



SLOVENSKI STANDARD SIST EN ISO 7500-1:2000

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Metallic materials - Verification of static uniaxial testing machines - Part 1:
Tension/compression testing machines (ISO 7500-1:1999)

Metallische Werkstoffe - Prüfung von Prüfmaschinen für statische einachsige
Beanspruchung - Teil 1: Zug - und Druckprüfmaschinen (ISO 7500-1:1999)

Matériaux métalliques - Vérification des machines pour essais statiques uniaxiaux -
Partie 1: Machines d'essai de traction/compression - Vérification et étalonnage du
système de mesure de charge (ISO 7500-1:1999)

Ta slovenski standard je istoveten z: EN ISO 7500-1:1999

ICS:

77.040.10 Mehansko preskušanje kovin Mechanical testing of metals

SIST EN ISO 7500-1:2000

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 7500-1

September 1999

ICS 77.040.10

English version

Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines (ISO 7500-1:1999)

Matériaux métalliques - Vérification des machines pour essais statiques uniaxiaux - Partie 1: Machines d'essai de traction/compression - Vérification et étalonnage du système de mesure de charge (ISO 7500-1:1999)

Metallische Werkstoffe - Prüfung von Prüfmaschinen für statische einachsige Beanspruchung - Teil 1: Zug- und Druckprüfmaschinen (ISO 7500-1:1999)

This European Standard was approved by CEN on 19 August 1999.

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.

This European Standard exists 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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

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EN ISO 7500-1:1999

Foreword

The text of the International Standard ISO 7500-1:1999 has been prepared by Technical Committee ISO/TC 164 "Mechanical testing of metals" in collaboration with Technical Committee ECISS/TC 1 "Steel testing", the secretariat of which is held by AFNOR.

This European Standard supersedes EN 10002-2:1991.

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 March 2000, and conflicting national standards shall be withdrawn at the latest by March 2000.

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

NOTE FROM CEN/CS: The foreword is susceptible to be amended on reception of the German language version. The confirmed or amended foreword, and when appropriate, the normative annex ZA for the references to international publications with their relevant European publications will be circulated with the German version.

Endorsement notice

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The text of the International Standard ISO 7500-1:1999 was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 7500-1

Second edition
1999-09-01

Metallic materials — Verification of static uniaxial testing machines —

Part 1:

Tension/compression testing machines —
Verification and calibration of
the force-measuring system

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*Matériaux métalliques — Vérification des machines pour essais statiques
uniaxiaux —*

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*Partie 1: Machines d'essai de traction/compression — Vérification et
étalonnage du système de mesure de charge*



Reference number
ISO 7500-1:1999(E)

ISO 7500-1:1999(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 7500-1 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 1, *Uniaxial testing*.

This second edition cancels and replaces the first edition (ISO 7500-1:1986) which has been technically revised.

ISO 7500 consists of the following parts, under the general title *Metallic materials — Verification of static uniaxial testing machines*:

- Part 1: *Tension/compression testing machines — Verification and calibration of the force-measuring system*
- Part 2: *Tension creep testing machines — Verification of the applied load*

Annex A forms a normative part of this part of ISO 7500. Annexes B and C are for information only.

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Metallic materials — Verification of static uniaxial testing machines —

Part 1:

Tension/compression testing machines — Verification and calibration of the force measuring system

1 Scope

This part of ISO 7500 specifies the verification of tension/compression testing machines.

The verification consists of:

- a general inspection of the testing machine, including its accessories for the force application;
- a calibration of the force-measuring system.

NOTE This part of ISO 7500 addresses the static verification of the force-measuring systems and the calibration values are not necessarily valid for high-speed or dynamic testing applications. Further information regarding dynamic effects is given in the Bibliography.

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2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 7500. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 7500 are encouraged to investigate the possibility of applying the most recent editions of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 376, *Metallic materials — Calibration of force-proving instruments used for the verification of uniaxial testing machines.*

3 Terms and definitions

For the purposes of this part of ISO 7500, the following term and definition apply.

3.1

calibration

set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards

NOTE 1 The result of a calibration permits either the assignment of values of measurands to the indications or the determination of corrections with respect to indications.

NOTE 2 A calibration may also determine other metrological properties such as the effect of influence quantities.

NOTE 3 The result of a calibration may be recorded in a document, sometimes called a calibration certificate or a calibration report.

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4 Symbols and their meanings

Symbols and their meaning are given in Table 1.

Table 1 — Symbols and their meaning

Symbol	Unit	Meaning
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_0	%	Relative zero error of the force-measuring system of the testing machine
F	N	True force indicated by the force-proving instrument with increasing test force
F'	N	True force indicated by the force-proving instrument with decreasing test force
F_C	N	True force indicated by the force-proving instrument with increasing test force, for the complementary series of measurements for the smallest range which is used
F_i	N	Force indicated by the force indicator of the testing machine to be verified, with increasing test force
F'_i	N	Force indicated by the force indicator of the testing machine to be verified, with decreasing test force
\bar{F}_i, \bar{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_{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
F_{i0}	N	Residual indication of the force indicator of the testing machine to be verified after removal of force
F_N	N	Maximum capacity of the measuring range of the force indicator of the testing machine
g_n	m/s ²	Local acceleration due to gravity
q	%	Relative accuracy error of the force-measuring system of the testing machine
r	N	Resolution of the force indicator of the testing machine
v	%	Relative reversibility error of the force-measuring system of the testing machine
ρ_{air}	kg/m ³	Density of air
ρ_m	kg/m ³	Density of the dead weights

5 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 calibration of the force-measuring system of the machine (see annex A).

NOTE Good metrological practice requires a calibration run prior to any maintenance or adjustments to the testing machine.

6 Calibration of the force-measuring system of the testing machine

6.1 General

This calibration shall be carried out for each of the force ranges used and with all force indicators employed. Any accessory devices (e.g. pointer, recorder) which may affect the force-measuring system shall, where used, be verified in accordance with 6.4.6.

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.

The calibration shall be carried out using force-proving instruments with the following exception. If the force to be verified is below the lower limit of the smallest capacity force proving device used in the calibration procedure, use known masses.

When more than one force-proving instrument is required to calibrate a force range, the maximum force applied to the smaller device shall be the same as the minimum force applied to the next force-proving instrument of higher capacity. When a set of known masses is used to verify forces, the set shall be considered as a single force-proving instrument.

The calibration should be carried out with constant indicated forces, F_i . When this method is not feasible, the calibration may be carried out with constant true forces.

NOTE 1 Calibration may 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 (see 6.4.5).

The instruments used for the calibration shall have a certified traceability to the international system of units.

The force-proving instrument shall comply with the requirements specified in ISO 376. The class of the instrument shall be equal to or better than the class for which the testing machine is to be calibrated. In the case of dead weights, the relative error of the force generated by these weights shall be less than or equal to $\pm 0,1\%$.

NOTE 2 The exact equation giving the force, F , in newtons, created by the dead weight of mass m , in kilograms, is:

$$F = mg_n \left[1 - \frac{\rho_{\text{air}}}{\rho_m} \right] \quad (1)$$

This force can be calculated using the following approximate formula:

$$F = mg_n \quad (2)$$

The relative error of the force can be calculated, using the formula:

$$\frac{\Delta F}{F} = \frac{\Delta m}{m} + \frac{\Delta g_n}{g_n} \quad (3)$$