SLOVENSKI STANDARD
SIST EN ISO 9921:2004

01-junij-2004

Ergonomija – Ocena govorne komunikacije (ISO 9921:2003)

Ergonomics - Assessment of speech communication (ISO 9921:2003)

Ergonomie - Beurteilung der Sprachkommunikation (ISO 9921:2003)

Ergonomie - Evaluation de la communication parlée (ISO 9921:2003)

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Ergonomics - Assessment of speech communication (ISO 9921:2003)

Ergonomie - Evaluation de la communication parlée (ISO 9921:2003)

Ergonomie - Beurteilung der Sprachkommunikation (ISO 9921:2003)

This European Standard was approved by CEN on 1 October 2003.

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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 Management Centre has the same status as the official versions.

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Foreword

This document (EN ISO 9921:2003) has been prepared by Technical Committee ISO/TC 159 "Ergonomics" in collaboration with Technical Committee CEN/TC 122 "Ergonomics", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2004, and conflicting national standards shall be withdrawn at the latest by April 2004.

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

Endorsement notice

The text of ISO 9921:2003 has been approved by CEN as EN ISO 9921:2003 without any modifications.

INTERNATIONAL STANDARD

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Ergonomics — Assessment of speech communication

Ergonomie — Évaluation de la communication parlée

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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 9921 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 5, *Ergonomics of the physical environment*.

This first edition of ISO 9921 cancels and replaces ISO 9921-1:1996.

Introduction

The aim of standardization in the field of the ergonomic assessment of speech-communication is to recommend the levels of speech-communication quality required for conveying comprehensive messages in different applications. The quality of speech communication is assessed for the following cases:

— warning of hazard;

— warning of danger;

— information messages for work places, public areas, meeting rooms, and auditoria.

For some applications, direct communication between humans is considered while, in others, the use of electro-acoustic systems (e.g. PA systems) or personal communication equipment (e.g. telephone, intercom) will be the most convenient means of informing and instructing or exchanging information.

The use of auditory warning symbols other than speech is not included in this International Standard but is covered by ISO 7731.

Acoustical danger and warning signals are in general omni-directional and therefore may be universal in many situations. Auditory warnings are of great benefit in situations where smoke, darkness or other obstructions interfere with visual warnings.

It is essential that, in the case of verbal messages, a sufficient level of intelligibility is achieved, in the coverage area. If this cannot be achieved, non-voice warning signals (see ISO 7731, IEC 60849 and [4] in the Bibliography) or visual warning signals (see ISO 11429) may be preferable.

If acoustical signals are too loud, hearing damage or environmental problems may occur (e.g. noise nuisance to dwellings near railway platforms, road traffic, airports, etc.). Good design can minimize these negative aspects. In addition, prediction methods with sufficient accuracy are useful for consultants, suppliers and end-users and may thus reduce costs of necessary adjustments after installation of a system.

The communications might be directly between humans, through public address or intercom systems or by pre-recorded messages. In general, text-to-speech systems are not recommended because of the low intelligibility of these systems.

It is recognized that, in a general-purpose document, simple to apply and easily available tools for prediction and assessment should be described, as well as more sophisticated advanced technological methodologies.

Ergonomics — Assessment of speech communication

1 Scope

This International Standard specifies the requirements for the performance of speech communication for verbal alert and danger signals, information messages, and speech communication in general. Methods to predict and to assess the subjective and objective performance in practical applications are described and examples are given.

In order to obtain optimal performance in a specific application, three stages can be considered:

a) specification of the application and definition of the corresponding performance criteria;

b) design of a communication system and prediction of the performance;

c) assessment of the performance for *in situ* conditions.

The use of auditory warning signals other than speech is not included in this International Standard but is covered by ISO 7731.

2 Normative references

The following referenced documents are indispensable for the application 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/TR 4870:1991, *Acoustics — The construction and calibration of speech intelligibility tests*

IEC 60268-16:1998, *Sound system equipment — Part 16: Objective rating of speech intelligibility by speech transmission index*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
alarm
warning of existing or approaching danger

3.2
danger
risk of harm or damage

3.3
effective signal-to-noise ratio
measure to express the (combined) effect of various types of distortions on the intelligibility of a speech signal in terms of the effect of a masking noise resulting in a speech signal having the same intelligibility

3.4
emergency
imminent risk or serious threat to persons or property

3.5
Lombard effect
spontaneous increase of the vocal effort induced by the increase of the ambient noise level at the speaker's ear

3.6
non-native speaker
person speaking a language which is different from the language that was learned as the primary language during the childhood of the speaker

3.7
speech communication
conveying or exchanging information using speech, speaking, hearing modalities, and understanding

NOTE Speech communication may involve brief texts, sentences, groups of words and/or isolated words.

3.8
speech communicability
rating of the ease with which speech communication is performed

NOTE Speech communicability includes speech intelligibility, speech quality, vocal effort, and delays.

3.9
speech intelligibility
rating of the proportion of speech that is understood

NOTE Speech intelligibility is usually quantified as the percentage of a message understood correctly.

3.10
speech intelligibility index
SII
objective method for prediction of intelligibility based on the Articulation Index

NOTE See [1] in the Bibliography.

3.11
speech interference level
SIL
difference between A-weighted speech level and the arithmetic average of sound-pressure levels of ambient noise in four octave bands with central frequencies of 500 Hz, 1 000 Hz, 2 000 Hz and 4 000 Hz

3.12
speech quality
rating of sound quality of a speech signal

NOTE Speech quality characterizes the amount of audible distortion of a speech signal and is usually rated by a description.

3.13
speech transmission index
STI
objective method for prediction and measurement of speech intelligibility

3.14
vocal effort
exertion of the speaker, quantified objectively by the A-weighted speech level at 1 m distance in front of the mouth and qualified subjectively by a description