

# ACES **Li** POWER

## USER MANUAL

12V 24V 48V 72V HFA Series



HFA series with smart BMS

## LITHIUM **LiFePO4** BATTERIES



ACES LI POWER®

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# 1. Product description

## 1.1 Introduction HFA series Batteries

Reading this manual first before use of the ACES Lithium battery is very **IMPORTANT!!**

We want you to have a battery that can last for a long time.

Using the batteries according this manual helps to achieve this.

Dependent on the application this type of battery could have a typical lifetime of 10-20 years.

Wrong usage of lithium batteries in general can lead to unsafe situations or permanently defect batteries.

This manual explains clearly how to use the ACES lithium batteries in the right way.

## 1.2 General

ACES Lithium batteries are designed in the Netherlands and are built with LiFePo4 or LFP cells.

The cells have a 3.2V nominal voltage.

In contrast with Lithium NMC, LMO and LCO cells these LiFePo4 cells are inherently safe.

NMC, LMO and LCO cells become unstable at high temperatures

The NMC, LMO and LCO cells are used in electric cars, phones, tables, bicycles, tools, toys and RC-models.

LFP cells do not contain Cobalt and Manganese and do not catch spontaneously fire or can explode.

These batteries are the best replacement for lead acid batteries.

Compared to Lead-acid ACES LiFePo4 batteries offer much longer life, and will accept much easier high charge currents, which is a big advantage for solar panels. Charging is possible at any moment.

They have a smaller volume and up to 4 times lower weight.

Where a lead acid battery has about 60% capacity left at 1C discharge, the ACES lithium battery has still 97%.

The ACES lithium batteries are expected to have a lifespan of 10-20 years and more than 3000 cycles before the capacity reaches 80%.

Whereas AGM lead-acid batteries have 2-5 years and about 300-500 cycles to 70%.

The Built-in Battery Management System protects the battery against fault conditions.

## 1.3 Product features





- Bluetooth functionality; the APP is available from our website
- Monitoring battery state via Bluetooth APP for iOS and Android
- LFP (LiFePo4) chemistry using cells with high power density
- Most safe Lithium Technology
- Can be connected in parallel up to 4 batteries
- Integrated BMS (Battery Management System)
- Electronic short circuit protection and integrated fuse
- Overload protection
- Except high charge currents
- Can be fast charged in about 1 hour
- Can be charged at all charge levels without shortening battery life
- Failsafe BMS protection functions
- Strong ABS case with handgrips
- Broad range of ACES chargers available for these batteries

## 1.4 Technical specifications 12V HFA series batteries (< 100AH)

				
Description	12.8V 24AH	12.8V 45AH	12.8V 60AH	12.8V 80AH
Model name	AL12V24HFA	AL12V45HFA-BT	AL12V60HFA-BT	AL12V80HFA-BT
EAN / GTIN	4738474176742	4738470384141	4738479938789	4738476325483
Rated Capacity	24Ah / 307WH	45Ah / 576WH	60Ah / 768WH	80Ah / 1024WH
Discharge current	24A	45A	60A	80A
Peak discharge current	100A	125A	200A	300A
Maximum charge current	24A	45A	60A	80A
Recommended charge current	2...12A	4...23A	6...30A	8...40A
Nominal Voltage	12.8V			
Operational Voltage range	11.0...13.5V			
BMS cutoff Voltage	10V			
Cycle Life 0.2C 80% DOD	>4000			
Charge end voltage range	14.2...14.6V (13.5V float Voltage)			
Charge characteristic	CC / CV			
Battery Management System	Integrated			
Serial connection	Not allowed			
Parallel connection	Up to 4 batteries			
Bluetooth monitoring	No	Yes inside; App available for Android and Iphone		
IP protection rating	IP65			
Temperature range discharge	-20°C ... +60 °C			
Temperature range charge	0°C ... +45 °C			
Temperature storage <1 month	-20°C ... +50 °C			
Temperature storage >1 month	5 °C ... +30 °C			
Connection	M5	M8	M8	M8
Weight	3 kg	4 kg	7.2 kg	9.3 kg
Dimensions (L x W x H) mm	181 x 76 x 167	165 x 126 x 175	197 x 166 x 173	260 x 168 x 209
Warranty	5 years			





