Model	C40	Spec No.	RD-C40-S01-LF	Version NO.	A

SPECIFICATION OF PRODUCT

（Model）：C40

Designed	Designer Checked	QC Checked	Sales Checked	Approved

Customer Signature
（Company name）： （Approved by）： （Signature Date）：

2022 03

EVE Energy CO., LTD

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（Customer Request）

NO.	Special Requirements	Specification
1		
2		
3		
4		
5		

（Customer Code）： _____

（Signature）： _____

（Date）： _____

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Revision History

Revision NO.	**Date**	**Description**	**Author**
A	2022.03.10	First Edition	

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（Definition of Terms）

Terms	Definition
Product	"Product" in this specification refers to 20 Ah rechargeable cylindrical lithium ion battery produced by EVE Energy Co., Ltd.
customer	Refers to the buyer in the product sales contract of EVE Energy Co., Ltd.
Nominal Capacity	Refers to the median capacity released in accordance with the discharge mode in Article 3.4 of this specification. 3.4
Rate C）	The ratio of the charge/discharge current to the rated capacity value. For example, the battery capacity is 20Ah, when the charging or discharging current is 20A, the charging or discharging rate is 1C.
State of charge SOC）	Under no-load conditions, the ratio of the battery capacity state to the rated capacity measured in Ah or Wh. For example, if the capacity is 20Ah as 100% SOC, when the capacity is 0Ah, the SOC is 0%.
Standard charging	The charging mode described in Article 3.3 of this specification.
Standard discharging	The discharging mode described in Article 3.4 of this specification.
DC Resistance DCR）	The ratio of the voltage changes of the battery to the corresponding current change under working conditions. 。
Units	“V” (Volt) “A” (Ampere) “Ah” (Ampere-Hour) “Wh” (Watt-Hour) “mΩ”(MilliOhm) “Hz” (Hertz)

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1. （Basic Information）

1.1. Scope）

This product specification has been prepared to specify the cylindrical rechargeable lithium-ion cell to be supplied to customer by EVE Energy Co., Ltd.

1.2.Description

Cylindrical Lithium-ion Rechargeable cell.

1.3. Model Name EVE—— C 40

① ② ③

① The letter "EVE" defines EVE Energy Co., LTD.

② The letter "C" defines Aluminous Cylindrical Li-ion rechargeable cell.

③ The letter "40" defines the diameter of the cell. 40 mm

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2. Specification Parameters

2.1. Basic Parameters

Item	Specification		Remarks
Median Capacity@3.65~2.5V	20500	mAh	0.33C discharge
Minimum Capacity@3.65~2.5V	19500	mAh	0.33C discharge
Nominal Capacity@3.65~2.5V	20000	mAh	0.5C discharge
AC-IR	≤3	mΩ	AC 1 kHz@25℃
DC-IR	≤8	mΩ	25℃@2C 30s
End-of-charge Voltage	3.65	V	
End-of-charge Current	1000	mA	0.05C
End-of-discharge Voltage	2.5 2.0	V	T＞0℃ T≤0℃
Nominal Voltage	3.2	V	
Standard Charging current	10000	mA	0.5C
Fast charge	20000	mA	1C
Standard Discharge current	10000	mA	0.5C
Max Continuous Discharge current	60000	mA	3C

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Operating Temperature Range（surface temperature of cell）	Charging Temp.	0~5℃	≤0.25C
		5~10℃	≤0.3C
		10~15℃	≤0.4C
		15~55℃	≤0.5C
	Discharging Temp.	-20~60℃	
	Storage Temp.	-20~45℃	≤1 month
		0~45℃	≤3 months
		0~25℃	≤1 year
	Storage Humidity	≤70% RH	

2.2. Product Specification

2.2.1. Dimension and Weight

NO.	Item	Specification	Test Method Chapter
1	Cell Dimension	Diameter: Φ40.5± 0.3 mm (coated)	3.5.1.
		Height : 135.0 ±0.5 mm（pole contained）	3.5.1.
2	Cell Weight	356±10g	3.5.2.

2.2.2. （Electrical Performance）

NO.	Test Item	Specification	Test Method Chapter

Model	C40	Spec. NO	**RD-C40-S01-LF**	Version NO.	A

1	Temperature Dependence of Discharge Capacity (1.0C discharge)	-20℃ Retention Ratio	≥70%	3.5.3.1.
		-10℃ Retention Ratio	≥80%	3.5.3.1.
		0℃ Retention Ratio	≥85%	3.5.3.1.
		25℃ Retention Ratio	100%	3.5.3.1.
		45℃ Retention Ratio	≥100%	3.5.3.1.
		60℃ Retention Ratio	≥100%	3.5.3.1.
2	100% SOC Temperature Charge Retention and Regain	28d，25℃	Retention Ratio≥95% Recovery Ratio≥97%	3.5.3.2.
		7d，60℃	Retention Ratio≥92% Recovery Ratio≥95%	3.5.3.2.
		28d，60℃	Retention Ratio≥85% Recovery Ratio≥90%	3.5.3.2.
3	（Cycle）	Normal Temperature Cycle Life	After 2000 cycles, Capacity retention≥70% Initial capacity	3.5.3.3.
		45℃ Cycle Life	After 1000 cycles, Capacity retention≥70% Initial capacity	3.5.3.4.
		25℃ 90%DOD Cycle Life	After 3500 cycles, Capacity retention≥70% Initial capacity	3.5.3.5.

