



BSI Standards Publication

Ergonomics of the thermal environment — Instruments for measuring and monitoring physical quantities

National foreword

This British Standard is the UK implementation of EN ISO 7726:2025. It is identical to ISO 7726:2025. It supersedes BS EN ISO 7726:2001, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PH/9/-/1, Ergonomics of the physical environment.

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

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© The British Standards Institution 2025
Published by BSI Standards Limited 2025

ISBN 978 0 539 20781 1

ICS 13.040.20; 13.180

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2025.

Amendments/corrigenda issued since publication

Date	Text affected
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English Version

Ergonomics of the thermal environment - Instruments for measuring and monitoring physical quantities (ISO 7726:2025)

Ergonomie des ambiances thermiques - Appareils et méthodes de mesure et de surveillance des grandeurs physiques (ISO 7726:2025)

Ergonomie der thermischen Umgebung - Instrumente zur Messung und Überwachung physikalischer Größen (ISO 7726:2025)

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European foreword

This document (EN ISO 7726:2025) 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 European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2026, and conflicting national standards shall be withdrawn at the latest by April 2026.

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The text of ISO 7726:2025 has been approved by CEN as EN ISO 7726:2025 without any modification.

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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 document 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).

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This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 5, *Ergonomics of the physical environment*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 122, *Ergonomics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 7726:1998), which has been technically revised.

The main changes are as follows:

- the physical quantities characterizing heat exchanges between a system and its environment have been divided into basic and derived. The basic quantities (like air temperature, irradiation and plane radiant temperature) are measured directly, while the derived quantities (like mean radiant temperature, operative temperature, humidity ratio, etc.) are measured indirectly (see [6.1](#) and [6.2](#));
- the concept of measurement uncertainty has been introduced (see [Clause 11](#)).

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.

Introduction

This document is one of a group of International Standards on the ergonomics of the thermal environment intended for use in the study of thermal environments.

This group of International Standards covers:

- definitions for the terms to be used in the methods of measurement, testing or interpretation, taking into account standards already in existence or in the process of being drafted;
- the laying down of specifications relating to the methods for measuring the physical quantities which characterize thermal environments;
- the selection of one or more methods for interpreting the parameters;
- the specification of recommended values or limits of exposure for the thermal environments coming within the comfort range and for extreme environments (both hot and cold);
- the specification of methods for measuring the efficiency of devices or processes for personal or collective protection from heat or cold.

The aim of this group of standards is simply to standardize the process of recording information leading to the determination of values of physical quantities. Other International Standards give details of the methods that make use of the information obtained in accordance with this standard.

This document can be used as a reference when establishing:

- a) specifications for manufacturers and users of instruments for measuring the physical quantities of the environment;
- 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. This document is applied in cases wherein comfort or human strain are the main concern.

Any measuring instrument which achieves the accuracy indicated in this document may be used. The description or listing of certain instruments in the annexes only signifies that they are "recommended", since characteristics of these instruments can vary according to the measuring principle, their construction and the way in which they are used. It is up to users to compare the quality of the instruments available on the market at any given moment and to check that they conform to the specifications contained in this document.

Ergonomics of the thermal environment — Instruments for measuring and monitoring physical quantities

1 Scope

This document 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.

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 13731, *Ergonomics of the thermal environment — Vocabulary and symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13731 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/>

4 Symbols and abbreviation

For the purposes of this document, the symbols and units listed in [Table 1](#) apply.