## 1.5 Technical specifications 12V HFA series batteries (>= 100Ah)

				
Description	12.8V 100AH	12.8V 120AH	12.8V 150AH	12.8V 150AH DIN
Model name	AL12V100HFA-BT	AL12V120HFA-BT	AL12V150HFA-BT	AL12V150HFAS-BT
EAN / GTIN	4738475950945	4738476073223	4738479950491	4738471253859
Rated Capacity	100Ah / 1280WH	120Ah / 1536WH	150Ah / 1920WH	150Ah / 1920WH
Discharge current	100A	100A	150A	150A
Peak discharge current	300A	350A	360A	360A
Maximum charge current	100A	100A	150A	150A
Recommended charge current	10...50A	12...60A	15...75A	15...75A
Nominal Voltage	12.8V			
Operational Voltage range	11.0...13.5V			
BMS cutoff Voltage	10V			
Cycle Life 0.2C 80% DOD	>4000			
Charge end voltage range	14.2...14.6V (13.5V float Voltage)			
Charge characteristic	CC / CV			
Battery Management System	Integrated			
Serial connection	Not allowed			
Parallel connection	Up to 4 batteries			
Bluetooth monitoring	Yes inside; App available for Android and Iphone			
IP protection rating	IP65			
Temperature range discharge	-20°C ... +60 °C			
Temperature range charge	0°C ... +45 °C			
Temp. storage <1 month	-20°C ... +50 °C			
Temp. storage >1 month	5 °C ... +30 °C			
Connection	M8	M8	M8	Din 17(-) / 19(+))mm
Weight	12.8 kg	13 kg	19 kg	17 kg
Dimensions (L x W x H) mm	306 x 168 x 211	260 x 168 x 209	483 x 170 x 240	355 x 175 x 188
Warranty	5 years			





				
Description	12.8V 200AH	12.8V 280AH	12.8V 320AH	12.8V 400AH
Model name	AL12V200HFA-BT	AL12V280HFA-BT	AL12V320HFA-BT	AL12V400HFA-BT
EAN / GTIN	4738476085431	4738477657125	4738470491856	4738477621232
Rated Capacity	200Ah / 2560WH	280Ah / 3584WH	320Ah / 4096Wh	400AH / 5120Wh
Discharge current	150A	200A	150A	150A
Peak discharge current	360A	400A	400A	400A
Maximum charge current	150A	150A	150A	150A
Recommended charge current	20...100A	20...100A	20...150A	20...150A
Nominal Voltage	12.8V			
Operational Voltage range	11.0...13.5V			
BMS cutoff Voltage	10V			
Cycle Life 0.2C 80% DOD	>4000			
Charge end voltage range	14.2...14.6V (13.5V float Voltage)			
Charge characteristic	CC / CV			
Battery Management System	Integrated			
Serial connection	Not allowed			
Parallel connection	Up to 4 batteries			
Bluetooth monitoring	Yes inside; App available for Android and Iphone			
IP protection rating	IP65			
Temp. range discharge	-20°C ... +60 °C			
Temp. range charge	0°C ... +45 °C			
Temp. storage <1 month	-20°C ... +50 °C			
Temp. storage >1 month	5 °C ... +30 °C			
Connection	M8	M8	M8	M8
Weight	23 kg	24 kg	32 kg	39 kg
Dimensions (L x W x H) mm	522 x 239 x 218	345 x 190 x 245	522 x 267 x 218	522 x 267 x 218
Warranty	5 years			



