SLOVENSKI STANDARD
SIST EN 10002-2:1996

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Kovinski materiali - Natezni preskus - 2. del: Preverjanje sistema za merjenje sile na nateznih preskuševalnih strojih

Metallic materials - Tensile testing - Part 2: Verification of the force measuring system of the tensile testing machines

Metallische Werkstoffe - Zugversuch - Teil 2: Prüfung der Kraftmeßeinrichtungen von Zugprüfmaschinen

Matériaux métalliques - Essai de traction - Partie 2: Vérification du systeme de mesure de la charge de la machine d'essai de traction

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English version

Metallic materials - Tensile testing - Part 2: Verification of the force measuring system of the tensile testing machines

Matériaux métalliques - Essai de traction - Partie 2: Vérification du système de mesure de la charge de la machine d'essai de traction

Metallische Werkstoffe - Zugversuch - Teil 2: Prüfung der Kraftmesseinrichtungen von Zugprüfmaschinen

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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Foreword

The proposal for this European Standard was prepared by the Technical Committee ECISS/TC1A 'Mechanical and physical tests' the Secretariat of which has been allocated to the Association Francaise de Normalisation (AFNOR).

It forms Part 2 of the general standard EN 10 002.

This Standard is based on the International Standard:

ISO 7500/1 - 1986 Metallic materials - Verification of static uniaxial testing machines -

Part 1 : Tensile testing machines.

According to the Common CEN/CENELEC Rules, being part of the Internal Regulations of CEN, the following countries are bound to implement this European Standard:

The Standard EN 10 002 will comprise the following parts:

Part 1 : Metallic materials; Tensile test; Method of test (at ambient temperature

Part 2 : Verification of the force measuring system of the testing machine

Part 3 : Metallic materials; Tensile test; Calibration of proving devices used for the verification of uniaxial testing machines

Part 4 : Metallic materials; Tensile test; Verification of extensometers used in uniaxial testing

Part 5 : Metallic materials; Tensile test; Method of test at elevated temperatures.

1 Scope

This European Standard specifies the verification of the force measuring system of tensile testing machines.

This verification shall be preceded by a general inspection of the testing machine (see clause 4).

The dynamic verification of the forces applied by tensile testing machines is excluded from this Standard.

This Standard is not concerned with the verification of extensometers (see EN 10 002-4).

2 Normative References

EN 10002-3 1) Part 3 : Metallic materials - Tensile test : Calibration of force proving instruments used for the verification of uniaxial testing machines.

EN 10002-4 1) Part 4 : Metallic materials - Tensile test - Verification of extensometers used in uniaxial testing.

3 Symbols and definitions

For the purpose of this European Standard the symbols and definitions of table 1 shall apply.

4 General inspection of the testing machine

The verification of the testing machine shall only be carried out if the machine is in good working order. For this purpose, a general inspection of the machine shall be carried out before verification of the force measuring system of the machine (see annex A).

5 Verification of the force-measuring system of the testing machine

5.1 General

This verification shall be carried out for each of the force ranges used and with the most frequently employed force indicator. Accessory devices (slave pointer, recorder) which may affect the force-measuring system shall, where used, be verified in accordance with 5.4.6.

If the testing machine has several force-measuring systems, each system shall be regarded as a separate testing machine. The same procedure shall be followed for double-piston hydraulic machines.

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1) In preparation.

This verification shall be carried out using tension force-proving instruments. For small forces ($\leq$ 500 N)this verification should be carried out with known masses. In the latter case, the value of local acceleration due to gravity shall be recorded in the verification report.

The verification shall, in general, be carried out with a constant indicated force F_i. When this method is not applicable, the verification may be carried out with a constant true force F (see Note).

Note

When the machine allows, all the verifications shall be carried out with a slowly increasing force. The word 'constant' signifies that the same value of F_i (or F) is used for the three series of measurements made (see 5.4.5).

The instruments used for the verification shall have a certified traceability using the International System of Units (SI).

Table 1 Symbols and definitions

Symbol	Unit	Definition
F_N	N	Maximum capacity of the measuring range of the force indicator of the testing machine
F_i	N	Force reading on the force indicator of the testing machine to be verified, with increasing test force
F'_i	N	Force reading on the force indicator of the testing machine to be verified, with decreasing test force
F	N	True force indicated by the force-proving instrument or exerted by the masses, with increasing test force
F'	N	True force indicated by the force-proving instrument or exerted by the masses, with decreasing test force
F_c	N	True force indicated by the force-proving instrument or exerted by the masses, with increasing test force, for the complementary series of measurements for the smallest range which is used
F_{ic}	N	Force reading on the force indicator of the testing machine to be verified, with increasing test force, for the complementary series of measurements for the smallest range which is used.
$\overline{F}_i$, $\overline{F}$	N	Arithmetic mean of several measurements of F_i and F for the same discrete force
$F_{i\,max}$, $F_{i\,min}$ F_{max}, F_{min}	N	Highest or lowest value of F_i or F for the same discrete force
F_{i0}	N	Residual indication on the force indicator of the testing machine to be verified after removal of force
a	%	Relative resolution of the force indicator of the testing machine
b	%	Relative repeatability error of the force measuring system of the testing machine
f_o	%	Relative zero error of the force-measuring system of the testing machine
q	%	Relative accuracy error of the force-measuring system of the testing machine
u	%	Relative error in reversibility of the force-measuring system of the testing machine

The force-proving instruments shall comply with the requirements specified in EN 10 002-3. The class of the instrument shall be equal or better to the class in which the tensile testing machine has been verified. In the case of dead weights, the relative error of the force generated by these weights shall be less than or equal to ± 0.1 %. 2).

The verification shall be carried out at ambient temperature between 10 °C and 35 °C.

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2) The exact equation giving the force F, in newtons created by the dead weights of mass M, in kilograms, is

$$F = Mg_l \left(1 - \frac{d}{D} \right)$$

where

g_l is the local acceleration due to gravity, in metres per second squared;

d is the density of air, in kilograms per cubic metre;

D is the density of the dead weights, in kilograms per cubic metre.

This force shall be calculated using the following approximate formula

$$F = Mg_l$$

The relative error of the force is calculated in this instance using the formula

$$\frac{\Delta F}{F} = \frac{\Delta M}{M} + \frac{\Delta g_l}{g_l}$$

5.2 Determination of the resolution

5.2.1 Analogue scale

The width of the graduation marks on the scale shall be uniform and the width of the pointer (or the width of the trace if a recorder is used) shall be approximately equal to the width of a graduation mark.

The resolution r of the indicator shall be obtained from the ratio between the width of the pointer or the trace and the centre-to-centre distance between two adjacent scale graduation marks (scale interval). The recommended ratios are 1/2, 1/5 or 1/10, a spacing of 2.5 mm or greater being required for the estimation of one-tenth of a scale division.