Celxpert Energy Corporation

Document NO. CPT-3R-XXX
Date : 2021/5/12
Revision 0.1

SPECIFICATION FOR REFERENCE

Customer Name:

Arlo Technologies

Model Name:

A-14 (1S4P) (Cell: N18650CP)

Model No.:
Celxpert No.

Customer No. 308-xxxxx-xx

[ACCEPTANCE]

Accepted by: _____

Date: _____

CELXPERT ENERGY CORPORATION

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History of Revision

Rev.	Date	Note
0.1	2021/5/12	TENTATIVE

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1. Scope

Specifications described in sections apply to the N18650CP rechargeable batteries supplied by Celxpert Energy Corporation. The battery described in these specifications is the battery pack, which consists of unit cells manufactured by BAK Battery CO, LTD.

2. Type and Name

Applied Product Name	Rechargeable Lithium-Ion Battery Pack
Cell Type	N18650CP
Cell Configuration	1 series 4 parallel
BMU Solution	BQ27Z561+R5486K532CM+R5437L303CA-TR

3. Rating

No	Item		Specification	Remarks
1	Norminal Capacity		13400 mAh	3.0A charge to cut off current 268mA at 25℃ 2.68A discharge to cut off voltage 2.5Vat 25℃
2	Minimum Capacity		13000 mAh	
3	Nominal Voltage		3.600 V	
4	Charge Voltage		4.20 V	
5	Max. Continuous Charge Current		3000 mA	Follow Cell Surface Temperature max. charge condition
6	Max. Continuous Discharge Current		5000 mA	Cell Surface Temperature: -20～+80°C
7	End of Discharging Voltage		2.50 V	
8	Internal Impedance		≦ 70 mΩ	Measure internal impedance by 1KHz
9	Operating Temperature For Ambient	Charge	0 ℃ ~ 40 ℃	
		Discharge	-10 ℃ ~ 40 ℃	
19	Storage Temperature	1 month	-20 ℃ ~ 50 ℃	Recoverable Capacity: 95% (*1) Cmin in 13000 mAh Humidity : 25%～50%RH
		3 month	-20 ℃ ~ 40 ℃	
		1 year	-20 ℃ ~ 20 ℃	
11	Shipping Voltage		3.65 V ~ 3.85 V	SOC 50~60% (*2) --- TBD
12	Current Consumption		≦80uA	Running mode
			≦20uA	Sleep mode
13	Pack Weight		240g ± 5%	

(*1)Recoverable : [Discharge Time after storage / Initail Discharge Time] X 100
The discharge time is measured by fully charging the battery at 25°C and then discharging it at a 0.65A to 2.50V per cell in series, Stored at 25°C for 28days

(*2)The shipping voltage detection specification is only grant 4 weeks warranty after manufacture date. The SOC value is not equal to the fuel gauge RSOC value.

4. Performance and Characteristics

4.1 Test conditions and instruments

4.1.1 Temperature and Humidity

Unless otherwise specified, the measurement is executed at a temperature of 25 ± 2 ℃ and at a relative humidity of 65±20%RH.

4.1.2 Initial Test

Initial test is started within 7 days after delivery.

4.1.3 Measuring Instruments and Devices

(1) Dimension measurement is carried out using a caliper whose measuring range is from 0 mm to 300mm and the precision is 1/20 mm.
(2) Voltage measurement is carried out using a DC voltmeter, which can measure from 0 V to 20 V.
(3) The precision of the voltmeter is ±1mV and input impedance is more than 10MΩ.
(4) Discharge is carried out using electronic load equipment. The precision of the current is ±0.5%.
(5) Impedance is carried out using an AC mΩ meter with 4 terminals at 1kHz.

4.1.4 Standard Charge

Standard charge means 2.5A CC charge to 4.2V,then CV charge till charge current dealine to 268mA, in 25℃.

4.1.5 Standard Discharge

Standard discharge means discharging at 2.5A down to 2.6V, in 25℃.

4.1.6 Cycle life Charge / Discharge condition

Charge pack with 2.5A CC charge to 4.2V,then CV charge till charge current dealine to 268mA, rest for 10min, and discharge pack with 2.5A dischargeing current until pack voltage reaches 2.6V, rest for 10 minutes between each charge/discharge step, in 25℃.

4.2. Electric Characteristics

4.2.1 Initial Capacity

After standard charge, within 1 hour, the duration time of standard discharge is measured and the capacity more than 13000 mAh.

