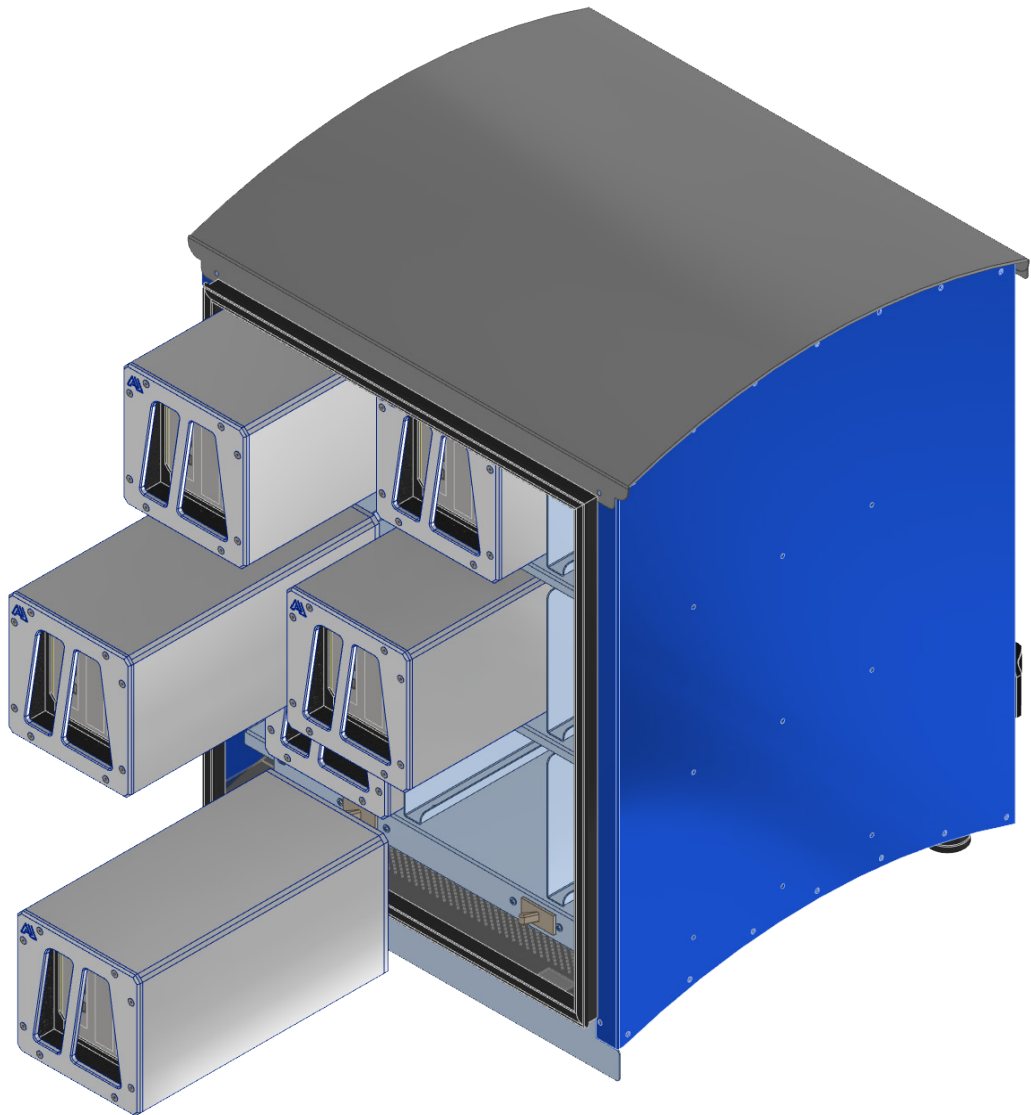


# **ADAPTIPHY**

## **ALTO System** *(Advanced Lithium Titanium Oxide System)*

### **Owner's Manual**



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# Introduction

The *ALTO (Advanced Lithium Titanium Oxide) Battery System* resolves various issues with the renewable market:

- 1) Reduce the *intricacies* and *cost* of installation
  - ALTO parts are Light Weight and manageable by one person.
  - Requires minimal external components to set up the complete system
  - You do not need vast electrical knowledge to connect the ALTO system
  - You do not need tools to install the *ALTO-Batteries* inside the *ALTO-Cabinet*
  
- 2) Give the user the same longevity as you get with Solar Panels.
  - Solar Panels offer a 25-year power production warranty. Why should you not expect the same from your storage
  
- 3) Materials used in the *ALTO System* are recyclable
  - Battery casing is *Aluminum* for long life and proper protection of the internal components
  - Other metal parts are *(SS) Stainless Steel*
  - Printed Circuit Boards (PCB) are all *Gold Plated* and *Conformal Coated* for long life
  - We minimized the usage of plastics for lower impact on the environment
  - The ALTO-Cabinet is entirely made of *SS*, and no powder coating is used anywhere on the product. All Nuts and Bolts and covers are *SS*.

# Notes & Symbols

 **WARNING**

Personal injury may occur if the provided information is not followed

**CAUTION**

Important information

**NOTE**

Provides important information about features of the ALTO system

- The intention behind this design is for a long-lasting system.
- Do not drop the ALTO modules
- Hold the handle firmly while transporting, pulling or inserting them in the ALTO-Cabinet



Do not discard any of the ALTO system components in the garbage



Safety first, please use protective gear when installing the ALTO system



The entire ALTO system is made of recyclable materials. Please Recycle

 **WARNING**

**CAUTION**

Risk of FIRE!!!

Do not open the battery. No user-serviceable parts inside

 **WARNING**

**CAUTION**

Lithium chemical material inside

Do not open the battery; there is a risk if mishandled

# Best Practices

- Protect terminals from short circuit before, during, and after installation
- Use electrically insulated tools when connecting the cables to the DC bus bar
- Wear eye protection
- Wear safety toe boots/shoes
- Handle batteries carefully

Secure the ALTO-Cabinet system safely to a wall

- Always assume battery terminals are energized, short circuit protection is on at all times, may spark
- Don't bring metallic objects near the magnetic interface of the ALTO system.
- Don't immerse the modules in water
- Don't operate or store battery outside of operating limits
- Don't short circuit battery (ALTO Batteries are protected against short circuit, but you will get a spark)
- Don't expose battery to flames or incinerate
- Don't open battery case or disassemble the battery
- Don't wear rings, watches, bracelets, or necklaces when handling or working near the battery
- Don't Drop or crush battery
- Don't vibrate battery
- Don't expose battery to direct sunlight
- Don't connect with other types of batteries
- Don't expose battery to high temperatures
- Don't install with other battery types or brands

## Transportation

Uninstalled batteries in the ALTO-Cabinet or ALTO-Accessory, must be transported in the original packaging or equivalent.

Cells are tested according to UN Handbook of Tests and Criteria, part III, subsection 38.3 For transport, the Cells belong to category UN3480, Class 9, Packaging Group II



## WARNING

### To maintain your WARRANTY, YOU MUST READ THE FOLLOWING:

Prevent Reverse Polarity, ALTO-Cabinet has two terminals on the back to connect to the DC bus bar, RED (positive terminal) and BLACK (negative terminal), reversing the cables to the DC bus bar will damage the system and will void the warranty.

ALTO-Battery terminals are magnetically keyed. When using approved accessories, they will not engage if installed incorrectly. DO NOT use unapproved accessories to attach to the ALTO-Batteries. Doing so will void the warranty.

DO NOT bring metal objects, like Nails, near the magnetic terminals of the ALTO-Batteries even though the internal BMS is designed to protect them.

ALTO-500Wh and ALTO-250Wh are designed as 12Vdc batteries, DO NOT connect them to higher than 18V DC sources. Follow the instructions in this manual for appropriate limits.

DO NOT drop the ALTO-Batteries or drop heavy objects on them.

DO NOT expose the ALTO-Batteries to moisture and liquids.

Battery Warranty does not cover damage caused by mishandling or improper use as described in this manual.

ALTO-Batteries should be checked regularly while in storage. We recommend a monthly check on voltage and SOC.

# Environmental Considerations

## Charging at Temperatures Below -30°C (-22°F) or Above 50°C (122°F)

Before charging the battery, It is essential the core of the ALTO-Battery is above -30°C (-22°F) and below 35°C (95°F). The battery's internal BMS and thermometer, when operating correctly, should automatically disable the charging circuit at these temperatures. However, it is good to check and not charge if the internal temperature is outside these ranges.



