DIN EN ISO 6892-1

ICS 77.040.10

Supersedes
DIN EN ISO 6892-1:2017-02

Metallic materials – Tensile testing – Part 1: Method of test at room temperature (ISO 6892-1:2019); English version EN ISO 6892-1:2019, English translation of DIN EN ISO 6892-1:2020-06

Metallische Werkstoffe –
Zugversuch –
Teil 1: Prüfverfahren bei Raumtemperatur (ISO 6892-1:2019);
Englische Fassung EN ISO 6892-1:2019,
Englische Übersetzung von DIN EN ISO 6892-1:2020-06

Matériaux métalliques –
Essai de traction –
Partie 1: Méthode d’essai à température ambiante (ISO 6892-1:2019);
Version anglaise EN ISO 6892-1:2019,
Traduction anglaise de DIN EN ISO 6892-1:2020-06

Document comprises 92 pages

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original shall be considered authoritative.

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A comma is used as the decimal marker.

National foreword

This document (EN ISO 6892-1:2019) has been prepared by Technical Committee ISO/TC 164 “Mechanical testing of metals” in collaboration with Technical Committee CEN/TC 459 “ECISS — European Committee for Iron and Steel Standardization” (Secretariat: AFNOR, France).

The responsible German body involved in its preparation was *DIN-Normenausschuss Materialprüfung* (DIN Standards Committee Materials Testing), Working Committee NA 062-01-42 AA “Tensile and ductility testing of metals”.

DIN EN ISO 6892 consists of the following parts, under the general title *Metallic materials — Tensile testing:*

— *Part 1: Method of test at room temperature*

— *Part 2: Method of test at elevated temperature*

— *Part 3: Method of test at low temperature*

— *Part 4: Method of test in liquid helium*

NOTE Part 5 *“Metallic materials — Tensile testing — Part 5: Guideline for testing miniaturised test pieces*” is currently under preparation as a Technical Report at international level.

The DIN documents corresponding to the international documents referred to in this document are as follows:

ISO 377	DIN EN ISO 377
ISO 2566-1	DIN EN ISO 2566-1
ISO 2566-2	DIN EN ISO 2566-2
ISO 3183	DIN EN ISO 3183
ISO 7500-1	DIN EN ISO 7500-1
ISO 9513	DIN EN ISO 9513
ISO 11960	DIN EN ISO 11960
ISO 80000-1	DIN EN ISO 80000-1

For current information on this standard, please go to DIN’s website (www.din.de) and search for the document number in question.

Amendments

This standard differs from DIN EN ISO 6892-1:2017-02 as follows:

a) in Clause 2 “Normative references”, the title of a standard has been corrected;

b) the term “coefficient of determination” has been corrected (“coefficient of determination” instead of “coefficient of correlation”);

c) Formula (1) has been corrected;

d) the wording has been revised in 10.3.2.1;

e) the wording in the key to Figure 9 has been revised;

f) the wording in Table B.2 has been revised;

g) the wording in Table D.3 has been revised;

h) the Bibliography has been corrected;

i) the standard has been editorially revised.

Previous editions

DIN 1602: 1924-06, 1927-04, 1929-08, 1936-03, 1944x-02
DIN DVM A 114: 1935-12
DIN 50112: 1935xx-12
DIN 1605-2: 1936-02
DIN DVM 125 = DIN 50125: 1940-08
DIN 50114: 1944x-01, 1960-07, 1965-12, 1980-12, 1981-08
DIN 50143: 1944-10
DIN 50144: 1944-10
DIN 50125: 1951-04, 1986-03, 1991-04
DIN 50146: 1951-05
DIN 50145: 1952-06, 1975-05
DIN 51210: 1961-08
DIN 50140: 1965-11, 1980-09
DIN 51210-1: 1976-04
DIN 51210-2: 1976-04
DIN EN 10002-1: 1991-04, 2001-12
DIN EN ISO 6892-1: 2009-12, 2017-02

National Annex NA
(informative)

Indices for the percentage elongation after fracture

As a rule, a differentiation is made between proportional and non-proportional test pieces as regards gauge length and percentage elongation after fracture. In the case of proportional pieces, the gauge length L_o is proportional to the square root of the original cross-section S_o (of any geometrical shape, e.g. round, oval, square, rectangular, annular, etc.).

$$L_o = k \times \sqrt{S_o}$$

To ensure comparability with previous data, the coefficient of proportionality has been internationally specified as $k = 5{,}65$. When the percentage elongation has been calculated on the basis of this coefficient of proportionality, no index is added. If another coefficient of proportionality has been used, this is to be indicated in the index to A for the elongation after fracture, e.g. $k = 11{,}3$: elongation after fracture $A_{11,3}$. (The coefficients 5,65 and 11,3 are derived from the conversion of gauge length L_o for circular cross-sections to other cross-sections.)

In the case of non-proportional test pieces, a differentiation is made between three different test piece geometries, according to Annex B:

— original gauge length L_o = 50 mm

— for a test piece width b_o = 12,5 mm

— gauge length L_o = 80 mm

— for a test piece width b_o = 20 mm

— original gauge length L_o = 50 mm

— for a test piece width b_o = 25 mm (JIS Z 2205 test piece)

The gauge length, along with the unit mm, is to be added as an index to the symbol A: e.g. $A_{50\ \mathrm{mm}}$, $A_{80\ \mathrm{mm}}$. Because the unit “mm” is included in the index, it is clear that the number does not refer to the coefficient of proportionality k. A comparison of the indices for percentage elongation in this standard and older standards is given in Table NA.1.