Table 1 — Symbols and units

Symbol	Term	Unit
A_{pr}	surface area projected on one direction	m ²
A_r	total radiant surface area	m ²
C	convective heat flow	W·m ⁻²
C_{res}	respiratory convective heat flow	W·m ⁻²
E	evaporative heat flow at the skin	W·m ⁻²
E_{res}	respiratory evaporative heat flow	W·m ⁻²
K	conductive heat flow	W·m ⁻²
M	metabolic rate	W·m ⁻²
p	atmospheric pressure	Pa
p_a	water vapour partial pressure	Pa
p_{as}	saturated water vapour pressure	Pa
$p_{as,w}$	saturated water vapour pressure at the wet-bulb temperature	Pa
R	radiative heat flow	W·m ⁻²
R_h	relative humidity	%

Table 1 (continued)

Symbol	Term	Unit
S	body heat storage rate	$\text{W}\cdot\text{m}^{-2}$
t_a	air temperature	$^{\circ}\text{C}$ or K
t_d	dew-point temperature	$^{\circ}\text{C}$ or K
t_g	globe temperature	$^{\circ}\text{C}$ or K
t_{nw}	natural wet-bulb temperature	$^{\circ}\text{C}$ or K
t_o	operative temperature	$^{\circ}\text{C}$ or K
t_{pr}	plane radiant temperature	$^{\circ}\text{C}$ or K
$\bar{t}_r, \bar{T}_r$	mean radiant temperature	$^{\circ}\text{C}$ or K
t_s	surface temperature	$^{\circ}\text{C}$ or K
t_w	psychrometric wet-bulb temperature	$^{\circ}\text{C}$ or K
v_a	air velocity	$\text{m}\cdot\text{s}^{-1}$
W	effective mechanical power	$\text{W}\cdot\text{m}^{-2}$
W_a	humidity ratio	$\text{g}\cdot\text{kg}^{-1}$

5 General

5.1 Specifications and methods

The specifications and methods contained in this document have been divided into two classes according to the extent of the thermal annoyance to be assessed. The type C specifications and methods relate to measurements carried out in moderate environments. The type S specifications and methods relate to measurements carried out in severe environments.

The specifications and methods described for each of these classes have been determined bearing in mind the practical possibilities of in situ measurements and monitoring and the performances of measuring instruments available at present.

Instructions are provided for monitoring (how, where, when) and for post processing recorded data.

5.2 The heat exchanges between human body system and its environment

The energy balance on the human body is shown in [Formula \(1\)](#):

$$S = (M - W) \pm R \pm C \pm E \pm E_{res} \pm C_{res} \pm K \quad (1)$$

This balance expresses that the internal heat production of the body, which corresponds to the metabolic rate, M , minus the effective mechanical power, W , are balanced by the heat exchanges in the respiratory tract by convection, C_{res} , and evaporation, E_{res} , as well as by the heat exchanges on the skin by conduction, K , convection, C , radiation, R , and evaporation, E .

Each term in [Formula \(1\)](#) requires the knowledge of some physical quantities. In [Table 2](#), these quantities and their connections with energy balance on a human body are shown.

Table 2 — Main independent quantities

Elements in thermal balance	Air temperature t_a	Mean radiant temperature t_r	Surface temperature t_s	Air velocity v_a	Water vapour partial pressure p_a
Heat transfer by radiation, R		X	X		
Heat transfer by convection, C^a	X			X	
Heat exchanges through evaporation: — evaporation from the skin, E — evaporation by respiration, E_{res}				X	X
Convection by respiration, C_{res}	X				
Heat transfer by conduction, K			X		
^a Heat transfer by convection is also affected by body movements. The resultant air velocity at skin level is usually defined relative air velocity (v_{ar}).					

6 Physical quantities characterizing heat exchanges

6.1 General

In general, the quantities affecting the energy balance on a system can be divided into two categories, basic and derived, depending to the possibility to measure them directly or indirectly.

6.2 Basic physical quantities

6.2.1 Quantities

The basic physical quantities are the quantities directly measurable. These quantities are as follows:

- air temperature;
- radiation flux;
- plane radiant temperature;
- dew point temperature;
- relative humidity;
- air velocity;
- surface temperature;
- globe temperature;
- psychrometric wet-bulb temperature;
- natural wet-bulb temperature.

6.2.2 Air temperature

It is the temperature of the air around the human body. It is measured by a temperature sensor shielded against radiation (see [Annex A](#)).