## 1.6 Technical specifications 24V HFA series batteries (< 75AH)





				
Description	25.6V 12AH	25.6V 30AH	25.6V 50AH	25.6V 60AH
Model name	AL24V12HFA	AL24V30HFA-BT	AL24V50HFA-BT	AL24V60HFA-BT
EAN / GTIN	4738474993882	4738470670572	4738475996288	4738473635950
Rated Capacity	12Ah / 307WH	30Ah / 768WH	50Ah / 1280WH	60Ah / 1536WH
Discharge current	12A	30A	50A	50A
Peak discharge current	80A	140A	220A	220A
Maximum charge current	12A	30A	50A	50A
Recommended charge current	1...6A	3...15A	5...25A	6...30A
Nominal Voltage	25.6V			
Operational Voltage range	22...27V			
BMS cutoff Voltage	20V			
Cycle Life 0.2C 80% DOD	>4000			
Charge end voltage range	28.4...29.2V			
Charge characteristic	CC / CV			
Battery Management System	Integrated			
Serial connection	Not allowed			
Parallel connection	Up to 4 batteries			
Bluetooth monitoring	no	Yes inside; App available for Android and Iphone		
IP protection rating	IP65			
Temp. range discharge	-20°C ... +60 °C			
Temp. range charge	0°C ... +45 °C			
Temp. storage <1 month	-20°C ... +50 °C			
Temp. storage >1 month	5 °C ... +30 °C			
Connection	M5	M8	M8	M8
Weight	3 kg	7.2 kg	12.8 kg	12 kg
Dimensions (L x W x H) mm	181 x 76 x 167	197 x 166 x 173	306 x 168 x 211	260 x 168 x 209
Warranty	5 years			

## 1.7 Technical specifications 24V HFA series batteries (>= 75Ah)

				
Description	25.6V 75AH	25.6V 84AH	25.6V 100AH	25.6V 160AH / 200AH
Model name	AL24V75HFA-BT	AL24V84HFA-BT	AL24V100HFA-BT	AL24V160HFA-BT AL24V200HFA-BT
EAN / GTIN	4738477281177	4738478485765	4738479791995	4738475180120 (160AH) 4738472410213 (200AH)
Rated Capacity	75Ah / 1920WH	84Ah / 2048WH	100Ah / 2560WH	160Ah / 4096WH 200Ah / 5120WH
Discharge current	60A	84A	100A	150A
Peak discharge current	220A	350A	350A	400A
Maximum charge current	60A	80A	100A	150A
Recommended charge current	8...38A	8...40A	10...50A	16...80A
Nominal Voltage	25.6V			
Operational Voltage range	22...27V			
BMS cutoff Voltage	20V			
Cycle Life 0.2C 80% DOD	>4000			
Charge end voltage range	28.4...29.2V (27V float Voltage)			
Charge characteristic	CC / CV			
Battery Management System	Integrated			
Serial connection	Not allowed			
Parallel connection	Up to 4 batteries			
Bluetooth monitoring	Yes inside; App available for Android and Iphone			
IP protection rating	IP65			
Temp range discharge	-20°C ... +60 °C			
Temp. range charge	0°C ... +45 °C			
Temp. storage <1 month	-20°C ... +50 °C			
Temp. storage >1 month	5 °C ... +30 °C			
Connection	M8	M8	M8	M8
Weight	12.8 kg	19 kg	22.5 kg	32 kg (160AH) 39 kg (200AH)
Dimensions (L x W x H) mm	306 x 168 x 211	483 x 170 x 240	522 x 239 x 218	522 x 267 x 218
Warranty	5 years			



## 1.8 Technical specifications 48V HFA series batteries (<100AH)

				
Description	51.2V 12AH	51.2V 18AH	51.2V 30AH	51.2V 80AH / 100AH
Model name	AL48V12HFA-BT	AL48V18HFA-BT	AL48V30HFA-BT	AL48V80HFA-BT AL48V100HFA-BT
EAN / GTIN	4738470107085	4738478548255	4738478298242	4738470112966 (80AH) 4738475050539 (100AH)
Rated Capacity	12AH / 614WH	18AH / 921WH	30AH / 1536WH	80AH / 4096WH 100AH / 5120WH
Discharge current	12A	18A	30A	80A / 100A
Peak discharge current	60A	80A	100A	220A
Maximum charge current	12A	18A	30A	80 / 100A
Recommended charge current	2...6A	3...9A	3...15A	8...40A / 10...50A
Nominal Voltage	51.2V			
Operational Voltage range	44.0...54V			
BMS cutoff Voltage	40V			
Cycle Life 0.2C 80% DOD	>4000			
Charge end voltage range	57.6...58.4V (54V float Voltage)			
Charge characteristic	CC / CV			
Battery Management System	Integrated			
Serial connection	Not allowed			
Parallel connection	Up to 4 batteries			
Bluetooth monitoring	Yes inside; App available for Android and Iphone			
IP protection rating	IP65			
Temperature range discharge	-20°C ... +60 °C			
Temperature range charge	0°C ... +45 °C			
Temperature storage <1 month	-20°C ... +50 °C			
Temperature storage >1 month	5 °C ... +30 °C			
Connection	M8	M8	M8	M8
Weight	6 kg	8 kg	13.5 kg	32 kg (80AH) 39kg (100AH)
Dimensions (L x W x H) in mm	181 x 76 x 167	260 x 168 x 209	330 x 172 x 215	522 x 267 x 218
Warranty	5 years			

