COTEK

LiFePO4 Battery

User's Manual

Legal Provisions

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1. SAFETY INSTRUCTIONS

1-1. Safety warning

To make full use of the energy efficiency of the lithium-ion battery pack and prevent the battery pack from leaking, heating, and other accidents, please prohibit the following precautions：

- It is strictly forbidden to immerse the battery pack in water. Once it enters the water or the water enters the battery, immediately isolate and treat it and ask a professional to handle it
- It is strictly forbidden to charge, discharge, or leave the battery pack at a high temperature exceeding 60℃ and keep it away from fire, heaters, corrosive materials, etc. Otherwise, it may cause the battery pack to overheat, catch fire or function failure, shorten the life span and even cause danger
- Never charge the battery pack below 0° C.
- It is strictly forbidden to reverse the positive and negative poles of the battery pack and it is strictly prohibited to short-circuit the positive and negative poles of the battery pack.
- New and old battery packs or battery packs of different batches cannot be used in parallel.
- It is strictly forbidden to reverse charge the battery pack, and it is strictly forbidden to plug the positive and negative terminals of the battery pack directly into the power socket.
- It is strictly forbidden to transport or store the battery pack with conductive objects (such as hairpins, necklaces, etc.)
- Knocking, throwing, stepping, falling, dismantling, impacting the battery pack, etc. is strictly prohibited.
- It is strictly forbidden to directly weld the battery pack and pierce the battery pack with nails or other sharp objects.
- It is strictly forbidden to use it under strong static electricity and strong magnetic field, otherwise it may damage the battery protection circuit.

- It is strictly forbidden to overload the battery pack.
- It is strictly forbidden to perform mechanical processing on the circuit board, which may damage the internal circuit and cause function failure.
- It is strictly forbidden to deform the product under force, which may cause damage to electronic components or parts of the circuit and make the product unstable.
- It is strictly forbidden to disassemble and assemble the shell to avoid unnecessary damage to you.
- It is strictly forbidden to overcharge or over-discharge the battery pack.
- When charging, please select a suitable special charger for the lithium-ion battery pack.
- After using the battery pack, please charge it within 12 hours. If battery pack has not been charged for more than 12 hours after use. Please test the battery before charging.
- If the battery pack leaks and liquid splashes into the eyes or skin, please do not rub, rinse with water and seek medical treatment immediately.
- Use dry powder fire extinguishers or sand to extinguish the fire in the battery pack accidentally.
- If the battery pack emits peculiar smell, heat, discoloration, deformation, or any abnormality during use, storage, and charging, stop charging immediately.
- Use insulating paper to wrap the electrodes at the terminals of the discarded battery pack to reduce potential safety hazards during later shelving.
- Reverse connection of the positive and negative poles of the charging port will burn the internal circuit board. Please pay attention to the positive and negative poles when connecting.

1-2. Safety guidelines

Clean the installation position of the battery pack to ensure that there is no dust, metal foreign objects, or other foreign objects. Smoke and fire are strictly prohibited during the installation process to avoid short circuits of the battery pack and prevent equipment damage or personal injury.

- The battery pack is in place and the battery pack is placed in the installation position. The battery pack should be installed in a well-ventilated, dry, and clean environment.
- Do not install the battery pack in a place where it may be immersed in water and the battery pack should be kept away from flammable and explosive materials during use and storage.
- Fasten the electrical wire terminals on the battery pack terminals. Do not use excessive force or exceed the specified torque when tightening, otherwise, the terminals may be caused damage.
- After installation, check whether the terminals are fastened in place and whether there are any sundries on the surface of the battery pack. Use a dry cloth to clean the outer packaging of the battery pack.
- Use tools that generate static electricity to clean the outer packaging of the battery pack. Do not use organic solvents such as volatile engine oil. Otherwise, the outer packaging of the battery pack may be damaged or even the battery pack may be damaged. The outer packaging is cracked.
- Make sure that the positive (+) and negative (-) polarities of the terminals are connected correctly. Otherwise, it may cause a fire or damage the battery pack and electrical appliances.
- Test operation of the equipment, observe whether the equipment and battery pack are abnormal.