6.2.3 Radiation

It is the energy exchanged by radiation from system and its environment. It is measured by a radiometer (see [Annex C](#)).

6.2.4 Plane radiant temperature

It is the uniform temperature of an enclosure where the irradiance on one side of a small plane element is the same as in the non-uniform actual environment. It can be measured from radiation with a radiometer or calculated from the surface temperatures of the environment and the shape factors between the surfaces and the plane element (see [Annex C](#)).

6.2.5 Dew point temperature

It is the temperature at which air becomes saturated (100 % relative humidity) with water vapour when cooled at constant pressure. In other words, the water vapor partial pressure at the given temperature is equal to the saturated water vapor pressure at the dew-point temperature (see [Annex D](#)).

6.2.6 Relative humidity

It is the actual vapour pressure divided by vapour pressure at saturation at the same temperature. It is measured by a capacitance hygrometer or a hair absorption hygrometer (see [Annex D](#)).

6.2.7 Surface temperature

It is the temperature of a given surface. It is measured by contact thermometers (resistance, thermocouples) or infrared sensors (see [Annex F](#)).

6.2.8 Air velocity

It is average velocity of the air, i.e. the magnitude of the velocity vector of the flow at the measuring point considered, over an interval of time (measuring period). It is measured using an anemometer (see [Annex E](#)).

6.2.9 Globe temperature

It is the temperature measured from a black-globe thermometer consisting of a black globe in the centre of which is placed a temperature sensor such as an expansion thermometer, a thermocouple or a resistance probe (see [Annex B](#)).

6.2.10 Psychrometric wet-bulb temperature

It is the temperature indicated by a psychrometer when the bulb of one thermometer is covered with a water saturated wick over which air is caused to flow at approximately 4,5 m/s to reach an equilibrium temperature of water evaporating into air, when the heat of vaporization is supplied by the sensible heat of the air. This temperature is lower than that of the gas stream itself and is the dynamic equilibrium value attained when the convective heat transfer to the sensor effectively equals the evaporative heat load associated with the moisture loss from the wetted surface. If small corrections are applied to a wet-bulb thermometer (e.g. a gas stream velocity greater than $3 \text{ m}\cdot\text{s}^{-1}$), it returns with a good approximation of the thermodynamic wet-bulb temperature. This is the limiting temperature reached as a gas cools on adiabatic saturation and is more properly termed the adiabatic-saturation temperature to avoid confusion. It is measured by a psychrometer (see [Annex D](#)).

6.2.11 Natural wet-bulb temperature

It is the temperature value read by a sensor covered with a wetted wick that is ventilated naturally (i.e. placed in the environment under consideration without additional forced ventilation). Since the sensor is unshielded, this quantity is affected also by radiation and cannot be confused with the psychrometric wet-bulb temperature. It is measured by a natural wet-bulb temperature sensor (see [Annex H](#)).

6.3 Derived physical quantities

6.3.1 General

The derived physical quantities are calculated from basic ones, or represent or characterize a group of factors of the environment, weighted according to the characteristics of the sensors used. The second ones are often used to define an empirical index of comfort or thermal stress without having recourse to a rational method based on estimates of the various forms of heat exchanges between the human body and the thermal environments, and of the resulting thermal balance and physiological strain. The following derived quantities are described in the specific standards as they apply and where measuring requirements are included:

- mean radiant temperature;
- radiant temperature asymmetry;
- operative temperature;
- water vapour partial pressure;
- humidity ratio;
- turbulence.

6.3.2 Mean radiant temperature

It is the uniform temperature of an imaginary enclosure in which radiant heat transfer from the human body is equal to the radiant heat transfer in the actual non-uniform enclosure.

The mean radiant temperature can be calculated from quantities measured by instruments which allow the generally heterogeneous radiation from the walls of an actual enclosure to be "integrated" into a mean value (see [Annex B](#)).

The mean radiant temperature can also be calculated from measured values of the temperature of the surrounding walls and the size of these walls and their position in relation to a person (see [Annex B](#)).

