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## General requirements for establishing anthropometric databases

*Exigences générales pour la création de bases de données  
anthropométriques*

iTeh STANDARD PREVIEW  
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ISO 15535:2023

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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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 3, *Anthropometry and biomechanics*, 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 fourth edition cancels and replaces the third edition (ISO 15535:2012), which has been technically revised.

The main changes are as follows:

- recommendation of tabulation for sex combined statistics in 9.4 has been removed;
- term “sex” has been replaced with “gender”;
- term “subject” has been replaced with “participant”;
- term “examination” has been replaced with “measurement”;
- [Annex A](#) has been revised to add another method for estimating a necessary sample size;
- [Table C.1](#) has been revised to correspond with dimension numbers in ISO 7250-1 and minor technical revisions have been made;
- former Annexes G and H have been removed.

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](http://www.iso.org/members.html).

## Introduction

The well-being of people is very much dependent on their proportional and geometric relationship with several factors, such as growth, design principles for clothing, transportation, workplace and homes, as well as sporting and recreational activities. Implementation of databases on the body dimensions of a population supports essential health and safety requirements, as well as International Standards in the field of machinery safety and personal protective equipment and has acquired importance in the devising of computer-generated manikins of the human body.

One of the major difficulties in formulating international databases on anthropometry is that the numerous existing studies are rarely comparable in the strictest sense. Difficulties arise in comparing one study with another because either the methods used differ or they are not sufficiently well described. The anthropometric standards used for the data collection are fundamental to setting up any anthropometric databases.

This document is intended to be used in close conjunction with ISO 7250-1. The ultimate goal is that a database developed by one researcher can be easily used by other researchers. This would be in a form that is readily accessible by those responsible for developing standards in support of good design and health and safety requirements (e.g. the ISO 15534 series and ISO 14738). To achieve this goal, it has been necessary to develop an appropriate International Standard to ensure that anthropometric databases and their associated reports are internationally compatible.

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# General requirements for establishing anthropometric databases

## 1 Scope

This document specifies general requirements for anthropometric databases and their associated reports that contain measurements taken in accordance with ISO 7250-1.

It provides necessary information, such as characteristics of the user population, sampling methods, measurement items and statistics, to make international comparison possible among various population segments. The population segments specified in this document are people who are able to hold the postures specified in ISO 7250-1.

**NOTE** The traditional anthropometry defined in ISO 7250-1 is considered to be a necessary complement to 3-D methods, which are used in some countries. Scanned data are verified according to the definitions given in ISO 7250-1 (see ISO 20685-1). State-of-the-art software allows integration of traditional anthropometric measures with those obtained by 3-D imaging.

## 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 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

ISO 7250-1:2017, *Basic human body measurements for technological design — Part 1: Body measurement definitions and landmarks*

ISO 8601-1, *Date and time — Representations for information interchange — Part 1: Basic rules*

ISO/IEC 8859-1, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

### 3.1

#### **population segment**

group of people having one or more common background characteristics that influence their anthropometric distributions

### 3.2

#### **user population**

*population segment* (3.1) or segments for whom a technological design is intended

**3.3**

**random sampling**

sampling which follows a set of procedures to ensure that each and every individual in the population has an equal chance of being selected

**3.4**

**stratified random sampling**

sampling following a procedure in which the population is divided into sub-populations (strata), each one of which contributes with a specified number of randomly selected individuals

**3.5**

**demographic data**

background information (e.g. gender, dwelling or working place, occupation, education) used to describe members of the *user population* (3.2) and/or *population segments* (3.1)

**3.6**

**anthropometry**

study and measurement of the physical dimensions and mass of the human body and its constituent (external) parts

**3.7**

**anthropometric data**

dimensional measurements (e.g. weight, height, length, depth, breadth and circumference) of the human body and its component parts

**3.8**

**anthropometric database**

collection of individual body measurements [*anthropometric data* (3.7)] and background information [*demographic data* (3.5)] recorded on a group of people (the sample)

**3.9**

**anthropometric report**

technical report describing the origin, contents, methods and statistical characteristics of an *anthropometric database* (3.8)

**3.10**

**relative accuracy**

ratio of accuracy of measurement to the population mean of the dimension in question

## **4 Data collection design**

### **4.1 General**

The following methods shall be used in assembling internationally compatible anthropometric databases.

### **4.2 Definitions, techniques and conditions of measurement**

**4.2.1** The measuring methods given in ISO 7250-1 shall be used. Any deviation from this shall be indicated in the anthropometric report. It is anticipated that items other than those specified by ISO 7250-1 will be measured according to the purpose of the investigation. In such cases, definitions, methods, instruments and measurement units shall be clearly indicated in the report.

**4.2.2** When a measurement can be taken on both the left and right sides of the human body, the report shall clearly indicate on which side the measurement has been taken.

**4.2.3** Photographs or detailed sketches of the measurements taken should be provided and the measurement procedures should be documented.



**4.2.4** The participant shall be nude or wearing minimal clothing, shall be bareheaded and without shoes. The type of clothing, if relevant, shall be coded on the anthropometric data sheet.

**4.2.5** The measurement conditions shall be documented, together with the numerical results of any survey.

### **4.3 Sampling techniques**

**4.3.1** The demographic characteristics of the population shall be indicated as clearly as possible in the report. In the event that the population is divided into several subgroups, for example measurement location and dwelling location for either sampling or statistical reporting, this shall be stated in the report.

**4.3.2** It is recommended that random or stratified random sampling methods be used. However, if this is not possible, the report shall indicate the sampling method used.