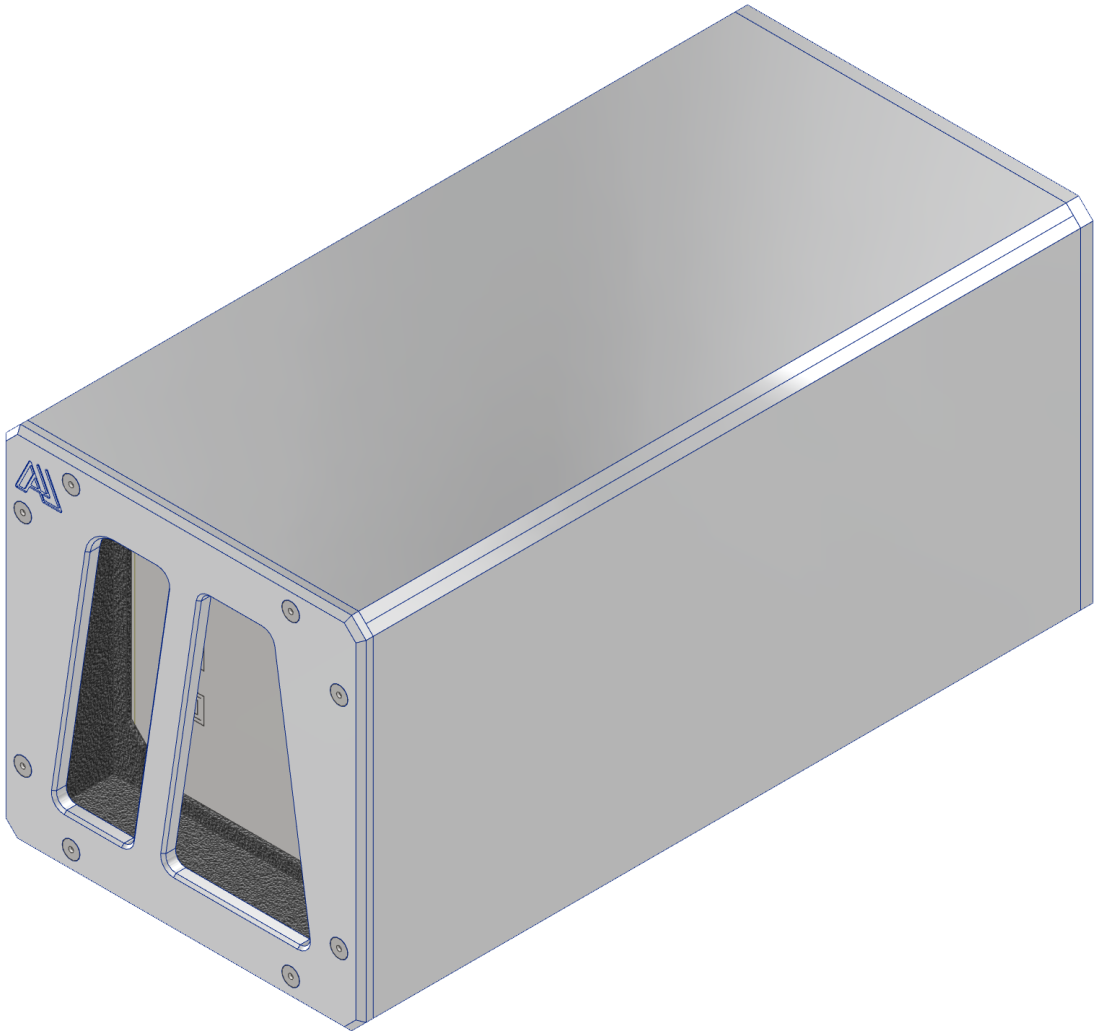
Do not attempt to charge the ALTO Batteries below -30°C (-22°F). Attempts to charge at these super cold temperatures can adversely affect SOH and Cycles of life and will VOID the Warranty.



Ne tentez pas de charger les batteries ALTO inférieures à -30 ° C (-22 ° F). Les tentatives de charge à ces températures extrêmement froides peuvent affecter négativement le SOH et les cycles de vie et ANNULERONT la garantie.

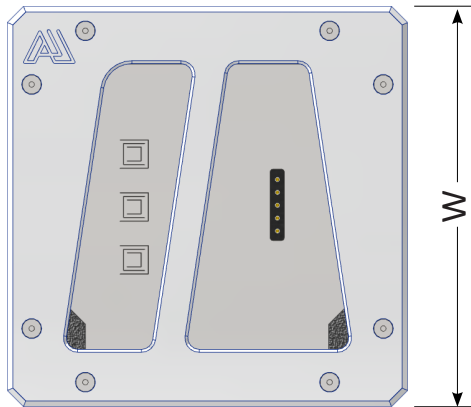
# **ALTO Battery** *(Advanced Lithium Titanium Oxide Battery)*

## **Owner's Manual**



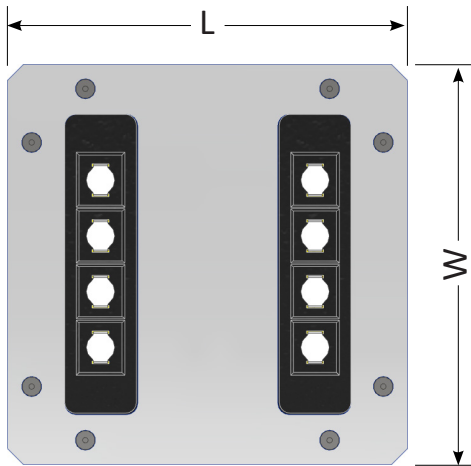


# ALTO-500Wh



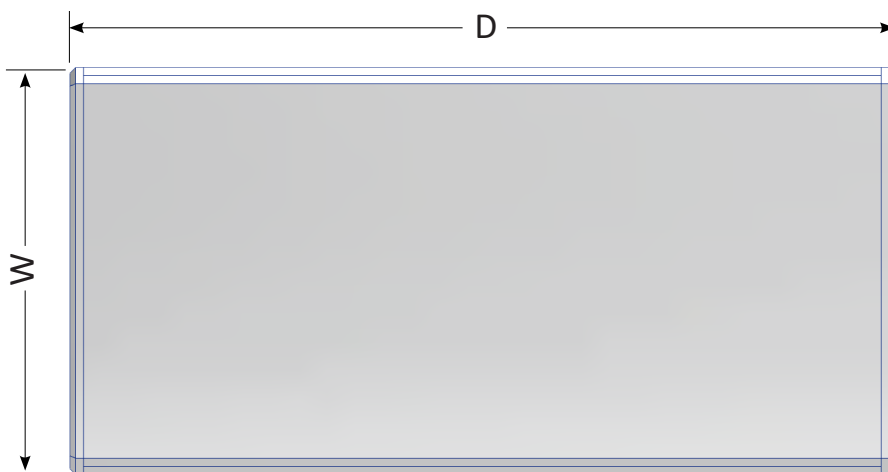
## Front View

L = 14cm (5.512")  
W = 14cm (5.512")  
Center bar may be used as a handle to carry the battery



## Rear View

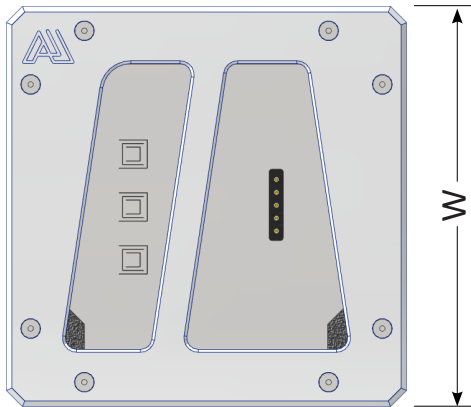
L = 14cm (5.512")  
W = 14cm (5.512")  
Magnetic NoWire connection is keyed for easy no hassle installation



## Side View

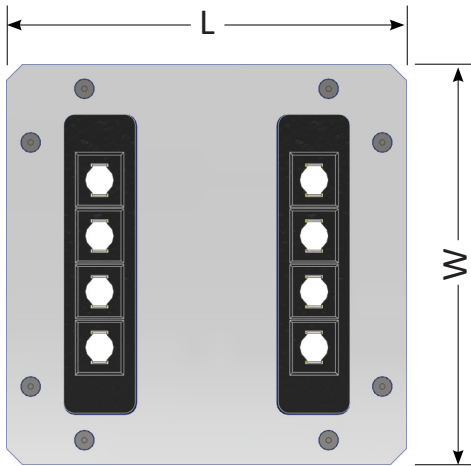
W = 14 cm (5.512")  
D = 284.6 cm (11.2")  
Aluminium Case is made out of #6063 and will protect and transfer heat

