

# TECHNICAL SPECIFICATION

Lithium Thionyl Chloride Battery

Model: ER18505H

Established date: 5 July,2021

|          | Position          | Signature   |
|----------|-------------------|-------------|
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## Version Record

| Version | Reviser    | Established Date | Version | Revise page | Revised reason |
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## 1. Scope

The document applies to ER18505H (Li/SOCl<sub>2</sub>) battery pack supplied by FANSO TECHNOLOGY CO.,LTD. Specify quality, test method, performance, quality assurance and matters need attention etc..

## 2. Battery type

Lithium Thionyl Chloride

## 3. Battery system characteristics

Table 1 General characteristics

| No. | Item                         | Characteristic  | Remarks                                                                                                                                                                                                                                                           |
|-----|------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Nominal Voltage              | 3.6V            |                                                                                                                                                                                                                                                                   |
| 2   | Nominal Capacity             | 4000mAh         | 23±3°C,3mA,2.0V cut off                                                                                                                                                                                                                                           |
| 3   | Max. constant current        | 70mA            |                                                                                                                                                                                                                                                                   |
| 4   | Max. pulse discharge current | 180mA           |                                                                                                                                                                                                                                                                   |
| 5   | Operate temperature          | -55~85°C        | Operation under higher temperature than ambient temperature may lead to reduced capacity and lower voltage reading at the beginning of pulses. If continuous high temperature over +40°C or low temperature down to -20°C usage conditions, please consult FANSO. |
| 6   | Dimension                    | Φ18.7mm*H50.5mm | See attached dimension image                                                                                                                                                                                                                                      |
| 7   | Weight                       | About 28g       |                                                                                                                                                                                                                                                                   |
| 8   | Annual self-discharge rate   | ≤1%             | At 23±3°C and humidity 65±10% RH long time storage                                                                                                                                                                                                                |

Table 2 Typical electrical performances

| No. | Item                 | Characteristic | Remarks                                                                |
|-----|----------------------|----------------|------------------------------------------------------------------------|
| 1   | Open Circuit Voltage | $\geq 3.64V$   | $23\pm 3^{\circ}C$ , by three and half digital meter                   |
| 2   | Load voltage         | $\geq 3.20V$   | $23\pm 3^{\circ}C$ , 20mA/165 $\Omega$ , discharge 3s                  |
| 3   | Capacity 1           | 3000mAh/60h    | $23\pm 3^{\circ}C$ , 50mA/62 $\Omega$ , 2.0V cut off, cathode up-right |

## 4. Appearance and structure

### 4.1 Appearance

ER18505H Cell appearance, no scratch, swelling, deformation, corrosion, electrolyte leakage and other defects.

### 4.2 Structure

ER18505H is “bobbin design” cell, whose cathode is cylindrical in shape.

Hermetic is ensured by a glass-to-metal sealing technology.(under a standard helium pressure, leakage rate  $\leq 10^{-8}Pa \cdot m^3/sec$ ).

## 5.2 Product mark

### 5.2.1 Battery' s label specification

- ① type                      ② nominal voltage    ③ positive and negative electrode mark
- ④ date code              ⑤ safety warning

### 5.2.2 Date code:

Date code will be marked on the sleeve of battery.

Method: MM YY “MM” stand for: month; “YY” stand for: year

## 5. Incoming inspection

As for the customer's incoming inspection, FANSO recommended sampling according to GB2828.1-2012 standard.

Table 3 Acceptability quality level

| No | Item                 | Technical request | Check level | AQL  |
|----|----------------------|-------------------|-------------|------|
| 1  | Dimension            | 2-6               | S-2         | 0.65 |
| 2  | Appearance           | 2-8               | II          | 1.0  |
| 3  | Open circuit voltage | 3-1               | II          | 0.4  |
| 4  | Load voltage         | 3-1               | II          | 0.4  |

Table 4 Sampling amount

| Lot size    | Sampling amount |
|-------------|-----------------|
| $\leq 3200$ | 32              |
| 3200~10000  | 50              |
| $> 10000$   | 80              |

Note: Unless other specified, the above items should be tested within 45 days since receipt of the battery.

