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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Non-destructive testing - Ultrasonic testing - Specification for
resin matrix composite reference blocks**

无损检测 超声检测 树脂基复合材料制件对比试块规范

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1. Structure and drafting rules for standardization documents" Drafting is required. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document is proposed and coordinated by the National Technical Committee for Standardization of Nondestructive Testing (SAC/TC 56). This document was drafted by: Shanghai Aircraft Manufacturing Co., Ltd., Shanghai Materials Research Institute Co., Ltd., Commercial Aircraft Corporation of China, Ltd. Co., Ltd., Jiangsu Special Equipment Safety Supervision and Inspection Institute, and Shandong Ruixiang Mould Co., Ltd. The main drafters of this document are. Jiang Liping, Zhang Dongmei, Xiao Peng, Jiang Jiansheng, Ding Jie, Chen Jian, Yuan Yuhui, Zhang Yanbing, Han Lina, Wan Haitao, Wei Yulong.

Ultrasonic test blocks are mainly divided into two types. One is used to evaluate and calibrate ultrasonic testing equipment and has a specified chemical composition, surface Standard test blocks with surface roughness, heat treatment and geometric shape; one is similar to the acoustic properties of the test piece or the material being tested and contains clear reference Reflectors are used to adjust the amplitude and/or time base of the ultrasonic detector to compare the detected discontinuity signal with the signal generated by the known reflector. A reference block to compare the signals. When the reference block is used to adjust the amplitude and/or time base of the ultrasonic detector and compare it with the detected discontinuous signal, the reference block A reference reflector with a clear meaning is set inside; when the comparison test block is only used to adjust the amplitude and (or) time baseline of the ultrasonic detector, the reference reflector is used. The bottom surface of the comparison test block is used as a reference reflector, that is, a step comparison test block without a reference reflector inside; the comparison test block can also be used only for comparison with the detected The discontinuous signal is compared to obtain the detection threshold, such as when ultrasonic testing and evaluating the

internal pores of resin-based composite parts. Porosity comparison test blocks used. At present, composite materials are widely used in sports equipment, automobile manufacturing, shipbuilding and aerospace. Composite materials are the most mature and widely used type of composite materials. However, due to the types of matrix materials and reinforcing materials in resin-based composite materials The various manufacturing processes lead to large differences in the acoustic properties of the materials. Standard test blocks cannot be used in the testing process, so the direct use Comparison test blocks. This document fully considers the method for making reference reflectors of ultrasonic testing comparison test blocks for resin-based composite materials that have been stably applied. Including embedded method, edge insert method, external sticking method, flat bottom hole method and other special methods, clarify the comparative test of ultrasonic testing of resin-based composite materials The requirements for the blocks are to standardize the design, production and inspection methods of the comparison blocks for ultrasonic testing of resin-based composite materials, and to guide the construction of resin-based composite materials. Ultrasonic testing in practice. Nondestructive testing of resin-based composite materials using ultrasonic testing Specifications for comparison test blocks

1 Scope

China's national specification for the reference blocks used in ultrasonic testing of resin matrix composites. A reference block is a specimen containing artificial defects of known size and position, and it is what an ultrasonic inspection is calibrated against - the instrument's gain is set so that a known reflector gives a known response, and everything found in the component is judged against that. For metals the blocks are straightforward. For composites they are not, because the material's attenuation and velocity depend on the layup, the fibre volume fraction and the cure, so a block must represent the component rather than merely being made of a similar material. The defects also have to represent the real ones: a flat-bottomed hole is easy to make and reflects quite differently from the delamination it stands for, which is why the specification has to address how the artificial defects are produced and what they are taken to represent.

This document specifies the design, production, inspection, marking and quality control requirements for reference test blocks used for ultrasonic testing of resin-based composite parts. This document is applicable to the ultrasonic testing of resin-based composite laminates (including R corners), plate/plate bonding structures, sandwich structures and other products. Design, production, inspection, marking and quality control requirements for comparison test blocks. Design of comparison test blocks for other non-destructive testing methods of resin-based composite materials Design, production, inspection, marking and quality control are carried out as reference.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 3365 Test method for void content and fiber volume content of carbon fiber reinforced plastics

GB/T 9445 Qualification and certification of non-destructive testing personnel

GB/T 20737 General terms and definitions for non-destructive testing

3 Terms and definitions

The terms and definitions defined in GB/T 20737 and the following apply to this document.

3.1 Laminate/laminate bonding A layered composite structure formed by bonding laminates (3.4) and laminates (3.4) or other plate-like materials by adhesive.

3.2 reference reflector Compare the reflectors in the test block with known shape, size and distance from the test surface.

3.3 Reference echo referenceecho The echo from the specified reference reflector (3.2).
[Source: GB/T 12604.1-2020, 5.4.4]

3.4 Laminate An integral board made by pressing two or more layers of the same or different materials. [Source: GB/T 3961-2009, 3.5.7]

3.5 Delamination The phenomenon of interlayer separation in laminated composite materials (3.6). [Source: GB/T 40724-2021, 5.90, modified]