## 1.9 Technical specifications 72V HFA series batteries (<100AH)

		
Description	73.6V 30AH	73.6V 60AH
Model name	AL72V30HFA-BT	AL72V60HFA-BT
EAN / GTIN	4738475685267	4738475648910
Rated Capacity	30AH / 2208WH	60AH / 4416WH
Discharge current	30A	60A
Peak discharge current	120A	200A
Maximum charge current	30A	60A
Recommended charge current	3...15A	6...30A
Nominal Voltage	73.6V	
Operational Voltage range	63.0...77.6V	
BMS cutoff Voltage	63V	
Cycle Life 0.2C 80% DOD	>4000	
Charge end voltage range	80...82.8V (77.6V float Voltage)	
Charge characteristic	CC / CV	
Battery Management System	Integrated	
Serial connection	Not allowed	
Parallel connection	Up to 4 batteries	
Bluetooth monitoring	Yes inside; App available for Android and Iphone	
IP protection rating	IP65	
Temperature range discharge	-20°C ... +60 °C	
Temperature range charge	0°C ... +45 °C	
Temperature storage <1 month	-20°C ... +50 °C	
Temperature storage >1 month	5 °C ... +30 °C	
Connection	M8	M8
Weight	17 kg	34 kg
Dimensions (L x W x H) in mm	483 x 170 x 240	522 x 267 x 218
Warranty	5 years	

## 1.10 Battery Management System (BMS)

The BMS will protect the battery against faults. See table below or a listing of BMS protections. This guarantees the best safety and best functionality of the battery. The BMS balances the cells, so the battery will always keep its maximum capacitance during life.

### Protection functions of the BMS:

Protection code	Protection description
OVP	Over Voltage Pack protection
OCP	Overvoltage Cell Protection
UVP	Under Voltage Pack protection
UCP	Undervoltage Cell Protection
SCP	Short Circuit Protection active
OCC	Over Current Charge protection
OCD	Over Current Discharge protection
OTD	Over Temperature Discharge protection
OTC	Over Temperature Charge protection
UTC	Under Temperature Charge protection (below zero)
UTD	Under Temperature Discharge protection

## 1.11 ACES APP installation and connection

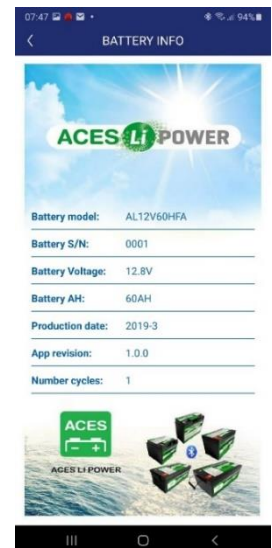
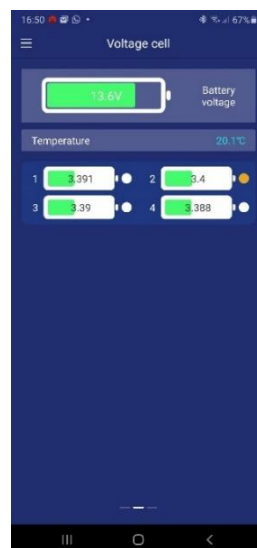
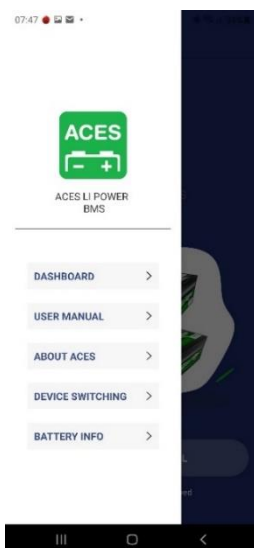
Step 1. Install the ACES App "ACES LI POWER" via Google play store or Apple store on your Smart phone  
Or you scan the QR code via our website  
Android or iOS download link can be found on our website

Step 2. Make sure the Bluetooth on your smartphone is activated  
Open the App on your smartphone

Step 3. You will see a list now with one or more Bluetooth connections.  
Chose the model and serial number of your battery and you will be connected to the battery.