The mean radiant temperature may also be calculated from the plane radiant temperature in six opposite directions weighted according to the projected area factors for a person. Similarly, it can be estimated from the measurement of the radiant flux from different directions (see [Annex B](#)).

6.3.3 Radiant temperature asymmetry

The radiant temperature asymmetry is the difference between the plane radiant temperature of the two opposite sides of a small plane element (see 5.1.3).

The asymmetric radiant field is defined in relation to the position of the plane element used as a reference. It is, however, necessary to specify exactly the position of the latter by means of the direction of the normal to this element.

The radiant temperature asymmetry is measured or calculated from the measured value of the plane radiant temperature in the two opposing directions (see [Annex C](#)).

6.3.4 Operative temperature

The operative temperature is the uniform temperature of an imaginary black enclosure in which an occupant would exchange the same amount of heat by radiation plus convection as in the actual non-uniform environment. It is measured or calculated from air temperature and mean radiant temperature (see [Annex G](#)).

6.3.5 Water vapour partial pressure

It is the pressure which the water vapour would exert if it alone occupied the whole volume occupied by the mixture at the same temperature. It is proportional to the absolute humidity, which represents to the actual amount of water vapour contained in the air as opposed to quantities such as the relative humidity or the saturation level.

The water vapour partial pressure can be determined directly or indirectly (see [Annex D](#)).

6.3.6 Humidity ratio

It is the ratio of the mass of water vapor in a sample of ambient air to the mass of dry air in the same sample (see [Annex D](#)).

6.3.7 Turbulence intensity

It is the standard deviation of the local air velocity to the local mean air velocity.

7 The characteristics of physical quantity measuring instruments

7.1 General

The characteristics depend on the class (C and S).

7.2 Characteristics of instruments for measuring the basic quantities

When a measurement is carried out, it is necessary to differentiate between the accuracy of the physical quantity that is affected by the variables involved in the measuring operations (e.g. the position of the sensors) and the accuracy of the sensor. To obtain reliable results, the former is the most important.

The measuring ranges, the measuring accuracy of the sensors for measuring the basic quantities are summarized in [Table 3](#). These characteristics shall be considered to be minimum requirements for each class (C and S). That means that according to needs and technical manufacturing possibilities, it is always possible to specify more exact characteristics or more prescriptive values. For certain quantities, very precise thermal stress measurements can require the use of appliances with measuring ranges in class S and accuracy of class C. The characteristics of measuring instruments for basic physical quantities are specified in [Table 4](#) (classes C and S). They shall be used as a reference, except where this contradicts the principle for measuring the quantities under consideration. In any case it is important to consider instrumental measurement uncertainty and measuring chain uncertainty (see [Clause 8](#)).

For the purposes of this document, the time constant of a sensor is considered to be numerically equal to the time taken for the output of the sensor, in response to a step change in the environmental quantity being measured, to reach 63 % of its final change in steady-state value without overshoot. The response time, which is in practice the time after which the quantity being measured (for example: temperature of the thermometer) can be considered to be sufficiently close to the exact figure for the quantity to be measured (for example: temperature of the air), can be calculated from the time constant. A 90 % response time is achieved after a period equal to 2,3 times the time constant. It is necessary to wait, as a minimum, for a time equivalent to the response time before a measurement is taken. In [Table 4](#) the standard environmental conditions for the determination of time constants of sensors are reported.

As the time constant of a sensor does not depend solely on the sensor (mass, surface area, presence of a protective shield) but also on the environment, and hence on factors connected with a given measurement (air velocity, radiation, etc.), it is necessary to indicate the conditions under which these values were obtained.

All measurement instruments should be periodically calibrated and verified they satisfy all required specifications.

