SLOVENSKI STANDARD
SIST EN ISO 16808:2014

01-oktober-2014

Kovinski materiali - Pločevina in trak - Ugotavljanje krivulje dvoosnega diagrama z izboklinskim preskusom optičnih merilnih sistemov (ISO 16808:2014)

Metallic materials - Sheet and strip - Determination of biaxial stress-strain curve by means of bulge test with optical measuring systems (ISO 16808:2014)

Metallische Werkstoffe - Bleche und Bänder - Bestimmung der biaxialen Spannung/Dehnung-Kurve durch einen hydraulischen Tiefungsversuch mit optischen Messsystemen (ISO 16808:2014)

Matériaux métalliques - Tôles et bandes - Détermination de la courbe contrainte-déformation biaxiale par la méthode du renflement avec système de mesure optique (ISO 16808:2014)

Ta slovenski standard je istoveten z: **EN ISO 16808:2014**

ICS:

77.040.10	Mehansko preskušanje kovin	Mechanical testing of metals
77.140.50	Ploščati jekleni izdelki in polizdelki	Flat steel products and semi-products

SIST EN ISO 16808:2014 **en**

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EN ISO 16808

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English Version

Metallic materials - Sheet and strip - Determination of biaxial stress-strain curve by means of bulge test with optical measuring systems (ISO 16808:2014)

Matériaux métalliques - Tôles et bandes - Détermination de la courbe contrainte-déformation biaxiale au moyen de l'essai de gonflement hydraulique avec systèmes de mesure optiques (ISO 16808:2014)

Metallische Werkstoffe - Bleche und Bänder - Bestimmung der biaxialen Spannung/Dehnung-Kurve durch einen hydraulischen Tiefungsversuch mit optischen Messsystemen (ISO 16808:2014)

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EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN ISO 16808:2014) has been prepared by Technical Committee ISO/TC 164 “Mechanical testing of metals” in collaboration with Technical Committee ECISS/TC 101 “Test methods for steel (other than chemical analysis)” the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by January 2015, and conflicting national standards shall be withdrawn at the latest by January 2015.

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The text of ISO 16808:2014 has been approved by CEN as EN ISO 16808:2014 without any modification.

INTERNATIONAL STANDARD

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Metallic materials — Sheet and strip — Determination of biaxial stress-strain curve by means of bulge test with optical measuring systems

Matériaux métalliques — Tôles et bandes — Détermination de la courbe contrainte-déformation biaxiale au moyen de l'essai de gonflement hydraulique avec systèmes de mesure optiques

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 2, *Ductility testing*.

Metallic materials — Sheet and strip — Determination of biaxial stress-strain curve by means of bulge test with optical measuring systems

1 Scope

This International Standard specifies a method for determination of the biaxial stress-strain curve of metallic sheets having a thickness below 3 mm in pure stretch forming without significant friction influence. In comparison with tensile test results, higher strain values can be achieved.

NOTE In this document, the term "biaxial stress-strain curve" is used for simplification. In principle, in the test the "biaxial true stress-true strain curve" is determined.

2 Symbols and abbreviated terms

The symbols and designations used are given in Table 1.

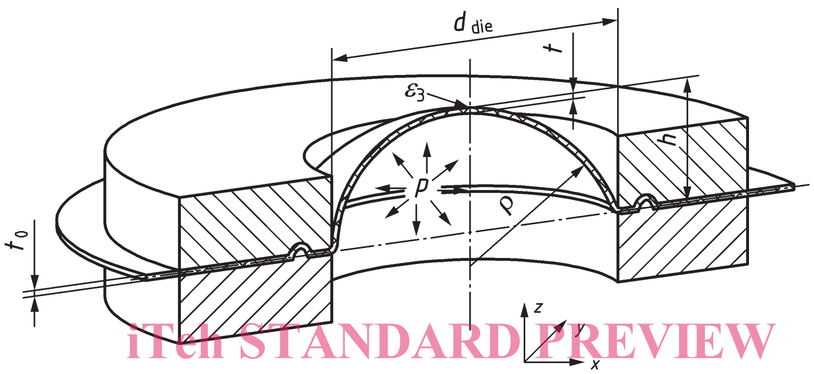
Table 1

Symbol	Designation	Unit
d_{die}	Diameter of the die (inner)	mm
d_{BH}	Diameter of the blank holder (inner)	mm
R_1	Radius of the die (inner)	mm
h	Height of the drawn blank (outer surface)	mm
t_0	Initial thickness of the sheet (blank)	mm
t	Actual thickness of the sheet	mm
p	Pressure in the chamber	MPa
rms	Standard deviation (root mean square)	-
ρ	Radius of curvature	mm
r_1	Surface radius for determining curvature	mm
r_2	Surface radius for determining strain	mm
r_{1_100}	Surface radius to determine curvature with a die diameter of 100 mm	mm
a_i , b_i	Coefficients for response surface	-
σ_B	Biaxial stress	MPa
e	Engineering strain	-
ε_1	Major true strain	-
ε_2	Minor true strain	-
ε_3	True thickness strain	-
ε_E	Equivalent true strain	-
l_s	Coordinate and length of a section	mm
dz	Displacement in the z-direction	mm
dz_{mv}	Displacement after movement correction	mm

3 Principle

A circular blank is completely clamped at the edge in a tool between die and blank holder. A bulge is formed by pressing a fluid against the blank until final fracture occurs (Figure 1). During the test, the pressure of the fluid is measured and the evolution of the deformation of the blank is recorded by an optical measuring system.[1],[2],[3] Based on the recorded deformation of the blank, the following quantities near the centre of the blank are determined: the local curvature, the true strains at the surface, and, by assuming incompressible deformation of the material, the actual thickness of the blank. Furthermore, assuming the stress state of a thin-walled spherical pressure vessel at the centre of the blank, the true stress is calculated from the fluid pressure, the thickness and the curvature radius.

NOTE In addition to the bulge test procedures with optical measurement systems introduced in Reference [1] and described in the following, there are also laser systems[4],[5],[6] or tactile systems[7],[8],[9] valid for bulge test investigation, which are not covered in this International Standard.



Key

h height of the drawn blank (outer surface)

p pressure in the chamber

ε_3 true thickness strain (at the apex of the dome)

d_{die} diameter of the die (inner)

ρ radius of curvature

t_0 initial thickness of the sheet (blank)

t actual thickness of the sheet

Figure 1 — Principle of the bulge test

The coordinate origin shall be in the centre of the blank holder. The XY-plane should be parallel to the surface of the blank holder (parallel to the clamped metal sheet before forming). Herein, the *x*-direction corresponds to the rolling direction. The *z*-direction shall be normal to the clamped metal sheet before forming, with the positive direction towards the optical sensor.

4 Test equipment

4.1 The bulge test shall be carried out on a machine equipped with a die, a blank holder and a fluid chamber. The proposed equipment is illustrated in Figure 2.