Functions on the main screen	Description
Current	Actual battery current (range -999...999A)
Voltage	Actual battery Voltage (V)
SOC	State Of Charge; % of capacity left in the battery
Temp	Temperature of the Battery cells
Rated capacity	Battery Capacity in Ah on label
Remaining	Battery remaining Capacity in Ah
Cell high	Highest Cell Voltage
Cell high	Highest Cell Voltage
Discharge / Charge	Discharge and or Charge switch ON or OFF
Protection	Shows the code for the active protection
Power	Shows the actual Power in Watts
Cycles	Shows the number of charge cycles

1.12 ACES Android and iOS App example screens



### 1.13 ACES Lithium in comparison with Lead-acid battery for 24V

Characteristic	ACES LiFePO4 lithium 24V-84AH 	2xVMF140AH 12V-140AH 	2 x 4PZS110 12V-155AH 	Benefits or drawbacks of ACES LiFePO4
Weight	18 kg	83kg	81kg	< 20% of the weight
Life Cycles@80% DOD	4000	450	n.a.	Much longer cycle life > 20 times
Life Cycles@50% DOD	10000	800	800	Much longer cycle life > 10 times
Capacity @ 0°C	85%	76%	70%	Best cold temp performance
Capacity @ C20 Capacity @ C5 Capacity @ C1	84AH 84AH 84AH	140AH 114AH 80AH	170AH 118AH 82AH	Almost 100% energy and power at any discharge rate
Max discharge level Useable capacity C5	100% 84Ah	80% 91Ah	80% 94Ah	Fully useable discharge range
Maintenance	None	Low	High	No maintenance
Charge at all SOC levels possible	yes	no	no	Can be charged at all SOC without lifetime impact
Fast charging time	1 hour	6 hours	6 hours	Can be charged 6 times faster. Charge in between
Lifetime	10...20 years	3...4 years	3...4 years	Much longer life
Cost price*	€ 1150	€ 506	€418	Higher initial cost
<b>Cost/cycle@50% DOD and C5 discharge</b>	<b>€ 0,1150</b>	<b>€ 0,58</b>	<b>€ 0,47</b>	<b>Lowest cost per cycle</b>

\*Prices are only for reference (status September 2020)

The table above shows the comparison for a typical Pipe Rail trolley application.

## 2. Safety guidelines







### 2.1 General rules for safety

These batteries shall only be serviced by authorized personnel.

Batteries opened by non-authorized personnel can have potential hazards and ACES cannot grant warranty on the product anymore.

The lithium batteries can provide extremely high currents, therefore be careful not to place any metal parts on the battery. Be careful when wearing metallic watches or armbands.

### 2.2. Explanation of the symbols on the battery

	Operational ambient temperature range -20°C ... 45°C
<b>IP 65</b>	Ingress protection rating IP65
	The battery should be kept far away from fire hazards
	Service and opening the battery is not allowed by unqualified persons
	The battery shall be disposed according local regulations
	This battery or parts of it can be recycled
	Conformity Declaration sign to EU legislation

### 2.3 Transport guidelines

The battery must be transported in original packing

Lithium batteries are classified as dangerous goods, should be treated according category UN3480, class 9 and should be packed according UN-handbook.

For land and sea transport the batteries must be packed according packing description P903.

For air-transport (IATA) the batteries must be packed according P965.

The original packing is according these rules.

