

JIS

JAPANESE INDUSTRIAL STANDARD

**Testing method for
complete reversed plane
bending fatigue of carbon
fibre reinforced plastics**

JIS K 7082—1993

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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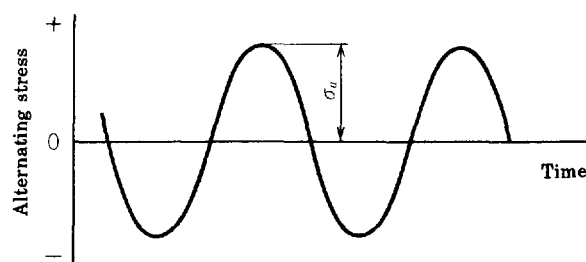
1. Scope This Japanese Industrial Standard specifies the testing method for complete reversed plane bending fatigue with constant stress amplitude of carbon fibre reinforced plastics (hereafter referred to as "CFRP").

- Remarks
1. This testing method covers the determination of the fatigue properties of material by applying cyclic bending moment which varies alternatively between plus and minus side of the same magnitude to the plane perpendicular to that of the flat-shaped test specimen.
 2. For unidirectional CFRP's, the compressive fracture at the edge part of grips, rather than the fracture by bending fatigue, becomes dominant. Hence, this Standard is not applicable to unidirectional CFRP's except under special purposes.
 3. The standards cited in this Standard are as follows:
JIS B 7502 Micrometer callipers for external measurement
JIS B 7507 Vernier, dial and digital callipers
JIS K 6900 Glossary of terms used in plastic industry
JIS K 7072 Preparation of carbon fibre reinforced plastic panels for test purpose
JIS K 7074 Testing methods for flexural properties of carbon fiber reinforced plastics
JIS K 7100 Standard atmospheres for conditioning and testing of plastics
JIS Z 8401 Rules for rounding off of numerical values
 4. The units given in { } in this Standard are based on the traditional units and are appended for informative reference.

2. Definitions For the main terms used in this Standard the definitions in JIS K 6900 apply, and the rest of the terms are as follows:

- (1) alternating stress The stress which periodically varies between definite maximum value and minimum value (refer to Fig. 1).

Fig. 1. Alternating stress – time diagram



(2) number of cycles The number of cycles of stress when the test specimen is subjected to alternating stress at a constant amplitude. This is expressed as N or n , where N represents the number of cycles to produce the fatigue fracture and n represents the number of cycles of stress during the fatigue test.

(3) stress amplitude (σ_a) Half of the difference between maximum value and minimum value of alternating stress (refer to Fig. 1).

(4) retention factor of rigidity The value in percentage obtained by dividing the final rigidity by the initial rigidity.

(5) fatigue strength for finite life The upper limiting value of the alternating stress which test specimen can withstand a specified number of cycles. After this value, the number of cycles shall be attached in parentheses.

Example: $\sigma_a (10^5)$

(6) S–N diagram (stress-to-number-of-cycles diagram) A plot of the alternating stress on the vertical-axis against the number of cycles up to fatigue fracture on the horizontal-axis (when the test is completed without breaking, put an arrow mark in the right-hand direction on that point).

(7) fatigue limit The upper limiting value of the alternating stress at which test specimens can withstand up to an infinite number of cycles. In most cases, plastic materials do not show the fatigue limit (the alternating stress at which an S–N diagram becomes parallel to the horizontal-axis in the direction on increasing cycles) up to the number of cycles of 10^7 . For this reason, generally the upper limiting value of the alternating stress at which the test specimen does not fracture up to the number of cycles of 10^7 is defined as the fatigue limit. In this case, it is necessary to clearly record that the fatigue limit is the upper limiting value of the alternating stress not producing fracture up to 10^7 cycles [refer to (5) fatigue strength for finite life].

(8) fatigue strength A generic term for the fatigue limit and the fatigue strength for finite life.

3. Conditioning of test specimens and test temperature and humidity

3.1 Conditioning of test specimens The test specimens shall be conditioned at a standard temperature Grade 2 and a standard humidity Grade 2 [temperature $23 \pm 2^\circ\text{C}$ and relative humidity $(50 \pm 5)\%$] for 48 h or longer before test in accordance with JIS K 7100, as a rule.