## 6. Capacity judgment

6.1 If the average capacity is not less than the standard value specified in Table 2, and no battery below 90% of the value, the battery capacity is qualified.

6.2 If the average capacity is lower than the standard value specified in Table 2, and some battery below 90% of the value, do re-sample test, If the average capacity is not less than the standard value specified in Table 2, and no battery below 90% of the value, the battery capacity is qualified.

6.3 if the average capacity is lower than the standard value specified in Table 2 and some battery below 90% of the value during the second test, the battery capacity is unqualified.

## 7. Safety and environmental performance

### 7.1 Environmental performance

#### 7.1.1 Altitude Simulation

A test battery shall be stored for 6h at an absolute pressure of 11.6KPa(1.68psi) and a temperature of  $20\pm3^{\circ}\text{C}$  ( $68\pm5^{\circ}\text{F}$ )

Pass/Fail criteria: there shall be no leakage,no venting, no short-circuit, no rupture, no explosion and no fire during this test.

#### 7.1.2 Thermal Cycling

A test battery shall be stored for at least 6h at test temperature of  $72^{\circ}\text{C}$ , followed by storage for at least 6h at temperature of  $-40^{\circ}\text{C}$ . The maximum time for transfer to each temperature shall be 30 min. Each test and battery shall undergo this procedure 10 times. This is then followed by storage of at least 24h at ambient temperature.

Pass/Fail criteria: there shall be no leakage,no venting, no short-circuit, no rupture, no explosion

and no fire during this test.

### **7.1.3 Free fall**

A test batteries shall be dropped from 1.0m height onto a concrete surface. Each test battery shall be dropped six times, a prismatic battery once from each of its six faces.

Pass/Fail criteria: there shall be no venting, no explosion and no fire during this test and within the 1h of observation.

### **7.1.4 Vibration test**

Test batteries shall be firmly secured to the platform of vibration machine without distorting them and in such a manner as to faithfully transmit the vibration. Battery vibration frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz, and return in not less than 90 or more than 100 minutes. The battery is to be tested in three mutually perpendicular directions

Pass/Fail criteria: there shall be no leakage, no venting, no short-circuit, no rupture, no explosion and no fire during this test.

### **Warning:**

The description of the following abuse tests is for demonstration purposes only. During handling and application of lithium batteries, abusive conditions must be avoided. Any application or test requiring performance beyond the limits given hereby must be approved by Fanso.

## **7.2 Safety test**

### **7.2.1 Thermal abuse**

A test battery shall be placed in an oven and the temperature raised at a rate of 5 °C /min to a temperature of 130°C at which the battery shall remain for 10 min.

Pass/Fail criteria: there shall be no explosion and no fire during this test.

### **7.2.2 Impact**

A test battery is placed on a smooth flat surface. A 5/8 in. (15.8 mm) diameter steel bar was placed across the center of the sample. The length of the bar should be at least as long as the width of the sample. A  $9.1 \pm 0.1$  kg weight is dropped from a height of  $24 \pm 1$  in. ( $610 \pm 25$  mm) on to the sample.

Pass/Fail criteria: there shall be no excessive temperature rise, no explosion and no fire during this test and within the 6h of observation.

### **7.2.3 Crush test**

A test battery is crushed between two flat hard surfaces (i.e. steel). The crushing was continued until a force of 3000 pounds ( $13\text{kN} \pm 0.78\text{kN}$ ) was applied by hydraulic piston with a diameter of 32mm. press continue until pressure reach up to 17.2Mpa. Once the maximum pressure was obtained, it was released.

Pass/Fail criteria: there shall be no excessive temperature rise, no explosion and no fire during this test and within the 6h of observation.

### **7.2.4 Forced discharge**

Each battery shall be force discharged at ambient temperature by connecting it in series with at 12V DC power supply at an initial current equal to the maximum continuous discharge current specified by the manufacture. The specified discharge current is obtained by connecting a resistive load of

appropriate size and rating in series with the test cell and the direct current power supply. Each battery shall be forced discharged for a time interval equal to its rated capacity divided by the initial test current.

