

# SLOVENSKI PREDSTANDARD

# oSIST prEN ISO 11064-5:2007

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**Ergonomsko načrtovanje krmilnih centrov – 5. del: Prikazovalniki in kontrolniki (ISO/DIS 11064–5:2006)**

**(istoveten prEN ISO 11064-5:2006)**

Ergonomic design of control centres - Part 5: Displays and controls (ISO/DIS 11064-5:2006)

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## Ergonomic design of control centres -- Part 5: Displays and controls (ISO/DIS 11064-5:2006)

Conception ergonomique des centres de commande -  
Partie 5: Dispositifs d'affichage et commandes (ISO/DIS  
11064-5:2006)

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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## **Foreword**

This document (prEN ISO 11064-5:2006) 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 document is currently submitted to the parallel Enquiry.

### **Endorsement notice**

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## Ergonomic design of control centres —

### Part 5: Displays and controls

*Conception ergonomique des centres de commande —*

*Partie 5: Dispositifs d'affichage et commandes*

ICS 13.180

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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 3.

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 part of ISO 11064 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11064-5 was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 4, *Ergonomics of human-system interaction*.

ISO 11064 consists of the following parts, under the general title *Ergonomic design of control centres*:

- *Part 1: Principle for the design of control centres*
- *Part 2: Principles of control suite arrangement*
- *Part 3: Control room layout*
- *Part 4: Workstation layout and dimensions*
- *Part 5: Displays and controls*
- *Part 6: Environmental requirements for control rooms*
- *Part 7: Principles for the evaluation of control centres*

*Annexes A and B of this part of ISO 11064 are for information only.*



## Introduction

This Part presents principles and processes to be adopted when designing the human system interface. These interface considerations are relevant for operators, supervisors and maintainers of systems. This Part of ISO 11064 is intended for use by such individuals as project managers, purchasers, systems designers & specifiers and those developing operator interfaces.

The purpose of Part 5 is to maximize the safe, reliable, efficient, and comfortable use of displays and controls in control centre applications. For this reason, rules and recommendations based upon ergonomic findings are established for:

- selection of the appropriate display and control types
- structuring and presentation of information on screens and shared off-workstation displays.
- establishing control and dialogue procedures

This standard focuses on the main principles for the selection, design and implementation of controls, displays and human system interactions for operation and supervision. The wide range of application of control and displays in control rooms, and the fast changes in technology, make it impracticable to provide requirements meeting all situations. The approach adopted by this standard has been to identify general principles of good practice that should be supported by information accessed from human factors publications and other ergonomics standards.

The usage of displays and controls in Control Centres differs from that typically found in offices and other non-control situations. Control Centre activities are characterised by:

- being driven by externally controlled events occurring within the process,
- requiring an appropriate human response in real time. (human reactions that are inadequate or too late may cause environmental damage, serious personal injury (e.g., safety critical situations), equipment damage, lost production, decreased output quality or pollution of the environment)
- controlling the dynamic behaviours of high energy or hazardous physical and chemical processes.
- involving information derived from a variety of sources
- including the monitoring of many complex process variables typically presented via multiple parallel visual and auditory devices
- involving team-work with resources both within and outside the control room.

For these reasons, the standards required in a control environment may have to be more stringent than those in the typical office environment (i.e., ISO 9241). This Part 5 of ISO 11064 defines principles and specifies requirements on the proper application of process related displays and controls for the undertaking of control room functions.

The application of this standard should be to the benefit to operators and operating companies, equipment buyers, interface designers, manufacturers of displays and controls, and engineering firms. In summary these benefits include:

- to operators and operating companies  
Communication between operators and equipment will be more uniform across plants to which this standard is applied. This may reduce training burdens and facilitate job rotations. Operator stress, and situation-induced operator errors, may be reduced thus improving operator efficiency and job satisfaction.
- to the buyer of equipment  
The buyer has standard criteria to use in judging and selecting any man-machine interface under consideration and the material can be included in procurement requirements. Tighter control of procurement offers a reduction of risk to project managers.
- to manufacturers of displays and controls  
The standard provides an agreed baseline from which manufacturers can develop and/or offer products.
- to engineering firms  
Engineering firms or departments can reference a common set of guidelines and principles in the selection and application of displays and controls to fit their particular needs. Part 5 also offers engineers and product developers advice in the design of displays and controls.