2. GENERAL INFORMATION

2-1. Liability

Please comply with the requirements of the specifications strictly while using the battery, any misuse causing the battery to overheat, burn or explode causing accidents, Cotek will not in be held liable for.

2-2. Warranty and disclaimer

This product provides a five-year warranty. One of the following conditions is not covered by the warranty

- Exceeding the warranty period.
- Man-made damage (including breakage, bumps, water immersion, fire damage, etc.)
- Damage caused by improper use, such as overcharging, over discharging, etc.
- Long-term storage in a high temperature environment exceeding 60℃ causes damage.
- Damage caused by lightning, static electricity, fire or other force majeure.
- Failure to operate in accordance with the parameters in the instruction manual causes damage.
- The battery is used for other purposes.

Consumers must strictly comply with the requirements of this specification to use batteries. Misuse will cause the battery to overheat, fire or explode. We are not responsible for any accidents caused by not operating in accordance with the specifications.

2-3. Sleep Mode

Cotek batteries are shipped under sleep mode. Before using the battery for the first time, please active the battery by charging or dis-charging the battery. To store the battery, please disconnect the battery from the system and Bluetooth, battery will enter sleep mode in 2 mins. Sleep mode has a low self-discharge rate and can hold the capacity for a longer period of time.

2-4. Life cycles and C-rate

The C-rate indicates how fast a battery can be (dis)charged. The capacity (C) of a battery is commonly expressed in numbers that look like 1C, 2C, or C/2. A C-rate of C/2 is also known as 0.5C. A fully charged battery rated at 100Ah, provides 100A for one hour. The same battery discharging at C/2 provides 50A for two hours. At 1C it provides 100A for an hour. Charge and discharge rates can have an impact on the number of life cycles. Cotek batteries provide 2000 cycles at an ambient temperature of 25ºC [77ºF] and a DoD set to 100%. To reach the specified number of cycles, we advise a maximum charge rate of C/2 and a discharge rate of C.

2-5. Identification label

2-6. Correct disposal of this product

This product is designed and manufactured with high quality materials and components, which can be recycled and reused. Act according to your local rules and do not dispose of your old products with your normal household waste. The correct disposal of your old product will help prevent potential negative consequences to the environment and human health.

3. PRODUCT DESCRIPTION

3-1. Cell spec

Item	Specification	
Capacity	105 Ah	25°C±2°C, 2.5V ~3.65V Fresh Battery
	105 Ah	25°C±2°C, 2.5V ~3.65V Fresh Battery
Internal Resistance	0.32 mΩ±0.05 mΩ	AC 1 kHz
Nominal Voltage	3.2V	0.5 C discharge, 25°C±2°C, 2.5V~3.65V
Charging Voltage	3.65±0.05 V	
Standard Charge Current	52.5A	
Max Charging Current	1C(100A)	
Standard Discharge Conditions	1C (100A)	25°C±2°C
Max Discharge Current	2.5C (250A)	
Charging Temperature	0~65°C	
Discharging Temperature	-35~65°C	
Storage Temperature	-20~40°C	
Weight	1980g±60g	
Dimension	148*54*119.5mm	
Appearance	Without break, scratch, distortion, contamination, leakage, and so on	

3-2. Battery pack spec

Model series		
Spec		12.8V 100Ah
Normal voltage		12.8Vdc
Typical capacity		100Ah
Nominal energy		1280Wh
Self-discharge		3%/month
Cycle life		2000 cycles at 100% DOD
Discharge	Max. continuous discharge current	100A
	Cut-off voltage	10V
	Max. discharge current	330A(640mS)
Charge	Bulk / Absorption Voltage	14.4V ± 0.1
	Float voltage	13.8V
	Max charging Current	100A
Operation Temperature	Charge	0°C ～ 55°C。
	Discharge	-20°C ～ 60°C
	Nominal operating	25ºC
Storage Temperature		-20°C ～ 60°C
Relative humidity		10 – 95% relative humidity
Protection Function		Overcharge protection、Over discharge protection、Temperature protection 、Short circuit protection 、Overcurrent protection
Protection degree		IP20
Safety		CE, UN38.3, MSDS,TELEC,IEC62619 ,E-MARK, UL1642
Communication		RS485 (Optional) /RVC (Optional)
Parallel configuration		8
Bluetooth		Optional (Not available with RVC model)

