

**Metallmaterjalid. Katusekatted ja sise- ja välisseina
kattematerjalid. Stantsimiskõverate määramine.
Osa 1: Stantsimisdiagrammide koostamine ja
kohaldamine stantsimistöökodades**

Metallic materials - Sheet and strip - Determination of
forming-limit curves - Part 1: Measurement and
application of forming-limit diagrams in the press shop

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN ISO 12004-1:2008 sisaldab Euroopa standardi EN ISO 12004-1:2008 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 15.12.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 15.10.2008.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN ISO 12004-1:2008 consists of the English text of the European standard EN ISO 12004-1:2008.

This standard is ratified with the order of Estonian Centre for Standardisation dated 15.12.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 15.10.2008.

The standard is available from Estonian standardisation organisation.

ICS 77.040.10

Võtmesõnad:

Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
Aru 10 Tallinn 10317 Eesti; www.evs.ee; Telefon: 605 5050; E-post: info@evs.ee

English Version

Metallic materials - Sheet and strip - Determination of forming-limit curves - Part 1: Measurement and application of forming-limit diagrams in the press shop (ISO 12004-1:2008)

Matériaux métalliques - Tôles et bandes - Détermination des courbes limites de formage - Partie 1: Mesurage et application des diagrammes limites de formage dans les ateliers d'emboutissage (ISO 12004-1:2008)

Metallische Werkstoffe - Bleche und Bänder - Bestimmung der Grenzformänderungskurve - Teil 1: Messung und Anwendung von Grenzformänderungsdiagrammen in Stanzereien (ISO 12004-1:2008)

This European Standard was approved by CEN on 12 October 2008.

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 CEN Management Centre 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Foreword

This document (EN ISO 12004-1:2008) has been prepared by Technical Committee ISO/TC 164 "Mechanical testing of metals" in collaboration with Technical Committee ECISS/TC 1 "Steel - Mechanical testing" 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 April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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

Endorsement notice

The text of ISO 12004-1:2008 has been approved by CEN as a EN ISO 12004-1:2008 without any modification.

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
2 Symbols and abbreviated terms	1
3 Principle.....	1
4 Test conditions.....	2
5 Procedure	2
6 Interpretation of results.....	3
7 Test report	3
Annex A (informative) Modification to forming-limit curves.....	5
Annex B (informative) Examples of grid patterns currently in use.....	6
Bibliography	8

Introduction

A forming-limit diagram (FLD) is a diagram containing measured major/minor strain points on a formed part.

An FLD can distinguish between safe and necked, or failed, points. The transition from safe to failed points is defined by the forming-limit curve (FLC).

To determine the forming limit of materials, two different methods are possible.

- 1) Strain analysis of failed press shop components to determine component and process dependent FLCs:

In the press shop, strain paths to reach these points are generally not known. Such an FLC depends on the material, the component and the chosen forming conditions. This method is described in this part of ISO 12004.

- 2) Determination of FLCs under well-defined laboratory conditions:

For evaluating formability, one unique FLC for the defined material is necessary. The determination of FLC has to be specific and it is necessary to use different linear strain paths. This method should be used for material characterization as described in ISO 12004-2.

Metallic materials — Sheet and strip — Determination of forming-limit curves —

Part 1:

Measurement and application of forming-limit diagrams in the press shop

1 Scope

This part of ISO 12004 provides guidelines for developing forming-limit diagrams and forming-limit curves for metal sheets and strips of thicknesses from 0,3 mm to 4 mm.

2 Symbols and abbreviated terms

The symbols used in forming-limit diagrams are specified in Table 1, and examples of grid patterns used are given in Annex B.

Table 1 — Symbols and definitions

Symbol	Definition	Unit
t_0	Thickness of test piece	mm
l_0	Original gauge length of grid pattern	mm
l_1	Final length in major strain direction	mm
l_2	Final length at 90° to major strain direction	mm
e	Engineering strain	%
e_1	Major engineering strain	%
e_2	Minor engineering strain (90° to major)	%
FLD	Forming-limit diagram	—
FLC	Forming-limit curve	—

3 Principle

A pattern of precise gauge lengths of appropriate size is applied to the flat surface of a metal sheet test piece, then the test piece is formed until fracture, and the percent change in the gauge length in the major direction and in the minor strain direction at 90° to this is measured in order to determine the forming-limit under the imposed strain conditions. A number of repeated tests under varying strain conditions are carried out to provide data for the forming-limit curve (FLC) for the material when these limiting strains are plotted on the forming-limit diagram (FLD) (see Figure 1).