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# Ergonomic design of control centres —

## Part 5: Displays and controls

### 1 Scope

This International Standard establishes requirements that shall, and recommendations that should, be met by displays, controls and interaction in the design of control room hardware and software.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of ISO 11064-5. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on ISO 11064-5 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ISO 7000: *Graphical symbols for use on equipment — Index and synopsis*

ISO 8995: *Principles of visual ergonomics — The lighting of indoor work systems*

ISO 9241: *Ergonomic requirements for office work with visual display terminals (VDT's)*

— Part 3: Visual Display Requirements

— Part 12: Ergonomic requirements for the presentation of information

These are 'generic' Parts (i.e. not influenced by differences in task, organisation or environment in control rooms or offices respectively) and therefore also applicable to control centres. The following Parts are not applicable in their entirety but contain some requirements of relevance to control rooms:

— Part 4: Keyboard requirements

— Part 9: Non-keyboard input devices

— Part 10: Dialogue principles

— Part 11: Guidance on usability

ISO 9355: (identical EN 894): *Ergonomic requirements for the design of displays and control actuators*

— Part 1: Human interactions with displays and control actuators

— Part 2: Displays

— Part 3: Control actuators

— Part 4: Location and arrangement of displays and control actuators

ISO/FDIS 14915, Parts 1-3: Software Ergonomics for Multi-media User Interfaces.

### 3 Definitions

For the purpose of this part of the International Standard, the following definitions apply:

#### 3.1

##### **alarm**

alarms are high priority alerts used to attract the operator's attention to important deviations or abnormal events in system operation

#### 3.2

##### **alert**

an alert is the method by which operators are notified of system events requiring a reaction or response

#### 3.3

##### **analogue display**

display in which the status information is shown as a function of length, angle or other dimension. In the case of visual displays, the information may be shown as a function of pointer deflection, length of a bar graph, or similar visual quantity. (ISO 9355-2)

EXAMPLE A physical variable (e.g., temperature) is represented by a bar. Its length corresponds to the current value of the variable.

#### 3.4

##### **brightness**

attribute of visual sensation associated with the amount of light emitted from a given area. It is the subjective correlate of luminance, ISO 8995

#### 3.5

##### **code**

technique for representing information by a system of alphanumeric characters, graphical symbols or visual techniques (e.g. font, colour or highlighting) ISO 9241-12

#### 3.6

##### **coding**

procedure within the design process by which categories of information are allocated to elements of a code alphabet

NOTE Examples for categories of information are:

- Operation modes of machines (i.e. ON, OFF, standby, in alarm).
- Kinds of media within the pipes or vessels of a plant.

Examples of codes include alphabets, shape, colour and size.

#### 3.7

##### **control**

- a) purposeful action to affect an intended change in the system or equipment. (see also "process control"

EXAMPLE Adjusting set-point, changing the operation mode from ON to OFF.

- b) Device that directly responds to an action of the operator, e.g. by the operator applying pressure.

EXAMPLE Push buttons, mice, track balls.

**3.8****control room operator**

an individual whose primary duties relate to the conduct of monitoring and control functions, usually at a control workstation, either on their own or in conjunction with other personnel both within the control room or outside, (11064–3)

**3.9****control workstation**

a single or multiple working position, including all equipment such as computers and communication terminals and furniture at which control and monitoring functions are conducted, ISO 11064-3

**3.10****data**

the raw material from which a user extracts information

NOTE 'data' may include numbers, words and/or pictures – such as a view out of a window.