Table 3 — Characteristics of measuring instruments for basic physical quantities

Quantity	Sym- bol	Class C (comfort)			Class S (stress)			Comments
		Measur- ing range	Accuracy	Response time	Measur- ing range	Accuracy	Response time	
Air tempera- ture	t_a	10 °C to 35 °C	Required: $\pm(0,3\text{ °C} + 0,005 \cdot t_a \text{ °C})$ Desirable: $\pm(0,1\text{ °C} + 0,001 \cdot t_a \text{ °C})$	$\leq 1\text{ min}$	-60 °C to 150 °C	Required: $\pm(0,6\text{ °C} + 0,01 \cdot t_a \text{ °C})$ Desirable: $\pm(0,15\text{ °C} + 0,002 \cdot t_a \text{ °C})$	$\leq 1\text{ min}$	Response time takes into account that the measure- ment is carried out in air.
Radiation flux	r_d	-35 W·m ⁻² to 35 W·m ⁻² spectral range: 0,3 µm to 50 µm	Required: $\pm 5\text{ W·m}^{-2}$ Desirable: $\pm 5\text{ W·m}^{-2}$	$\leq 1\text{ min}$	-300 W·m ⁻² to -100 W·m ⁻² -100 W·m ⁻² to +100 W·m ⁻² > +100 W·m ⁻² spectral range: 0,3 µm to 50 µm	Required: 10 % $\pm 5\text{ W·m}^{-2}$ 10 % Desirable: 5 % $\pm 5\text{ W·m}^{-2}$ 5 %	$\leq 1\text{ min}$	Accuracy values have been chosen as a function of the different measuring ranges and propor- tional to the read value in the ranges 300 W·m ⁻² to -100 W·m ⁻² and > +100 W·m ⁻² .
Plane radiant temperature	t_{pr}	0 °C to 50 °C	Required: $\pm(0,6\text{ °C} + 0,05 \cdot t_{pr} \text{ °C})$ Desirable: $\pm(0,2\text{ °C} + 0,04 \cdot t_{pr} \text{ °C})$ These levels shall be guaranteed at least for a deviation $ t_{pr} - t_a < 10\text{ °C}$		-60 °C to +200 °C	Required: $\pm(1,2\text{ °C} + 0,02 \cdot t_{pr} \text{ °C})$ Desirable: $\pm(0,6\text{ °C} + 0,02 \cdot t_{pr} \text{ °C})$ These levels shall be guar- anteed at least for a deviation $ t_{pr} - t_a < 50\text{ °C}$		
Dew point temperature	t_d	-5 °C to 28 °C	Required: 0,2 °C Desirable: 0,1 °C		-5 °C to +50 °C	Required: 0,5 °C Desirable: 0,2 °C		
Relative hu- midity	R_h	20 % to 80 % 10 °C to 35 °C	Required: 3 % Desirable: 2 %	$\leq 3\text{ min}$	5 % to 95 %	Required: 3 % Desirable: 2 %	$\leq 3\text{ min}$	The range proposed for class S instruments is consistent with the limits of the current measure- ment tech- nology.

Table 3 (continued)