2.2.3. （Safety Performance）

NO.	Test Item	Specification	Test Method Chapter
1	Over-charge Test	No explosion, no fire	3.5.4.1.

2	Over-discharge Test	No explosion, no fire, no leakage	3.5.4.2.
3	Short-circuit Test	No explosion, no fire	3.5.4.3.
4	Drop Test	No explosion, no fire	3.5.4.4.
5	Crush Test	No explosion, no fire	3.5.4.5.
6	Heating Test	No explosion, no fire	3.5.4.6.
7	Sea Water Immersion Test	No explosion, no fire,	3.5.4.7.
8	Low Pressure Test	No explosion, no fire, no leakage	3.5.4.8.

2.3. Outline Dimensions）

See the attachment (Fig. A).

2.4. Appearance）

There shall be no such defects as rust, discoloration, leakage which may adversely affect commercial value of the cell.

3. Standard Test Condition

3.1. （Environment Condition）

Unless otherwise specified, all tests stated in this Product Specification should be conducted at temperature 25℃±2℃ and humidity 65%±20% RH.

3.2. Measuring Equipment

The accuracy of measuring instruments and meters should meet the following requirements:

（1） Volt measuring Equipment）： ±0.1%；

（2） Amp measuring Equipment）： ±0.1%；

（3） Temp measuring Equipment）： ±0.5℃；

（4） Dimension measuring Equipment）： ±0.01mm；

（5） Weight measuring Equipment）： ±0.1g。

3.3. （Standard Charge Method）

The "Standard Charge" means charging the cell at a constant current of 0.5C until the voltage is 3.65V, then charged at a constant voltage of 3.65V until its current is less than 0.05C. For test purpose, charging shall be performed at 25℃±2℃

3.4. （Standard Discharge Method）

The "Standard Discharge" means discharging the cell at a constant current of 0.5C until the voltage is 2.5V. For test purpose, discharging shall be performed at 25℃±2℃

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3.5. （Test Method）

3.5.1. Dimension）

Use a caliper to measure the diameter and height of the cell.

3.5.2.Weight

Use an electronic scale to measure the weight of the battery.

3.5.3. （Electrical Characteristics）

3.5.3.1. Temperature Dependence of Discharge Capacity

The cell is measured with discharge constant current of 1C to 2.5V with follow discharge temperature and rest for 6h after the standard charging.

3.5.3.2. 100% SOC 2.5V(≤0℃ 12h 1C 2.0V) (100% SOC Temperature Charge Retention and Regain)

Capacity after storage at certain time and temperature after the standard charged measured with discharge current of 0.5C to cut-off voltage. Then capacity after 0.5C charge and 0.5C discharge for 3 cycles.

3.5.3.3. Normal Temperature Cycle Life）

Each cycle is an interval between 0.5C charges to 3.65V with 0.05C cut-off and 0.5C discharge with 2.5V cut-off at 25℃±2℃. Record the capacity after 2000cycles at 25℃.

3.5.3.4. 45℃ Cycle Life

Each cycle is an interval between 0.5C charges to 3.65V with 0.05C cut-off and 0.5C discharge with 2.5V cut-off at 45℃±2℃. Record the capacity after 1000cycles.

3.5.3.5. 25℃ 90%DOD Cycle Life)

Each cycle is an interval between 0.5C charge and discharge at 25℃±2℃. Record the capacity after 3500 cycles at 25℃.

3.5.4. Safety Test

All below tests are carried out on the equipment with forced ventilation and explosion-proof device. Before test, all cells should be charged in accordance with 3.2.

3.5.4.1. Over-charge Test

Stop charging after charging with constant 1C current until reaching 1.5 times of the charging termination voltage or charging time reaching 1.5h.

3.5.4.2. Over-discharge Test

Discharge at a constant current of 1C for 90 minutes and observe for 1 h.

3.5.4.3. Short-circuit Test

Short-circuit the standard charged cell by connecting positive and negative terminal by less 5 mΩ wire for 10min.

3.5.4.4. Drop Test

Drop the positive or negative terminal of the cell down freely from the height of 1.5m to the cement ground once.

3.5.4.5. Crush Test

A cell is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cells and the crushing is to be continued until voltage reaches 0V, the deformation reaches 15%, or the squeezing force reaches 100kN or 1000 times the weight of the test subject.

3.5.4.6. Heating Test

A cell is to be heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of 5℃±2℃ per minute to a temperature of 130℃±2℃ and remain for 30 min and observed 1h.

3.5.4.7. Sea Water Immersion Test

The cell was immersed in 3.5%Nacl solution (mass fraction, simulated seawater composition at normal temperature) for 2h.

