ISO Standards Produced by ISO TC159 SC5

ISO 7726:1998 Ergonomics of the thermal environment – Instruments for measuring physical quantities

Specifies the minimum characteristics of instruments for measuring physical quantities characterizing an environment as well as the methods for measuring the physical quantities of this environment. It does not aim to define an overall index of comfort or thermal stress but simply to standardize the process of recording information leading to the determination of such indices. This International Standard is used as a reference when establishing a) specifications for manufacturers and users of instruments for measuring the physical quantities of the environment, and b) a written contract between two parties for the measurement of these quantities. It applies to the influence of hot, moderate, comfortable or cold environments on people.

ISO 7243:1989 Hot environments – Estimation of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature)

Gives a method that can be easily used in an industrial environment for evaluating the stresses on an individual. It applies to the evaluation of the mean effect of heat on man during a period representative of this activity but it does not apply to very short periods or to zones of comfort.

ISO 7730:2005 Ergonomics of the thermal environment – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria

Presents methods for predicting the general thermal sensation and degree of discomfort (thermal dissatisfaction) of people exposed to moderate thermal environments. It enables the analytical determination and interpretation of thermal comfort using calculation of PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) and local thermal comfort, giving the environmental conditions considered acceptable for general thermal comfort as well as those representing local discomfort.

ISO 7731:2003 Ergonomics – Danger signals for public and work areas – Auditory danger signals

Specifies the physical principles of design, ergonomic requirements, and the corresponding test methods for danger signals for public and work areas in the signal reception area and gives guidelines for the design of the signals. It may also be applied to other appropriate situations.

It does not apply to verbal danger warnings (e.g. shouts, loudspeaker announcements). It covers verbal danger signals.

Special regulations such as those for a public disaster and public transport are not affected by this International Standard.

ISO 7933:2004 Ergonomics of the thermal environment – Analytical determination and interpretation of heat stress using calculation of the predicted heat strain

Specifies a method for the analytical evaluation and interpretation of the thermal stress experienced by a subject in a hot environment. It describes a method for predicting the sweat rate and the internal core temperature that the human body will develop in response to the working conditions.

The various terms used in this prediction model, and in particular in the heat balance, show the influence of the different physical parameters of the environment on the thermal stress experienced by the subject. In this way, this International Standard makes it possible to determine which parameter or group of parameters should be modified, and to what extent, in order to reduce the risk of physiological strains.

The main objectives of ISO 7933:2004 are the following:

1. The evaluation of the thermal stress in conditions likely to lead to excessive core temperature increase or water loss for the standard subject;
2. The determination of exposure times with which the physiological strain is acceptable (no physical damage is to be expected). In the context of this prediction mode, these exposure times are called “maximum allowable exposure times”.

ISO 7933:2004 does not predict the physiological response of individual subjects, but only considers standard subjects in good health and fit for the work they perform. It is therefore intended to be used by ergonomists, industrial hygienists, etc., to evaluate working conditions.

ISO 8996:2004 Ergonomics of the thermal environment – Determination of metabolic rate

The metabolic rate, as a conversion of chemical into mechanical and thermal energy, measures the energetic cost of muscular load and gives a numerical index of activity. Metabolic rate is an important determinant of the comfort or the strain resulting from exposure to a thermal environment. In particular, in hot climates, the high levels of metabolic heat production associated with muscular work aggravate heat stress, as large amounts of heat need to be dissipated, mostly by sweat evaporation.

ISO 8996:2004 specifies different methods for the determination of metabolic rate in the context of ergonomics of the climatic working environment. It can also be used for other applications – for example, the assessment of working practices, the energetic cost of specific jobs or sport activities, the total cost of an activity, etc.

ISO 9886:2004 Ergonomics – Evaluation of thermal strain by physiological measurements

Describes methods for measuring and interpreting the follow physiological parameters: body core temperature; skin temperatures; heart rate; body-mass loss.

