SLOVENSKI STANDARD
SIST EN ISO 9664:1998

01-februar-1998

Lepila - Preskusne metode za ugotavljanje odpornosti konstrukcijskih lepil proti utrujanju pri natezno strižnih obremenitvah (ISO 9664:1993)

Adhesives - Test methods for fatigue properties of structural adhesives in tensile shear (ISO 9664:1993)

Klebstoffe - Verfahren zur Prüfung der Ermüdungseigenschaften von Strukturklebungen bei Zugscherbeanspruchung (ISO 9664:1993)

Adhésifs - Méthodes d'essai de tenue a la fatigue d'adhésifs structuraux en traction-cisaillement (ISO 9664:1993)

Ta slovenski standard je istoveten z: **EN ISO 9664:1995**

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English version

Adhesives - Test methods for fatigue properties of structural adhesives in tensile shear (ISO 9664:1993)

Adhésifs - Méthodes d'essai de tenue à la fatigue d'adhésifs structuraux en traction-cisaillement (ISO 9664:1993)

Klebstoffe - Verfahren zur Prüfung der Ermüdungseigenschaften von Strukturklebungen bei Zugscherbeanspruchung (ISO 9664:1993)

This European Standard was approved by CEN on 1995-05-11. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Foreword

The text of the International Standard from ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) has been taken over as a European Standard by the Technical Committee CEN/TC 193 "Adhesives".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 1995, and conflicting national standards shall be withdrawn at the latest by December 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 9664:1993 has been approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 9664

First edition
1993-05-15

Adhesives — Test methods for fatigue properties of structural adhesives in tensile shear

Adhésifs — Méthodes d'essai de tenue à la fatigue d'adhésifs structuraux en traction-cisaillement

Reference number
ISO 9664:1993(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9664 was prepared by Technical Committee ISO/TC 61, *Plastics*, Sub-Committee SC 11, *Products*.

Annexes A and B form an integral part of this International Standard.

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Adhesives — Test methods for fatigue properties of structural adhesives in tensile shear

1 Scope

This International Standard specifies a method for estimating the fatigue strength of adhesives in shear by tension loading, using standardized specimens under specified conditions, with the aim of characterizing structural adhesives on a given metallic substrate.

The fatigue properties are a function of the specimen geometry. The results do not correspond to intrinsic properties of the adhesive and cannot be used for design purposes.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 4587:1979, *Adhesives — Determination of tensile lap-shear strength of high strength adhesive bonds.*

ISO 4588:1989, *Adhesives — Preparation of metal surfaces for adhesive bonding.*

3 Definitions and symbols

For the purposes of this International Standard, the following definitions and symbols apply.

3.1 shear stress (τ)**:** Stress determined by dividing the force by the bonded surface area.

It is expressed in megapascals (MPa).

3.2 static shear strength (τ_R)**:** Average static shear stress at rupture as determined by ISO 4587.

It is expressed in megapascals (MPa).

3.3 stress cycle: Smallest part of the stress/time function which is repeated at regular intervals.

It is of sinusoidal form (see figure 1) with undulating shear.

Cyclic stress may be considered to be the superposition of an alternating stress on a static stress which is the mean stress.

3.3.1 maximum stress (τ_{max})**:** Greatest algebraic value reached at regular intervals by the stress.

It is expressed in megapascals (MPa).

3.3.2 minimum stress (τ_{min})**:** Smallest algebraic value reached at regular intervals by the stress.

This stress shall always be positive and is expressed in megapascals (MPa).

3.3.3 mean stress (τ_m)**:** Albegraic mean of the maximum and minimum stresses.

$$\tau_m = \frac{\tau_{max} + \tau_{min}}{2}$$

It is expressed in megapascals (MPa).