# ALTO-250Wh



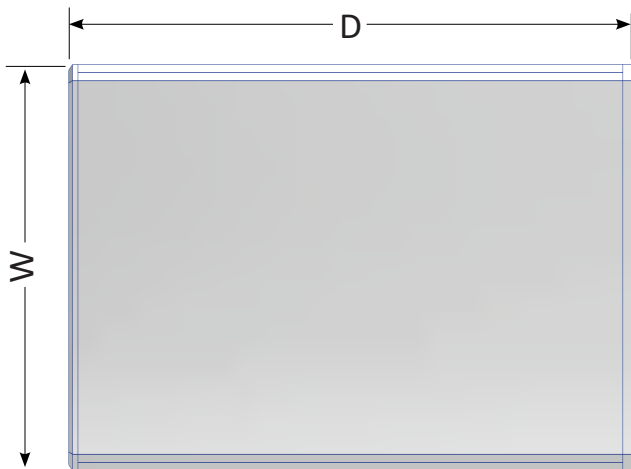
## Front View

L = 14cm (5.512")  
W = 14cm (5.512")  
Center bar may be used as a handle to carry the battery



## Rear View

L = 14cm (5.512")  
W = 14cm (5.512")  
Magnetic NoWire connection is keyed for easy no hassle installation



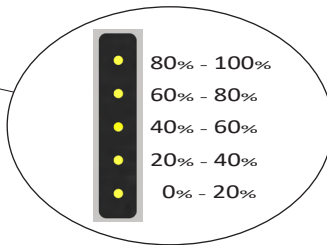
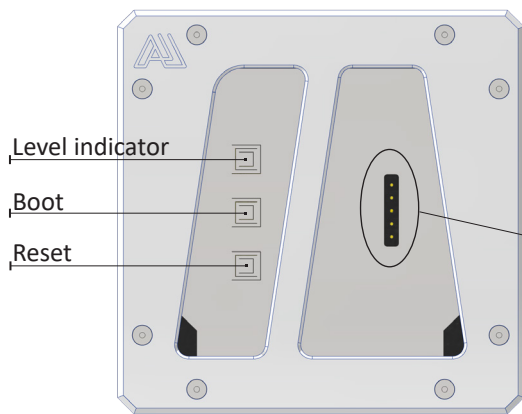
## Side View

W = 14 cm (5.512")  
D = 175.6 cm (6.914")  
Aluminium Case is made out of #6063 and will protect and transfer heat

# ALTO-Battery Start-Up

Following steps can be done while the ALTO-Battery module is inside or outside of the ALTO-Cabinet.

- 1) locate the “BOOT” button in front of the ALTO-Battery module and use the tip of your finger to press it.
  - ALTO-Batteries are shipped in a “power down” mode
  - The BMS will “power up” after 5 seconds
- 2) Press the “RESET” button,
  - Reset will start the BMS from a known state.
- 3) Pressing the “level indicator” will show you the **SOC** (State of Charge) of the ALTO-Battery



## LED Power level indicator

### Charging:

LED Solid Green ON:

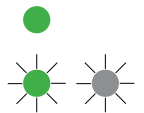
Percentage range is full.

LED flashing Green ON/OFF:

Charging that range

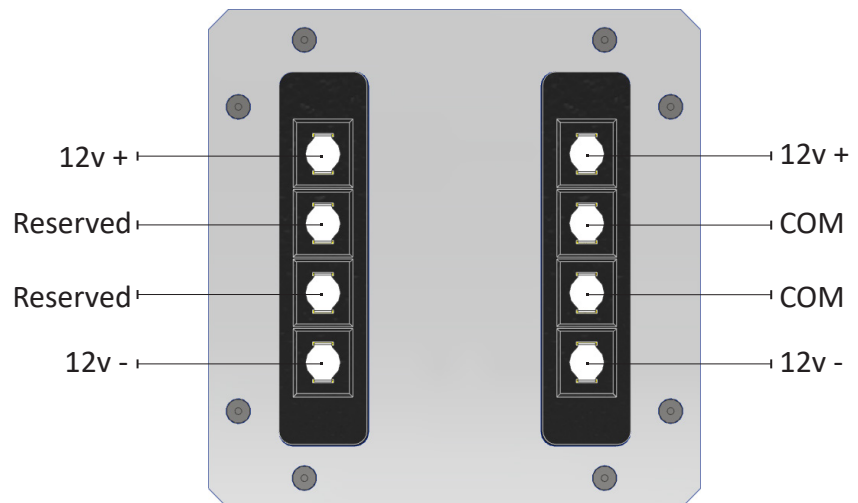
5 LEDs Solid Green ON:

Battery is fully charged



### Discharging:

To preserve power, they are OFF



# ALTO Battery Operating Limits:

## MAX Limits

ALTO batteries must operate within the ranges mentioned in the tables below. The BMS will protect the cells if MAX limits exceed the recommendations. To prolong the battery life, we recommend you operate the battery at 25°C. **Using the batteries at temperatures above 35°C (95°F) will result in fewer cycles.**

	ALTO-250Wh	ALTO-500Wh
MAX Continuous Charge Current	32 A	43 A
MAX Continuous Discharge Current	32 A	43 A
MAX Charge Voltage	16 V	16 V
Operating Voltage, MAX discharge / MAX charge	8 <sup>1</sup> - 12.85 V	8 <sup>1</sup> - 12.85 V
Charge Temperature MIN & MAX	-30 to 50°C (-22° to 122 °F)	-30 to 50°C (-22° to 122 °F)
Discharge Temperature MIN & MAX	-30 to 50°C (-22° to 122 °F)	-30 to 50°C (-22° to 122 °F)
Storage Temperature MIN & MAX	-40 to 50°C (-40° to 122 °F)	-40 to 50°C (-40° to 122 °F)

NOTES:

<sup>1</sup> - This is the lowest limit before the internal BMS disconnects the cells from load. For normal operation Please stay above 9Vdc

## Normal User Operating Limits

Please make sure the batteries operate within the ranges mentioned in the table below. The BMS will protect the cells if these MAX limits are exceeded.

	ALTO-250Wh	ALTO-500Wh
Continuous Charge Current	20 A	40 A
Continuous Discharge Current	20 A	40 A
Charge Voltage	12.8 V <sub>DC</sub>	12.8 V
Operating Voltage MIN & MAX	9 - 12.5 V <sub>DC</sub>	9 - 12.5V
Normal Operating temperature (charge/discharge) <sup>2</sup>	-30 to 35°C (-22° to 95°F)	-30 to 35°C (-22° to 95°F)

NOTES:

<sup>2</sup> - To achieve the expected cycles, user must operate ALTO batteries within this temperature range, any operation outside of these ranges will result in reduced cycles of life. User may have to add external HVAC to manage higher temperatures.

# ALTO Battery Features

## **BMS** (integrated Battery Management System)

Will Monitor Battery:

- Total module voltage
- Temperature
- Current
- Cell level voltages
- SOC (state of charge)
- SOH (State of health)
- Cycles (90% DOD will increment the counter by 1, the % is cumulative)

Will balance the cells

Protection:

- The internal electronics will open the circuitry when MAX limits are surpassed.
- After 10 seconds, the BMS will retry powering the output; if over MAX limits remain, the MOSFETs will disconnect the ALTO battery from the circuit again. The BMS will retry five times, after which it will disable the battery until the problem is resolved. A reset on the front panel

	Auto Recovery	Description
Over Voltage	Yes	The BMS monitors each cell within the ALTO battery. When charging, if any of the cells reach the upper limit, the BMS will automatically stop taking charge.
Under Voltage	Yes	The BMS monitors each cell within the ALTO battery. When discharging, if any of the cells reach the lower limit, the BMS will automatically stop allowing discharge and shut down. Recharging will enable the battery to go back to normal operating mode.
Over Current	Yes	The BMS will disconnect the ALTO Battery from the circuit. After 10 seconds, the ALTO Battery will retry the connection. If the condition causing the event is cleared, the regular operation will resume. The BMS will retry five times, and if the event persists, the BMS will lock the battery out. A manual reset will resume normal operations
High and low Temperature	Yes	The BMS monitors the core temperature of the pack. If the upper or lower limits are reached, the Power flow circuitry is turned off. Charge and Discharge is not allowed until the core temperature returns to within the permitted limits.

