outages, or battery discharged for long duration without charging.
Contact Eternity Technologies if you have any questions regarding maintenance.

Disposal

Eternity QUASAR-FT batteries are recyclable. Scrap batteries must be packaged and transported in accordance with local transportation rules and regulations.

Scrap batteries must be disposed of in compliance with local and national laws by a licensed or certified lead acid battery recycler.

Additional information

For any further information on Eternity QUASAR Front Terminal batteries, please contact:

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