



BSI Standards Publication

Quantities and units —

Part 14: Telebiometrics related to human physiology

National foreword

This British Standard is the UK implementation of EN 80000-14:2009. It is identical to IEC 80000-14:2008.

The UK participation in its preparation was entrusted to Technical Committee SS/7, General metrology, quantities, units and symbols.

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

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ISBN 978 0 580 61238 1

ICS 01.060

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2009

Amendments issued since publication

Amd. No.	Date	Text affected
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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 80000-14

April 2009

ICS 01.060

English version

Quantities and units -
Part 14: Telebiometrics related to human physiology
(IEC 80000-14:2008)

Grandeurs et unités -
Partie 14: Télébiométrie
relative à la physiologie humaine
(CEI 80000-14:2008)

Größen und Einheiten -
Teil 14: Telebiometrische Identifizierung
unter den Bedingungen
der Physiologie des Menschen
(IEC 80000-14:2008)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: avenue Marnix 17, B - 1000 Brussels

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Ref. No. EN 80000-14:2009 E

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Foreword

The text of the International Standard IEC 80000-14:2008, prepared by IEC TC 25, Quantities and units, in co-operation with ISO/TC 12, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 80000-14 on 2009-04-01 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2010-04-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-04-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 80000-14:2008 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 80000-1	- ¹⁾	Quantities and units - Part 1: General	-	-
ISO 80000-3	2006	Quantities and units - Part 3: Space and time	-	-
ISO 80000-4	2006	Quantities and units - Part 4: Mechanics	-	-
ISO 80000-5	- ²⁾	Quantities and units - Part 5: Thermodynamics	-	-
IEC 80000-6	- ²⁾	Quantities and units - Part 6: Electromagnetism	EN 80000-6	2008 ³⁾
ISO 80000-7	- ²⁾	Quantities and units - Part 7: Light	-	-
ISO 80000-8	- ²⁾	Quantities and units - Part 8: Acoustics	EN ISO 80000-8	2007 ³⁾
ISO 80000-9	- ²⁾	Quantities and units - Part 9: Physical chemistry and molecular physics	-	-
ISO 80000-10	- ¹⁾	Quantities and units - Part 10: Atomic and nuclear physics	-	-
ITU-T Recommendation X.1081	- ²⁾	The telebiometric multimodal model - A framework for the specification of security and safety aspects of telebiometrics	-	-
VIM	2008	International Vocabulary of Metrology - Basic and General Concepts and Associated Terms	-	-

¹⁾ At draft stage.

²⁾ Undated reference.

³⁾ Valid edition at date of issue.

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0 Introduction

Subclauses 0.1 to 0.5 are text that is common to many Parts of ISO/IEC 80000. Some of this text is not applicable to this Part of ISO/IEC 80000, but is included for consistency with other parts. Subclause 0.6 is specific to this part of ISO/IEC 80000.

0.1 Arrangement of the tables

The tables of quantities and units in ISO/IEC 80000 are arranged so that the quantities are presented on the left-hand pages and the units on the corresponding right-hand pages.

All units between two full lines on the right-hand pages belong to the quantities between the corresponding full lines on the left-hand pages.

Where the numbering of an item has been changed in the revision of a part of ISO 31, the number in the preceding edition is shown in parenthesis on the left-hand page under the new number for the quantity; a dash is used to indicate that the quantity in question did not appear in the preceding edition.

0.2 Tables of quantities

The names in English and in French of the most important quantities within the field of this part of ISO/IEC 80000 are given together with their symbols and, in most cases, definitions. These names and symbols are recommendations. The definitions are given for identification of the quantities in the International System of Quantities (ISQ), listed on the left hand pages of the Tables in this part of ISO/IEC 80000; they are not intended to be complete.

The scalar, vectorial or tensorial character of quantities is pointed out, especially when this is needed for the definitions.

In most cases only one name and only one symbol for the quantity are given; where two or more names or two or more symbols are given for one quantity and no special distinction is made, they are on an equal footing. When two types of italic letters exist (for example as with ϑ and θ ; φ and ϕ ; a and α ; g and g) only one of these is given. This does not mean that the other is not equally acceptable. It is recommended that such variants should not be given different meanings. A symbol within parenthesis implies that it is a reserve symbol, to be used when, in a particular context, the main symbol is in use with a different meaning.

In this English edition the quantity names in French are printed in an italic font, and are preceded by *fr*. The gender of the French name is indicated by (m) for masculine and (f) for feminine, immediately after the noun in the French name.

0.3 Tables of units

0.3.1 General

The names of units for the corresponding quantities are given together with the international symbols and the definitions. These unit names are language-dependent, but the symbols are international and the same in all languages. For further information, see the SI Brochure (8th edition 2006) from BIPM and ISO 80000-1.

The units are arranged in the following way:

- a) The coherent SI units are given first. The SI units have been adopted by the General Conference on Weights and Measures (Conférence Générale des Poids et Mesures, CGPM). The coherent SI units, and their decimal multiples and submultiples formed with the SI prefixes, are recommended, although the decimal multiples and submultiples are not explicitly mentioned.
- b) Some non-SI units are then given, being those accepted by the International Committee for Weights and Measures (Comité International des Poids et Mesures, CIPM), or by the International Organization of Legal Metrology (Organisation Internationale de Métrologie Légale, OIML), or by ISO and IEC, for use with the SI. Such units are separated from the SI units in the item by use of a broken line between the SI units and the other units.

