ALPHACell®

AlphaCell® Batteries Installation, Operation, and Maintenance Manual

EnerSys®
Power/Full Solutions

Visit us at **www.enersys.com**

Important

Read these instructions immediately upon receipt. AlphaCell® HP batteries are safe when operated and handled properly. It is vitally important that you observe the precautions recommended in this instruction sheet. YOU SHOULD BE TRAINED IN HANDLING, INSTALLING, OPERATING AND MAINTAINING BATTERIES BEFORE YOU WORK ON ANY BATTERY SYSTEM.

California Proposition 65 Warning (www.P65Warnings.ca.gov) Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

When working on batteries wear safety glasses with side shields, rubber gloves and protective clothing. All metallic personal objects, such as rings, watches, bracelets, etc., should be removed before starting work on the battery! Only use insulated tools!

Electrolyte is corrosive

In case of **SKIN CONTACT** with electrolyte, **IMMEDIATELY**

1. **REMOVE** contaminated **CLOTHING**
2. **FLUSH** the area **THOROUGHLY** with WATER
3. Get **MEDICAL ATTENTION**

In case of **EYE CONTACT** with electrolyte, **IMMEDIATELY**

1. **FLUSH THOROUGHLY** for at least 15 minutes with large amounts of **WATER**
2. Get **MEDICAL ATTENTION**

In case of electrolyte **CONTACT WITH CLOTHING OR MATERIAL, IMMEDIATELY**

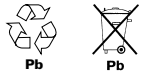
1. **REMOVE CONTAMINATED CLOTHING**
2. Apply large amounts of water to affected area.
3. Wash clothing as soon as possible.

Batteries can generate gases which, when released, can explode, causing blindness and other serious personal injury.

Do not allow flames, embers or sparks near the battery due to the risk of explosion or fire!

Warning: batteries remain live even though they are disconnected. No rings or metal bracelets should be worn during the assembly of the battery. Do not place electrically conductive objects such as tools etc. on top of the battery! Warning: cells are heavy, use proper lifting technique.

The Instruction Sheet must be strictly observed. Non-compliance with the Instruction Sheet, use of non OEM spares or use of additives to the electrolyte or unauthorized tampering will void the warranty.



Spent batteries with this symbol are reusable products and have to be put into a recycling system. Used batteries must be disposed of as special waste in accordance with all standards.

AlphaCell® HP batteries are supplied in a charged state and are capable of extremely high short circuit currents. Take care to avoid short-circuiting terminals of opposite polarity. Warning: cells are heavy, use proper lifting technique.

1. Receiving the battery

1.1 In-Transit Damage or Short Shipments

Upon receipt of a shipment, check that the items delivered are undamaged and match the carrier's Bill of Lading. Report any damage or shortages to the carrier. EnerSys is not responsible for shipment damage or shortages that the receiver does not report to the carrier.

1.2 Shipment Damage or Shortages

Open the shipping containers and check the contents for damage and against the packing slip. Immediately inform EnerSys of any damaged or missing items. EnerSys is not responsible for damaged or missing items after a shipment has been in storage.

2. Storage

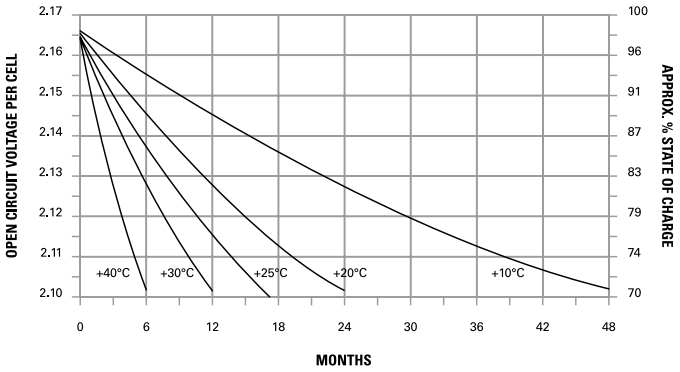
2.1. Storage Conditions and Time

If a battery cannot be immediately installed it should be stored in a clean, cool, dry area.

During storage, the battery's state of charge is reduced due to self-discharge.

High temperature increases the rate of self-discharge and reduces the storage life.

The chart below shows the relationship between Open-Circuit Voltage (OCV) and storage time at various temperatures. While the batteries are in storage, OCV should be measured according to the OCV audit intervals.



Do not store below -40°F (-40°C)

Temperature °F (°C)	Storage Time (Months)*	OCV Audit Intervals (Months)**
50 (10) and less	48	6
59 (15)	34	6
68 (20)	24	4
77 (25)	17	4
86 (30)	12	3
95 (35)	8.5	2
104 (40)	6	2

*Storage values indicated are based on constant temperatures.
**Recommended OCV audit interval.