Pass/Fail criteria: there shall be no explosion and no fire during this test and within the 7 days after the test.

#### **7.2.5 External Short-circuit**

The test battery shall be stabilized at an external case temperature of 55°C and then subjected to a short-circuit condition with a total external resistance of less than 0.1Ω at 55°C. This short-circuit condition is continued for at least 1h after the battery external case temperature has returned to 55°C. The test sample shall be observed for a further 6h.

Pass/Fail criteria: there shall be no excessive temperature rise, no rupture, no explosion and no fire during this test and within the 6h of observation.

#### **7.2.6 Abnormal recharging**

The test battery shall be subjected to a charging current of three times the current  $I_c$ , specified by the manufacturer by connecting it in opposition to a dc-power supply. The specified charging current is to be obtained by connecting a resistor of the specified size and rating in series with the battery.

The test time is calculated from the formula:

$$T_c = 2.5 \cdot C / (3 \cdot I_c)$$

In which:

$T_c$ —charge time, hour,  $T_c \geq 7$ Hour;

C——Nominal capacity, Ah;

Ic——Max. charging current, mA. ER18505H maximum charge current is 0.010A.

**Pass/Fail criteria:** The samples shall be no explosion or catch fire.

## 8. Safety terms

8.1 Before use, do not remove the battery from the original packaging.

8.2 Do not scattered placed the battery together in order to avoid accidental short circuit.

8.3 Do not heat the battery above 100 °C or incinerated.

8.4 Do not recharge the battery.

8.5 Do not mixed with different brand, model or type batteries.

8.6 Do not mix the new and used batteries.

8.7 Do not disassembly or open battery.

8.8 Do not short circuit the battery or reversely contact the positive and negative terminals.

8.9 Do not solder on the battery surface.

8.10 Do not test environment and safety under extrusion without any protection.

8.11 Do not use or store batteries under wet conditions without protection.

8.12 Batteries are not allowed to be used excessively in the equipment without setting the cut-off voltage. After reaching the cut-off voltage, it should be removed from the equipment immediately to stop working.

8.13 Stop using if the battery is found to have heat, odor, discoloration, deformation, or other abnormalities during using or storage.

8.14 Batteries used should be handled in accordance with local environmental regulations and

buried deep underground or into brine.

8.15 If the liquid is splashed on the skin, eyes and clothes, rinse immediately with plenty of water, and then seek medical care immediately.

## **9. Storage**

9.1 Batteries should be used and stored away from static electricity

9.2 Batteries shall be stored not exceeding 30 DEG C and relative humidity of 45% - 75%.

9.3 Keep the battery away from the heat source, away from corrosive gas, avoid direct sunlight, and make sure the storage area is clean, cool, dry and ventilated.

9.4 The battery packing carton height shall not exceed 1.5 meters, and the wooden box shall not exceed 3 meters.

9.5 Batteries should keep the original storage state when not using, after removing the packaging, the battery should not be piled up irregularly.

## **10. Transportation**

10.1 Battery meets the tests and criteria requirements of UN Manual, Part III, subsection 38.3.

10.2 Batteries should be protected against sunlight, fire, rain, immersion, and corrosive substances in transportation.

10.3 Handling and loading should be with care.

10.4 For long transportation, such as shipping, should be kept away from the engine. And in summer should not be prolonged in an airless environment.

## **11. Effective**

11.1 Because the voltage passivation is the basic feature of lithium thionyl chloride battery, if the

batteries will not install within 3 months, we suggest to activate the battery before using. please consult the FANSO for activation scheme.

11.2 In practical applications, customer should be responsible for the compatibility and reliability of the battery and the device.

11.3 In any of the following circumstances, FANSO will not take any responsibility: the client' s fails of appropriate treatment, operation, installation, testing, maintenance and inspection of the battery, or do not follow the instructions provided in the specification, notes, terms, and other FANSO instructions.

11.4 This specification is accepted after 6 months from the date of issues if not be refunded.

## 12. Statement

If you have any questions on the product specifications, please contact with Wuhan Fanso Technology Co. ltd. Fanso reserves the right to amend the product specification.

## 13. Battery dimension

