PD CEN ISO/TS 9241-430:2023
Incorporating corrigendum April 2023



BSI Standards Publication

Ergonomics of human-system interaction

Part 430: Recommendations for the design of non-touch gestural input for the reduction of biomechanical stress

bsi.

National foreword

This Published Document is the UK implementation of CEN ISO/TS 9241-430:2023. It is identical to ISO/TS 9241-430:2021. It supersedes PD ISO/TS 9241-430:2021, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PH/9, Applied ergonomics.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2023
Published by BSI Standards Limited 2023

ISBN 978 0 539 23679 8

ICS 13.100; 13.180; 35.180

Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 June 2022.

Amendments/corrigenda issued since publication

Date	Text affected
30 April 2023	This corrigendum renumbers PD ISO/TS 9241-430:2021 as PD CEN ISO/TS 9241-430:2023

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN ISO/TS 9241-430

March 2023

ICS 13.100; 13.180; 35.180

English Version

Ergonomics of human-system interaction - Part 430: Recommendations for the design of non-touch gestural input for the reduction of biomechanical stress (ISO/TS 9241-430:2021)

Ergonomie de l'interaction homme-système - Partie 430: Recommandations pour la conception de la saisie gestuelle sans contact pour la réduction du stress biomécanique (ISO/TS 9241-430:2021)

This Technical Specification (CEN/TS) was approved by CEN on 17 March 2023 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2023 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.

Ref. No. CEN ISO/TS 9241-430:2023 E

European foreword

The text of ISO/TS 9241-430:2021 has been prepared by Technical Committee ISO/TC 159 "Ergonomics" of the International Organization for Standardization (ISO) and has been taken over as CEN ISO/TS 9241-430:2023 by Technical Committee CEN/TC 122 "Ergonomics" the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO/TS 9241-430:2021 has been approved by CEN as CEN ISO/TS 9241-430:2023 without any modification.

Contents

Page

Foreword ..... **iv**

Introduction ..... **v**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **2**

4 Selection of non-contacting gestures **3**
4.1 Overall approach to the selection of non-contacting gestures 3
4.2 Large shoulder and elbow movements 3
4.3 Optimal hand location relative to body 3
4.4 Wrist and forearm posture 3
4.5 Comfort of hand postures and motions 3
4.5.1 Fist, neutral and extended fingers 3
4.5.2 Asynchronous adjacent finger postures 4
4.5.3 Thumb flexion or extension and abduction or adduction 4
4.5.4 Speed of finger or hand movements and impact 4
4.5.5 Hand microgestures 5

5 Evaluation of non-contacting gestures **5**
5.1 General 5
5.2 Laboratory-based study design 5
5.3 Subjects for studies 5
5.4 Independent variables 5
5.5 Example technologies for gesture capture 6
5.6 Dependent variables (outcome measures) 6
5.7 Examples of tasks 7
5.8 Target size 8
5.9 Data analysis, interpretation and reporting 9

Annex A (informative) **Example of questionnaire for assessing subjective usability measures** **10**

Bibliography **11**

© ISO 2021 – All rights reserved

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).

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).

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.

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

A list of all parts in the ISO 9241 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.

© ISO 2021 – All rights reserved

Introduction

Non-contacting hand and arm gestures (e.g. mid-air gestures) for interacting with computing devices are emerging as a useful form of input for both consumer and commercial applications.

Non-contacting gestures can be particularly well-suited for certain tasks, equipment and environments, such as with wearable technology (e.g. head-mounted displays, instrumented gloves), in dirty or sterile settings (e.g. kitchens or operating rooms) or for tasks where both hands are also used for other activities (e.g. sorting packages).

This document provides guidance on the design and selection of non-contacting hand and arm gestures and recommends methods for the usability and ergonomic evaluation of gestures in order to prevent fatigue and discomfort during prolonged gesturing.

ISO 9241-910 provides a common set of terms, definitions and descriptions of the various concepts central to designing and using tactile or haptic interactions. It also provides an overview of the range of tactile or haptic applications, objects, attributes and interactions.

ISO 9241-920 provides basic guidance (including references to related standards) in the design of tactile or haptic interactions.

ISO 9241-940 provides ways of evaluating tactile or haptic interaction for various aspects of interaction quality, such as haptic device attributes, logical space design and usability.

ISO 9241-960 provides guidance on gestures for tactile or haptic interaction. It explains how to describe their features and what factors to consider when defining gestures.

There are many factors to consider in the selection of non-contacting hand and arm gesture sets for human-computer interaction, including task, workstation, environment, natural language, recall, common existing contacting hand gesture sets, technology limitations on gesture recognition, usability, preference, arm and shoulder fatigue and other ergonomic factors. This document provides guidance primarily on usability, preference, arm and shoulder fatigue and biomechanical or kinesiology factors. This document recommends methods to assess these factors based on the reliability and validity of the methods.

© ISO 2021 – All rights reserved

TECHNICAL SPECIFICATION **ISO/TS 9241-430:2021(E)**

Ergonomics of human-system interaction —

Part 430: Recommendations for the design of non-touch gestural input for the reduction of biomechanical stress

1 Scope

This document provides guidance on the design, selection and optimization of non-contacting hand and arm gestures for human-computer interaction. It addresses the assessment of usability and fatigue associated with different gesture set designs and provides recommendations for approaches to evaluating the design and selection of gestures. This document also provides guidance on the documentation of the process for selecting gesture sets.

This document applies to gestures expressed by humans. It does not consider the technology for detecting gestures or the system response when interpreting a gesture. Non-contacting hand gestures can be used for input in a variety of settings, including the workplace or in public settings and when using fixed screens, mobile, virtual reality, augmented reality or mixed-mode reality devices.

Some limitations of this document are:

— The scope is limited to non-contacting gestures and does not include other forms of inputs. For example, combining gesture with speech, gaze or head position can reduce input error, but these combinations are not considered here.

— The scope is limited to non-contacting arm, hand and finger gestures, either unilateral (one-handed) or bilateral (two-handed).

— The scope assumes that all technological constraints are surmountable. Therefore, there is no consideration of technological limitations with interpreting ultra-rapid gestures, gestures performed by people of different skin tones or wearing different colours or patterns of clothing.

— The scope is limited to UI-based command-and-control human computer interaction (HCI) tasks and does not include gaming scenarios, although the traversal of in-game menus and navigation of UI elements is within scope.

— The scope does not include HCI tasks for which an obviously more optimal input method exists. For example, speech input is superior for inputting text than gesture input.

— The scope includes virtual reality (VR), augmented reality (AR) and mixed reality (MR) and the use of head-mounted displays (HMDs).

— The scope does not include the discoverability of gestures but does include the learnability and memorability of gestures. It is assumed that product documentation and tutorials will adequately educate end users about which gestures are possible. Therefore, assessing gesture discoverability is not a primary goal of the recommendations in this document.

2 Normative references

There are no normative references in this document.

© ISO 2021 – All rights reserved