KES

Testing Standard for Fatigue of Rigid Plastic Materials

KES T – L203

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1. Scope of Application

This standard shall regulate a testing method for fatigue of rigid plastic materials([1])

(Plastic hereinafter).

Note([1]) : The rigid plastic is the plastic that is possible to perform the test on in regulated conditions in this standard.

Remark : Units and sizes expressed in ( ) in this standard are in Systeme International (SI), and are written for reference.

2. Definition of Terminologies

Definitions of terminologies in this standard are described in KS M 3000 (Terminologies for plastics), and others are as following. In addition, symbols are expressed as in Figure 1.

2.1 Terminologies for stress and repetitive number

2.1.1 Stress : It is a stress (kg f / mm^2) { N / mm^2 }, which is calculated based on a basic elastic theory, not a stress concentration by a cut connection, etc., and express vertical stress as σ and shearing stress as τ.

2.1.2 Repetitive stress : Stress yielded periodically between certain maximum and minimum values.

2.1.3 Maximum and minimum stresses : Maximum and minimum values of the repetitive stresses σ_{max}, τ_{max}, σ_{min}, τ_{min}, considering positive and negative symbols.

2.1.4 Mean stress σ_m, τ_m : A half of addition of the maximum and minimum stresses of the repetitive stress.

2.1.5 Stress amplitude σ_a, τ_a: A half of difference between the maximum and minimum stresses of the repetitive stress.

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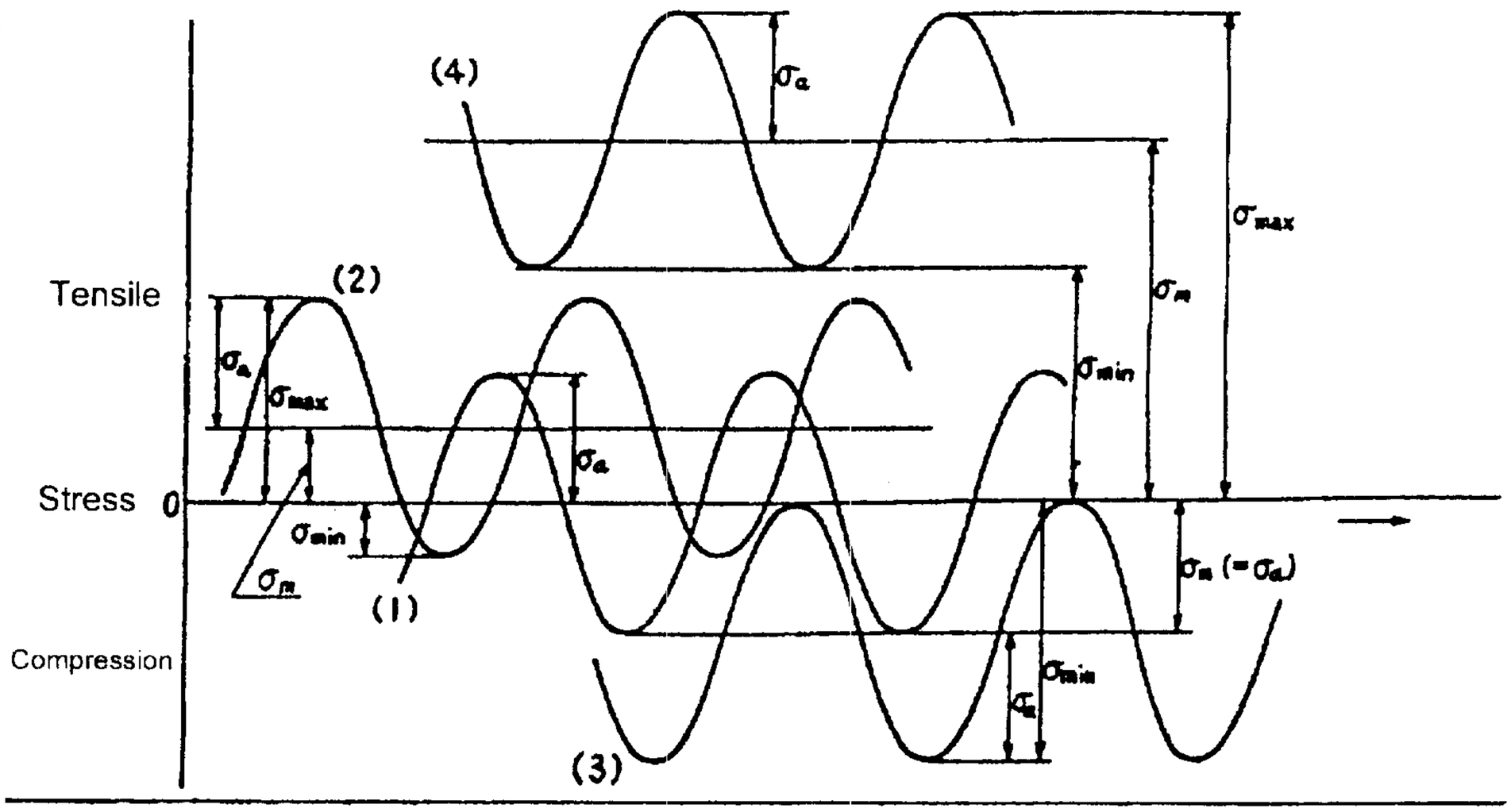