Quantity	Symbol	Class C (comfort)			Class S (stress)			Comments
		Measuring range	Accuracy	Response time	Measuring range	Accuracy	Response time	
Surface temperature	t_s	0 °C to 50 °C	Required: $\pm(0,6 \text{ °C} + 0,01 \cdot t_s \text{ °C})$ Desirable: $\pm(0,15 \text{ °C} + 0,002 \cdot t_s \text{ °C})$	$\leq 1 \text{ min}$	-50 °C to +200 °C	Required: $\pm(0,6 \text{ °C} + 0,01 \cdot t_s \text{ °C})$ Desirable: $\pm(0,15 \text{ °C} + 0,002 \cdot t_s \text{ °C})$	$\leq 1 \text{ min}$	The accuracy of the measurement is affected by the contact pressure.
Air velocity	v_a	0,05 m·s ⁻¹ to 1 m·s ⁻¹	Required: $\pm(0,1 + 0,05 \cdot v_a) \text{ m·s}^{-1}$ Desirable: $\pm(0,05 + 0,05 \cdot v_a) \text{ m·s}^{-1}$ These levels shall be guaranteed whatever the direction of air flow within a solid angle $\omega = 3\pi \text{ sr}$	Required: $\leq 2 \text{ s}$ Desirable: $\leq 1 \text{ s}$ For turbulence measurement $\leq 0,2 \text{ s}$ (*)	0,1 m·s ⁻¹ to 20 m·s ⁻¹	Required: $\pm(0,1 + 0,05 \cdot v_a) \text{ m·s}^{-1}$ Desirable: $\pm(0,1 + 0,03 \cdot v_a) \text{ m·s}^{-1}$	Required: $\leq 2 \text{ s}$ Desirable: $\leq 1 \text{ s}$ For turbulence measurement $\leq 0,2 \text{ s}$ (*)	The turbulence intensity can be calculated only with a suitable frequency of the measurement. The ranges of air velocity are made consistent with the accuracies specified.
Globe temperature	t_g	0 °C to 50 °C	Required: $\pm(0,6 \text{ °C} + 0,01 \cdot t_g \text{ °C})$ Desirable: $\pm(0,15 \text{ °C} + 0,002 \cdot t_g \text{ °C})$	$\leq 30 \text{ min}$	-50 °C to +200 °C	Required: $\pm(0,6 \text{ °C} + 0,01 \cdot t_g \text{ °C})$ Desirable: $\pm(0,15 \text{ °C} + 0,002 \cdot t_g \text{ °C})$	$\leq 30 \text{ min}$	for a globe 150 mm in diameter.
Psychrometric wet-bulb temperature	t_w	5 °C to 40 °C	Required: $\pm(0,6 \text{ °C} + 0,01 \cdot t_w \text{ °C})$ Desirable: $\pm(0,15 \text{ °C} + 0,002 \cdot t_w \text{ °C})$	$\leq 1 \text{ min}$	-	-	-	Response time takes into account that the measurement is carried out in air.
Natural wet-bulb temperature	t_{nw}	-	-		5 °C to 40 °C	Required: $\pm(0,6 \text{ °C} + 0,01 \cdot t_{nw} \text{ °C})$ Desirable: $\pm(0,15 \text{ °C} + 0,002 \cdot t_{nw} \text{ °C})$	$\leq 1 \text{ min}$	Response time takes into account that the measurement is carried out in air.

7.3 Characteristics of integrating types of measuring instruments

All measurement instruments should be periodically calibrated and verified they satisfy all required specifications.

Any measuring instrument integrating the measurement of several variables (e.g. WBGT index meters) shall have a measuring interval, and an accuracy equal to or better than those of the minimum between corresponding individual variables.

All measurement instruments should be periodically calibrated and verified they satisfy all required specifications.

8 Specifications relating to measuring methods

8.1 General

The methods for measuring the physical quantities characterizing the environment shall take account of the fact that these characteristics vary in location and time. Furthermore, the methods can be different depending on the environment use, for example for human occupation or for the collections preservation. In this document, only environments for human occupation are considered.

Table 4 — Standard environmental conditions for the determination of time constants of sensors

	t_a	$\bar{t}_r$	p_a	v_a
Air temperature		$= t_a$	any	$< 0,15 \text{ m}\cdot\text{s}^{-1}$
Mean radiant temperature	$= \bar{t}_r$	$= t_a$	any	$< 0,15 \text{ m}\cdot\text{s}^{-1}$
Plane radiant temperature	$= 20 \text{ }^\circ\text{C}$	$= t_a$	any	$< 0,15 \text{ m}\cdot\text{s}^{-1}$
Water vapour partial pressure	$= 20 \text{ }^\circ\text{C}$	$= t_a$		To be specified according to the measuring method
Air velocity	$= 20 \text{ }^\circ\text{C}$	$= t_a$	any	-
Surface temperature	$= 20 \text{ }^\circ\text{C}$	$= t_a$	any	$< 0,15 \text{ m}\cdot\text{s}^{-1}$

The thermal environment can vary with time and the horizontal location and the vertical direction (as shown in [8.2](#)). Therefore, it should be taken into account for how long a time a person is working at the different locations.