- c) Non-SI units currently accepted by the CIPM for use with the SI are given in small print (smaller than the text size) in the “Conversion factors and remarks” column.
- d) Non-SI units that are not recommended are given only in annexes in some parts of ISO/IEC 80000. These annexes are informative, in the first place for the conversion factors, and are not integral parts of the standard. These deprecated units are arranged in two groups:
 - 1) units in the CGS system with special names;
 - 2) units based on the foot, pound, second, and some other related units;
- e) Other non-SI units given for information, especially regarding the conversion factors are given in another informative annex.

0.3.2 Units for quantities of dimension one, or dimensionless quantities

The coherent unit for any quantity of dimension one, also called a dimensionless quantity, is the number one, symbol 1. When the value of such a quantity is expressed, the unit symbol 1 is generally not written out explicitly.

EXAMPLE 1 Refractive index $n = 1,53 \times 1 = 1,53$

Prefixes shall not be used to form multiples or submultiples of this unit. Instead of prefixes, powers of 10 are recommended.

EXAMPLE 2 Reynolds number $Re = 1,32 \times 10^3$

Considering that plane angle is generally expressed as the ratio of two lengths and solid angle as the ratio of two areas, in 1995 the CGPM specified that, in the SI, the radian, symbol rad, and steradian, symbol sr, are dimensionless derived units. This implies that the quantities plane angle and solid angle are considered as derived quantities of dimension one. The units radian and steradian are thus equal to one; they may either be omitted, or they may be used in expressions for derived units to facilitate distinction between quantities of different kind but having the same dimension.

0.4 Numerical statements in this part of ISO/IEC 80000

The sign = is used to denote “is exactly equal to”, the sign $\approx$ is used to denote “is approximately equal to”, and the sign := is used to denote “is by definition equal to”.

Numerical values of physical quantities that have been experimentally determined always have an associated measurement uncertainty. This uncertainty should always be specified. In this part of ISO/IEC 80000, the magnitude of the uncertainty is represented as in the following example.

EXAMPLE $l = 2,347\,82(32)\text{ m}$

In this example, $l = a(b)\text{ m}$, the numerical value of the uncertainty b indicated in parentheses is assumed to apply to the last (and least significant) digits of the numerical value a of the length l . This notation is used when b represents one standard uncertainty (estimated standard deviation) in the last digits of a . The numerical example given above may be interpreted to mean that the best estimate of the numerical value of the length l when l is expressed in the unit metre is 2,347 82 and that the unknown value of l is believed to lie between $(2,347\,82 - 0,000\,32)\text{ m}$ and $(2,347\,82 + 0,000\,32)\text{ m}$ with a probability determined by the standard uncertainty 0,000 32 m and the probability distribution of the values of l .

0.5 Remark on logarithmic quantities and their units

The expression for the time dependence of a damped harmonic oscillation can be written either in real notation or as the real part of a complex notation

$$F(t) = A e^{-\delta t} \cos \omega t = \text{Re} (A e^{(-\delta + i\omega)t}), \quad A = F(0)$$

This simple relation involving δ and ω can be obtained only when e (base of natural logarithms) is used as the base of the exponential function. The coherent SI unit for the damping coefficient δ and the angular frequency ω is second to the power minus one, symbol s^{-1} . Using the special names neper, symbol Np,

and radian, symbol rad, for the units of δt and ωt , respectively, the units for δ and ω become neper per second, symbol Np/s and radian per second, symbol rad/s, respectively.

Corresponding variation in space is treated in the same manner

$$F(x) = Ae^{-\alpha x} \cos \beta x = \operatorname{Re}(Ae^{-\gamma x}), \quad A = F(0) \quad \gamma = \alpha + i\beta$$

where the unit for α is neper per metre, symbol Np/m, and the unit for β is radian per metre, symbol rad/m.

The taking of logarithms of complex quantities is usefully done only with the natural logarithm. In ISO/IEC 80000, the level L_F of a field quantity F is therefore defined by convention as the natural logarithm of a ratio of the field quantity and a reference value F_0 , $L_F = \ln(F/F_0)$, in accordance with decisions by CIPM and OIML. Since a field quantity is defined as a quantity the square of which is proportional to power when it acts on a linear system, a factor 1/2 is introduced in the expression of the level of a power quantity, $L_P = (1/2) \ln(P/P_0)$, when defined by convention using the natural logarithm, in order to make the level of the power quantity equal to the level of the corresponding field quantity when the proportionality factors are the same for the considered quantities and the reference quantities, respectively. See IEC 60027-3:2002, subclause 4.2¹.

The neper and the bel, symbol B, are units for such logarithmic quantities. The neper is the coherent unit when the logarithmic quantities are defined by convention using the natural logarithm, 1 Np = 1. The bel is the unit when the numerical value of the logarithmic quantity is expressed in terms of decimal logarithms, 1 B = (1/2) ln 10 Np $\approx$ 1,151 293. The use of the neper is mostly restricted to theoretical calculations on field quantities, when this unit is most convenient, whereas in other cases, especially for power quantities, the bel, or in practice its submultiple decibel, symbol dB, is widely used. It should be emphasized that the fact that the neper is chosen as the coherent unit does not imply that the use of the bel should be avoided. The bel is accepted by the CIPM and the OIML for use with the SI. This situation is in some respect similar to the fact that the unit degree (...°) is commonly used in practice instead of the coherent SI unit radian (rad) for plane angle.