**4.3.3** It is recommended that the number of participants needed for a database be established using a statistical power formula based on the accuracy of results desired by the investigator (see [5.5](#)). However, in reality the selection of participants is often influenced by various factors, such as population size, number of people who agree to participate, and cost and period of time required for the investigation.

## **5 Data collection requirements**

### **5.1 Basic demographic description of participants**

Biographic questionnaires shall be filled out to provide information that includes gender, date of birth, date of measurement and measurement location. Other demographic data may be included on the questionnaire depending upon the purposes of the study.

### **5.2 Detection and treatment of measurement errors**

The editing of obvious anomalies during data collection shall be carried out following the procedure described in [Annex E](#), for example using computer software specifically written for the purpose of detecting figures that lie outside any reasonable range of data given for that dimension.

### **5.3 Instrument accuracy**

Anthropometric instruments for taking linear and circumferential measures shall measure to the nearest millimetre. Instruments for measuring body mass shall weigh to the nearest 500 g.

### **5.4 Sample composition**

The following shall always be taken into account during planning of data collection:

- age;
- gender.

### **5.5 Sample size**

The sample size shall be sufficient to estimate the value of the given measurement in a specified group, following a method for calculating sample size described in [Annex A](#).

Where appropriate for a particular study, the following may also be taken into account for sample size determination:

- geographical location;
- socio-economic status;
- educational level;
- occupation;
- other demographic variables that influence anthropometric distributions.

### 5.6 Data-storage system

All biographical and participant data should be recorded on digital media compatible with widespread digital systems, whenever possible.

### 5.7 Type of clothing

The type of clothing shall be coded and identified (e.g. nude = 0, underwear = 1, light clothing = 2, other clothing as specified = 3) for analysis purposes.

### 5.8 Measurer training and quality control

Frequent and regular measurer training and quality control shall be carried out by persons experienced in anthropometry, in order to ensure acceptable standards of accuracy. The expected performance of skilled anthropometrists is given in ISO/TR 7250-4.<sup>1)</sup> Repeated measurement data should be recorded. Inter- and intra-measurer standard error of measurement, or mean absolute difference, shall be calculated and recorded for all anthropometric variables, in order that random checks can be carried out on the measuring teams during the survey.

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## 6 Database format

**6.1** The ASCII code according to ISO/IEC 8859-1 shall be used. For analytical purposes, it can also be convenient to utilize other data storage formats in addition to ASCII.

**6.2** Each data item shall be separated by a tab.

**6.3** The contents of rows in the database are given in [6.4](#) to [6.6](#).

**6.4** The data shall be entered in English.

**6.5** The name of each data item shall be shown in the first row of the database using the designated English words and appropriate labels in other language(s), if needed. Item code numbers and acronyms should not be used in row 1 instead of English names, as they can cause confusion.

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1) Under preparation. Stage at the time of publication: ISO/DTR 7250-4:2023.

**6.6** The second and subsequent rows of the database shall contain actual data from participants, with each data item in the same order as its name is listed in row 1.

EXAMPLE

Participant number	Gender	Measurement location	Measurement date	Body mass	Stature	...
0001	M	GB/London	2000-05-23	78,5	1 756	...

**6.7** All body measurements shall be recorded in millimetres (mm) or kilograms (kg) (SI units).

**6.8** Missing data shall be recorded as 9 999.

**6.9** An example of database format from an anthropometric survey using the sample data sheet ([Annex C](#)) is seen in [Annex G](#). The example shows the format of a database when some, but not all, ISO 7250-1 dimensions are measured.

## 7 Database contents

### 7.1 General

The following data items shall be included in the database.

### 7.2 Required background data

**7.2.1** Item 1 – Participant number.

**7.2.2** Item 2 – Gender: M for male participants, F for female participants.

**7.2.3** Item 3 – Measurement location: country, country code (in accordance with ISO 3166-1) and location.

**7.2.4** Item 4 – Measurement date: use the method specified in ISO 8601-1, yyyy-mm-dd (e.g. 2003-05-23 for 23 May 2003).

**7.2.5** Item 5 – Birth date: use the method specified in ISO 8601-1, yyyy-mm-dd (e.g. 2003-04-05 for 5 April 2003).

**7.2.6** Item 6 – Decimal age: participant's age calculated after the measurement in accordance with the method described in [Annex D](#).

### 7.3 Recommended background data

Additional background data items, such as birthplace, school, occupation or population segment, may also be included, depending upon the purposes of the study.

### 7.4 Anthropometric data

In accordance with ISO 7250-1, anthropometric data shall be recorded as items 11 to 72. In the event that some variables in ISO 7250-1 are not measured, or if there are missing data, these shall be recorded as 9 999.

## 7.5 Complementary data

In the event that additional body measurements not present in ISO 7250-1 are measured, these data shall be recorded as data items 73 and higher, in alphabetical order.

## 8 Anthropometric data sheets

Biographical data and measurements of each participant shall be recorded on electronic forms or data sheets described in [Annex B](#) (see also [Annex C](#)).

## 9 Statistical processing

9.1 Before calculating statistical values, irregular values shall be detected and reviewed along with the procedure described in [Annex F](#).

9.2 The age of each participant shall be calculated by decimal notation (see [Annex D](#)).

9.3 In the event that participants are in the growth period, their measurements shall be tabulated for each 1-year age interval as described in [Annex E, Table E.1](#).

9.4 It is recommended that the data be tabulated for adult participants in 5-year divisions (see [Annex E](#)). If that is impossible, for example when sample sizes are small, 10-year divisions or 20-year divisions, as given in [Table E.2](#), shall be used. It is desirable to tabulate data for the adult male and adult female samples.

9.5 Information on the presentation of data and interpretation of statistics is given in [Annex F](#).

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