# ALTO-Batteries

Electrical Spec's	ALTO-250Wh	ALTO-500Wh	
Charge Voltage	12.8	12.8	V
Nominal Voltage	12.5	12.5	V
Maximum Voltage	16	16	V
Nominal Capacity	20	40	Ah
Nominal Capacity	250	500	Wh
MAX continuous Charge Current	20	40	A
MAX continuous Discharge Current	20	40	A
Cell configuration	5s	2p5s	
Cell Chemistry	LTO		
Self Discharge at room temp	< 1% when battery is off		

Cell Limits		
Over Temperature - Charge/Discharge (5 seconds)	50°C (122°F)	
Low Temperature - Charge/Discharge (5 seconds)	-30°C (-22°F)	
Over Voltage Protection on any cell	>2.57	V
Under Voltage Protection on any cell	< 1.58	V
Over Current Protection on ALTO_500Wh module	> 43	A
Over Current Protection on ALTO_250Wh module	> 32	A

Other Specs	ALTO-250Wh	ALTO-500Wh
Weight	4.3Kg (9.5lb)	8.6Kg (18lb)
Dimensions (LxWxD) (inches)	5.512 x 5.512 x 6.89	5.512 x 5.512 x 11.2
Dimensions (LxWxD) (cm)	14 x 14 x 17.5	14 x 14 x 28.5
Case Material	Aluminum 6063	Aluminum 6063
Terminals, Magnetic Nickel Plated Copper	<i>Magnetic NoWire™</i>	<i>Magnetic NoWire™</i>
Charge/Discharge Temperature (imperial)	-22° to 122°F <sup>4</sup>	-22° to 122°F <sup>4</sup>
Charge/Discharge Temperature (metric)	-30° to 50°C <sup>4</sup>	-30° to 50°C <sup>4</sup>
Depth Of Discharge	100%	100%
Cycles expected to 90% remaining capacity	10,000	10,000
Battery Management System	Integrated	Integrated

<sup>4</sup> Temperatures above 95°F 35°C will result in reduced life

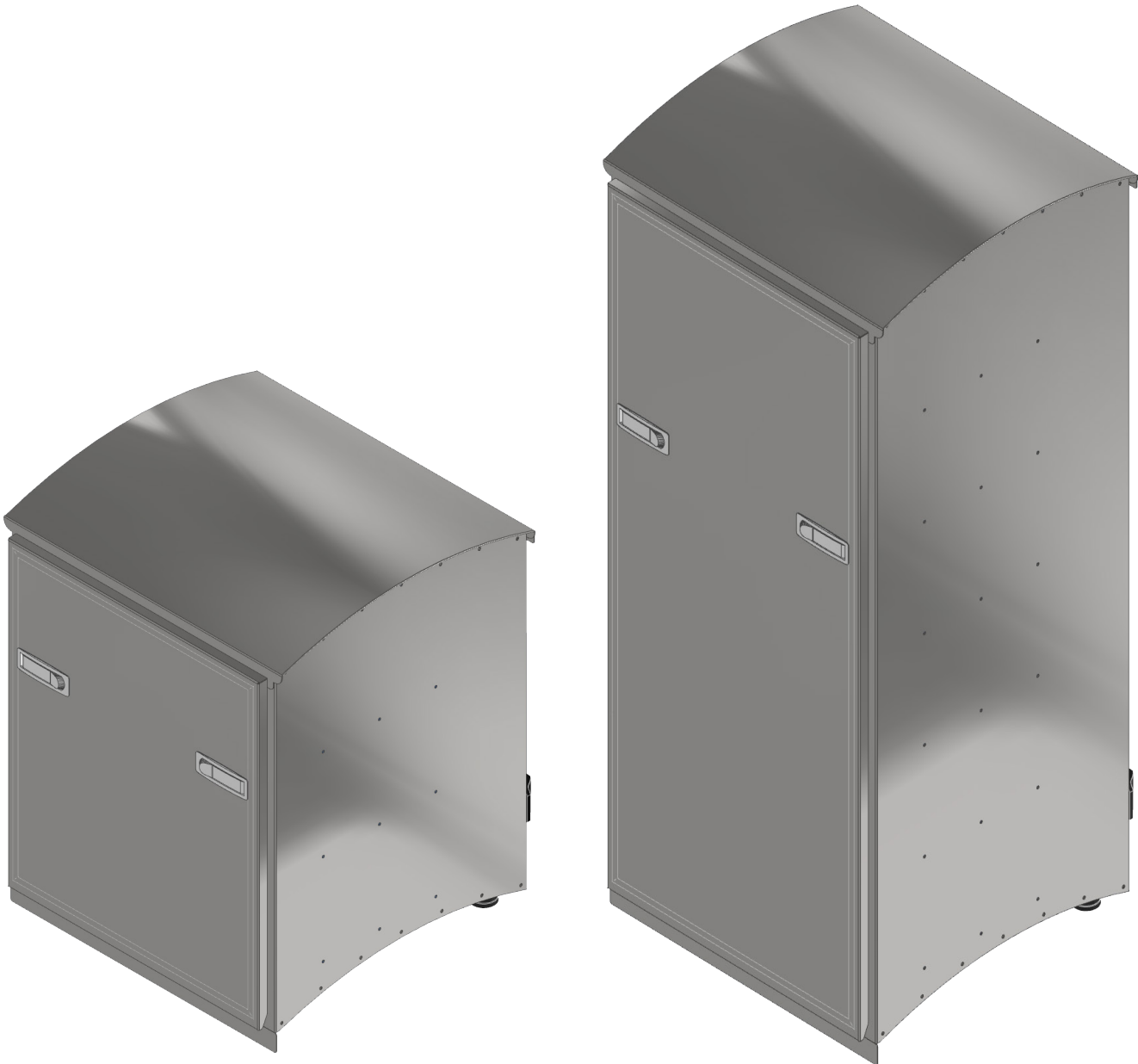
Features	
Life Time Monitoring in the NVRAM	<ul style="list-style-type: none"> <li>• MAX/MIN Cell Voltages</li> <li>• Temperature</li> <li>• MAX/MIN Voltage and Current</li> <li>• SOC and SOH</li> </ul>
Cell Balancing	<ul style="list-style-type: none"> <li>• YES</li> </ul>
Ports	<ul style="list-style-type: none"> <li>• Power: plus and minus</li> <li>• I<sup>2</sup>C for communication and programming</li> </ul>
Communication	<ul style="list-style-type: none"> <li>• Through ALTO-CAB, Ethernet and Modbus</li> <li>• External optional Wifi accessory available</li> <li>• External accessories will have Wifi built in</li> </ul>

## ALTO-Accessories

If you purchased one of the many ALTO-Accessories, connecting them is very easy. Find a flat surface, place the ALTO-500Wh or ALTO-250Wh on it, bring the Magnetic NoWire™ Patented sides close together, and let the magnets do the rest of the job for you. PMK™ (Patented Magnetic Keying) takes the guesswork out of the picture. You don't need to know which terminal is +ve, which one is -ve. Incorrectly oriented devices will not engage.

# ***ALTO Cabinet 3KWh & 6KWh***

## ***Owner's Manual***





# Introduction

## ALTO-Cabinet

Is designed for versatility and ease of installation to give the end user more capacity. With it, you can start from 500Wh at a time up to 3KWh with ALTO-CAB-3KW and 6KWh with ALTO-CAB-6KW.

The ALTO-CAB, among its many features, will give you these:

- Easy installation, POS and NEG DC terminals to an inverter or DC bus bar, communication cable. That's it.
- With its full wall mount bracket, Find the center of one of the studs on the wall and screw the first bolt in. the rest is pre-drilled and ready to go. Level and put the rest of the bolts, and it's done.
- Incremental capacity increase.
- 48V @3KWh or 48V @6KWh
- MOD Bus and Ethernet communication.
- Adjustable feet
- IP14 rating (NEMA-3R equivalent)
- 100% Stainless Steel for reduced Carbon footprint and longest life span
- easy ALTO-Battery installation/removal
- Safety built-in for electrical connection.
- With 125V@80A DC breaker for extra protection

# ALTO-Cabinet Unboxing

The ALTO-Cabinets come complete and ready to use from the factory to your door step. When you unbox the cabinet please make sure there are no dents or visible damage on the SS skin of the cabinet. If there are any please take pictures and make note of its location and submit to our support@adaptiphy.com