Generally it is not the logarithmic quantity itself (such as L_F or L_P) that is of interest; it is only the argument of the logarithm that is of interest.

To avoid ambiguities in practical applications of logarithmic quantities the unit should always be written out explicitly after the numerical value, even if the unit is neper, 1 Np = 1. Thus, for power quantities, the level is generally given by $L_P = 10 \lg(P/P_0)$ dB, and it is the numerical value $10 \lg(P/P_0)$ and the argument P/P_0 that are of interest. This numerical value is, however, not the same as the quantity L_P , because the unit decibel (or the unit bel) is not equal to one, 1. The corresponding applies to field quantities where the level is generally given by $L_F = 10 \lg(F/F_0)^2$ dB.

EXAMPLES

The implication of the statement that $L_F = 3$ dB (= 0,3 B) for the level of a field quantity is to be read as meaning: $\lg(F/F_0)^2 = 0,3$, or $(F/F_0)^2 = 10^{0,3}$. It also implies that $L_F \approx 0,3 \times 1,151\,293 = 0,345\,387\,9$ Np, but this is not often used in practice.

Similarly the implication of the statement that $L_P = 3$ dB (= 0,3 B) for the level of a power quantity is to be read as meaning: $\lg(P/P_0) = 0,3$, or $(P/P_0) = 10^{0,3}$. It also implies that $L_P \approx 0,3 \times 1,151\,293 = 0,345\,387\,9$, but this is not often used in practice.

Meaningful measures of power quantities generally require time averaging to form a mean-square value that is proportional to power. Corresponding field quantities may then be obtained as the root-mean-square value. Peak values during specified time intervals are also important. For such applications, the decimal (base 10) logarithm is generally used to form the level of field or power quantities. However, the natural logarithm could also be used for these applications, especially when the quantities are complex.

¹ IEC 60027-3, Letter symbols to be used in electrical technology — Part 3: Logarithmic and related quantities, and their units.

0.6 Introduction specific to 80000-14

0.6.1 The basis for the determination of the quantities and units to be addressed is the taxonomy specified in the Telebiometric Multimodal Model (TMM, see ITU-T Rec. X.1081). In the TMM ten aspects of the interaction between the human body and its environment are recognised (base modalities). These interactions are assumed to occur at various scales of propinquity and at various intensities across the "personal privacy sphere" (see Figure 1 of ITU-T Rec. X.1081).

0.6.2 Using the terminology of the TMM, these interactions (base modalities) are classified as follows (see the definition of terms in clause 3):

- TANGO–IN
- TANGO–OUT
- VIDEO–IN
- VIDEO–OUT
- AUDIO–IN
- AUDIO–OUT
- CHEMO–IN
- CHEMO–OUT
- RADIO–IN
- RADIO–OUT

0.6.3 It is also recognised that the temperature of (parts of) the human body is important both for safe operation of a telebiometric device and for its use in providing telebiometric security. This aspect of the interaction of a human body with its environment uses the base modalities TANGO–IN, TANGO–OUT, VIDEO–IN, and VIDEO–OUT, but is sufficiently important that it is defined in this part of ISO/IEC 80000 as an additional derived modality:

- CALOR–IN describes the absorption of heat by the whole human body mediated by electromagnetic radiation (including infra-red or micro-wave radiation), heat conduction (by direct contact) or heat convection (by a heat transporting liquid or gas).
- CALOR–OUT describes the loss of heat by the whole human body mediated by electromagnetic radiation, heat conduction, heat convection or evaporation.

0.6.4 Clauses 5 to 11 define quantities and units for the in and out aspects of one of the interactions of the human body with a telebiometric device – see [10].

0.6.5 The terminology used in this classification is derived as follows:

- TANGO: from Latin: tangō, -ēre, tetigī, tāctum Latin, meaning "I touch"

NOTE 1 TANGO–IN has been listed first, because in terms of the development of life, skin sensitivity came first, and other input organs were specialisations of that.

NOTE 2 There are two forms of skin, glabrous and hairy (see Figures 1 and 2). These have different properties for sensitivity (see VIM, 4-12), giving rise to different TANGO–IN units.

- VIDEO: from Latin: videō, -ēre, vīdī, vīsum Latin, meaning "I see"
- AUDIO: from Latin: audiō, -īre, -īvī (īī), -ītum Latin, meaning "I hear"
- CHEMO: from Medieval Latin: chemia, from Arabic al-kimia meaning "chemistry"
- RADIO: from Latin: radiō, -āre, -āvi, ātum Latin, meaning "I radiate"
and: Latin: radius, -iī (m) Latin, meaning "ray, beam"
- CALOR: from Latin: calor, calōris (m) Latin, meaning "warmth, heat"

0.6.6 In Annex C (normative) a code is specified that can be applied to classify a telebiometric device, and a compact graphical symbol that can be used to represent that code. This is based essentially on whether the device is an actuator or a sensor, and on which modalities it uses.