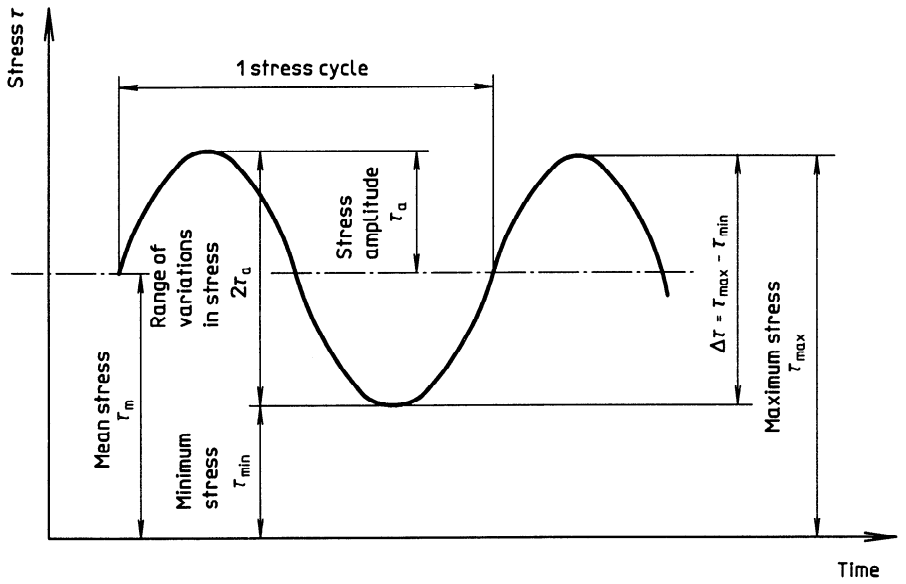


Figure 1 — Fatigue stress cycle

3.3.4 stress amplitude (τ_a)**:** Alternating stress equal to half the algebraic difference between the maximum and minimum stresses.

$$\tau_a = \frac{\tau_{max} - \tau_{min}}{2}$$

It is expressed in megapascals (MPa).

3.3.5 stress ratio (R_τ)**:** Algebraic ratio of the minimum stress to the maximum stress in one cycle.

$$R_\tau = \frac{\tau_{min}}{\tau_{max}}$$

3.4 fatigue limit (τ_D)**:** Limiting value which the stress amplitude τ_a approaches when the number of cycles becomes very large, for a given mean stress τ_m or stress ratio R_τ.

For some materials, stress amplitude versus the number of cycles does not reach a limiting value but decreases constantly on increasing the number of cycles. In this case it is useful to determine a limit of endurance.

3.5 limit of endurance [$\tau_D(N_F)$]**:** Shear stress determined at a specific number of fault test cycles N_F.

It is expressed in megapascals (MPa).

Depending on whether the tests are carried out at constant τ_m or at constant R_τ, the results should be presented in the form:

$\tau_D(N_F, \tau_m)$ in megapascals (MPa)

or

$\tau_D(N_F, R_\tau)$ in megapascals (MPa)

3.6 service life (N)**:** Number of stress cycles applied to a specimen until it has reached the chosen end of the test. Where it has not failed, the service life is not defined but is termed greater than the test duration.

3.7 cycle ratio (n/N)**:** Ratio of the number of applied cycles (n) to the service life (N). This ratio is used in tests with load bearings, together with an SN curve (Woehler's curve).

3.8 SN curve: Curve, allowing the resistance of the material to be seen, which indicates the relationship observed experimentally between service life N, shown conventionally in abscissae (logarithmic scale) and stress τ_a or τ_{max} shown in ordinates in linear scale [typical curve in figure 2 a)] or in logarithmic scale [typical curve in figure 2 b)]. This curve is established by keeping either τ_m or R_τ constant. The SN curve is defined by the relationship between amplitude of stress and service life. On this curve [figure 2 a)] we can distinguish:

— the endurance zone where, for a given stress, failures as well as non-failures for a number of fault test cycles N_F can be identified;

— the fatigue zone where, for a given stress, all the specimens fail at the end of a number of cycles less than the number of conventional fault test cycles N_F mentioned above.

4 Principle

The specimen is cyclically stressed in a way that may be regarded as the superposition of an alternating stress on a static stress which is the mean stress.

The number of cycles at failure of the specimen is determined for a given τ_m and τ_a. These values are used to establish SN curves which then permit the estimation of the confidence zone concerning the fatigue resistance of a joint.

5 Apparatus

5.1 Template, for the accurate positioning of substrates during bonding.

5.2 Fatigue test machine, to enable sinusoidal fatigue stress cycles to be obtained such that the maximum stress is between 10 % and 80 % of the scale range. The test frequency and the type of equipment may affect the test result. Unless indicated otherwise, the frequency shall be 30 Hz. The maximum frequency shall be 60 Hz, since excessive heating of the bond can occur at frequencies higher than 60 Hz. The machine shall be provided with a self-centring device for attachment of the specimen. The device shall be designed in such a way that its various components move in perfect alignment with the specimen as soon as the specimen is subjected to stress. In this way the major axis of the specimen coincides with the direction of application of the force and the axis of symmetry of the device.