8.2 Specifications relating to variations in the physical quantities within the space surrounding the subject

It is first necessary to check whether the environment is homogeneous or heterogeneous

An environment should be considered to be "homogeneous" from the microclimatic point of view if, at a given moment, air temperature, globe temperature, mean radiant temperature, air velocity and relative humidity can be considered to be practically uniform around the subject, i.e. when the deviations between each of these quantities and their mean spatial value calculated as a mean of the locations does not exceed the values obtained by multiplying the required measuring accuracy from [Table 3](#) by the corresponding factor X listed in [Table 5](#). This condition is frequently met in case of air temperature, air velocity and relative humidity, but more rarely in the case of mean radiant temperature. If the environment is homogeneous, the arithmetic mean of values of physical quantities is not required.

When the environment is heterogeneous, the physical quantities shall be measured at several locations at or around the subject or in a position representative of the occupation and account taken of the partial results obtained in order to determine the mean value of the quantities to be considered in assessing the comfort or the thermal stress. Other standards in this group, such as ISO 15265 or ISO 15743, provide information about the previous analyses of the comfort or the thermal stress conditions of the workplaces being studied or of workplaces of a similar type can provide information of interest in determining whether certain physical quantities are distributed in a homogeneous way. It is typical in the case of poorly defined rooms or workplaces to consider only a limited zone of occupancy where the criteria of comfort or thermal stress shall be respected. In case of dispute in the interpretation of data, measurements carried out presuming the heterogeneous environment shall be used as a reference.

Whatever the type of environment, the basic physical quantities must be measured at the heights shown in [Table 6](#). In class S all quantities shall be measured at the heights required by standards which define the stress indices and which takes precedence over this document.

The different sensors shall be placed at the heights indicated in [Table 6](#) where the person normally carries out their activity. When it is impossible to interrupt the activity in progress, the sensors must be placed in positions such as that the thermal exchanges are more or less identical to those to which the person is exposed (this measurement detail shall be mentioned in the results).

8.3 Specifications relating to the variations in the physical quantities with time

The physical quantities in the space surrounding the person can change as a function of time, for example the following reasons:

- a) the environment is naturally ventilated;
- b) for a given activity, the quantities can vary as a function of external incidents such as those which accompany a manufacturing process in the case of an industrial activity;
- c) the quantities vary as a result of the movements of the person in different environments (for example, a warm environment close to a machine and a comfortable rest environment);
- d) changes in external irradiation.

Table 5 — Values of factor X for determining the microclimatic homogeneity of an environment

	Factor X	
	Class C (comfort)	Class S (stress)
Air temperature	3	4
Globe temperature	2	2
Mean radiant temperature	2	2
Air velocity	2	3
Relative humidity	2	3
NOTE: Deviation between each individual quantity and their mean value shall be less than that obtained by multiplying the required measuring accuracy (Table 3) by the appropriate factor X from this table.		

Table 6 — Measuring heights for the physical quantities of an environment in class C

	Recommended heights	
	Sitting	Standing
Head level	1,1 m	1,7 m
Abdomen level	0,6 m	1,1 m
Ankle level	0,1 m	0,1 m

An environment is said to be static in relation to the subject when the physical quantities used to describe the level of exposure are practically independent of the time, i.e. for instance when the fluctuations in these parameters in relation to their mean temporal value do not exceed the values obtained by multiplying the required measuring accuracy from [Table 3](#) by the corresponding factor X listed in [Table 5](#).

It should be noted that the other quantities used to describe the level of exposure to heat (metabolism, energy efficiency, insulation of clothing) can also depend on time. Their variation can be assessed using ISO 8996 and ISO 9920 respectively.

When an environment cannot be considered as static in relation to the subject, a monitoring should be required. The measuring time and interpretation of the data will depend on which comfort or thermal stress index is being used. This information shall be found by reference to the appropriate standards.