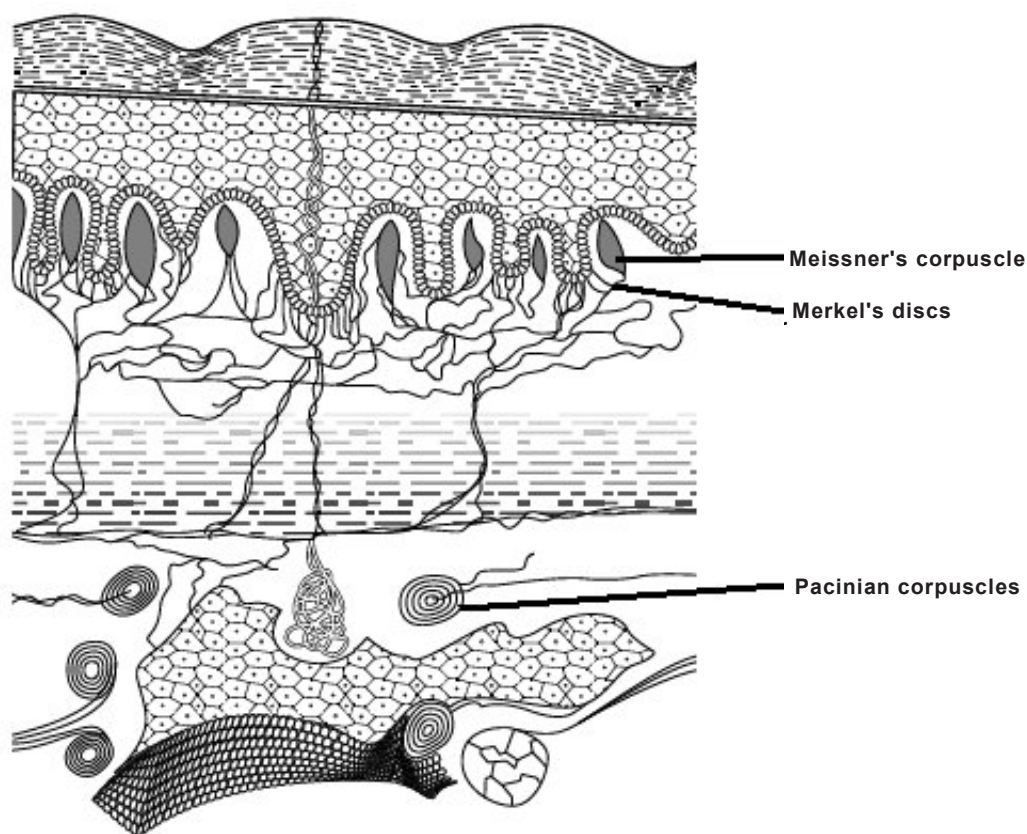


Figure 1 – Schematic drawing of a cross-section of glabrous skin

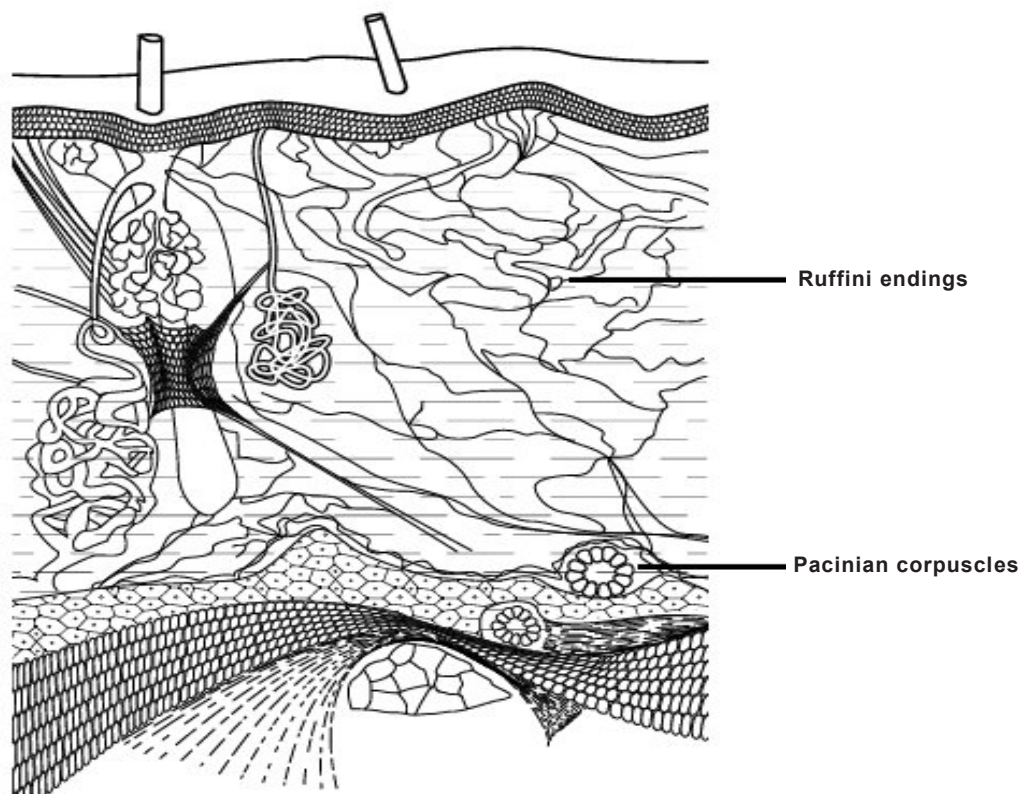


Figure 2 – Schematic drawing of a cross-section of hairy skin

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that the tables of Quantities appear on an even numbered page
and the tables of units on an odd numbered page.**

QUANTITIES AND UNITS –

Part 14: Telebiometrics related to human physiology

1 Scope

In this part of ISO/IEC 80000 names, symbols, and definitions for quantities and units of telebiometrics related to human physiology are given.