## 2.4 End of Life and disposal

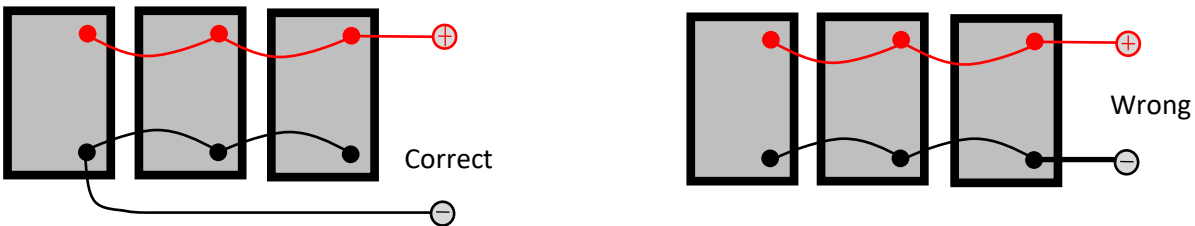
ACES LiFePO<sub>4</sub> batteries are considered EOL (End Of Life) when the usable capacity drops below 70% of the initial capacity. EOL or defect lithium batteries are not allowed to put in private or industrial waste. Therefore lithium batteries need to be disposed separately according to EU standard 2002/96/CE to official Recycling places. Lithium batteries or parts of it can be recycled.

## 3. Installation

### 3.1 Mounting and connection instructions

Check the battery for damages before installation. If battery has damages contact your reseller. A maximum of 4 batteries can be connected in Parallel. Series connection is not allowed. The battery shall be mounted using special straps or clamps. The battery shall be connected by using M8 screws and cable lugs (torque of about 8-10 nm). The battery shall be mounted on rubber foam or rubber blocks. Fixing of the battery shall be strong and suitable for the application. The cable cross section shall be suitable for the maximum continuous current. Finally the cable connection shall be isolated by a suitable cable-boot, red for + and black for -. The batteries are splash waterproof, but it is not allowed to use them under water.

### 3.2 Parallel connection of the batteries



Before parallel connection follow the instructions below:

- Make sure all the batteries are fully charged and have the same voltage
- Use only batteries with the same capacity
- The best is to use new batteries
- Use only short cables suitable for the amount of current
- When connecting N Batteries in parallel the max. discharge current shall be  $(N-1) \cdot I_{max}$

### 3.3 Short circuit prevention

The battery is electronically protected for short-circuit. Additionally the battery contains a fuse that will not trip in normal use. The fuse only can trip at short-circuit when the electronic protection fails.

### 3.4 Maintenance

No regular maintenance is needed for the battery.

Check the connection to the battery poles regularly if the screw is fixed strongly.

Clean the battery poles when heavy corrosion is noticed.



## 4. Use of the battery

### 4.1 Charge

1. Use only appropriate CC/CV chargers with charge end-voltage and charge current within according battery specification. For longest cycle life use the recommended charge current.
2. After finishing the charge to 100% the charger shall switch-off or fall back to floating voltage.  
If the maximum charging voltage is kept for a long time battery lifetime will be shortened.
3. The battery can be charged at every SOC level without impact on lifetime
4. The battery will not accept charge current below 0°C
5. The battery can accept fast charging up to 1C. It is not recommended to do this always, because it will reduce cycle-life substantially.
6. Switch on/off the charger first before connect/disconnect to the battery.
7. Always charge the battery to 100%. When the charger is ready it is recommended to keep the charger connected for at least 3 hours. During this time the battery will finish the internal cell balance process. When the cells are fully balanced each time, there will be no loss of capacity over long time due to balance mismatch.

### 4.2 Discharge

1. Care should be taken that the battery is not discharged with currents exceeding the specification.
2. If the battery is discharged with maximum currents at high ambient temperatures it is possible BMS thermal protection will switch off the battery.
3. It is recommended to set the undervoltage protection level in the connected equipment to a level higher than the BMS UVP level. Advised for 12V battery 11V, 24V battery 22V, for 48V battery 44V.
4. If during discharge the BMS undervoltage protection level is exceeded, the battery will switch itself off. The battery will switch on again when a charger is connected.

### 4.3 Deep discharge

Deep discharge means that the battery is fully depleted and switched off by the BMS UVP.

This is an unwanted situation, because after longer period in UVP protection the cells can be completely deep discharged. Completely deep discharged cells means the battery is permanently defect and cannot be repaired. Warranty is not granted when batteries are used like this.