Table NA.1 — Equivalent indices for percentage elongation as specified in previous standards

Percentage elongation as in DIN EN ISO 6892	Gauge length L_o	Simplified formula for L_o for a circular cross-section	Equivalent symbol for percentage elongation acc. to withdrawn standards
A	$L_o = 5{,}65 \times \sqrt{S_o}$	$L_o = 5 \times d_o$	DIN 50145:1975-04: A_5
$A_{11,3}$	$L_o = 11{,}3 \times \sqrt{S_o}$	$L_o = 10 \times d_o$	DIN 50145:1975-04: A_{10}
$A_{50\ \mathrm{mm}}$	$L_o = 50$ mm		DIN 50114:1981-08: $A_{L=50}$
$A_{80\ \mathrm{mm}}$	$L_o = 80$ mm		DIN 50114:1981-08: $A_{L=80}$

National Annex NB
(informative)

Comparison of international symbols used in tensile testing

International symbols used in tensile testing are given in Table NB.1.

Table NB.1 — Comparison of international symbols used in tensile testing

Symbol used in this document	English	French	German	German symbol	Anglo-American symbol	Unit
e	Engineering strain	Allongement conventionnel	Dehnung or technische Dehnung	ε	e	%
R	Engineering stress	Contrainte conventionnelle	Spannung (sometimes. Nennspannung, technische Spannung or Ingenieur-Spannung)	σ	S	MPa
ε	True strain (logarithmic strain)	Déformation vraie	Wahre Dehnung or Umformgrad	φ	ε	–
σ	True stress	Contrainte vraie	Wahre Spannung	k_f	σ or R	MPa

National Annex NC
(informative)

Additional information on the use of extensometer systems for determining the modulus of elasticity according to Annex G

In Annex G, use of special extensometer systems is required for determining the modulus of elasticity. These shall be capable of measuring strain on two opposite sides of the test piece.

Extensometers that are customarily used in standard tensile tests do not have this characteristic. With such systems, the change in length is often determined via the measuring edge on both sides of the test piece, but the change in length of the test piece is not measured independently on both sides.

Compliance with the requirement of Annex G, however, necessitates the use of a system that uses two sensors measuring independently of each other. Measurement and display of the elastic range independently on each side has the added advantage that potential bending stresses or bending strain can be identified when the stress and strain are given separately for each side of the test piece and/or these are compared. In addition, it also makes it possible to reduce these bending stresses or this bending strain by optimizing the testing system as a whole.

Care shall also be taken to ensure that the extensometers are calibrated in the relevant range (e.g. between 5 μm and 200 μm) and the extensometer signals are almost linear.

Suitable systems are generally limited to a maximum change in length of approximately 1 mm, with the result that only very slight strain can be measured, albeit with great precision. In other words, these systems do not generally allow for standard tensile testing with a determination of the percentage elongation after fracture.

Reference is also made to the methods of estimating measuring uncertainty in Annex G, in particular to footnote c in Table G.2.

Additional literature on this topic:

1. Aegerter, J., Borsutzki, M., Knauf, G., Moninger, M.: Ergebnisse eines VDEh-Ringversuches zum Stahl-Eisen-Prüfblatt 1235 "Bestimmung des Elastizitätsmoduls an Stahl im Zugversuch bei Raumtemperatur", Tagungsband "Werkstoffprüfung 2012", Verlag Stahleisen GmbH, Düsseldorf (2012), pp. 65-72, ISBN 978-3-514-00794-9
2. Kühn, H.-J., Aegerter, J., Uhlemann, P.: Bestimmung des Elastizitätsmoduls im einachsigen, Tagungsband "Werkstoffprüfung 2009", Verlag Stahleisen GmbH, Düsseldorf (2009), pp. 137-142, ISBN 978-3-514-00769-7

Additional presentations on this topic:

1. 27.06.2018 in Ulm: Aegerter, J.: Die neue Ausgabe der Metallzugnorm DIN EN ISO 6892-1:2017-02 — Hinweise zu E-Modul, Prüfgeschwindigkeiten und Bruchdehnung, 8. Zwick Roell Metall Symposium
2. 29.09.2015 in Darmstadt: Aegerter, J.: Zugversuchsnorm DIN EN ISO 6892-1: Kennwerte, Prüfgeschwindigkeiten und E-Modulbestimmung — was ändert sich mit der Ausgabe 2016, Werkstofftechnischen Kolloquium, Mess- und Kalibriertechnik, MPA Darmstadt
3. 24.09.2013 in Darmstadt: Aegerter, J.: E-Modulbestimmung mit Messunsicherheit nach dem neuen Anhang G, Werkstofftechnischen Kolloquium, Mess- und Kalibriertechnik, MPA Darmstadt
4. 09.10.2012 in Darmstadt: Aegerter, J.: Ermittlung des Elastizitätsmoduls im Zugversuch, Werkstofftechnischen Kolloquium, Mess- und Kalibriertechnik, MPA Darmstadt

National Annex ND
(informative)

Bibliography

DIN EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

DIN EN ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels*

DIN EN ISO 2566-2, *Steel — Conversion of elongation values — Part 2: Austenitic steels*

DIN EN ISO 3183, *Petroleum and natural gas industries — Steel pipe for pipeline transportation systems*

DIN EN ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

DIN EN ISO 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

DIN EN ISO 11960, *Petroleum and natural gas industries — Steel pipes for use as casing or tubing for wells*

DIN EN ISO 80000-1, *Quantities and units — Part 1: General*

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EUROPEAN STANDARD

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Supersedes EN ISO 6892-1:2016

English Version

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This European Standard was approved by CEN on 12 November 2019.

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