This part of ISO/IEC 80000 encompasses quantities and units for physiological, biological or behavioural characteristics that might provide input or output to telebiometric identification or verification systems (recognition systems), including any known detection or safety thresholds.

It also includes quantities and units concerned with effects on a human being caused by the use of a telebiometric device.

NOTE The quantities and units, their names and letter symbols, specified here are those widely used in the disciplines and specialities related to telebiometrics: the telebiometric industry and telebiometry. Telebiometric units are SI units (see ISO 80000-1).

A code and an associated graphical symbol for the identification of the type of a telebiometric device are also specified in this part of ISO/IEC 80000.

2 Normative references

The following referenced documents are indispensable for the application 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 80000-1, *Quantities and units — Part 1: General*²

ISO 80000-3:2006, *Quantities and units — Part 3: Space and time*

ISO 80000-4:2006, *Quantities and units — Part 4: Mechanics*

ISO 80000-5, *Quantities and units — Part 5: Thermodynamics*

IEC 80000-6, *Quantities and units — Part 6: Electromagnetism*²

ISO 80000-7, *Quantities and units — Part 7: Light*²

ISO 80000-8, *Quantities and units — Part 8: Acoustics*

ISO 80000-9, *Quantities and units — Part 9: Physical chemistry and molecular physics*²

ISO 80000-10, *Quantities and units — Part 10: Atomic and nuclear physics*

ITU-T Rec. X.1081, *The Telebiometric Multimodal Model — A Framework for the Specification of Security and Safety Aspects of Telebiometrics*

VIM (2007), *International Vocabulary of Metrology — Basic and General Concepts and Associated Terms* – 3rd edition

²⁾ In preparation.

3 Terms, definitions, abbreviations and symbols

For the purpose of this document, the following terms and definitions apply.

3.1 General concepts

3.1.1

base modality

one of the classifications of the interaction of a human body with its environment based on the physical nature of the interaction or on the human sensory system that it affects (see 3.4.1 to 3.4.10)

NOTE If the interaction is from the environment to the human body it is described as an in-modality. If it is from the human body to the environment is described as an out-modality

3.1.2

derived modality

one of the classifications of the interaction of a human body with its environment based on a property of the human body that is determined or changed using one or more of the base modalities (see 3.4.11 to 3.4.12)

NOTE The temperature of the human body or parts of the human body can be detected (CALOR–OUT) by an infrared detector or by conduction to a thermometer and can be changed by convection, conduction, or various forms of radiation (CALOR–IN).

3.1.3

in-modality

modality of interactions from the environment to the human body

3.1.4

out-modality

modality of interactions from the human body to the environment

3.1.5

wetware

that physical aspect of a human being that is affected by or affects telebiometric devices

NOTE This term is not used in the normative text, but it is extensively used in Annex D and the definition is provided here for completeness.

3.1.6

biometrics

automated recognition of individuals based on their behavioural and biological characteristics

NOTE In some other disciplines the meaning of biometrics encompasses counting, measuring and statistical analysis of any kind of data in the biological sciences including the relevant medical sciences.

3.1.7

telebiometrics

application of biometrics to telecommunications and of telecommunications to remote biometric sensing

3.1.8

telebiometric device

sensor or actuator interacting remotely with a human being, using telecommunications

3.1.9

telebiometric multimodal model

model of the interactions of a human being with its environment using modalities based on the human senses.

3.1.10

TMM metric layer

layer in the TMM taxonomy that identifies the SI units used to describe an IN or OUT interaction.

3.1.11

TMM scientific layer

layer in the TMM taxonomy that identifies the scientific discipline that investigates the properties and thresholds of an IN or OUT interaction.

3.1.12

TMM sensory layer

layer in the TMM taxonomy that identifies the human senses involved in producing or detecting an IN or OUT interaction.

3.2 Thresholds

3.2.1

threshold

boundary between two identifiable regions of the stimulus to response curve for human sensors

3.2.2

detection threshold

level at which a stimulus applied to a conscious human subject just produces a response

3.2.3

suprathreshold stimulus

stimulus greater than the detection threshold

3.2.4

comfort threshold

level (above or below) which a stimulus is known to cause discomfort for most human beings

3.2.5

safety threshold

level at which a stimulus changes from being safe to not being safe.

NOTE In many cases a stimulus is safe below a safety threshold (a maximum safe level) and unsafe above (for example a hot object), but there are cases where the stimulus is safe above a safety threshold (a minimum safe level) and unsafe below (for example a cold object).