Series configuration	4
Balancing mechanism	YES
Integrated BMS	YES
Integrated fuse	NO
Self-heating	Optional
Charge and discharge port	M8 terminal
Shell material	Plastic
Weight	12Kg
Size（L*W*H）	279 * 178 * 193

3-3. Battery Management System (BMS)

	Project	**Specification**			
		MIN	**TYP**	**MAX**	**Unit**
Over-voltage and Under-voltage protection	Over-voltage	14.4	14.6	14.6	V
	Over-voltage delay	1000	2000	2000	mS
	Over-voltage recovery	13.8	14.0	14.2	V
	Under-voltage	10	10	10.4	V
	Under-voltage delay	2000	2000	3000	mS
	Under-voltage recovery	11.2	11.2	11.6	V
	Under-voltage release conditions	Self-recovery by increasing voltage or charging			
	Over-current Charge protection value	Refer to configuration table of over-current protection value below			
	Over-current Charge delay	5	10	15	S
	Over-current Charge release conditions	Automatic recover after a delay of 32S			
	1st Over-current Discharge value	Refer to configuration table of over-current protection value below			
	1st Over-current Discharge delay	5	10	15	S

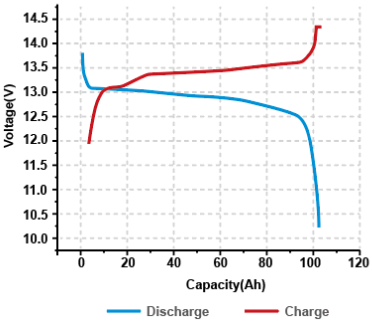
		2nd Over-current Discharge value	Refer to configuration table of over-current protection value below			
		2nd Over-current Discharge delay	480	640	800	mS
		Over-current Discharge release	Automatic recover after a delay of 32S			
Short Circuit Protection		Short circuit protection current value	Refer to configuration table of over-current protection value below			
		Short circuit protection delay time		400	600	uS
		Short circuit protection recovery	Recover by releasing load after approximately 5s			
		(Short-circuit description: The short-circuit current is less than the minimum value or higher than the maximum value, which may cause the short-circuit protection to fail, and the short-circuit current exceeds 2500A,short-circuit protection is not guaranteed, and short-circuit protection testing is not recommended.)				
Temperature protection	**CHG**	High-Temperature protection value	62	65	68	℃
		High-Temperature protection release value	52	55	58	℃
		Low-Temperature protection value)	-3	0	3	℃
		Low-Temperature protection release value	2	5	8	℃
	DSG	High-Temperature protection value	59	62	65	℃
		High-Temperature protection release value	52	55	58	℃
		Low-Temperature protection value	-25	-20	-15	℃
		Low-Temperature protection release value	-15	-10	-5	℃
	FET	Temperature protection value	87	90	93	℃
		Temperature protection release value	67	70	73	℃
Balance Function		Balance function turn-on voltage	3.37	3.4	3.43	V
		Difference opening voltage value		15		mV
		Balance current	50		150	mA
		Balance model	Idle equalization			
		Balance type	Pulsed model			

3-4. Overcurrent protection value configuration table

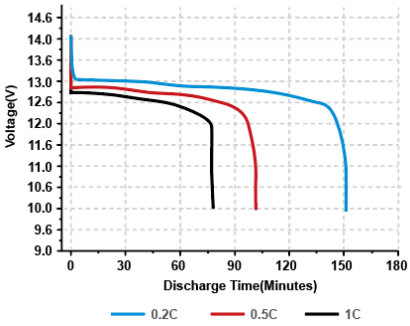
Continuous current	100A
Charge over current protection value	120±10A
First discharge over current protection value	120±10A
Second discharge over current protection value	330±34A
Short circuit protection value	560±56A

3-5. Charging & Discharging (graph)

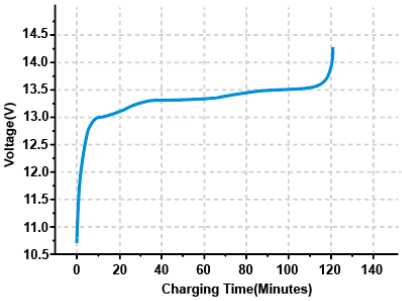
12.8V 100Ah Charge-Discharge Curve 0.5C, 25°C