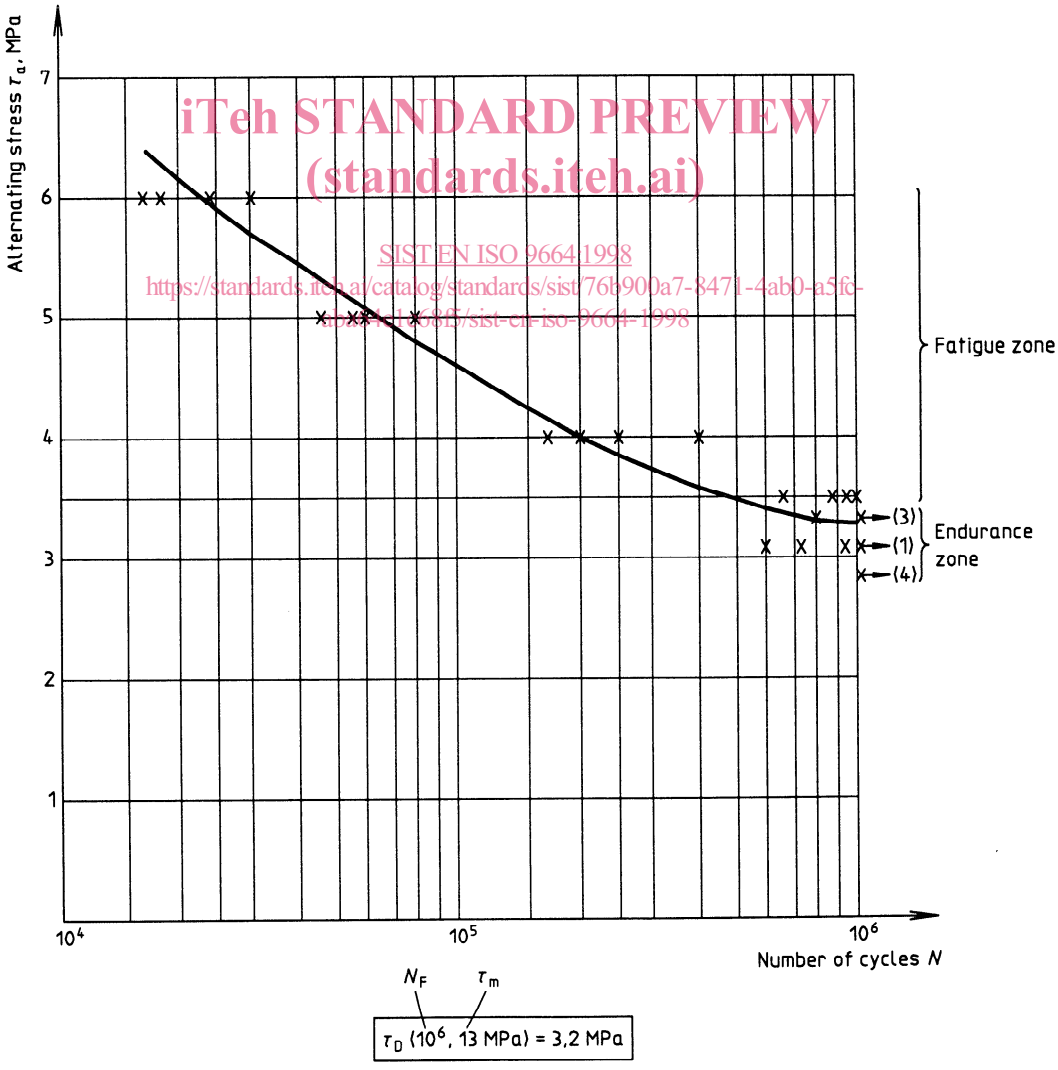
Attachments passing through the substrate may be used, in which case the specimen shall be reinforced as indicated in figure 3 b), using additional supports.

6 Specimens

6.1 Substrate materials

The specimens shall conform in shape, dimensions and alignment to those indicated in figures 3 a) or 3 b) for steel and 3 c) for aluminium.

NOTE 1 Recommended substrates are aluminium 2024 A 5T3 and steel XC 18 or E 24, grade 1 or 2. Other grades may be used, depending on the end use of the adhesive.



2 a) Standard steel specimens, test at 30 Hz at room temperature, semi-logarithmic coordinates