ISO 9920:2007 Ergonomics of the thermal environment – Estimation of thermal insulation and water vapour resistance of a clothing ensemble

Specifies methods for estimating the thermal characteristics (resistance to dry heat loss and evaporative heat loss) in steady-state conditions for a clothing ensemble based on values for known garments, ensembles and textiles. It examines the influence of body movement and air penetration on the thermal insulation and water vapour resistance. It does not deal with other effects of clothing, such as adsorption of water, buffering or tactile comfort, take into account the influence of rain and snow on the thermal characteristics, consider special protective clothing (water-cooled suits, ventilated suits, heated clothing), or deal with the separate insulation on different parts of the body and discomfort due to the asymmetry of a clothing ensemble.

ISO 9921:2003 Ergonomics - Assessment of speech communication

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 performance in practical applications are described and examples are given.

ISO 10551:1995 Ergonomics of the thermal environment – Assessment of the influence of the thermal environment using subjective judgement scales

Covers the construction and use of judgement scales for use in providing reliable and comparative data on the subjective aspects of thermal comfort or thermal states.

ISO 11079:2007 Ergonomics of the thermal environment - Determination and interpretation of cold stress when using required clothing insulation (IREQ) and local cooling effects

Specifies methods and strategies for assessing the thermal stress associated with exposure to cold environments. These methods apply to continuous and intermittent, as well as occasional ,exposure and type of work, indoors and outdoors. They are not applicable to specific effects associated with certain meteorological phenomena (e.g., precipitation), which are assessed by other methods.

ISO 11399:1995 Ergonomics of the thermal environment – Principles and application of relevant International Standards

Purpose is to specify information which will allow the correct, effective and practical use of International Standards concerned with the ergonomics of the thermal environment. Describes the underlying principles concerning the ergonomics of the thermal environment.

ISO 11429:1996 Ergonomics – System of auditory and visual danger and information signals

Specifies a system of danger and information signals taking into account the different degrees of urgency. Applicable to all danger and information signals which have to be clearly perceived and differentiated as specified in ISO/TR 12100-2. Does not apply to certain fields covered by specific standards.

ISO 12894:2001 Ergonomics of the thermal environment – Medical supervision of individual exposed to extreme hot or cold environments

Provides guidance for those with responsibility for people exposed to extreme hot and cold environments to assist them in reaching decisions about the appropriate level of medical supervision required in different situations. A rough definition of an extreme hot environment , for purposes of this Standard, is a wet bulb globe temperature (WBGT) of 25 degrees centigrade or greater; an extreme cold environment is defined as an air temperature of 0 degrees Centigrade or less. The guidance is applicable to laboratory and occupational exposures to extreme thermal environments.

ISO 13731:2001 Ergonomics of the thermal environment – Vocabulary and symbols

ISO 13732-1:2006 Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces -- Part 1: Hot surfaces

Provides temperature threshold values for burns that occur when human skin is in contact with a hot solid surface. It also describes methods for the assessment of the risks of burning, when humans could or might touch hot surfaces with their unprotected skin.

In addition, ISO 13732-1:2006 gives guidance for cases where it is necessary to specify temperature limit values for hot surfaces, but does not set surface temperature limit values.

ISO 13732-1:2006 deals with contact periods of 0.5 sec and longer.

It is applicable to contact when the surface temperature is essentially maintained during the contact.

It is not applicable if a large area of the skin (approximately 10% or more of the skin of the whole body) can be in contact with the hot surfaces. Neither does it apply to skin contact of more than 10% of the head or contact which could result in burns of vital areas of the face.

ISO 13732-1:2006 is applicable to the hot surfaces of all kind of objects: equipment, products, buildings, natural objects, etc. It is applicable to hot surfaces of products that may be touched by healthy adults, children, elderly people and also by people with physical disabilities. For the purposes of simplification, it mentions only products; nevertheless, it applies to all other objects as well. It is applicable to products used in any environment, e.g. in the workplace, in the home.

It does not provide data for the protection against discomfort or pain.

