
**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 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
r_{ms}	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