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

Part 1:

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

*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*



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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 2.

The main task of technical committees is to prepare International Standards. 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.

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

ISO 12004-4 was prepared by Technical Committee ISO/TC 164, *Mechanical testing of metals*, Subcommittee SC 2, *Ductility testing*.

This first edition of ISO 12004-1, together with ISO 12004-2, cancels and replaces ISO 12004:1997 which has been technically revised.

ISO 12004 consists of the following parts, under the general title *Metallic materials — Sheet and strip — Determination of forming-limit curves*:

- *Part 1: Measurement and application of forming-limit diagrams in the press shop*
- *Part 2: Determination of forming-limit curves in the laboratory*

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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.