3.2.6

pain threshold

level above which a stimulus is known to cause the sensation of pain

3.2.7

damage threshold

level above which a stimulus may cause temporary or permanent damage

NOTE Damage thresholds often depend on the duration of the exposure to a stimulus as well as the level of that stimulus.

3.3 Safety and security

3.3.1

safety

property of a physical device or procedure that determines (and limits through mechanisms, procedures, regulations and permitted operating thresholds) the extent of the damage that the device can cause to one or more human beings.

NOTE Examples of mechanisms, procedures, regulations, and permitted operating thresholds are permitted electronic emissions from devices, the temperature of surfaces on operating devices, the volume of sounds in public entertainment, and mechanisms to ensure the shut-down of nuclear power plants in the event of some failure. In many cases the operation of a device within these limits can be both sensed and controlled by telecommunications.

3.3.2

security

protection of a human being's activities (particularly those involving privileges and financial activities) from attack by other human or computer activities, usually achieved by the use of mechanical or electronic devices or mechanisms associated with the protected human being.

NOTE Examples of security devices and mechanisms are physical door-locks, the use of PINs or biometrics to protect credit cards or passports, and the use of biometrics for access control. In many cases these devices and mechanisms use telecommunications as an essential part of their operation.

3.3.3

safe telebiometric device

telebiometric device that is harmless to human physiology, culture, psychology, and meets public information rights requirements and privacy requirements

NOTE 1 The Telebiometric Multimodal Model (see ITU-T Rec. X.1081) provides a framework for the identification of safety aspects of biometric devices, and for the specification of limits (safety thresholds) by analysing and categorising the interactions between a human body and its environment.

NOTE 2 Safe telebiometric devices meet a specified set of conditions derived from identified safety thresholds.

3.3.4

telebiometric security

security obtained through the use of telebiometric devices for authentication of a human being, using one or more of the modalities of interaction between a human body and its environment, meeting public information rights requirements and privacy requirements

NOTE The "out" modalities specified in the Telebiometric Multimodal Model (see ITU-T Rec. X.1081) provide a framework for the identification of devices that can provide telebiometric acquisition and processing.

3.3.5

telebiometric identification

telebiometric system function that performs a one-to-many search to obtain a candidate list using telecommunications to access one or more biometric systems.

3.3.6

telebiometric verification

telebiometric system function that performs a one-to-one comparison to show true or false, using telecommunications to access one or more biometric systems.

3.4 Modalities

3.4.1

TANGO-IN

characterization of any stimulus that can be detected by nerve endings in the human body, other than by the specialised nerves active in seeing, hearing, tasting and smelling, or that affects or damages human cells

NOTE 1 The term TANGO-IN is used both as an adjective applied to a stimulus, but more commonly as a noun referring to a TANGO-IN stimulus.

NOTE 2 The human body is sensitive to the impact of objects or to irritation by (for example) nano-particles or abrasion or chemical substances related to the use of telebiometric devices, and this forms part of the safety levels associated with TANGO-IN.

NOTE 3 Safety levels for TANGO-IN also include the pain caused by pressure to activate a telebiometric device (or other mechanical effects of a device on the body) or by chemical substances.

3.4.2

TANGO-OUT

characterization of any force or other non-sound effect produced by a part of the human body, including but not limited to blows with or without an associated instrument or tool, that can be detected by a sensor or another human being

NOTE 1 The term TANGO-OUT is used both as an adjective applied to a specific output, but more commonly as a noun referring to a TANGO-OUT specific output.

NOTE 2 TANGO-OUT includes quantities and units related to the ability of the human body to produce a force or physical effect, including measurements of both muscular and lung capability. This also includes quantities and units used in measurements of obesity and of general fitness.

3.4.3

VIDEO-IN

characterization of any stimulus that can be detected by, affects or is likely to affect or damage, the human eye

NOTE 1 The term VIDEO-IN is used both as an adjective applied to a stimulus, but more commonly as a noun referring to a VIDEO-IN stimulus.

NOTE 2 VIDEO-IN includes quantities and units related to the sensing by the eye of (non-ionizing) electromagnetic radiation at various wavelengths and at various intensities.

3.4.4

VIDEO—OUT

characterization of any output from a human being that can be detected by the human eye or an image sensor, including but not limited to behaviour or signs produced by a human being that can be observed by another human being or a sensor

NOTE The term VIDEO—OUT is used both as an adjective applied to a specific output, but more commonly as a noun referring to a VIDEO—OUT specific output.

3.4.5

AUDIO—IN

characterization of any sound stimulus that can be detected by, affects or is likely to affect or damage, the human ear or otherwise impair hearing

NOTE 1 The term AUDIO—IN is used both as an adjective applied to a stimulus, but more commonly as a noun referring to a AUDIO—IN stimulus.

NOTE 2 AUDIO-IN includes quantities and units related to both the effect of loud sounds on the ear, and the frequency range and possible impairment of human hearing.

3.4.6

AUDIO—OUT

characterization of any sound produced by the vocal chords of a human being, or through activators for disabled speech, or by mechanical, possibly amplified, production of sound that can be detected by the human ear or a sensor

NOTE 1 The term AUDIO—OUT is used both as an adjective applied to a specific output, but more commonly as a noun referring to a AUDIO—OUT specific output.

