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**Ergonomska načela v zvezi s psihičnimi obremenitvami - 2. del: Načela za načrtovanje (ISO/DIS 10075-2:2023)**

Ergonomic principles related to mental workload - Part 2: Design principles (ISO/DIS 10075-2:2023)

Ergonomische Grundlagen bezüglich psychischer Arbeitsbelastung - Teil 2: Gestaltungsgrundsätze (ISO/DIS 10075-2:2023)

Principes ergonomiques relatifs à la charge de travail mentale - Partie 2 : Principes de conception (ISO/DIS 10075-2:2023)

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## Ergonomic principles related to mental workload —

### Part 2: Design principles

*Principes ergonomiques relatifs à la charge de travail mentale —**Partie 2: Principes de conception*

ICS: 13.180

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# Contents

	Page
Foreword.....	v
Introduction.....	vi
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>1</b>
<b>3 Terms and definitions.....</b>	<b>1</b>
<b>4 Design principles.....</b>	<b>2</b>
4.1 General principles.....	2
4.2 Guiding principles in relation to work organisation.....	3
4.2.1 Perform system design reviews and include prospective risk assessment.....	3
4.2.2 Individual's and team's related objectives.....	3
4.2.3 Extended reachability.....	4
4.2.4 Flexibility in time allocation.....	4
4.2.5 Definition of the scope and character of work services.....	4
4.2.6 Duration of working hours.....	5
4.2.7 Time off between successive work days or shifts.....	5
4.2.8 Time of day.....	6
4.2.9 Shift work.....	6
4.2.10 Breaks and rest pauses.....	7
4.3 Guiding principles in relation to working task.....	7
4.3.1 Operating strategies.....	7
4.3.2 Continuous time constraints.....	8
4.3.3 Flexibility of decision making.....	8
4.3.4 Ambiguity of task goals.....	9
4.3.5 Complexity of task requirements.....	9
4.3.6 Time sharing.....	10
4.3.7 Dimensionality of motor performance.....	10
4.3.8 Mental models.....	10
4.3.9 Parallel vs. serial processing.....	11
4.3.10 Decision support.....	11
4.3.11 Sustained attention.....	12
4.4 Guiding principles in relation to job.....	12
4.4.1 Social Interaction.....	12
4.4.2 Dependencies on others' task performance.....	13
4.4.3 Identical task requirements.....	13
4.4.4 Confidential Communication.....	13
4.4.5 Changes in task-related activities with different demands or kinds of mental workload.....	14
4.5 Guiding principles in relation to work equipment and interfaces.....	14
4.5.1 Design the socio-technical system transparent for the user.....	14
4.5.2 Re-evaluate after adopting an assistance system to an existing system.....	15
4.5.3 Time lag.....	15
4.5.4 Adequacy of information.....	15
4.5.5 Ambiguity of information.....	16
4.5.6 Signal discriminability.....	16
4.5.7 Redundancy.....	16
4.5.8 Compatibility.....	17
4.5.9 Accuracy of information processing.....	18
4.5.10 Controllability.....	18
4.5.11 Control dynamics.....	18
4.5.12 Tracking requirements.....	19
4.5.13 Error tolerance.....	19
4.5.14 Adjust system design.....	20
4.5.15 Anticipate shifts in operating states and potential consequences.....	20

**ISO/DIS 10075-2:2023(E)**

4.5.16	Coupling in human-machine arrangements.....	20
4.5.17	Adaptable and adaptive human-automation interaction.....	21
<b>5</b>	<b>Information and training.....</b>	<b>21</b>
<b>Annex A</b>	<b>(informative) Examples of design solutions.....</b>	<b>23</b>

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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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 1, *General ergonomic principles*.

This third edition cancels and replaces the second edition (ISO 10075-2:1996), which has been technically revised.

The main changes are as follows:

- The structure of the standard is based on working conditions and no longer on strain consequences. All guidelines are formulated positively and are divided into three parts, namely justification, design principles and examples.

A list of all parts in the ISO 10075 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## ISO/DIS 10075-2:2023(E)

### Introduction

This part of ISO 10075 represents an extension of ISO 6385, providing design principles for work systems with special reference to mental workload as defined in ISO 10075-1.