3.5.4.8. Low Pressure Test

The cell was placed in a low pressure box, the pressure in the test box was adjusted to 11.6kPa, the temperature was room temperature, then standing and observed for 1h.

4. （Cell Operation Instruction and Precautions ）

4.1. Storage Recommendations）

4.1.1. Short Period Storage

* Storage the cell at temperature of 0℃ ~ 45℃（less than 3 months）, low humidity and no corrosive gas atmosphere.

* No press on the cell

4.1.2. Long Period Storage

* In case of long period storage (more than 3 months), storage the cell at temperature range of 0℃~25℃, low

humidity, no corrosive gas atmosphere.

* No press on the cell.

4.2. Shipment

The capacity of delivery cell is approximately at 30% of charging. It is not specified more than 30% capacityremain at customer, because of self-discharge. During transportation, keep the cell from acutely vibration, impacting, solarization, drenching.

4.3. （Operation Instruction）

4.3.1. （Charging）

* Charge the cell in an ambient temperature range of 0 ℃ to 55 ℃.

* Charge the cell at a constant current of 10000mA until 3.65V is attained. Charge rates greater than 20000mA are not recommended.

* Maintain charge voltage at 3.65V for 1hour (recommended for maximum capacity).

* Cell must be charged with constant current-constant voltage method.

4.3.1.1. Temperature gradient charging scheme

	SOC	Temperature Gradient				
		0℃~5℃	5℃~10℃	10℃~15℃	15℃~45℃	45℃~55℃
Charge Current	100%	0.05C	0.05C	0.05C	0.05C	0.05C
	90%	0.15C	0.3C	0.4C	0.5C	0.5C
	80%	0.25C	0.3C	0.4C	0.5C	0.5C
	70%	0.25C	0.3C	0.4C	0.5C	0.5C
	60%	0.25C	0.3C	0.4C	0.5C	0.5C
	50%	0.25C	0.3C	0.4C	0.5C	0.5C
	40%	0.25C	0.3C	0.4C	0.5C	0.5C
	30%	0.25C	0.3C	0.4C	0.5C	0.5C

	20%	0.25C	0.3C	0.4C	0.5C	0.5C
	10%	0.25C	0.3C	0.4C	0.5C	0.5C
	0%	0.25C	0.3C	0.4C	0.5C	0.5C

4.3.2. Discharging)

* Recommended cut-off voltage to 2.5V. Recommended max continuous discharge current is 60000mA.

* For maximum performance, discharge the cell in an ambient temperature range of -20 ℃ to 60 ℃.

4.3.3. Standard Cell Precaution

* Do not expose the cell to extreme heat or flame.

* Do not short circuit, over-charge or over-discharge the cell.

* Do not subject the cell to strong mechanical shocks.

* Do not immerse the cell in water or sea water, or get it wet.

* Do not reverse the polarity of the cell for any reason.

* Do not disassemble or modify the cell.

* Do not handle or store with metallic like necklaces, coins or hairpins, etc.

* Do not use the cell with conspicuous damage or deformation.

* Do not connect cell to the plug socket or car-cigarette-plug.

* Do not make the direct soldering onto a cell.

* Do not touch a leaked cell directly.

* Do not use for other equipment.

* Do not use Lithium-ion cell in mixture.

* Do not use or leave the cell under the blazing sun (or in heated car by sunshine).

* Keep cell away from children.

* Do not drive a nail into the cell, strike it by hammer or tread it.

* Do not give cell impact or fling it.

4.4. （Others）

For the sake of safety assurance, if there are equipment design, lithium ion cell system protection circuit, fast charging and other special application, please consult EVE first.

5. （Consultation）

（Attachment I: C40 drawing）

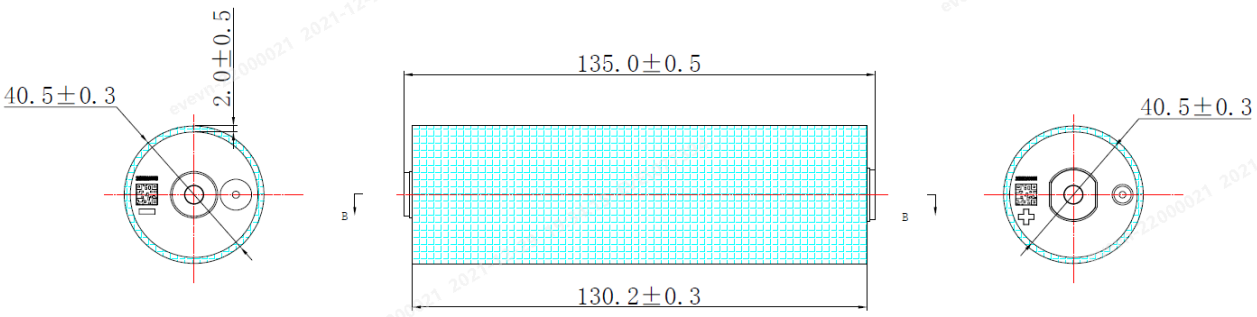

Figure A A）