NOTE 2 AUDIO-OUT includes quantities and units related to the production of sound by the vocal chords, including musical ranges (alto, tenor, etc.) or production of sound with amplification and the quantification of the loudness of such output, where it affects the human physiology or may be used in telebiometrics

3.4.7

CHEMO—IN

characterization of any stimulus that can be detected by, affects or is likely to affect, the human sense of taste or smell or to damage these chemo senses

NOTE 1 The term CHEMO—IN is used both as an adjective applied to a stimulus, but more commonly as a noun referring to a CHEMO—IN stimulus.

NOTE 2 CHEMO-IN includes quantities and units related to the ability of the human body to smell or taste chemical substances, including both descriptions of tastes and smells (for example of food and wine) and the lethality of specific chemicals.

3.4.8

CHEMO—OUT

characterization of any chemical emission from the human body that can be detected by the chemical sensing organs of a human being or by a sensor (including but not limited to the use of sniffer dogs, sniffer wasps and olfactory chips as sensors)

NOTE The term CHEMO—OUT is used both as an adjective applied to a specific output, but more commonly as a noun referring to a CHEMO—OUT specific output.

3.4.9

RADIO—IN

characterization of any stimulus from external sources of radiation (except those covered by VIDEO—IN and AUDIO—IN) that can affect or damage the human body or implanted devices

NOTE 1 The term RADIO—IN is used both as an adjective applied to a stimulus, but more commonly as a noun referring to a RADIO—IN stimulus.

NOTE 2 An implanted device may be any of (not exclusive):

- a cochlear-Implant that activates ear nerves directly by signals from a signal processor
- a pacemaker to control the heart beat
- an implanted cardioverter-defibrillator to provide immediate defibrillation of the heart
- a transcutaneous electrical nerve stimulator (an electronic pain reducer)
- a muscle activator
- an implanted Radio Frequency Identification tag (RFid tag)

3.4.10

RADIO–OUT

characterization of any output from the human body (or from implanted devices) that is a source of radiation (except those covered by VIDEO–OUT and AUDIO–OUT)

NOTE 1 The term RADIO–OUT is used both as an adjective applied to a specific output, but more commonly as a noun referring to a RADIO–OUT specific output.

NOTE 2 RADIO–OUT is concerned with the measurement of all sources of radiation from the human body, for example after exposure to or ingestion of radioactive material, except those radiations covered by VIDEO–OUT and AUDIO–OUT.

NOTE 3 The base modalities do not encompass non-ionising electromagnetic radiation from and to the human body that is outside the visible spectrum.

3.4.11

CALOR–IN

characterization of any stimulus that can be detected by thermo sensors (cold receptors and warm receptors) in the human skin and mucous surfaces and any kind of heat transfer into the human body

NOTE 1 The term CALOR–IN is used both as an adjective applied to a stimulus, but more commonly as a noun referring to a CALOR–IN stimulus.

NOTE 2 This is a derived modality.

NOTE 3 Heat transfer into the human body can occur by conduction of hot surfaces, by convection of air above skin temperature, by radiation from the sun, heat bulbs, thermo cameras etc and by micro-wave radiation.

3.4.12

CALOR–OUT

characterization of any kind of heat transfer from the human body

NOTE 1 The term CALOR–OUT is used both as an adjective applied to a specific output, but more commonly as a noun referring to a CALOR–OUT specific output.

NOTE 2 CALOR–OUT is a derived modality.

NOTE 3 Heat transfer from the human body can occur by conduction to cold surfaces, by convection of air below skin temperature, by infra-red radiation to a cold environment and by evaporation.

3.5 Abbreviations

CGPM	General Conference on Weights and Measures (Conférence Générale des Poids et Mesures)
CIPM	International Committee for Weights and Measures (Comité International des Poids et Mesures)
ICRU	International Commission on Radiation Units and Measurement
TMM	Telebiometric Multimodal Model

3.6 Symbols used in telebiometrics

The following symbols are used to denote telebiometric devices (see Annex C and threshold tables):



The symbol  represents conformance to safety and security limits for a given modality or set of modalities; where possible, this symbol should be displayed in green.

The symbol **F** is used to denote a threshold, with subscripts that denote, or are related to, the modality that the threshold references.

4 Content of this part of IEC 80000

4.1 Where a quantity relates to a safety threshold which if exceeded might cause discomfort, pain, or damage to the human body, it is, where possible, characterized in the remarks column of the tables by a safety threshold value.

4.2 Quantities and units that are applicable to several modalities are given in clause 5. Quantities and units that are specific to single modality are given in clauses 6 to 11.

5 Quantities and units used for more than one telebiometric modality

The following table contains the base quantities of the International System of Quantities (ISQ) and its units which are the seven base units of the International System of Units (SI) and additionally those derived quantities and units which are relevant for more than one telebiometric modality.