4.2.2 Cycle Life

Packs shall be charged and discharged per 4.1.6, 300cycles at 25℃±2℃. 301st discharge capacity shall be measured capacity≧9750 mAh.

4.3 Safety Performance

4.3.1 Terminal short circuit

After fully charged connect positive andnegative terminal with a copperwire ofresistance less than 100m Ohm.
No explode, No fire

4.3.2 Overcharge

After Fully charged, continuously charge by constant current 2.5A and constant voltage of 6V for
No explode, No fire

4.3.3 Reverse charge test

Apply 6V/2.5A current with reverse polarity for 2.5 hour at fully charged state.
No explode, No fire

4.3.4 ESD Test

Contact discharge ± 8KV , Air discharge ± 12KV
No protect function

5. Protection Function

Built-in control circuit of BMU (Battery Management Unit) for safety .(Ta= 25°C)

No	Function	Type	SPEC	Unit
1	1'st Cell Overvoltage protection	Threshold	4230±20	mV
		Delay Time	700~1300	mSec
2	2'nd Cell Overvoltage protection	Threshold	4350±25	mV
		Delay Time	4.8~7.2	Sec
3	Cell Undervoltage protection	Threshold	2600±35	mV
		Delay Time	14~26	mSec
4	Over charge current protection	Threshold	3.1~5.1	A
		Delay Time	10.7~23.6	mSec
5	Over discharge current protection	threshold	6.8~9.1	A
		time	7.4~18.5	mSec
6	Short protection	threshold	22~49	A
		Delay Time	160~490	µSec

6. Terminal Specifications

No.	Name	Function	Remark
1	**BATT+**	**Battery pack V+**	
2	**SCL**	**Serial Clock for I^2C interface**	
3	**SDA**	**Serial Data for I^2C interface**	
4	**BATT-**	**Battery pack V-**	

7. Handling Instructions

The following hazard alert signals and words must appear in user manuals and / or instructions for users.

HANDLING INSTRUCTIONS
FOR
LI-POLYMER RECHARGEABLE BATTERY

Please read and follow the handling instructions before using the battery.
Improper use of the battery may cause heat generation, fire, explosion, damage, or capacity deterioration of the battery.



WARNING

01. Keep the battery and equipment out of reach of infants/children or pets so that they are not able to swallow or mistreat the battery by mistake.

    In case of ingestion, seek medical advice immediately.

02. Do not let leaked electrolyte come into contact with eyes or skin.

    In such a case, immediately flush the contact area with plenty of water and seek help from a doctor.

    If not treated soon, prolonged contact may cause serious injury.

03. Do not throw the battery into a fire. Do not use or leave it in a place near fire, heaters, or high temperature sources.

    In such a case, the insulator in the battery may be melted, the safety vent and structure may be damaged, or the electrolyte may catch fire, all of which may cause heat generation, explosion, or fire.

04. Do not submerge the battery in water, or wet the battery.

    If the protecting device assembled in the battery is damaged, the battery may be charged with an abnormal current and voltage and may cause an abnormal chemical reaction within the battery, which may result in the cause of heat generation, explosion, or fire of the battery.

05. Do not use any battery chargers not specified by the end product. Also, follow the charge conditions specified by the end product.

If the battery is charged under other conditions (a high temperature, a high voltage/current, or an altered charger) not specified by the end product, the battery may become over-charged with an excessive current and cause heat, explosion, or fire with abnormal chemical reactions.

06. Do not use, charge, or leave the battery in a car under the blazing sun.

Such a high temperature may cause damage of the protecting device in the battery, which may result in an abnormal reaction, and then heat generation, explosion, or fire.

07. Do not connect the battery reversed in positive (+) and negative (-) terminals in the charger or equipment.

In case the battery is connected and charged reversely, it may cause heat generation, explosion, or fire due to an abnormal chemical reaction.

08. Do not let the battery terminals (+ and -) contact a wire or any metal (like a metal necklace or a hairpin) with which it carried or stored together.

In such a case, the battery will be shorted and cause an excessive current, which may result in heat generation, explosion, or fire.

09. Do not connect the battery directly to an electric outlet or cigarette heater socket in car.

With a high voltage applied, the battery may overheat, explode, or cause fire.

10. Do not throw or drop the battery.

Strong impacts or shocks may damage the protecting device, which may cause an abnormal chemical reaction during charging and result in heat generation, explosion, or fire of the battery.