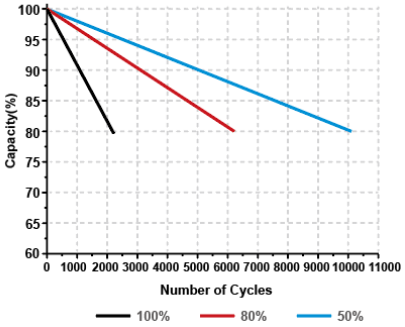
Different Rate Discharge Curve, 25°C



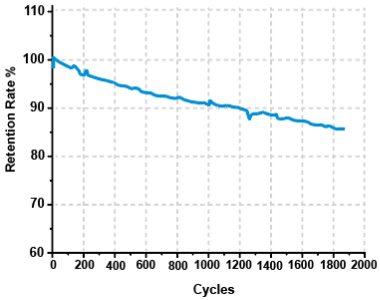
Voltage & Charging Time Curve, 0.5C, 25°C



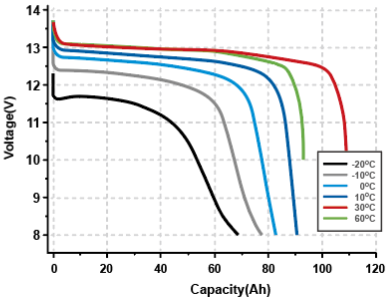
Different DOD Discharge Cycle Life Curve



Cycles & Capacity Retention Rate



Discharge Curves at Different Temperature



4. BASIC INSTALLATION

4-1. Installation Location

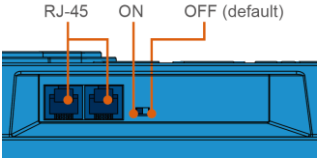
- Install in a well-ventilated room protected against rain, snow, spray, vapour, bilge, moisture and dust.
- Keep away from heat sources. See specifications for allowed operating temperatures.
- Must be installed in upright position or on the long side of the case, although upright mounting is recommended.

- Keep at least 1cm [3/8"] between two Li-Ion batteries for air flow.

4-2-1 Connection With Cotek Inverter/Charger

4-2-2 Terminating resistor

For the last battery connected, please slide the slide switch to the on position for the terminating resistor to be activated.

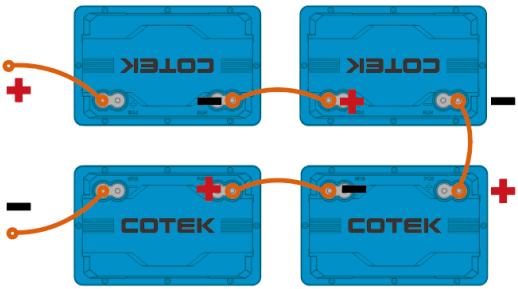


5. BUILDING A BATTERY BANK

5-1. Before building a battery pack

- Only create battery banks with batteries of the same type and capacity.
- Batteries have the same product code and software version. Do not mix with other models.
- Make sure that all batteries are fully charged before creating a battery bank to ensure balancing s optimized.
- Use properly sized fuses and wiring.
- Keep the cables between the batteries as short as possible.
- All battery-to-bus bar cables should be of the same length.
- Install the batteries as close as possible to the charger.
- We recommend one charger for batteries that are connected in series.
- It is best practice to label the batteries (e.g. Primary, Replica1,Replica2).

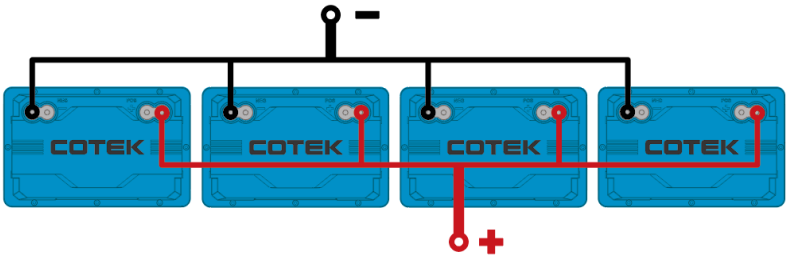
5-2. Series



Note: For RVC connection, an external 12v is required

Note: Can be connected in series up to 4

5-3. Parallel



Note: For RVC connection, an external 12v is required

Note: Can be connected in paralleled up to 8.

