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Safety of machinery — Relationship with ISO 12100 —

Part 3: Implementation of ergonomic principles in safety standards

Sécurité des machines — Relation avec l'ISO 12100 —

Partie 3: Mise en oeuvre des principes ergonomiques dans les normes de sécurité

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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.

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

The committee responsible for this document is ISO/TC 199, *Safety of machinery*.

ISO/TR 22100 consists of the following parts, under the general title *Safety of machinery — Relationship with ISO 12100*:

— *Part 1: How ISO 12100 relates to type-B and type-C standards*

— *Part 2: How ISO 12100 relates to ISO 13849-1*

— *Part 3: Implementation of ergonomic principles in safety standards*

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Introduction

The primary purpose of this document is to provide designers with an overall framework and guidance for decisions about ergonomic aspects during the development of machinery, to help them design machines that are safe for their intended use. As mentioned in ISO 12100:2010, 6.2.8, failure to follow ergonomic principles in design can result in the inadequate adaptation of machines to the capacities and skills of the intended user population and hence place their health or safety at risk.

ISO 12100 describes an iterative process to reduce risks. This document describes the main ergonomic factors influencing the safety of machinery and gives a framework for incorporating them into this design process.

Mental (cognitive) aspects are also to be considered. For example, machines which are operated in an inappropriate manner or whose control devices are not clearly identifiable can lead to human error.

This document is intended to guide users to make effective use of ergonomics standards within the context of machinery design.

This document will help both ergonomics and machinery standards writers to incorporate the structure specified in ISO Guide 78.

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Safety of machinery — Relationship with ISO 12100 —

Part 3: Implementation of ergonomic principles in safety standards

1 Scope

This document describes the main ergonomic risk factors influencing the safety of machinery and gives a framework for incorporating them into the design of machines by the integration of important ergonomic principles relating to:

— avoiding stressful postures and movements during use of the machine;

— designing machines, and more especially hand-held and mobile machines, which can be operated easily;

— avoiding as far as possible noise, vibration, thermal effects;

NOTE 1 The health effects of noise, vibration and adverse thermal conditions are well-known and are not addressed here. However environmental factors can interact with machine design and risks arising from such influences are addressed in this document.

— avoiding linking the operator's working rhythm to an automatic succession of cycles;

— providing local lighting on or in the machine;

NOTE 2 Lighting of the machine or of the surrounding workplace by the machine can have a significant impact on the safety of machine operation and this risk is addressed by this document.

— selecting, locating and identifying manual controls (actuators) so that they are clearly visible and identifiable and appropriately marked where necessary;

— selecting, designing and locating indicators, dials and visual display units.

The approach is based on ISO 12100 with its iterative process to identify significant hazards and reduce risks.

Relevant steps of this iterative process have been adapted to include ergonomic principles, and practical guidance is given to apply standards dealing with ergonomics which are relevant for machinery design.

This document is intended for use by standards writers and designers of machinery. It can be used when no relevant C-type standards are available.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
ergonomics
study of human factors
scientific discipline concerned with the understanding of interactions among human and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance

[SOURCE: ISO 6385:2004, 2.3]

3.2
ergonomic hazard
hazard arising from the failure to adequately consider ergonomic principles in machine design

Note 1 to entry: For ergonomic hazards see also ISO 12100:2010, Table B.1, No. 8.

4 Strategy for risk assessment and risk reduction in relation to ergonomic hazards

4.1 General

The risk assessment process carried out by designers in accordance with ISO 12100:2010, Clause 5, provides information that is required for the risk evaluation through which decisions can be taken whether risk reduction is necessary. These decisions have to be supported by a qualitative or, where appropriate, a quantitative estimation of the risk identified. This is to be met by taking into account both the risks normally considered in machine design, and those arising from failing to consider the principles of ergonomics.

Figure 1 shows a schematic representation of the risk reduction process, derived from ISO 12100:2010, which illustrates how ergonomics can be integrated into the iterative three-step risk reduction process (including references to the relevant clauses in this document).

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