11. Do not drive a nail in or piece the battery with sharp objects.

In such a case, the battery may be deformed and shorted, witch which may cause heat generation, explosion, or fire of the battery.

12. Do not solder the battery directly.

Heat applied during soldering may damage the insulator of the safety vent and mechanism, which may result in heat generation, explosion, or fire of the battery.

13. Do not disassemble or alter the battery.

The battery employs a safety mechanism and a protecting device in order to avoid any danger.

If these are damaged, heat, explosion or fire may be caused.

14. A battery subjected to extremely low air pressure that may result in an explosion

or the leakage of flammable liquid or gas

CAUTION

01. Do not put the battery in a microwave, oven, or high pressure container.

    Sudden heat may damage the seal of the battery and may cause heat generation, explosion, or fire of the battery.

02. Do not leave the battery in a charger or equipment if it generates an odor and/or heat, color and/or shape changed, electrolyte leaked, or any other abnormalities. In such a case, immediately take the battery out of the charge or equipment and keep it away from fire, otherwise, the battery might overheat, explode, or cause fire.

    In such a case, over-discharge during use, or over-charge during charge may occur abnormal chemical reactions and may cause heat generation, explosion, or fire of the battery.

03. Discontinue charging after specified charging time even if the charge is not complete, otherwise, the battery might cause heat generation, explosion, or fire.

04. Do not use the battery in the place where the static electricity (more than the limit of the manufacturer's guarantee) occurs. Otherwise, the protecting device in the battery might be damaged and cause heat generation, explosion, or fire.

05. Do not use and store the battery in other than the following conditions; otherwise, the battery might cause heat generation, damage, or deterioration of its performance.

Operating environment:

When the battery is charged： 0℃ ~ +40℃

When the battery is discharged： -10℃ ~ +40℃

When stored 3 month： -20 ~ 40℃ (on the charge of 50%), 45 ~ 85%RH.

When stored 12 month： -20 ~ 20℃ (on the charge of 50%), 45 ~ 85%RH.

Celxpert Energy Corporation

Document NO. CPT-3R-XXX
Date : 2021/6/21
Revision 0.4

SPECIFICATION FOR REFERENCE

Customer Name:

Arlo Technologies

Model Name:

A-14 (1S4P) (Cell: NCR18650GA)

Model No.:
Celxpert No.

Customer No. 308-xxxxx-xx

[ACCEPTANCE]

Accepted by: _____

Date: _____

CELXPERT ENERGY CORPORATION

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History of Revision

Rev.	Date	Note
0.1	2021/4/13	TENTATIVE
0.2	2021/5/4	Modify item 3 Rating table follow BAK cell spec.
0.3	2021/5/12	Modify item Storage Temperature condition follow Pana cell spec.
0.4	2021/6/21	Modify Cell Surface Temperature: -20 ~ +80°C @ Max. Continuous Discharge Current

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1. Scope

Specifications described in sections apply to the NCR18650GA rechargeable batteries supplied by Celxpert Energy Corporation. The battery described in these specifications is the battery pack, which consists of unit cells manufactured by Panasonic, LTD.

2. Type and Name

Applied Product Name	Rechargeable Lithium-Ion Battery Pack
Cell Type	NCR18650GA
Cell Configuration	1 series 4 parallel
BMU Solution	BQ27Z561+R5486K532CM+R5437L303CA-TR

3. Rating

No	Item		Specification	Remarks
1	Norminal Capacity		13400 mAh	3.0A charge to cut off current 268mA at 25℃ 2.68A discharge to cut off voltage 2.5Vat 25℃
2	Minimum Capacity		13000 mAh	
3	Nominal Voltage		3.600 V	
4	Charge Voltage		4.20 V	
5	Max. Continuous Charge Current		3000 mA	Follow Cell Surface Temperature max. charge condition
6	Max. Continuous Discharge Current		5000 mA	Cell Surface Temperature: -20 ~ +80°C
7	End of Discharging Voltage		2.50 V	
8	Internal Impedance		≦ 70 mΩ	Measure internal impedance by 1KHz
9	Operating Temperature For Ambient	Charge	0 ℃ ~ 40 ℃	
		Discharge	-10 ℃ ~ 40 ℃	
10	Storage Temperature	1 month	-20 ℃ ~ 50 ℃	Recoverable Capacity: 95% (*1) Cmin in 13000 mAh Humidity : 25% ~ 50%RH
		3 month	-20 ℃ ~ 40 ℃	
		1 year	-20 ℃ ~ 20 ℃	
11	Shipping Voltage		3.65 V ~ 3.85 V	SOC 50~60% (*2) --- TBD
12	Current Consumption		≦80uA	Running mode
			≦20uA	Sleep mode
13	Pack Weight		240g ± 5%	