6. Storage and care

The storage temperature is -20°C to 60°C. The performance of the battery pack is affected by temperature. The most intuitive performance is the change in the battery pack capacity, which is normal. Avoid condensation caused by temperature changes during storage, otherwise, it will cause the battery or metal parts to rust.

7. Troubleshooting

- After the battery pack is fully charged, the voltage is too low or zero.

Common error	Solution
If the battery pack is stored for a long time and not used, and it is not maintained following the regulations	Please test the battery pack voltage. If the battery pack voltage value is less than 8V, it cannot be recharged and placed in isolation. Please consult your local dealer. If the voltage ≥8V is normal, it can be charged in isolation, and regularly check whether it can be charged normally.
Battery pack open circuit	Disassemble the battery pack, check whether the circuit is broken, check whether the solder joints fall off, whether the nickel belt is broken, and repair the damaged place according to the situation.
The protection board does not work	First of all, confirm whether the cable of the protection board is in good contact with the protection board, and observe whether the solder joints fall off. If there is no abnormality in the above conditions, test the voltage between B+ and B- and the voltage between P+ and P-, if the two voltages are different Large, it means that the protection board is broken. The protection board needs to be tested in detail, and the protection board needs to be replaced if the test fails
The battery pack has been subjected to violent collisions, characterized by The outside of the battery case is damaged or the battery has the smell of electrolyte.	This type of situation is generally not within the scope of maintenance. If maintenance needs to be done, determine whether there is a problem with the output circuit or the battery pack itself. First disassemble the battery case and check whether the P+/C+ and P-/C- wires or solder joints of the

	battery pack are damaged. If there is damage, replace it. Then use the smell method to determine the smell of the battery pack. If there is an irritating electrolyte smell, it means that the battery pack has leaked. It is necessary to conduct a voltage test on each string of the battery pack. If one string of voltage is different from the other groups of voltages If it is too large and very low, you need to replace this string of batteries.

- Unstable battery voltage or abnormal charging and discharging.

Common error	Solution
Welding	Use the internal resistance tester to test the internal resistance of the battery pack. If it exceeds the specified value, there may be false welding inside the battery pack, and the battery pack needs to be disassembled and re-soldered.
Protection board is abnormal	Replace the protective plate.
Poor contact of terminals or connectors	Replace terminal or connector be replaced if the test fails

- Insufficient capacity.

Common error	Solution
	Charge and discharge the battery pack, generally 3-5 cycles.

Under voltage	If the battery's voltage drops below 10V and it cannot be revived using the SC inverter/charger's LFP rescue mode, charge the battery with a low current (1A). Once the battery reaches 12V, you can switch the charger back to its normal current setting.

8. Daily maintenance of battery pack

If the battery is not used for a long time, it may be in an over-discharged state due to its self-discharge characteristics. To prevent the occurrence of over-discharge, the battery should be charged and discharged regularly to maintain its voltage within a certain range(13.28--13.6V). In the case of prolonged non-use, we suggest checking the state of charge (SOC) every 2 months so that it ideally remains above 50%.

- Do not use organic solvents to clean the battery pack casing.
- The battery pack is a consumable and has a limited life span. When the battery pack capacity is lower than the usage requirement, please replace the battery pack in time to avoid loss due to insufficient capacity.
- To prevent safety problems caused by the failure of the overcharge protection function of the protection board, do not charge for a long time. The battery should be taken out after it is fully charged. Besides, you must use the original charger or the charger that comes with the battery when charging, and operate and use according to the instructions. Otherwise, the battery may be damaged or even dangerous.
- The shallow charge and shallow discharge of the battery can ensure the economic use of the battery pack. Overcharging and over-discharging may cause the battery pack to overheat, catch fire or function failure, shorten the

life span, and even cause danger.

- Lithium batteries at the end of their life should be recycled and disposed of following local laws.

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