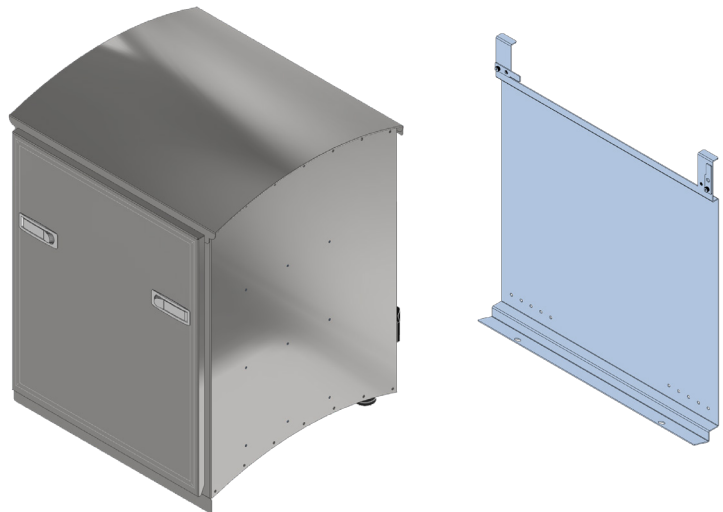
## ALTO-Cabinet 3kWh

What is in the box:

- ALTO-3kWh Cabinet
- A full wall mount bracket

Not Included:

- Bolts to attach to studs



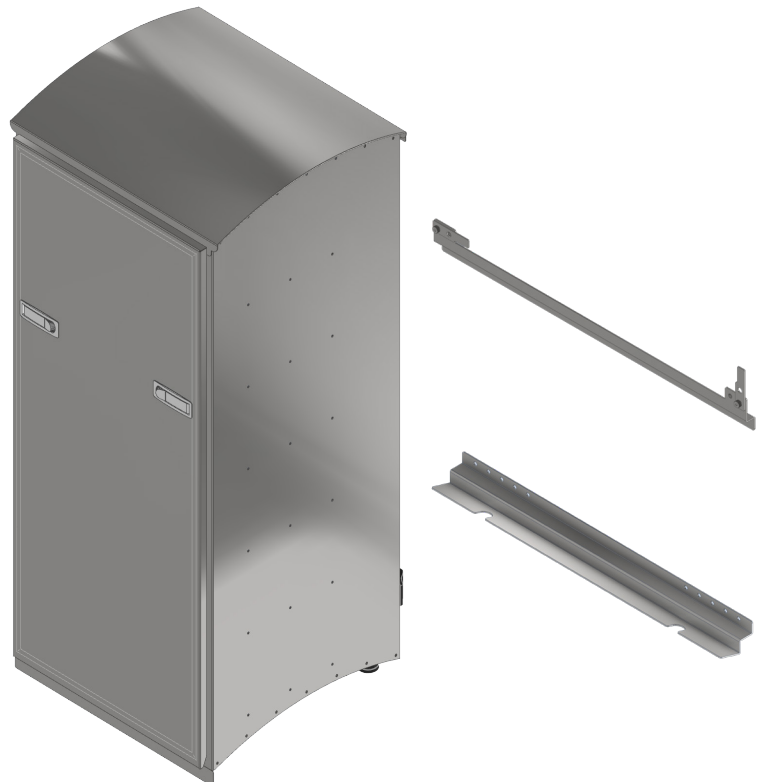
## ALTO-Cabinet 6kWh

What is in the box:

- ALTO-6kWh Cabinet
- Upper and Lower wall mount brackets

Not Included:

- Bolts to attach to studs

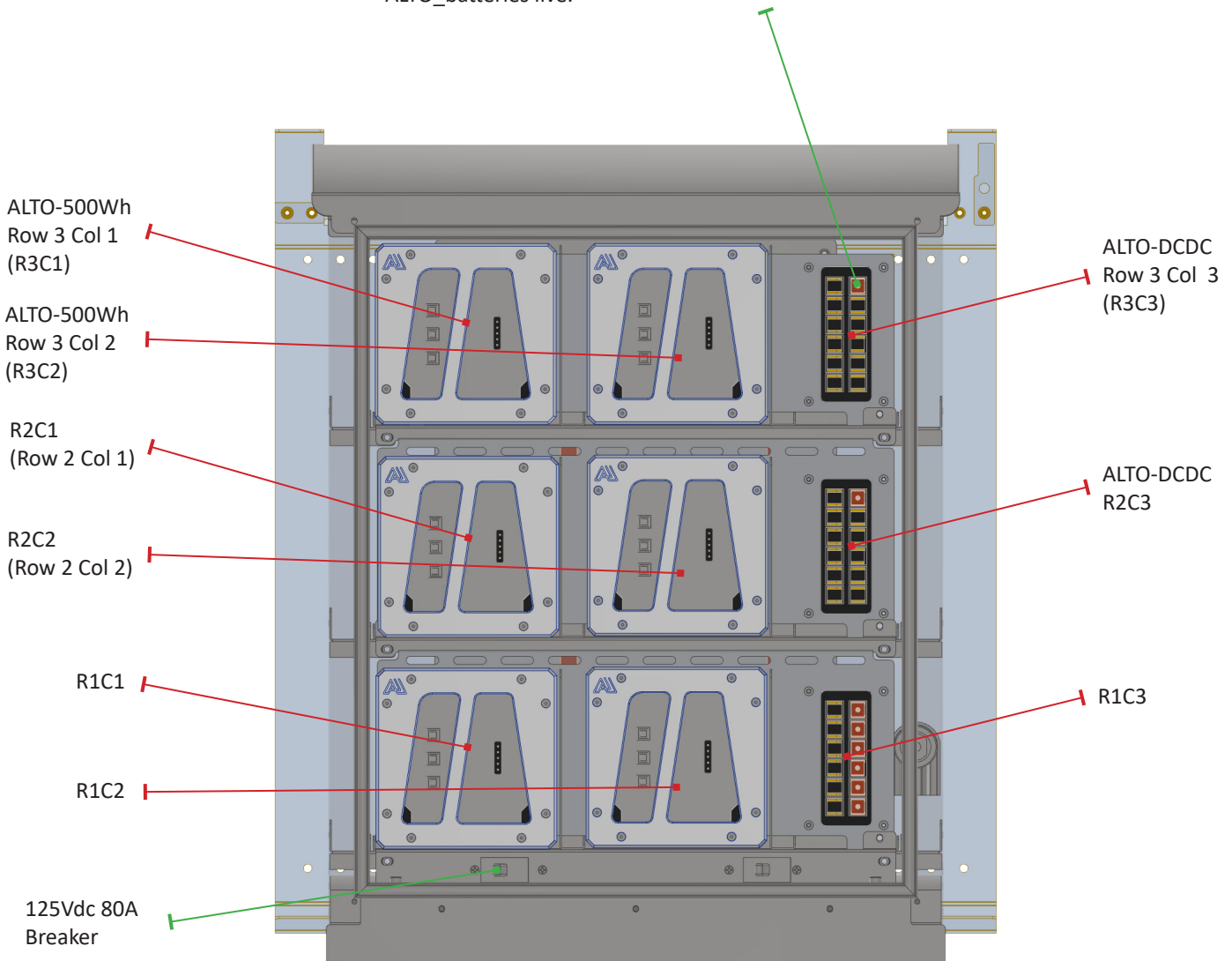


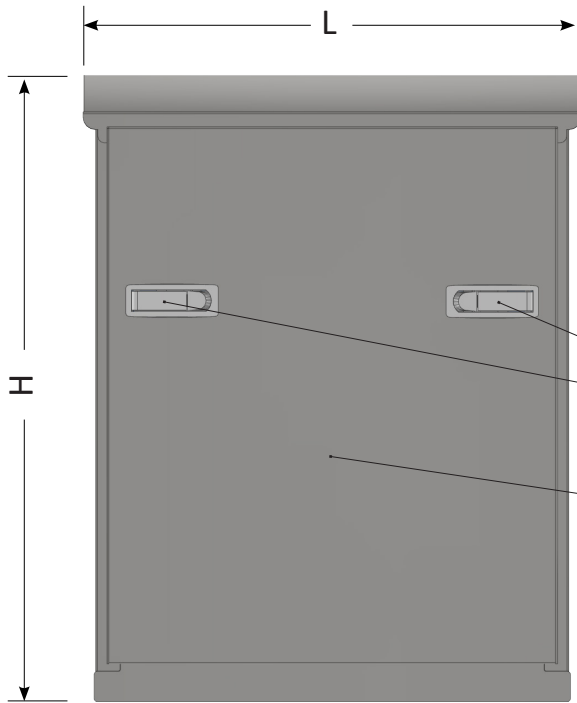
# ALTO-Cabinet explained

The ALTO-Cabinets come complete and ready to use from the factory. All you need to add are communications cables and DC power connection to the inverter or DC Bus Bar. The full size mounting bracket will hold the ALTO-Cabinet securely to the wall. It is made out of Stainless Steel 304, which should last a very long time.