Cells must be given a freshening charge when bloc voltages approach the equivalent of 2.10 volts per cell or when the maximum storage time is reached, whichever occurs first.

2.2. Freshening Charge

Charge the module or string of modules at a constant voltage equivalent to 2.27Vpc with current limited to 10A per 100Ah nominal capacity for a period of at least 24 hours, but with a maximum of 48 hours. Use temperature compensation as indicated in Section 5. Start monitoring the charging current 21 hours after initiating the freshening charge. The charge is complete when the current stabilizes. Current stabilization is defined as 3 current readings at least 1 hour apart within five percent of each other. Do not charge in an airtight enclosure.

Completing a freshening charge according to the instruction will reset the storage OCV audit interval and suggested maximum storage time. If voltage drops below 2.10 Vpc contact EnerSys for instruction.

3. Ventilation

The battery compartment/room must have adequate ventilation to limit hydrogen accumulation to a maximum of 1% by volume.

4. Installation

Install the batteries in accordance with instructions below:

1. Refer to the layout for 36V single string and 36V dual string (parallel) configurations (Fig.1 and Fig.2).
2. Position batteries into the location required by the application. Do not handle the batteries by terminals as this can damage terminal seals.
3. Ensure the battery terminals, interconnect straps and cable lugs are clean and free of electrolyte corrosion. If the environment is corrosive, a light coating of NO-OX can be applied to the battery terminals prior to installing the connectors on to the terminals. Install connectors to battery terminals with the specified torque.
4. Recheck the torque on the installed connectors to ensure secure connections.
5. EnerSys strongly recommends using fuses in both single and parallel string configurations.

AlphaCell HP® products (3.5HP and 4.0HP/HP+) use a threaded alloy insert terminal designed for a ¼"-20 UNC bolt, with a recommended terminal torque of 110 in-lbs (12.4 Nm).

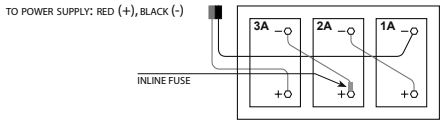


Fig. 1, Series String of Batteries
(For illustration purposes, a 36Volt string is shown. 48Volt strings are also available)

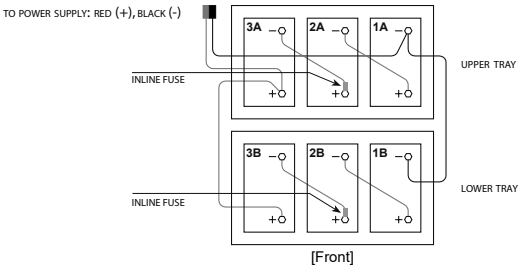


Fig. 2, Parallel String of Batteries

5. Operation

Constant voltage chargers are recommended. The acceptable float voltage range is 2.27-2.29Vpc at 68ºF (20ºC) and 2.25-2.27Vpc at 77ºF (25ºC).

The temperature compensated voltage should not go below 2.21Vpc.

The recommended float voltage temperature compensation is:

	Temperature ºF / ºC						
	50/10	59/15	68/20	77/25	86/30	95/35	104/40
Recommended	2.33	2.31	2.29	2.27	2.25	2.23	2.21 Vpc
Minimum	2.31	2.29	2.27	2.25	2.23	2.21	2.21 Vpc

The float voltage must be applied as soon as possible after termination of the discharge, and not later than seven days after any discharge.

Do not discharge the battery beyond the voltage cut-off limit for the given discharge rates:

1.80Vpc @ 10 hr rate 1.75Vpc @ 8 hr rate
1.75Vpc @ 5 hr rate 1.70Vpc @ 3 hr rate
1.60Vpc @ 1 hr rate 1.60Vpc @ 15 min rate

Discharging to voltages below these values can result in irrecoverable capacity loss and premature end of life. The float voltage must be applied to the battery as soon as possible, and no later than seven days after any discharge. If it is not, contact EnerSys for more information.

5.1. Power Supply Charging Profile

BULK charge is a "Constant Current" charge. This current is the maximum the charger is capable of delivering: 10A for 615, 906/915/915HV, and 922/922HV. As the charge is returned to the batteries, their voltage increases to a specific threshold (2.27Vdc per cell).

The **BULK** charger mode generally returns the battery charge state to 80 percent of rated battery capacity. Bulk mode is not temperature compensated. The charger then automatically switches to ACCEPT mode.

ACCEPT charge is a "Constant Voltage" charge. This voltage, 2.2-2.45Vdc per cell, is manually adjustable if needed and temperature-compensated to ensure longer battery lifeand proper completion of the charge cycle.

