

JIS

JAPANESE INDUSTRIAL STANDARD

Testing method for ultrasonic pulse echo technique of carbon fibre reinforced plastic panels

JIS K 7090—1996

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Testing method for ultrasonic pulse echo
technique of carbon fibre reinforced plastic panels K 7090-1996

1. Scope This Japanese Industrial Standard specifies testing method for ultrasonic pulse echo technique by which flaws such as delamination, measuring at least $2\text{ mm} \times 2\text{ mm}$ or at least 2 mm in diameter, dwelling inside of carbon fibre reinforced plastic (hereafter referred to as "CFRP") panels, are detected by water-immersion method using ultrasonic pulse.

Remarks 1. The testing person who carries out the test using this Standard shall bear the required license or have the sufficient skill and knowledge corresponding to the license.

2. The standards cited in this Standard are listed as follows.

JIS B 0601 Surface roughness – Definitions and designation

JIS K 6900 Plastics – Vocabulary

JIS K 7072 Preparation of carbon fibre reinforced plastic panels for test purpose

JIS Z 2300 Glossary of terms used in nondestructive testing

JIS Z 2350 Method for measurement of performance characteristics of ultrasonic probes

JIS Z 2351 Method for assessing the electrical characteristics of ultrasonic testing instrument using pulse echo technique

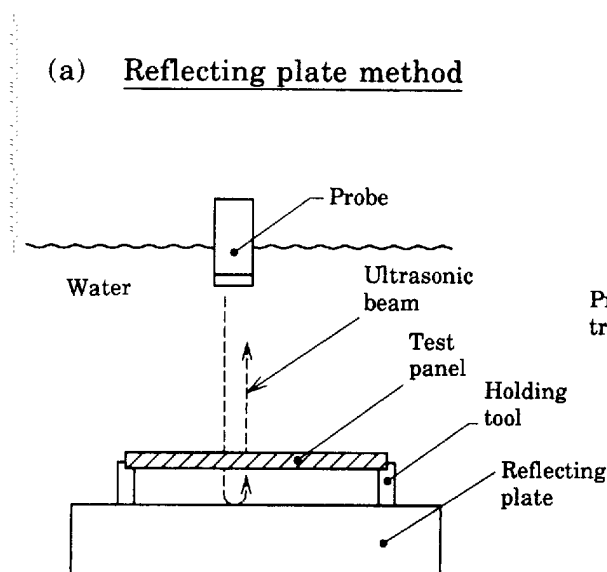
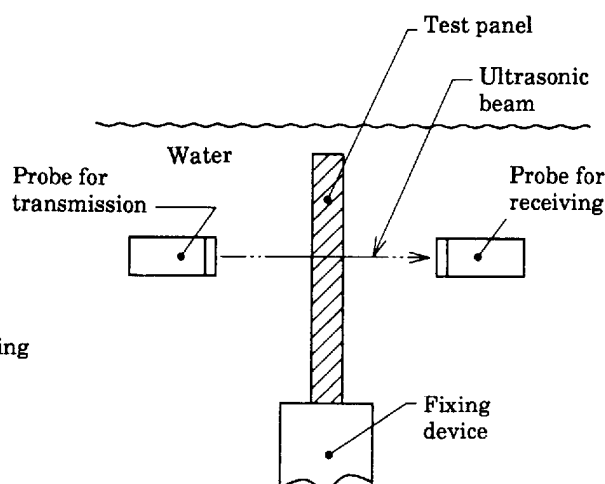
2. Definitions The definitions of main terms used in this Standard shall follow JIS K 6900 and JIS Z 2300.

3. Principle of test

3.1 Classification of testing methods The ultrasonic flaw detecting methods for CFRP flat panel shall be classified into the reflecting plate method [Fig. 1 (a)] and the penetration method [Fig. 1 (b)], and a test panel shall be arranged in water as shown in Fig. 1 (a) or (b).

For the test panel with thickness less than 10 mm , either of these methods can be used; and for thickness 10 mm or over up to and including 20 mm , the penetration method shall be used.