Please see "Installation" instructions later in this manual.

Magnetic *NoWire* interlocking, allows you to insert and remove the ALTO-Batteries and ALTO-DCDC converters with ease and no need for Tools, Nuts and Bolts. You may remove ALTO\_batteries live.





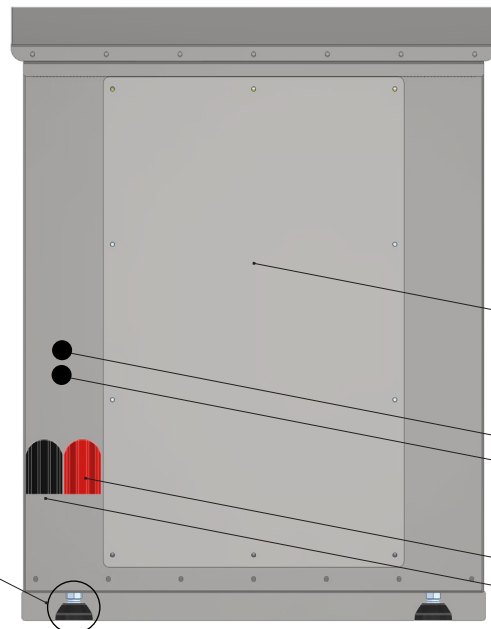
## Front View

H = 63.5 cm (25.014")  
 L = 49.9 cm (19.654")  
 D = 50.27cm (19.791")

Cabinet is made out of SS #304

Locking door Latches

Removable front door



## Rear View

H = 63.5 cm (25.014")  
 L = 49.9 cm (19.654")  
 Cabinet is made out of SS #304

Rear removable cover plate for installer use ONLY

MOD BUS port for communication to Invertors  
 Ethernet port for communication and monitoring

+ve post for attaching cable to main DC bus bar  
 -ve post for attaching cable to main DC bus bar

Adjustable feet

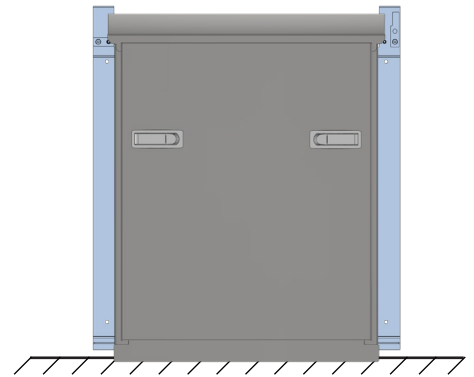
# ALTO-Cabinet combinations

These are some of the possible combinations.

There are no theoretical limits on how you can combine the ALTO-Cabinets.

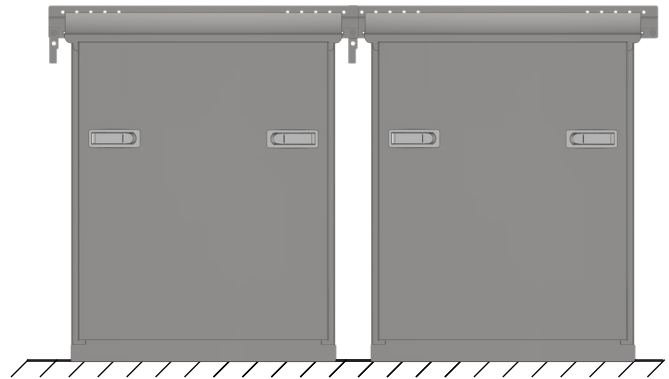
500Wh to 3kWh

- Place this unit on the ground
- Attach the bracket on to the wall to prevent movement



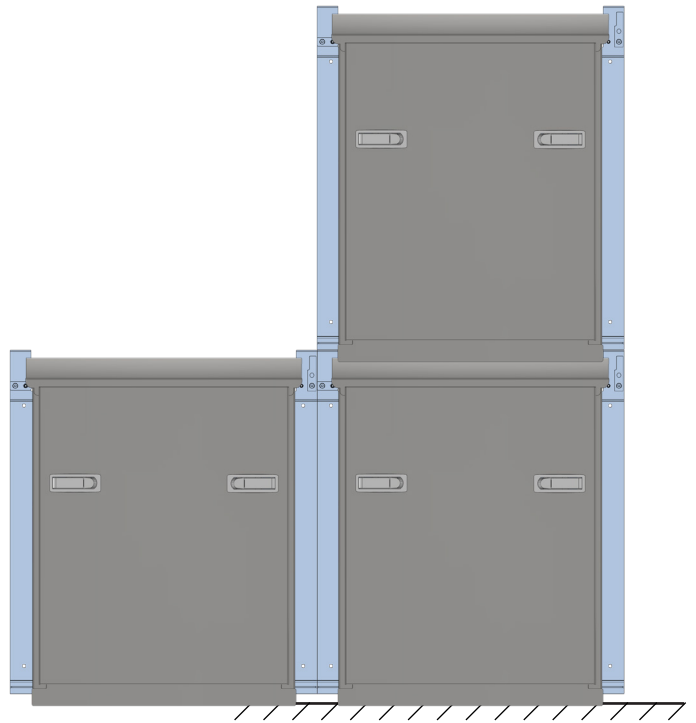
500Wh to 6kWh

- 2x Units if space is available can go side by side



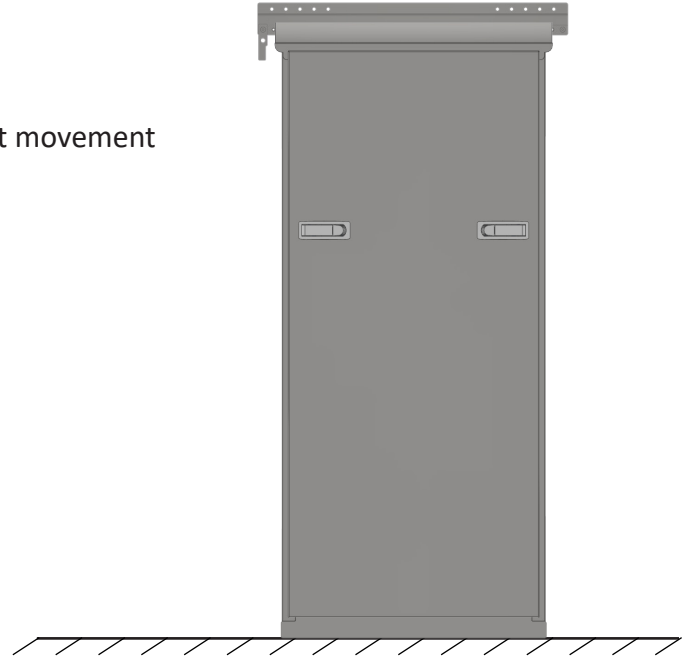
500Wh to 9kWh

- May be mounted vertically on top of each other by using the "Full Bracket Mounting System"