This cycle is complete when the charging current into the batteries becomes less than 0.5A, or approximately six hours elapses from the time ACCEPT mode was entered. When the batteries are fully recharged the charger switches to the FLOAT mode of operation.

FLOAT charge is a temperature-compensated charge, averaging about 2.1-2.35Vdc (adjustable) per cell. During FLOAT mode, the batteries are fully charged and ready to provide backup power.

During ACCEPT and FLOAT modes, the cell voltage is temperature-compensated at -0.004Vdc per cell per degree C (adjustable) to ensure a safe battery cell voltage and to maximize battery life.

For AlphaCell HP batteries, the recommended battery system float charge voltage is equal to the number of cells in the system multipled by the range of 2.1 to 2.35 volts per cell at 77°F(25°C).

For example, float charge a string of 3 each 12 volt (6 cell) batteries within a range of 37.8 to 42.3 Vdc (18 cells x 2.1 V/C minimum and 18 x 2.35 V/C maximum) at 77°F(25°C).

Severe overcharging over extended periods of time can induce a thermal runaway condition.

This requires replacing the battery system.

6. Maintenance

In practice the user usually specifies the maintenance schedule based on site criticality, location, and manpower.

The following is a suggested maintenance schedule.

Every Six Months (Record All Readings)

Measure the battery string voltage, temperature, float current, inter-module resistances and internal ohmic values. If necessary, adjust the float voltage to the correct value. Measure individual module voltages.

The individual module voltages must be within ± 0.30V of the nominal float voltage. Inspect for contamination of dust and loose or corroded connections. Corrosion can be caused by environmental factors and/or battery electrolyte. Batteries and interconnect straps with electrolyte corrosion should be replaced. Corrosion due to electrolyte typically originates at the base of the battery terminal with a wet appearance and propagates outward while being localized to the terminal(s). Light corrosion that is dry in appearance and relatively uniform across all connections may be environmental corrosion. Batteries with light environmental corrosion do not need to be replaced if connection surfaces were protected from corrosion with NO-OX. If environmental corrosion is suspected, clean with a water dampened clean cloth and cover metal conductors with NO-OX. Do not use solvents or scouring powders to clean the modules.

The recommended practice is to replace the battery if its capacity is below 80% of the manufacturer's rating.

7. Disposal

AlphaCell HP batteries are recyclable. Scrap batteries must be packaged and transported in accordance with prevailing 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.

8. Shipping

AlphaCell HP batteries are approved as non-hazardous cargo for ground, sea, and air transportation in accordance with US DOT Regulation 49 and ICAO & IATA Packing Instruction 806. Please see our MSDS for complete details at: www.enersys.com.

9. AlphaCell® HP Battery Maintenance Log

ollow this sample when filling out the maintenance log (following page).

Node / Location _____
Power Supply Type _____
Load (kW) _____

String	Battery	Battery Type	Initial Install Date	Mfr. Date Code	PM Date	Float Current	Battery Temp	Evaluation Procedure #1		Evaluation Procedure #2		Evaluation Procedure #3	
								Vdc Float No Load	Conductance mhos @ 77°F	Vdc 24 Hour OCV	Conductance mhos @ 77°F/25°C	Vdc @ 100A after 10 seconds	Vdc 24 Hour OCV
A	1	4.0 HP	4/11	3/11		.2	70°	13.4	2100				
A	2	4.0 HP	4/11	3/11		.2	70°	13.5	2087				
A	3	4.0 HP	4/11	3/11		.2	70°	13.4	2100				
B	1	4.0 HP	4/11	3/11		.1	70°	13.4	2087				
B	2	4.0 HP	4/11	3/11		.1	70°	13.4	2100				
B	3	4.0 HP	4/11	3/11		.1	70°	13.6	2087				
A	1	4.0 HP	4/11	3/11	7/8	.1	85°	13.3	2100				
A	2	4.0 HP		3/11	7/8	.1	85°	13.3	2087				
A	3	4.0 HP		3/11	7/8	.1	85°	13.4	2100				
B	1	4.0 HP		3/11	7/8	.1	85°	13.2.	2087				
B	2	4.0 HP		3/11	7/8	.1	85°	13.2	2100				
B	3	4.0 HP		3/11	7/8	.1	85°	13.2	2087				

Node / Location ______________________
Power Supply Type ______________________
Load (kW) ______________________

String	Battery	Battery Type	Initial Install Date	Mfr. Date Code	PM Date	Float Current	Battery Temp

Evaluation Procedure #1		**Evaluation Procedure #2**		**Evaluation Procedure #3**	
Vdc Float No Load	Conductance mhos @ 77°F	Vdc 24 Hour OCV	Conductance mhos @ 77°F/25°C	Vdc @ 100A after 10 seconds	Vdc 24 Hour OCV

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