Deep discharge with permeant damage can have following reasons:

1. During long time storage, connected equipment to the battery have still current draw and finally the battery goes in UVP protection mode. Too long time in this protection mode can cause deep discharge.
2. The battery is not charged before long, e.g. a winterstop, period.
3. The battery poles are not disconnected before a long period of no usage.

Solution: charge the battery to full before winterstop period and disconnect the poles.

Check by the APP the SOC condition of the battery regularly.

**Important!! The battery shall be fully charged at least every 4 months to prevent deep discharge!!**

## 5. Technical support

When the battery seems to be faulty first check protection condition CODE on APP and check the monitoring values.

Following situations can apply:

Fault description	Possible cause	Solution
0V output voltage on poles	Internal fuse and BMS defect	Repair by ACES service center
Too low voltage on poles 1	BMS in protection UVP	Charge the battery
Too low voltage on poles 2	BMS in protection OTP	Wait until battery cools down
Too low voltage on poles 3	BMS in protection UTP	Use battery above -10 °C
Too low voltage on poles 4	BMS in protection OCD	Will recover within 1 minute after load disconnect
Too low voltage on poles 5	BMS in protection SCP	Will recover within 1 minute after remove short circuit
Battery does not charge 1	BMS in protection UTC	Use battery above zero °C
Battery does not charge 2	BMS in protection OTC	Wait until battery cools down
Battery has too low AH 1	Cells unbalanced	Keep charger connected for longer time until cells balanced
Battery has too low AH 2	Defect in BMS or cells	Repair by ACES service center

If the suggested solution doesn't help it is recommended to send the battery to ACES service Center.

**Contact details ACES service Center:**

**ACES Energy**

Ambachtstraat 36

7622AP Borne

The Netherlands

Email: [support@aces-energy.nl](mailto:support@aces-energy.nl)

Tel: +31 (0) 74-7857701

## 6. Warranty and liability

### ACES ENERGY GENERAL TERMS AND CONDITIONS OF WARRANTY ON PRODUCTS.

#### 6.1 SCOPE

ACES Energy BV or ACES Energy SP BV, hereafter stated as ACES, offers manufacturer's guarantee as described in this document.

The prerequisite for a warranty claim is a defect or a malfunction that affects the intended use of the battery is no longer possible or is disproportionately restricted.

The guarantee period is not extended due to the granting of Services under this guarantee, in particular not for replacement or repair. In this case, the guarantee period does not start again.

This warranty does not limit legal provisions of the customer and are valid for all ACES lithium batteries with a purchase date from 01/01/2018. Accessories, consumables and other accessories are excluded.

The geographical scope of guarantee protection is Europe-wide and place of jurisdiction is the Netherlands.

#### 6.2 IDENTIFICATION

All batteries and chargers delivered are uniquely identified with a serial number printed on a label attached to the product.

If the label is not clearly readable or removed it causes loss of warranty on the product.

#### 6.3 PERIOD OF WARRANTY FOR ACES PRODUCTS

- The period of warranty for HP and HFA Series is 60 months starting from the moment it is invoiced.
- The period of warranty for HF Series is 36 months starting from the moment it is invoiced.
- The period of warranty of custom designed Batteries is 36 months starting from the moment it is invoiced.
- All other ACES products have 24 months of warranty starting from the moment it is invoiced.
- At the end of the above mentioned period, the warranty will automatically expire without any notice
- The eventual repair or substitution does not extend the period of warranty.
- For distributors and OEM customers the warranty is extended for 3 months from the date of the invoice.

#### 6.4 WARRANTY

Only manufacturing faults are covered by the warranty.

The warranty is limited to the original paid purchase price.

ACES liability under this guarantee is limited to the exchange, repair, reimbursement of the product.

The guarantor is solely responsible for the choice of an exchange, repair or reimbursement of costs.

Is this defective product no longer in the delivery program, so the guarantor reserves the right to replace it with a technically equivalent one from the current range.

Not covered by the warranty are listed below:

Damages, defects or malfunctions caused by force majeure, like lightning, overvoltage, severe weather, flood, fire.

Procedures described in the installation manual are not followed.

- Using the batteries or products outside the specifications and safety precautions as stated in the manual.
- Incorrect installation or commissioning, malfunction of other devices
- Failures caused by HW or SW design of parts that are designed not under responsibility of ACES
- Changes to and/or dismantling of the battery or product

#### 6.5 WARRANTY MANAGEMENT AND RETURN CONDITIONS

- As soon as a problem is noticed, ACES ENERGY must be informed within 7 days.

