

Summary of the Standards Published by ISO/TC159 SC4 during 2008-2013

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ABSTRACT

Objective: The aim of this study is to give ergonomists the brief summary of the recently published ISO standards on human-system interaction and tips for application of the standards. **Background:** Standard developers did hard work on developing a standard in a concise manner. But most of standards are often bulky in volume. Readers of the standards are difficult to catch key points from the voluminous contents of standards and intermingle among them. **Method:** Focused on newly developed display/control technology, this study reviewed the 4 ISO standards on human-system interaction published during 2008-2013 and summarized key points from them. **Results:** Schematic diagrams and tables concisely illustrated the processes, procedures, dimensions, or best practices recommended by the standards concerning conception, design, and usability testing for consumer products. **Conclusion:** The standards provided the minimum level of requirements on design and evaluation on the physical input devices, electronic displays, and control interfaces based on the current state of technology. But the minimum requirements specified in the standards nowadays become mandatory ergonomic requirements in global trade world. **Application:** Ergonomists can take a quick and broad view on international standardization activities on newly developed display/control technology from this summary study.

Keywords: ISO, TC 159, Standards, Ergonomics, Usability

2008-2013

1. Introduction

The purpose of this study is to give ergonomists a quick and broad view on the standard practices and how to apply the standards to the human-system interaction design issues.

2.1 ISO 9241-307:2008 Ergonomics of human-system interaction-Part 307: Analysis and compliance test methods for electronic visual displays

ISO 9241-307:2008 provides test methods for CRT, LCD, PDP, front screen projection display, and hand held LCD.

2. Summary of the ISO standards on human-system interaction published during

Table 1. Procedure of compliance test for a CRT (ISO 9241-307:2008)

process	practice	example
describe intended context of use	specify the user	user with normal vision
	specify the environment	screen luminance

		ambient temperature
	specify the task	contents of perception such as simple text or simple graphics amount of information without scrolling such as 1 character or n character viewing condition such as viewing distance, viewing direction, and eye/head position
	specify the use of technology	optical mode of operation in CRT diagonal of the active display area resolution equipment is used stationary equipment is used indoor
specify compliance assessment method	specify attributes to test	design viewing distance design viewing direction
	establish pass/fail criteria	for viewing condition: the workplace and the visual display should permit the user to view the screen with a gaze angle from 0 to 40 degrees and a head tilt angle 0 to 25 degrees
	specify measuring method	supplier specification
Assess and report	report assessment data	refer to ISO/IEC 17025

2.2 ISO 9241-331:2012 Ergonomics of human-system interaction-Part 331: Optical characteristics of autostereoscopic displays

The purpose of ISO 9241-331:2012 standardizes the methodology which characterizes and validates the 3D

technology to ensure visual quality of autostereoscopic display (ASD) and to reduce the undesirable visual fatigue caused by imperfection of the technology. Table 2 compares three kinds of ASD with each own advantages and disadvantages.

Table 2. Summary of technical features of autostereoscopic displays presented in ISO 9241-331:2012

ASD	technology	advantage	disadvantage
two-view	two monocular views	simple implementation methods with high	viewing space is small

ASD		resolution	
multi-view ASD	more than two monocular views	wide viewing spaces	degraded image quality at other viewpoint area decreased resolution with increased number of view
integral ASD	integrated images dependent on the number of rays through lenslets and the pitch of lenslets	clear images smooth simulated motion parallax	image quality is lower than at the viewpoint of multi-view ASD

2.3 ISO 9241-410:2008 Ergonomics of human-system interaction-Part 410: Design criteria for physical input devices

ISO 9241-410:2008 deals with properties of physical input devices such as keyboard, computer mice, pucks,

joysticks, trackballs, trackpads, tablets, overlays, touch screen, styli, light pens, and voice- or gesture-controlled devices in relation to usability and design requirements for these input devices. Table 3 shows the generic design requirements for input devices.

Table 3. Summary of generic design requirements for physical input devices specified in ISO 9241-410:2008

design requirement	detailed requirement
appropriateness	appropriate for the intended tasks compatible with anthropometric dimensioning of the part of the body performance enhancement by software
operability	obvious intended use by appearance, trial and error, instructions or training predictable input movement operating in a consistent manner accommodation of the intended user's anthropometry and force effective feedback
controllability	consistent and sufficient response to actuation non-interference with its own use

	reliable, quick and easy access to the input devices
biomechanical loads	operable without undue posture or excessive effort

2.4 ISO 9241-411:2012 Ergonomics of human-system interaction-Part 411: Evaluation methods for the design of physical input devices

ISO 9241-411:2012 provides methods for evaluating conformance with the requirements of ISO

9241-410:2008 for physical input devices including keyboards, mice, pucks, joysticks, trackballs, touchpads, tablets, overlays, styli, light-pens and touch screens. As an example, the evaluating methods for requirements of computer mice specified in ISO 9241-411:2012 are shown in Table 4.

Table 4. Evaluating methods for computer mice requirements excerpted from ISO 9241-411:2012

design requirement	pass/fail criterion for the requirement	measuring method
appropriateness: effectiveness of pointing, selecting, etc.	index of difficulty > 6 for class 1 equipment	measurement of index of difficulty defined in ISO 9241-441 during multi-directional tapping task, dragging task, or tracing task
functional property: button displacement	maximum button displacement on a mouse ≤ 6 mm	measurement of button displacement on a mouse
maintainability related property: maintainability	user shall gain access to maintainable part of the mouse (eg. mouse ball) and surface for cleaning without any tools	verify that user can clean the part without any tools
health- and safety-related property: contacting with edges of a mouse during use	edges on a mouse shall not cause discomfort or injury	verify that edges do not cause any discomfort or injury even for prolonged use

3. Conclusion

The standards dealt with in this study can be classified into four areas: ergonomic design principle/technology, ergonomic design requirements, usability test principles and usability test methods.

The recently published standards from ISO/TC159 SC4 cover all the human-system interaction area: display, control and interactive system.

The readers of the standards can use these standards as a way of getting information on state of the art technology and design requirements for interactive system or the usability test method to prove their

products' conformance of a specific standard. It is the trend that the ergonomic design requirements specified in the standards becomes the minimum design requirements of consumer products in the global trade world. So it is important for developers of the product to be aware of those essential requirements.

References

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ISO 9241-410:2008 Ergonomics of human-system interaction-Part 410: Design criteria for physical input devices, ISO, Geneva, 2008.

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Areas of interest: Human Factors in Nuclear Power Plant, Risk Management, HCI