**3.11****digital display**

display in which the information is shown in numerical code (EN 894-2)

**3.12****display**

device for presenting information that can change with the aim of making things visible, audible or discriminable by tactile or proprioceptive perception (ISO 11064-3, also see Figure 1)

**3.13****element**

the basic component used to make up formats such as abbreviations, labels, items, symbols, coding and highlighting (Based on Nureg 0700, also see Figure 1)

**3.14****event**

any spontaneous Transition from one discrete status to another

NOTE 1 if the initial status is not displayed (i.e. it is normal) an event will be perceived as the occurrence of a defined change of status.

NOTE 2 "Occurrence" is synonymous with "transition from one discrete status to another".

NOTE 3 "Status" can be either normal or abnormal conditions.

**3.15****format**

a pictorial display of information on visual display units (VDU) such as message text, digital presentation, symbols, mimics, bar-chart, trend graphics, pointers, multi-angular presentation. (IEC 964)

(NOTE for the purposes of ISO 11064 it is assumed that this term also covers auditory displays).

**3.16****human-System-Interface (HSI), or Human-Machine interface (HMI)**

all matters and procedures of a machine (or system) available for interaction with its (human) users

**3.17****information**

anything which is not known by a person in advance (i.e. what is **new** to the operator)

NOTE 1 Information is extracted from data.

NOTE 2 Knowledge is required to interpret information.

NOTE 3 There are several definitions for information, e.g., "Commodity that reduces the uncertainty". The definition chosen here is essential for allocating the appropriate importance or quality value to display elements.

**3.18  
interaction**

exchange of information between a user and a system via the Human-system-interface (HSI) to achieve the intended goal

NOTE "Dialogue" is often used as a synonym.

**3.19  
interface**

see Human-System-Interface

**3.20  
mimics, mimic display, mimic diagram**

simplified graphical depiction of a system by presenting its components and their interrelationships

EXAMPLES Piping diagrams, rail networks, road networks.

**3.21  
monitoring**

activity for the purpose of detecting deviations from normal operation (by checking variables, or their course against limits, trends or the values of other variables) in order to enable timely and appropriate action for response

NOTE Monitoring of the process is performed either by a human being and/or by a control (e.g., a SCADA) system.

**3.22  
overview display**

high level abstraction, or low level of detail, of the of the system status covering the areas of responsibility

NOTE An overview display supports control room personnel in obtaining an overall view of systems status by bringing to their attention significant changes in system conditions and presenting those that are important.

**3.23  
page**

a defined set of information that is intended to be displayed on a single display screen (Based on Nureg 0700)

NOTE A window may form an entire page where it fills a single display screen, see Figure 1.

**3.24  
process control**

monitoring and manipulation of variables influencing the behaviour of a process in order to meet specified objectives

NOTE 1 Operators use displays and controls in executing their activities of monitoring, control, and system management.

NOTE 2 Process control is accomplished by regulation or manipulation of variables influencing the conduct of a process in such a way as to obtain a product of desired quality and quantity in an efficient manner, ISA S 51.1 (1979).

**3.25****status, state**

distinct condition of an object

NOTE The "object" can be a system, a process unit, a machine etc. Conditions can be operation modes either normal (e.g. 'on', 'closed', 'standby') or abnormal (e.g. 'disturbed'). They may be determined by checking values of variables against limits (e.g. "to high" or High-Alarm).

**3.26****symbol**

letters, digits, pictorial representations, or combinations of these, used for labeling a display's graduations, or as a means of identifying the display itself (DIN Directory)

**3.27****task**

human activities required to achieve a goal, ISO 9241-11

NOTE The task is accomplished by means of (several) jobs. The goal is specified by the organisation for the human-machine system. Example of a task is "process control" which pursues the goal of safe and economic operation of e.g. production plants or passenger safety for a transportation system.

**3.28****visual display**

display (in the sense of "format") providing visual presentation of data, mappings or videos

NOTE Visual displays are classified according to the presentation mode of single data (analogue, binary, digital, hybrid) of a single datum. Complex data may be presented in graphic or alphanumeric dimension presented (2D, 3D) relation between time of view and time presented ("predictive" or "quickened" display).

**3.29****window**

independently controllable area on the display screen used to present objects and/or conduct a dialogue with the user (9241-16)

The relationship between some of the terms is presented in Figure 1 below.