Table 1 – Quantities, units, and definitions for multiple modalities

MULTIPLE MODALITIES				QUANTITIES	
Item No.	Name	Symbol	Definition	Remarks	Modality
14-5.1.1	length <i>fr longueur</i> (f)	l, L	one of the base quantities in the International System of Quantities (ISQ), on which the International System of Units (SI) is based	Length is that quantity that can often be measured with a measuring rod. 14-5.1.1 to 14-5.1.13 are various quantities that are used to specify a length.	TANGO VIDEO AUDIO CHEMO RADIO CALOR
14-5.1.2	breadth <i>fr largeur</i> (f)	b, B			TANGO VIDEO
14-5.1.3	height <i>fr hauteur</i> (f)	h, H			TANGO VIDEO AUDIO
14-5.1.4	thickness <i>fr épaisseur</i> (f)	d, δ			TANGO AUDIO
14-5.1.5	radius <i>fr rayon</i> (m)	r, R			TANGO AUDIO
14-5.1.6	radial distance <i>fr distance</i> (f) <i>radiale</i>	r_Q, ρ			TANGO VIDEO AUDIO
14-5.1.7	diameter <i>fr diamètre</i> (m)	d, D			TANGO VIDEO
14-5.1.8	length of path <i>fr longueur</i> (f) <i>curviligne</i>	s			TANGO VIDEO AUDIO
14-5.1.9	distance <i>fr distance</i> (f)	d, r			TANGO VIDEO
14-5.1.10	cartesian coordinates <i>fr coordonnées</i> (f) <i>cartésiennes</i>	x, y, z			TANGO VIDEO AUDIO RADIO
14-5.1.11	position vector <i>fr rayon</i> (m) <i>vecteur</i>	$\mathbf{r}$			TANGO VIDEO AUDIO
14-5.1.12	displacement <i>fr déplacement</i> (m)	$\Delta \mathbf{r}$			TANGO AUDIO
14-5.1.13	radius of curvature <i>fr rayon</i> (m) <i>de courbure</i>	ρ			TANGO VIDEO AUDIO

UNITS			MULTIPLE MODALITIES	
Item No.	Name	Symbol	Definition	Remarks
14-5.1.a	metre	m	length of the path travelled by light in vacuum during a time interval of $1/299\,792\,458$ of a second	This definition implies that the speed of light in vacuum is exactly $299\,792\,458$ m/s. [17th CGPM (1978)] See ISO 80000-3.

(Cont.)

MULTIPLE MODALITIES				QUANTITIES	
Item No.	Name	Symbol	Definition	Remarks	Modality
14-5.2	curvature <i>fr courbure</i> (f)	κ	$\kappa = 1/\rho$ where ρ is the radius of the curvature		TANGO VIDEO
14-5.3	area <i>fr aire</i> (f)	$A, (S)$	$A = \iint dx dy$ where x and y are cartesian coordinates	For an element of area dA , $d\sigma$ is sometimes used.	TANGO CALOR
14-5.4	volume <i>fr volume</i> (m)	V	$V = \iiint dx dy dz$ where x, y and z are cartesian coordinates	$V = \int dV$ For an element of volume dV , $d\tau$ is sometimes used.	TANGO CHEMO
14-5.5	angle, plane angle <i>fr angle</i> (m), <i>angle</i> (m) <i>plan</i>	α, β, γ ϑ, φ	for the angle between two half-lines terminating at the same point, $\alpha = s/r$ where s is the length of the included arc of the circle, with its centre at that point, and r is the radius of that circle	Other symbols are also used. See ISO 80000-3.	TANGO VIDEO AUDIO CHEMO
14-5.6	solid angle <i>fr angle</i> (m) <i>solide</i>	Ω	$\Omega = A/r^2$ where A is the area of the included surface of a sphere in a cone with its apex at the centre of the sphere and r is the radius of the sphere		TANGO VIDEO AUDIO CHEMO RADIO CALOR
14-5.7	mass <i>fr masse</i> (f)	m	one of the base quantities in the International System of Quantities (ISQ), on which the International System of Units (SI) is based	See ISO 80000-4, item 4-1.	TANGO CHEMO
14-5.8	time, duration <i>fr temps</i> (m), <i>durée</i> (f)	t	one of the base quantities in the International System of Quantities (ISQ), on which the International System of Units (SI) is based	See ISO 80000-3, item 3-7.	TANGO VIDEO AUDIO CHEMO RADIO CALOR

UNITS			MULTIPLE MODALITIES	
Item No.	Name	Symbol	Definition	Remarks
14-5.2.a	metre to the power minus one	m^{-1}		
14-5.3.a	square metre	m^2		
14-5.4.a	cubic metre	m^3		
14-5.4.b	litre	l, L	$1 \text{ l} := 10^{-3} \text{ m}^3 = 1 \text{ dm}^3$	In International Standards only the lower case l is used.
14-5.5.a	radian	rad	$1 \text{ rad} := 1 \text{ m/m} = 1$	The radian is the angle between two radii of a circle which cut off on the circumference an arc equal in length to the radius.
14-5.6.a	steradian	sr	$1 \text{ sr} := 1 \text{ m}^2/\text{m}^2 = 1$	The steradian is the solid angle of a cone that, having its apex in the centre of a sphere, cuts off on the sphere a surface equal in area to a square with sides of length equal to the radius of the sphere.
14-5.7.a	kilogram	kg	unit of mass equal to the mass of the international prototype of the kilogram	See ISO 80000-4. [3 rd CGPM (1901)]
14-5.8.a	second	s	duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom	See ISO 80000-3. [13 th CGPM (1966/67)]

(Cont.)