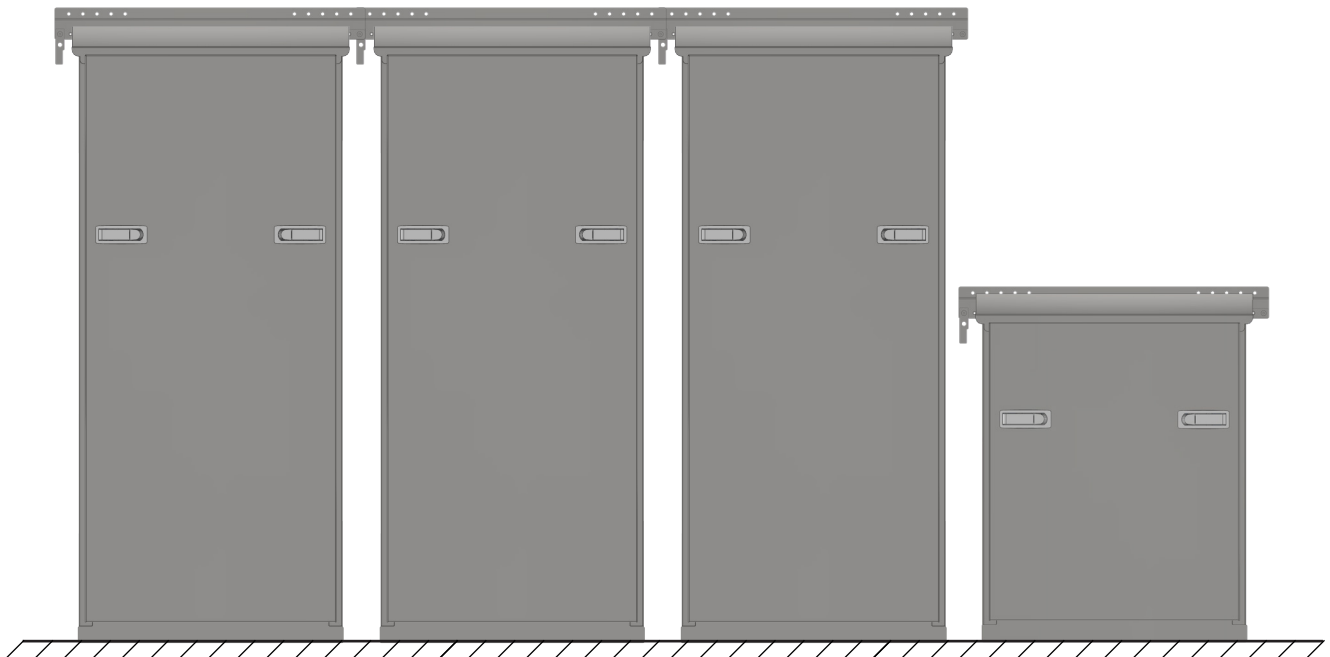
500Wh to 6kWh

- Place this unit on the ground
- Attach the upper bracket on to the wall to prevent movement



500Wh to 21kWh

- You may combine various size ALTO-Cabinets



# ALTO-Cabinet

Specs	ALTO-CAB-3KW	ALTO-CAB-6KW
Weight (empty, no ALTO-Batteries)	25 Kg (55 lb)	50Kg (100 lb)
Dimensions (LxHxD) (inches)	19.65 x 25 x 19.75	19.65 x 44.403 x 19.75
Dimensions (LxHxD) (cm)	49.9 x 63.5 x 50.27	49.9 x 112.8 x 50.27
Cabinet Material	SS - 304	SS - 304
Terminals, Magnetic Nickel Plated Copper	<i>Magnetic NoWire</i>	<i>Magnetic NoWire</i>
DC Posts Positive & Negative	YES	YES
ethernet RJ45	YES	YES
Modbus	YES	YES
ALTO-500Wh and ALTO-250Wh Capacity	6	12

# Installation

**WARNING**

Please follow all safety procedures before installing the Batteries  
Do not install Lithium batteries in Series, unless specifically approved by Adaptiphy

**NOTE**

**NO TOOLS ARE NEEDED**  
for installation of the ALTO-Batteries in the ALTO-Cabinet  
ALTO-Cabinet will require external cables to DC bus bars and appropriate tools to connect

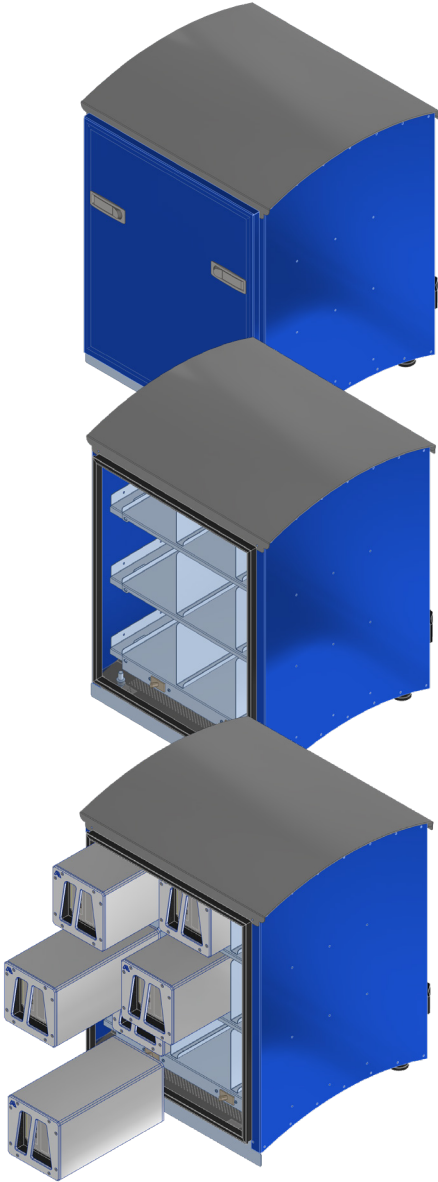
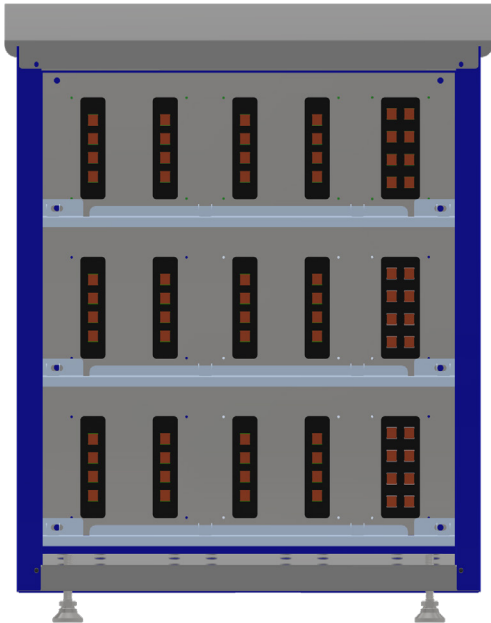
## ALTO-Cabinet (option)

If you have purchased the ALTO-CABINET, installation is straightforward. ALTO-CABINET installation and connection to the inverter is explained in its user manual.

To install the ALTO-Batteries in the ALTO-CABINET:

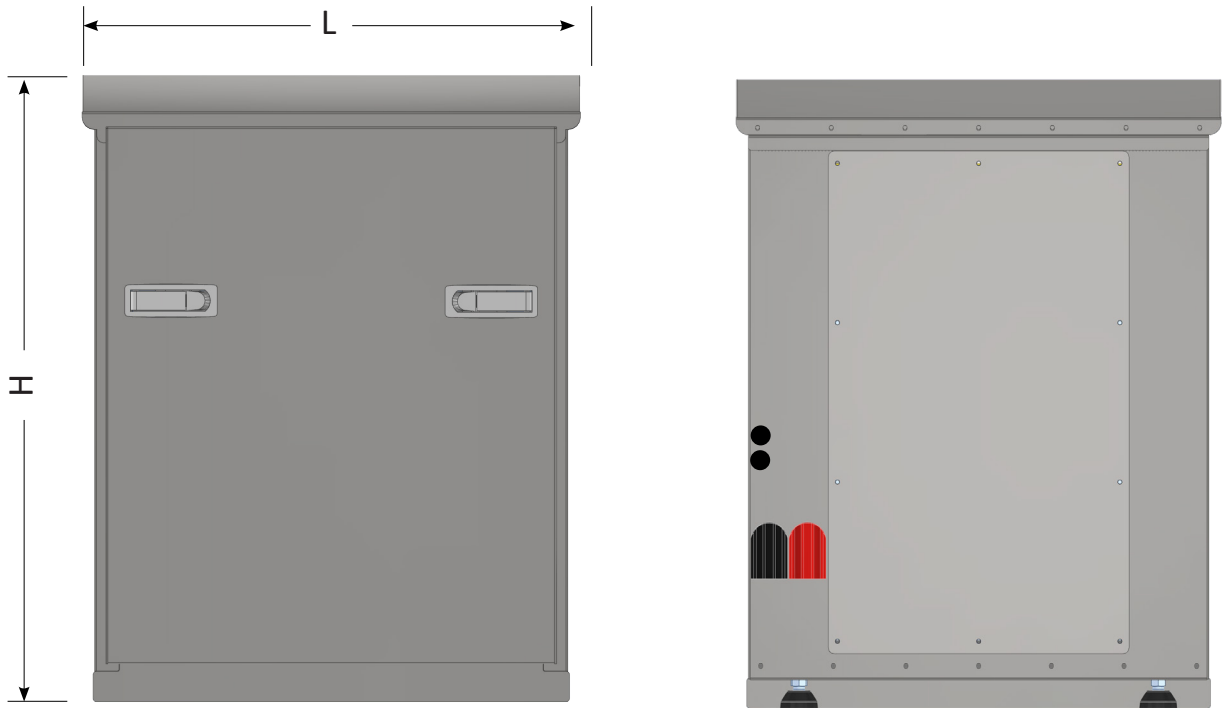
- Open the front cover of the ALTO-Cabinet and find an empty slot. There are six available.
- Insert the ALTO-Batteries by sliding the module in towards the back.
- As the ALTO-Battery gets closer to the back of the cabinet, the Magnetic NoWire™ Patented system will make the necessary electrical connections.