(*1)Recoverable : [Discharge Time after storage / Initail Discharge Time] X 100
The discharge time is measured by fully charging the battery at 25°C and then discharging it at a 0.65A to 2.50V per cell in series, Stored at 25°C for 28days

(*2)The shipping voltage detection specification is only grant 4 weeks warranty after manufacture date. The SOC value is not equal to the fuel gauge RSOC value.

4. Performance and Characteristics

4.1 Test conditions and instruments

4.1.1 Temperature and Humidity

Unless otherwise specified, the measurement is executed at a temperature of 25 ± 2 ℃ and at a relative humidity of 65±20%RH.

4.1.2 Initial Test

Initial test is started within 7 days after delivery.

4.1.3 Measuring Instruments and Devices

(1) Dimension measurement is carried out using a caliper whose measuring range is from 0 mm to 300mm and the precision is 1/20 mm.
(2) Voltage measurement is carried out using a DC voltmeter, which can measure from 0 V to 20 V.
(3) The precision of the voltmeter is ±1mV and input impedance is more than 10MΩ.
(4) Discharge is carried out using electronic load equipment. The precision of the current is ±0.5%.
(5) Impedance is carried out using an AC mΩ meter with 4 terminals at 1kHz.

4.1.4 Standard Charge

Standard charge means 2.5A CC charge to 4.2V,then CV charge till charge current dealine to 268mA, in 25℃.

4.1.5 Standard Discharge

Standard discharge means discharging at 2.5A down to 2.6V, in 25℃.

4.1.6 Cycle life Charge / Discharge condition

Charge pack with 2.5A CC charge to 4.2V,then CV charge till charge current dealine to 268mA, rest for 10min, and discharge pack with 2.5A dischargeing current until pack voltage reaches 2.6V, rest for 10 minutes between each charge/discharge step, in 25℃.

4.2. Electric Characteristics

4.2.1 Initial Capacity

After standard charge, within 1 hour, the duration time of standard discharge is measured and the capacity more than 13000 mAh.

4.2.2 Cycle Life

Packs shall be charged and discharged per 4.1.6, 300cycles at 25℃±2℃. 301st discharge capacity shall be measured capacity≧9750 mAh.

4.3 Safety Performance

4.3.1 Terminal short circuit

After fully charged connect positive andnegative terminal with a copperwire ofresistance less than 100m Ohm.
No explode, No fire

4.3.2 Overcharge

After Fully charged, continuously charge by constant current 2.5A and constant voltage of 6V for
No explode, No fire

4.3.3 Reverse charge test

Apply 6V/2.5A current with reverse polarity for 2.5 hour at fully charged state.
No explode, No fire

4.3.4 ESD Test

Contact discharge ± 8KV , Air discharge ± 12KV
No protect function

5. Protection Function

Built-in control circuit of BMU (Battery Management Unit) for safety .(Ta= 25°C)

No	Function	Type	SPEC	Unit
1	1'st Cell Overvoltage protection	Threshold	4230±20	mV
		Delay Time	700~1300	mSec
2	2'nd Cell Overvoltage protection	Threshold	4350±25	mV
		Delay Time	4.8~7.2	Sec
3	Cell Undervoltage protection	Threshold	2600±35	mV
		Delay Time	14~26	mSec
4	Over charge current protection	Threshold	3.1~5.1	A
		Delay Time	10.7~23.6	mSec
5	Over discharge current protection	threshold	6.8~9.1	A
		time	7.4~18.5	mSec
6	Short protection	threshold	22~49	A
		Delay Time	160~490	µSec

6. Terminal Specifications

No.	Name	Function	Remark
1	**BATT+**	**Battery pack V+**	
2	**SCL**	**Serial Clock for I^2C interface**	
3	**SDA**	**Serial Data for I^2C interface**	
4	**BATT-**	**Battery pack V-**	

7. Handling Instructions

The following hazard alert signals and words must appear in user manuals and / or instructions for users.