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# Ergonomic principles related to mental workload —

## Part 2: Design principles

### 1 Scope

This document gives guidance on the design of work systems, including task and equipment design (comprising robotics and intelligent autonomous systems) and design of the workplace, as well as working conditions with the inclusion of social and organisational factors, emphasizing mental workload and its effects, as specified in ISO 10075-1. It applies to the adequate design of work and use of human capacities, with the intention to provide for optimal working conditions with respect to health and safety, well-being, performance, and effectiveness, preventing over- as well as underload, in order to avoid the impairing effects and to foster the facilitating effects described in ISO 10075-1.

Mental workload is the effect of a complex interaction of individual, technical, organizational and social factors. Thus personnel, technical, organizational and social factors and the effects of their interactions have to be taken into account in the design of work systems. However, this document includes the design of technical, organizational and social factors only and does not apply to problems of selection or training.

This document provides guidelines for system design. It does not address problems of measurement of mental workload or its effects.

This document refers to all kinds of human work activities (see ISO 10075-1), not only to those which would be described as cognitive or mental tasks in a restricted sense, but also to those with primarily physical workload.

This document is thus relevant to all those engaged in the design and use of work systems, e.g. system and equipment designers, employers' and workers' representatives.

This document is applicable to the design of new work systems as well as to the redesign of existing ones undergoing substantial revision.

### 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 6385, *Ergonomics principles in the design of work systems*

ISO 10075-1, *Ergonomic principles related to mental work-load — Part 1: General terms and definitions*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6385 and ISO 10075-1 apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

## ISO/DIS 10075-2:2023(E)

### 4 Design principles

#### 4.1 General principles

In order to avoid impairing effects and to foster facilitating effects of work system design on users, it is necessary to fit the work system to the user. The guidelines given in this document are recommendations concerning human-factor/ergonomic-related work design. Designing or redesigning work systems requires taking into account people, technology, organizational and social conditions and their interaction right from the beginning, e. g. when planning work systems. This means that ergonomists should be integrated into the design process as early as possible. If there are users, as in system redesign, their experiences and competences should be integrated into the design or redesign process in order to achieve and verify an optimal level of design quality. This can be done by using methods of participation, by which user expectations and needs with respect to design quality can be incorporated into the design process. This will provide for user-oriented results and better acceptance on the side of the user, which will contribute to the efficiency of the work system as a whole. Furthermore, feedback mechanisms are useful to enable the workers help the designer to continuously improve the design, taking into account new situations or problems. If the design is made for an entirely new system, the designer should take due account of the abilities, skills, experiences, expectations and needs of the prospective user population. It should be kept in mind that training should be regarded as supporting work system design, not as a replacement for system design omissions leading to sub-optimal design.

This concern for the user is necessary from the beginning of the design process when system functions are specified. Defining system functions and subfunctions as well as function allocation between workers and technical systems and between different workers requires consideration of the characteristics of the people involved.

In designing work systems, it should be kept in mind that work consists of a combination of tasks, which are executed with particular technical equipment in a particular work environment, in a particular organizational and social structure. Therefore, each of these components offers opportunities to influence the design of the work system with regard to mental workload.

Design principles can thus be related to different levels of the design process and the design solution in order to influence:

- a) the intensity of the workload:
  - at the task and/or job level,
  - at the level of technical equipment,
  - at the environmental level,
  - at the organizational and social level, and
- b) the duration of the exposure to the workload:
  - at the level of the temporal organization of work.

[Table A.1](#) in [Annex A](#) shows a matrix of the levels of the design process and their relation to the consequences of mental strain, together with examples of applicable design solutions.

Personal factors, like abilities, performance capacities, motivation — on an inter-individual as well as on an intra-individual differences' basis — will influence the resulting workload. Thus, selection and training, as mentioned above, have to be taken into account appropriately in the design of work systems.

Work system design starts with a function analysis of the system, followed by function allocation among worker and technical system, task analysis, and results in task design and allocation to the worker. It is essential that human factors experts are integrated into this process from the beginning in order to be able to perform these steps with a view to the resulting design requirements, in particular with respect to mental workload. Such a procedure will reveal the appropriate requirements to be taken into account at each level of system design.