(1) Alternating

(2) Partial alternating

(3) Pulsating

(4) Partial pulsating

σ_m : Mean stress

σ_a : Stress amplitude

σ_{max} : Maximum stress

σ_{min} : Minimum stress

(Same for τ)

Figure 1

2.1.6 Alternating stress : Stress that repeats the same positive and negative value.

(In a word, a case of $\sigma_m = 0$, $\tau_m = 0$: $\sigma_{max} = \sigma_a$, $\tau_{max} = \tau_a$)

2.1.7 Partial alternating stress : Repetitive stress that includes $\sigma = 0$ and $\tau = 0$, which means $\sigma_m \neq 0$ and $\tau_m \neq 0$.

2.1.8 Pulsating stress : Repetitive stress that the maximum or the minimum value is 0.

(In a word, $|\sigma_m| = \sigma_a$, $|\tau_m| = \tau_a$)

2.1.9 Partial pulsating stress : Stress that repeats the same positive and negative maximum and minimum values. (In a word, $|\sigma_m| > \sigma_a$, $|\tau_m| > \tau_a$)

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2.1.10 Repetitive number : The repetitive stress is loaded on the testing plate in fixed amplitude during the fatigue test. The repeating number of this stress is called the repetitive number and expressed as N or n. n is the repetitive number until the fatigue breakage and n is the repetitive number of the stress during the fatigue test.

2.2 Terminologies for fatigue strength

2.2.1 Fatigue limit: Maximum stress that can endure unlimited repetitions. The fatigue limit for the plastic is mostly not shown until 10^7 repetitions (Number larger than this is the repetitive stress parallel to a horizontal axis in the S-N degree line), and, generally, the maximum value of the stress, which does not break until 10^7 repetitions, is used as the fatigue limit. In this case, record that this is the maximum value of the stress, which does not break until 10^7 repetitions. (Refer to item 2.2.10 time strength)

2.2.2 Alternating tensile and compressive fatigue limit σ_u : Fatigue limit when alternating tensile and compressive stresses are applied. Express as the stress amplitude.

2.2.3 Pulsating tensile fatigue limit σ_u : Fatigue limit when a pulsating tensile stress is applied. Express as twice the stress amplitude.

2.2.4 Pulsating compressive fatigue limit σ_{-u} : Fatigue limit when a pulsating compressive stress is applied. Express as twice the stress amplitude.

2.2.5 Rotary bending fatigue limit σ_{wb} : Fatigue limit when rotary bending stress is applied. Express as the stress amplitude.

2.2.6 Alternating planar bending fatigue limit σ_{wp} : Fatigue limit when an alternating planar bending stress is applied. Express as twice the stress amplitude.

2.2.7 Pulsating planar bending fatigue limit σ_{up} : Fatigue limit when a pulsating planar bending stress is applied. Express as twice the stress amplitude.

2.2.8 Alternating torsional fatigue limit τ_w : Fatigue limit when an alternating torsional stress is applied. Express as the stress amplitude.

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