Provide information about the exact model of the product, the quantity, the serial number, the supplier, the date of purchase and a copy of the original invoice.

- The warranty may be not applicable if it is not possible to define the condition of usage of the battery.
- Customers shall arrange the return of the products at their own expenses.
- Batteries will be checked in less than 10 labor days from their arrival at ACES.

- After analysis, repair or replacement they will be shipped back to the customer.
- Defective batteries or products arriving within the warranty period and excepted for warranty, will be repaired or replaced, and shipped back to the client under warranty.

## 6.6 NO WARRANTY CHARGES

In case of batteries or products returned are not defective or out of warranty, investigation and repair cost will be offered to the customer before repair.

If products have damage, are modified or opened by non-qualified persons no warranty can be granted.

The Analysis cost of 100 Euros is always invoiced to the customer.

If repair is not possible the total cost is limited to the analysis cost.

## 6.7 TRANSPORT

The sender will be liable for the quality of the packaging.

ACES, will not be liable for damages on products during the shipping, following the shipment conditions at the expenses of the sender.

Transport damages at receipt at ACES of returned products will be reported by ACES to the sender within 24 hours.

The carriage of lithium batteries is subject to special restrictions. For defective batteries special rules apply.

At delivery of the returned product by ACES, the customer shall immediately check on damages and make sure to make a written note to the transporter in case of damages.

All damages at delivery must be reported to ACES ENERGY within 24 hours after delivery.

ACES ENERGY is not liable for eventual direct or indirect damages to people or things by the damage of the product or caused by the improper use or transport of the product itself.

## 6.8 RETURN ADDRESS

ACES-ENERGY B.V.

Ambachtstraat 36

7622 AP Borne

The Netherlands

Tel. +31 (0) 74-7857701

## 7. Glossary of Abbreviations

Abbreviation	Explanation
BMS	Battery Management System for battery protection and monitoring
CC/CV	Constant Current / Constant Voltage charge
Cycle	1 Cycle is use of the battery after discharge and charge
EOL	End Of Life
LiFePo4	Lithium Iron Phosphate chemistry; in short LFP
NMC	Nickel Manganese Cobalt chemistry
LCO	Lithium Cobalt Oxide chemistry
LMO	Lithium Manganese Oxide chemistry
SOC	State Of Charge, means AH-used/AH-rated
OVP	Over Voltage protection
UVP	Under Voltage protection

## 8. CE declaration

### DECLARATION OF CONFORMITY



COMPANY : ACES Energy B.V.  
ADRESS : Ambachtstraat 36  
7622 AP Borne  
The Netherlands

Declares that the following products:

PRODUCT : Lithium Ion 12V LiFePO4 Battery – ABS Casing  
BRAND : ACES Energy or ACES Li POWER  
MODEL NAME: - AL12V50HF-BT / AL12V80HF-BT  
- AL12V24HFA / AL12V45HFA-BT / AL12V60HFA-BT / AL12V80HFA-BT /  
AL12V100HFA-BT / AL12V120HFA-BT /AL12V150HFA-BT / AL12V150HFAS-BT /  
AL12V200HFA-BT / AL12V280HFA-BT / AL12V320HFA-BT / AL12V400HFA-BT  
- AL24V12HFA /AL24V30HFA-BT / AL24V50HFA-BT / AL24V60HFA-BT /  
AL24V75HFA-BT / AL24V84HFA-BT/ AL24V100HFA-BT /  
AL24V160HFA-BT/ AL24V200HFA-BT  
- AL48V12HFA-BT / AL48V18HFA-BT / AL48V30HFA-BT /AL48V80HFA-BT /  
AL48V100HFA-BT  
- AL72V30HFA-BT / AL72V60HFA-BT

Are in conformity with the requirements of the following Directives of the European Union:

#### Directive 2014/30/EU with the following harmonized standards:

EN 61000-6-3:2007/A1:2011/AC:2012  
EN 61000-6-2:2005/AC:2005

CE MARK DATE : 21-04-2020  
Signed : Wolter Buikema

Authority : Director