HANDLING INSTRUCTIONS
FOR
LI-POLYMER RECHARGEABLE BATTERY

Please read and follow the handling instructions before using the battery.
Improper use of the battery may cause heat generation, fire, explosion, damage, or capacity deterioration of the battery.



WARNING

01. Keep the battery and equipment out of reach of infants/children or pets so that they are not able to swallow or mistreat the battery by mistake.

    In case of ingestion, seek medical advice immediately.

02. Do not let leaked electrolyte come into contact with eyes or skin.

    In such a case, immediately flush the contact area with plenty of water and seek help from a doctor.

    If not treated soon, prolonged contact may cause serious injury.

03. Do not throw the battery into a fire. Do not use or leave it in a place near fire, heaters, or high temperature sources.

    In such a case, the insulator in the battery may be melted, the safety vent and structure may be damaged, or the electrolyte may catch fire, all of which may cause heat generation, explosion, or fire.

04. Do not submerge the battery in water, or wet the battery.

    If the protecting device assembled in the battery is damaged, the battery may be charged with an abnormal current and voltage and may cause an abnormal chemical reaction within the battery, which may result in the cause of heat generation, explosion, or fire of the battery.

05. Do not use any battery chargers not specified by the end product. Also, follow the charge conditions specified by the end product.

If the battery is charged under other conditions (a high temperature, a high voltage/current, or an altered charger) not specified by the end product, the battery may become over-charged with an excessive current and cause heat, explosion, or fire with abnormal chemical reactions.

06. Do not use, charge, or leave the battery in a car under the blazing sun.

Such a high temperature may cause damage of the protecting device in the battery, which may result in an abnormal reaction, and then heat generation, explosion, or fire.

07. Do not connect the battery reversed in positive (+) and negative (-) terminals in the charger or equipment.

In case the battery is connected and charged reversely, it may cause heat generation, explosion, or fire due to an abnormal chemical reaction.

08. Do not let the battery terminals (+ and -) contact a wire or any metal (like a metal necklace or a hairpin) with which it carried or stored together.

In such a case, the battery will be shorted and cause an excessive current, which may result in heat generation, explosion, or fire.

09. Do not connect the battery directly to an electric outlet or cigarette heater socket in car.

With a high voltage applied, the battery may overheat, explode, or cause fire.

10. Do not throw or drop the battery.

Strong impacts or shocks may damage the protecting device, which may cause an abnormal chemical reaction during charging and result in heat generation, explosion, or fire of the battery.

11. Do not drive a nail in or piece the battery with sharp objects.

In such a case, the battery may be deformed and shorted, witch which may cause heat generation, explosion, or fire of the battery.

12. Do not solder the battery directly.

Heat applied during soldering may damage the insulator of the safety vent and mechanism, which may result in heat generation, explosion, or fire of the battery.

13. Do not disassemble or alter the battery.

The battery employs a safety mechanism and a protecting device in order to avoid any danger.

If these are damaged, heat, explosion or fire may be caused.

14. A battery subjected to extremely low air pressure that may result in an explosion

or the leakage of flammable liquid or gas

CAUTION

01. Do not put the battery in a microwave, oven, or high pressure container.

    Sudden heat may damage the seal of the battery and may cause heat generation, explosion, or fire of the battery.

02. Do not leave the battery in a charger or equipment if it generates an odor and/or heat, color and/or shape changed, electrolyte leaked, or any other abnormalities. In such a case, immediately take the battery out of the charge or equipment and keep it away from fire, otherwise, the battery might overheat, explode, or cause fire.

    In such a case, over-discharge during use, or over-charge during charge may occur abnormal chemical reactions and may cause heat generation, explosion, or fire of the battery.

03. Discontinue charging after specified charging time even if the charge is not complete, otherwise, the battery might cause heat generation, explosion, or fire.

04. Do not use the battery in the place where the static electricity (more than the limit of the manufacturer's guarantee) occurs. Otherwise, the protecting device in the battery might be damaged and cause heat generation, explosion, or fire.

05. Do not use and store the battery in other than the following conditions; otherwise, the battery might cause heat generation, damage, or deterioration of its performance.

Operating environment:

When the battery is charged： 0℃ ~ +40℃

When the battery is discharged： -10℃ ~ +40℃

When stored 3 month： -20 ~ 40℃ (on the charge of 50%), 45 ~ 85%RH.

When stored 12 month： -20 ~ 20℃ (on the charge of 50%), 45 ~ 85%RH.