In designing work systems, it should further be kept in mind that environmental requirements, system demands, challenges and people themselves change over time; with the latter e.g. developing skills, abilities and expectations. This means that systems design should provide for such changes, enabling the system to adapt to these evolving requirements. This can be done for example by dynamic task allocation, allowing the worker to allocate tasks to the technical system or to the worker, depending on the actual state of the worker.

Mental workload is not a one-dimensional concept but has different qualitative aspects leading to different qualitative effects (see ISO 10075-1). It is thus not sufficient to simplistically consider workload ranging on a unitary dimension (quantitatively) from underload to optimal load to overload. Some of the impairing effects of mental workload share common causes, although the effects are different. The presentation of the following guidelines has thus been organized according to the components in work system design in ISO 6385 and referring to impairing and fostering effects as described in ISO 10075-1. This should help the designer to take appropriate measures to avoid impairing effects and to foster facilitating effects of mental workload. Since some of the principles apply to more than one of these effects, principles can be repeated. Since some of the principles address more than one component of a work system there can be adjustment across components.

## 4.2 Guiding principles in relation to work organisation

### 4.2.1 Perform system design reviews and include prospective risk assessment

#### 4.2.1.1 Justification

The evaluation of work processes at various stages of development allows for adjustments. The focus should always be human-centred, since latent or occasional impairments due to working conditions can result in reasonably foreseeable misuse, fatigue and stress responses during worker task performance.

#### 4.2.1.2 Guidelines

The designer should:

- Perform system design reviews.
- Assess dynamics and variability of health and safety risks during system design.
- Include in design reviews the system life cycle, potential system states, contexts of use, risks by system wear and tear, and reasonably foreseeable misuse.

#### 4.2.1.3 Example

A building originally designed as production is to be used as office or coworking space. Work in offices and production have different illumination requirements. Due to the different original purpose of use, illumination for office use is suboptimal with regard to natural illumination and artificial illumination design.

### 4.2.2 Individual's and team's related objectives

#### 4.2.2.1 Justification

Objectives shall be reachable within regular working hours because otherwise the worker can experience mental fatigue, stress response or burnout.

#### 4.2.2.2 Guidelines

The designer should:

- Define individual's and team's work-related objectives consistently and attainably.

**ISO/DIS 10075-2:2023(E)**

- Enable worker participation in setting objectives and give support for achieving it if necessary.

NOTE Common criteria follow the Criteria: “SMARTER” (Specific-Measurable-Achievable-Reasonable-Timely-Ethical)

**4.2.2.3 Examples**

A nursing goal following the SMARTER criteria could be that a particular patient consumes at least 1,5 litres of fluid every day starting on a certain date, and this goal is reviewed daily.

At a financial bank a worker shall finish a fixed number of financial transactions (e. g. funds) monthly. Every month this objective is reviewed by the worker and employer regarding the attainability.

**4.2.3 Extended reachability****4.2.3.1 Justification**

If workers are available outside working hours fatigue and burnout can occur.

**4.2.3.2 Guideline**

The designer should:

- Provide rules for extended reachability which are clearly agreed, communicated and documented.

**4.2.3.3 Example**

Define times of non-availability, ignore certain calls, separate mail accounts into private and professional, automatic mail sorting, disable notification functions.

**4.2.4 Flexibility in time allocation****4.2.4.1 Justification**

In interaction work, the worker should be able to satisfy the needs of the interaction partner (e.g. patients, clients) in the given situation otherwise, fatigue or burnout can result.

**4.2.4.2 Guideline**

The designer should:

- Ensure that work systems allow flexibility in the time allocated to any task, especially those requiring social interaction.

**4.2.4.3 Example**

A certain proportion of the daily working time could be set aside for disposable as well as demand-oriented interaction times.

**4.2.5 Definition of the scope and character of work services****4.2.5.1 Justification**

If there are no definitions and clear descriptions of roles, the expectations between workers, clients, management can differ and unnecessary work can result for the persons involved leading to stress response and satiation.