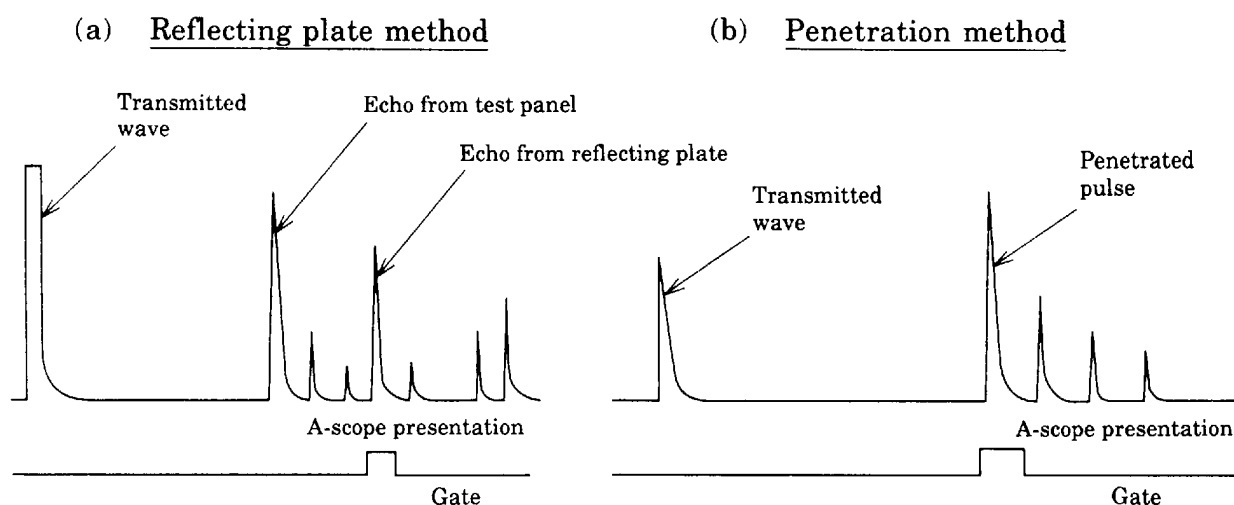
Fig. 1. Ultrasonic flaw detecting method for CFRP panel

(a) Reflecting plate method(b) Penetration method

3.2 Reflecting plate method The ultrasonic pulse, which has been transmitted into water, partly goes through a test panel to arrive at a reflecting plate and it reflects on the surface of the reflecting plate. Reflected pulse is received by the probe after passing through the test panel again. If there is such as delamination or void in the test panel, the echo height, which was reflected from the reflecting plate and received, is lowered than that at sound area, therefore flaw can be detected. This type of testing method is called reflecting plate method, and the typical flaw display of obtained fundamental presentation (A-scope presentation) is shown in Fig. 2 (a).

3.3 Penetration method Two probes, which are arranged face to face with putting a testing panel between them, can be used for transmission side and for receiving side respectively. The ultrasonic pulse transmitted from the probe for transmission goes through water and the test panel, and then is received by the probe for receiving after passing through water again. If there is such as delamination or void in the test panel, the height of penetrated pulse, which was received, is lowered than that at sound area, therefore the flaw can be detected. This type of testing method is called penetration method, and the typical flaw display by A-scope presentation is shown in Fig. 2 (b).

Fig. 2. Flaw display by A-scope presentation by reflecting plate method and penetration method



4. Testing apparatus and accessory

4.1 Construction of testing apparatus The testing apparatus shall be constructed with the following devices.

- (1) Ultrasonic flaw detector and probe
- (2) Image processor and display for indication
- (3) Probe scanner and controller
- (4) Water tank, reflecting plate, and supporting tool or fixing device

4.2 Ultrasonic flaw detector The performance of transmitting-receiving apparatus for ultrasonic wave for the test shall be as follows.

- (1) Flaw detecting method One probe method and two probe method can be used for flaw detection.
- (2) Test frequency The test frequency of a probe used for test shall be in the range from 5 MHz incl. to 20 MHz incl.
- (3) Transmitted pulse The rise time of transmitted pulse shall be measured according to 4.1.3 of JIS Z 2351, and be 30 ns or less.
- (4) Frequency band for high frequency amplification circuit The frequency band for high frequency amplification circuit for receiver shall be the band in which characteristics of signal are not damaged. For this purpose, it is preferable to set the frequency band width wider than $0.5f_p$ where the nominal frequency of a probe is f_p .