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**Forming moulds of composite material for upper cover of
new energy vehicle battery pack**

新能源汽车电池包上盖复合材料成型模

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Foreword

This document was drafted in accordance with the rules given in GB/T 1.1-2020, *Directives for standardization - Part 1: Rules for the structure and drafting of standardizing documents*.

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Main drafters of this document: Jiang Chao, Zhu Zhe, Wei Wei, Zhang Chuanzhong, Zhu Lingling, Zhang Li, Zhuang Xincun, Li Peng, Deng Yangquan, Ding Jingen, Yu Yinan, Xu Huajie, Ying Zhaohui, Li Tongyu, Gu Weixing, Lv Jianguan, Wang Zhong, Chen Xinkai, He Xingxi, Liu Xiwang, Cai Lihua, Zhang Shengrong, Lv Wei, Liu Jianjun, Hu Fangping, Li Liang, Zhao Xuefeng, Liu Wei, Yang Xinbing, Shen Hailin, Bu Xiangnan, Lu Shaozhou, Liu Qiang, Zhang Wenbo, Gu Hongjun, Lan Jiashui, Zhao Fengsong, Jin Bo, Cui Jie.

Forming moulds of composite material for upper cover of new energy vehicle battery pack

1 Scope

This document specifies the structure, parts, assembly and performance requirements, describes the corresponding test methods, and stipulates inspection rules, marking, packaging, transportation and storage for forming moulds of composite material for upper cover of new energy vehicle battery pack.

This document is applicable to the manufacture of forming moulds of composite material for upper cover of new energy vehicle battery pack.

Note 1: The “composite material” in this document refer specifically to “resin-based fiber-reinforced composite materials”.

Note 2: In order to avoid confusion, the "forming moulds of composite material for upper cover of new energy vehicle battery pack" in this document is referred to as the "moulds".

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 191, Packaging - Pictorial marking for handling of goods

GB/T 230.1, Metallic materials - Rockwell hardness test - Part 1: Test method

GB/T 1958, Geometrical product specifications (GPS) - Geometrical tolerance - Verification

GB/T 3177, Geometrical product specifications (GPS) - Inspection of plain workpiece sizes

GB/T 8845, Dies and moulds - Terminology

GB/T 11379-2008, Metallic coatings - Electroplated coatings of chromium for engineering purposes

GB/T 40724, Terminology for carbon fiber and carbon fiber composites

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 8845 and GB/T 40724, as well as the following apply:

3.1

upper cover of battery pack

Protective cover on the top of the power battery.

3.2

projected area of moulded part

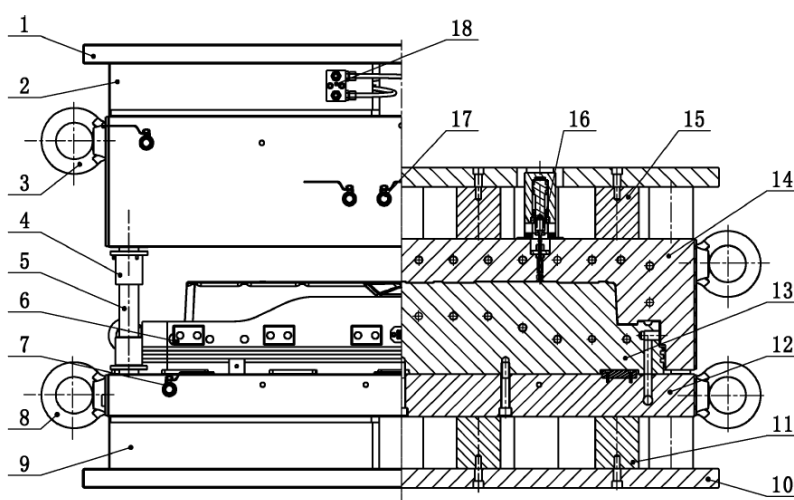
The total projected area of the moulded part in the direction of the main pressure.

4 Technical requirements

4.1 Structure

4.1.1 Typical structure

The mould structure is shown in Figure 1.



4.1.3 Overflow system

4.1.3.1 A semicircular overflow trough shall be provided on the outside of the lower die. Its width B shall not be less than twice the thickness δ of the moulded part; the distance b between the overflow trough and the edge of the cavity should be preferably 10 mm ~ 20 mm, as shown in Figure 3.

4.1.3.2 A venting gap shall be reserved between the upper and lower dies. The gap value h should be 0.3 times the thickness δ of the moulded part; the venting structure shall be set outside the size of the moulded part blank, as shown in Figure 3.

4.3.3 The opening, closing and demoulding of the mould shall be smooth and without interference, obstruction or abnormal noise.

4.3.4 The contact area between the limit blocks and guide plates of the upper and lower dies shall not be less than 75%.

4.3.5 There shall be no leakage at the joints and plugs, and the external pipes shall not interfere with other parts.

4.4 Performance

4.4.1 Vacuum degree

For moulds that require vacuuming, test according to 5.2.3. After closing the vacuum valve for 5 minutes, the relative vacuum degree change rate shall not be greater than 10%.

4.4.2 Temperature difference

The temperature difference between two locations within 1 m of the cavity shall not be greater than 5 °C, and the temperature difference between two locations 1 m or more apart shall not be greater than 10 °C.

4.4.3 Workpiece quality

Carry out mould trial according to 5.2.5. All inspection data of the workpiece shall meet the requirements of the customer's drawings.

4.4.4 Mould quality stability

During customer acceptance, the mould shall be able to produce continuously without failure for no less than 60 moulds (times) or 8 hours under normal working conditions.

5 Test methods

5.1 Static test

5.1.1 Materials and hardness

5.1.1.1 Check the material report and quality certificate of the parts.

5.1.1.2 Rockwell hardness shall be determined in accordance with GB/T 230.1.

5.1.2 Dimensions and tolerances

Dimensions shall be measured according to GB/T 3177 and geometric tolerances shall be measured according to GB/T 1958.

5.1.3 Surface treatment

The coating thickness shall be determined according to the method described in 6.4 of GB/T 11379-2008.

5.2 Dynamic test

5.2.1 Idle running test

5.2.1.1 The mould shall be opened and closed repeatedly for not less than 10 times, and the mould ejection mechanism shall be operated repeatedly for not less than 10 times. Observe whether there is any interference, obstruction or abnormal noise in the mechanism operation.

5.2.1.2 Apply blue-lead/red-lead mould oil evenly to the stop block and guide plate; apply 30% of the rated mould clamping force to the mould; observe the contact condition of the stop block and guide plate.

5.2.2 Tightness test

Test the pressure of the temperature control system at 1.5 times the rated pressure value and maintain the pressure for 24 hours. Use absorbent cotton to wipe the joints and seals; check the cleanliness of the absorbent cotton.

5.2.3 Vacuum test

Carry out a vacuum test of the mould in the following steps:

- a) Under normal temperature and pressure, apply clamping force to the mould and then evacuate the mould. The clamping force is calculated according to Formula (1);
- b) When the relative vacuum degree of the mould cavity drops to -0.06 MPa ~ -0.1 MPa, close the vacuum valve, read the pressure counter value and record it as p_0 ;
- c) After maintaining the pressure for 5 minutes, read the pressure gauge value again and record it as p_1 ;
- d) Calculate the relative vacuum degree change rate Δ according to Formula (2).

$$F = kA \dots\dots\dots (1)$$

Where:

F – clamping force, in kilonewtons (kN);

A – projected area of moulded part, in square meters (m^2);

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Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

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