ISO 13732-2:2001 Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 2: Human contact with surfaces of moderate temperature

ISO 13732-3:2005 Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 3: Cold surfaces

Provides methods for the assessment of the risk of cold injury and other adverse effects when a cold surface is touched by bare-hand/finger skin. It provides ergonomics data for establishing temperature

limit values for cold solid surfaces. The values established can be used in the development of special standards, where surface temperature limit values are required. Its data are applicable to all fields where cold solid surfaces cause a risk of acute effect: pain, numbness and frostbite, and are not limited to the hands but can be applied in general to the healthy human skin of male and female adults.

ISO 14415:2005 Ergonomics of the thermal environment – Application of International Standards to people with special requirements

Provides background information on the thermal responses and needs of groups of persons with special requirements so that International Standards concerned with the assessment of the thermal environment can be appropriately applied for their benefit.

ISO 14505-1:2007 Ergonomics of the thermal environment – Evaluation of thermal environments in vehicles – Part 1: Principles and methods for assessment of thermal stress

Gives guidelines for the assessment of thermal stress inside vehicles used for land, sea and air operation. It offers information about the assessment of hot, cold, as well as moderate thermal environments by referring to different methods, as specified in International Standards, and specifying the constrains and necessary adjustments needed for the special case of vehicle climate assessment.

ISO 14505-2:2006 Ergonomics of the thermal environment – Evaluation of thermal environments in vehicles – Part 2: Determination of equivalent temperature

Provides guidelines for the assessment of the thermal conditions inside a vehicle compartment. It can also be applied to other confined spaces with asymmetric climatic conditions. It is primarily intended for assessment of thermal conditions when deviations from thermal neutrality are relatively small. Appropriate methodology, as given in ISO 14505-2:2006 can be chosen for inclusion in specific performance standards for testing of HVAC-systems for vehicles and similar confined spaces.

Note: There is also a corrigenda that was published for this standard in 2007 (ISO 14505-2:2006 Cor 1: 2007). No information was readily available about its contents.

ISO 14505-3:2006 Ergonomics of the thermal environment – Evaluation of thermal environments in vehicles – Part 3: Evaluation of thermal comfort using human subjects

Gives guidelines and specifies a standard test method for the assessment, using human subjects, of thermal comfort in vehicles. It is not restricted to any particular vehicle but provides the general principles that allow assessment and evaluation. The method can be used to determine a measure of the performance of a vehicle for conditions of interest, in terms of whether it provides thermal comfort to people or not. This can be used in vehicle development and evaluation.

ISO 14505-3:2006 is applicable to all types of vehicles, including cars, buses, trucks, off-road vehicles, trains, aircraft, ships, submarines, and to the cabins of cranes and similar spaces. It applies where people are enclosed in a vehicle and when they are exposed to outside conditions. For those exposed to outside conditions, such as riders of bicycles or motorcycles, drivers of open sports cars and operators of

fork lift trucks without cabins, vehicle speed and weather conditions can dominate responses. The principles of assessment, however, will still apply.

ISO 14505-3:2006 applies to both passengers and operators of vehicles where its application does not interfere with the safe operation of the vehicle.

ISO 15265:2004 Ergonomics of the thermal environment – Risk assessment strategy for the prevention of stress or discomfort in thermal working conditions

Describes a strategy for assessing and interpreting the risk of physiological constraints, or of discomfort, while working in a given climatic environment.

It is applicable in any working situation with steady or varying conditions of the climate, metabolic rate, or clothing.

It does not describe a single procedure, but a strategy in three stages that can be used successively to gain deeper insight in the working conditions, as it is needed to draw the most appropriate conclusions about the risk involved and identify the best control and prevention measures.

It is definitely oriented toward the prevention and/or control of these working problems in the heat or cold. The risk of heat or cold disorders and/or discomfort is therefore assessed only to the extent that is required to reach this goal.