Once the ALTO-Batteries are installed, proceed to the next page, start up the batteries one by one and get ready to use the storage from Adaptiphy Energy Solutions for a lifetime.



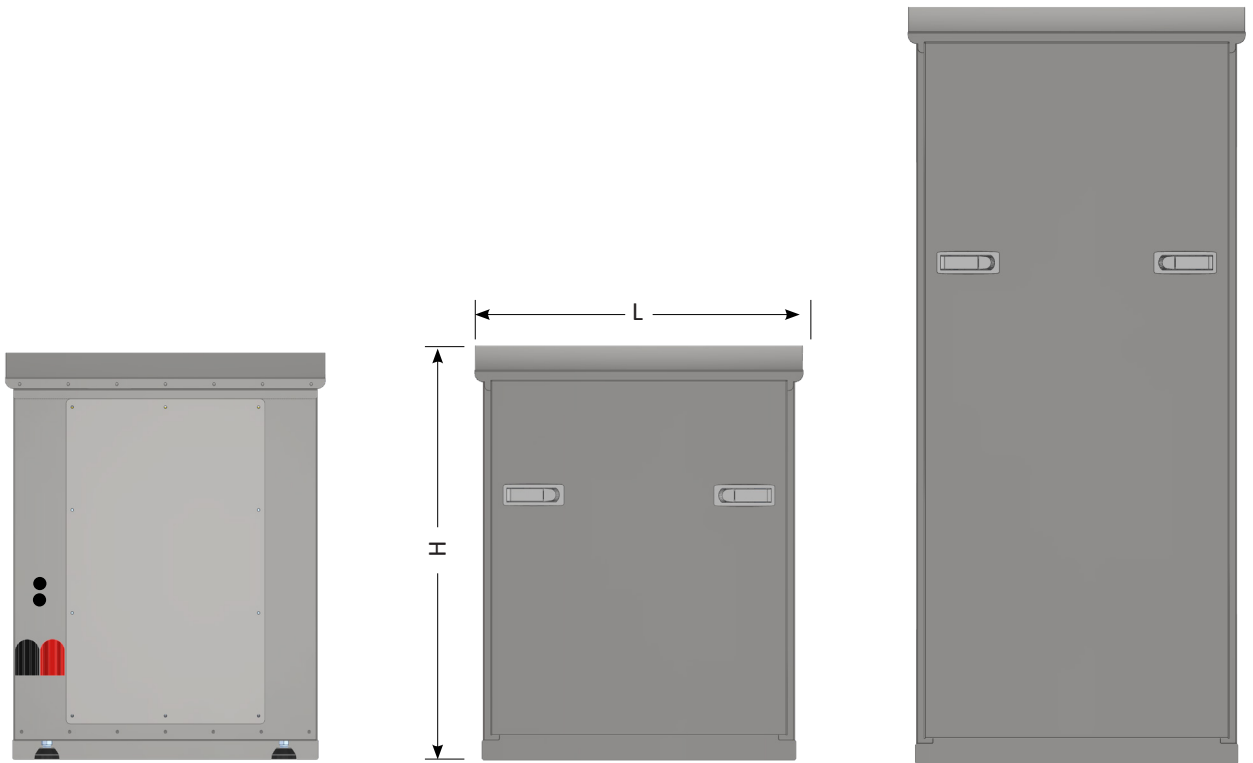


# ALTO-Cabinet



Specs	ALTO-CAB-3KW	ALTO-CAB-6KW
Weight (empty, no ALTO-Batteries)	25 Kg (55 lb)	50Kg (100 lb)
Dimensions (LxHxD) (inches)	19.65 x 25 x 19.75	19.65 x 44.403 x 19.75
Dimensions (LxHxD) (cm)	49.9 x 63.5 x 50.27	49.9 x 112.8 x 50.27
Cabinet Material	SS - 304	SS - 304
Terminals, Magnetic Nickel Plated Copper	<i>Magnetic NoWire</i>	<i>Magnetic NoWire</i>
DC Posts Positive & Negative	YES	YES
ethernet RJ45	YES	YES
Modbus	YES	YES
ALTO-500Wh and ALTO-250Wh Capacity	6	12
ALTO-DCDC	3	6

# ALTO-Cabinet



Specs	ALTO-CAB-3KW	ALTO-CAB-6KW
Weight (empty, no ALTO-Batteries)	25 Kg (55 lb)	50Kg (100 lb)
Dimensions (LxHxD) (inches)	19.65 x 25 x 19.75	19.65 x 44.403 x 19.75
Dimensions (LxHxD) (cm)	49.9 x 63.5 x 50.27	49.9 x 112.8 x 50.27
Cabinet Material	SS - 304	SS - 304
Terminals, Magnetic Nickel Plated Copper	<i>Magnetic NoWire</i>	<i>Magnetic NoWire</i>
DC Posts Positive & Negative	YES	YES
ethernet RJ45	YES	YES
Modbus	YES	YES
ALTO-500Wh and ALTO-250Wh Capacity	6	12
ALTO-DCDC	3	6

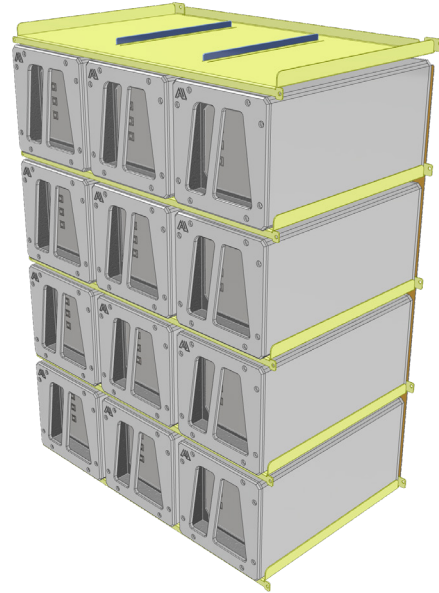
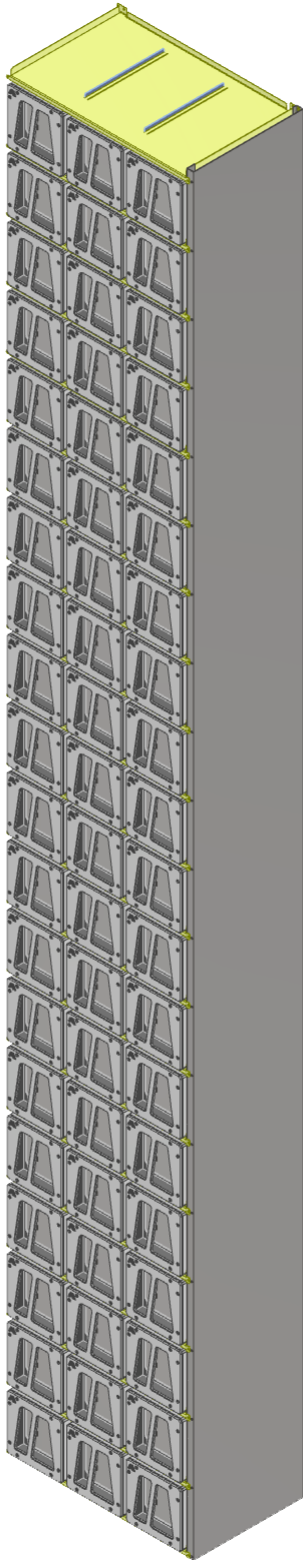
# Registration

## *Warranty Registration*

Your system needs to be connected to the cloud for regular upgrades and monitoring.

To take advantage of the long warranty Adaptiphy Energy Solutions Inc. offers with each ALTO system you must take note of the serial numbers in the back of each device and register them Online.

# ALTO-TOWER



## ALTO-TOWER-30KWh

- ALTO-TOWER is made of 12x ALTO-500WH-1c for a total of 6KWh
- The 12x sections can be mounted 5 high for a total of 30KWh MAX per section
- No Limit on paralleling

Specs	ALTO-TOWER
Cabinet Material	SS-304 or Coated Steel
Terminals, Magnetic Plated Copper	<i>Magnetic NoWire</i>
DC Posts Positive & Negative	YES
ethernet RJ45	YES
Modbus	YES
ALTO-500Wh and ALTO-250Wh Capacity	12 / Section
ALTO-DCDC 48V integrated in the back	12