ISO 15743:2008 Ergonomics of the thermal environment – Cold workplaces – Risk assessment and management

Presents a strategy and practice tools for assessing and managing cold risk in the workplace, and includes: models and methods for cold risk assessment and management, a checklist for identifying cold-related problems at work; a model, method and questionnaire intended for use by occupational health care professionals in identifying those individuals with symptoms that increase their cold sensitivity and, with the aid of such identification, offering optimal guidance and instructions for individual cold protection; guides on how to apply thermal standards and other validated scientific methods when assessing cold-related risks; a practical example from cold work.

It is applicable to both indoor and outdoor work situations – indoor work includes work done inside vehicles, outdoor work both inland and offshore work – but is not applicable to diving situations or other types of work performed underwater.

ISO 24500:2010 – Ergonomics -- Accessible Design – Auditory signals for consumer products

Specifies the auditory signals used as a means of feedback for operations or conditions of consumer products when used by a person with or without visual or auditory impairment. It is intended to be applied as appropriate to such products depending on the product type and its conditions of use.

It is applicable to auditory signals of a fixed frequency used in general applications (also called “beep sounds”), but not to variable frequency or melodic sounds.

It does not specify fire or gas leak alarm sounds or crime prevention alarm sounds (determined by other laws and regulations), electronic chimes, voice guides or other sounds particular to communication instruments such as telephones; nor is it applicable to auditory danger signals for public or work areas (covered in ISO 7731, ISO 8201, and ISO 11429).

It is not applicable to machines and equipment used for professional work; nor does it specify the sound pressure levels of auditory signals from consumer products (for determination of these levels, taking into consideration accessible design, see ISO 24501).

ISO 24501:2010 Ergonomics – Accessible design – Sound pressure levels of auditory signals for consumer products

Specifies methods for determining the sound pressure level range of auditory signals so that the users of consumer products, including people with age-related hearing loss, can hear the signal properly in the presence of interfering sounds.

Auditory signals, in ISO 24501:2010, refer to sounds with a fixed frequency (also called "beep sounds") and do not include variable frequency sounds, melodic sounds, or voice guides.

ISO 24501:2010 is applicable to auditory signals which are heard at an approximate maximum distance of 4 m from the product, as long as no physical barrier exists between the product and the user. It is not applicable to auditory signals heard through a head receiver or earphones, or to those heard with the ear located very near to the sound source because of the interference of the head with sound propagation.

ISO 24501:2010 does not specify the sound pressure level of auditory signals regulated by other statutes, such as those for fire alarms, gas leakages and crime prevention; nor does it specify auditory signals particular to a communication tool such as telephones.

ISO 24501:2010 does not specify auditory danger signals for public or work areas which are covered in ISO 7731, ISO 8201, and ISO 11429.

ISO 24502:2010 Ergonomics – Accessible design – Specification of age-related luminance contrast for coloured light

Specifies the age-related luminance contrast of any two lights of different colour seen by a person at any age, by taking into account the age-related change of spectral luminous efficiency of the eye.

ISO 24502:2010 provides a basic method of calculation that can be applied to the design of lighting, visual signs and displays. It applies to light, self-luminous or reflected, in visual signs and displays seen under moderately bright conditions called photopic vision and whose spectral radiance is known or measurable. It does not apply to light seen under darker conditions called mesopic or scotopic vision.

ISO 24502:2010 specifies the luminance contrast for people aged from 10 t0 79 years who have had no medical treatment or surgery on their eyes that may affect their spectral luminous efficiency.

ISO 24502:2010 does not apply to visual signs and displays seen by people with colour defects whose spectral luminous efficiency is different from those with normal colour vision, nor those seen by people with low vision.

Editorial Note: This standard provides no design guidance, per se. Although data are provided, as noted above, no guidance is provided as to how these data could or should be applied in the design of visual displays. It is left to the user of the document to determine this.

ISO Technical Reports

ISO /TR 19358:2002 Ergonomics – Construction and application of tests for speech technology

Deals with the testing and assessment of speech-related products and services, and is intended for use by specialists active in the field of speech technology, as well as purchasers and users of such systems.