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Basic human body measurements for technological design

Part 2:

Statistical summaries of body measurements from national populations

Définitions des mesures de base du corps humain pour la conception technologique

Partie 2: Résumés statistiques des mesurages du corps de populations nationales

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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
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technological design —**

**Part 2:
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measurements from national populations**

*Définitions des mesures de base du corps humain pour la conception
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*Partie 2: Résumés statistiques des mesurages du corps de populations
ISO individuelles*

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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 documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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

This document was prepared by Technical Committee ISO/TC 159, *Ergonomics*, Subcommittee SC 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 second edition cancels and replaces the first edition (ISO/TR 7250-2:2010 and ISO/TR 7250-2:2010/Amd 1:2013), which ~~have~~ been technically revised. ~~It also incorporates the amendment ISO/TR 7250-2:2010/Amd 1:2013.~~

The main changes are as follows:

- Measurement item numbers ~~were~~ updated to harmonize with ISO 7250-1:2017.
- Statistics for the male and female combined data ~~were~~ deleted.
- Data from ~~the~~ Republic of Korea ~~was~~ updated.
- New data from Sweden and Brazil ~~were~~ added.

A list of all parts in the ISO 7250 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Anthropometric data used for technological design have been included in many ISO product standards. However, different review cycles make it impossible for simultaneous revision of these product standards as new anthropometric data become available. This document is intended to serve as a continually updated repository of the most current national anthropometric data. It is intended to make current and updated anthropometric data available for inclusion by reference in the various ISO product standards requiring ISO 7250-1 body measurement input, wherever national specificity of design parameters is required.

Body dimensions of people have been increasing in many countries over the ~~last several~~^{past few} decades. The rate of increase differs from country to country. In the area where significant secular change is going on, statistical summaries described in this document will be outdated sooner. Therefore, it is intended that statistical summaries of human body measurements described in this document be updated as new data become available.

This document provides body dimensions data for people of working age. In order to provide practical data, the working age population is not defined and the decision is left to each country, because working age differs ~~among~~^{between} countries. However, the data for children under 16 years are not included.

To ensure the comparability of measurements, body dimensions in this document are measured according to ISO 7250-1:~~2017~~. To ensure the reliability of statistical data, databases from which statistics are calculated adhere to ISO 15535:2012 and ISO/~~DIS~~^{DIS} 15535:~~2022~~²⁰²³.¹

Users of this document and ISO member bodies are encouraged to submit anthropometric data for this document. Users with knowledge of additional anthropometric data are encouraged to contact their ISO member body, and copy the ISO/TC 159/SC 3 committee manager on the communication (e-mail addresses can be found on the ISO website: <https://www.iso.org/>). Member bodies ~~should~~^{will} ~~can~~ contact the ISO/TC 159/SC 3 committee manager directly.

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¹ Under preparation. Stage at the time of publication: ISO/DIS 15535:2023.

Basic human body measurements for technological design — Part 2: Statistical summaries of body measurements from national populations

1 Scope

This document provides statistical summaries of body measurements measured according to ISO 7250-1:2017, together with database background information for working age people prepared according to ISO 15535:2012 in the national populations of individual ISO member bodies. This document also describes the process of the measurement and preparation of statistical summaries.

2 Normative references

There are no normative references in this document.

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

~~Secular~~secular change

~~Changes~~changes in mean body dimensions of a specific group over time.

Note 1 to entry: The direction of change can be positive or negative.

4 Anthropometric measurements

Measuring conditions and definitions of measurements in this document are the same as those described in ISO 7250-1:2017. Body measurements are described in millimetres (mm) or kilograms (kg).

Body measurements obtained from 3-D systems or obtained using instruments different from those described in ISO 7250-1:2017 are confirmed by member bodies to be sufficiently close to those produced by the traditional methods of ISO 7250-1:2017 according to ISO 20685-1:2018, Clause 5.

Sometimes a measurement is not performed exactly as described in ISO 7250-1:2017, but is very similar. In such cases, the measurement can be substituted for the ISO 7250-1:2017 measurement if its value is adequately close. To judge closeness, the method described in ISO 20685-1:2018 ~~are~~ is used. The criteria for the judgment are given in Annex A.

The measured side (right or left) is described.

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When measurements not described in ISO 7250-1:2017 are also available, the number of these measurements and the reference are provided.

Age statistics are tabulated similarly and presented together with the anthropometric measurements.

5 Statistical procedures

5.1 Data editing

Before calculating statistical values, irregular values are detected and reviewed according to ISO 15535:2012, Annex F or ISO/FPIS 15535:2022:—, Annex F.²

5.2 Statistics

In this document, the following statistics are described for each measurement: sample size, mean, standard deviation (SD), and 1st, 5th, 50th, 95th and 99th percentile values.

5.3 Population stratification

Population can be stratified by gender, age, location, occupation or education. To keep this document at a reasonable size, statistics are presented for females and males, but not for other strata.

5.4 Age stratification

In order to provide practical data and to keep this document at a reasonable size, only one age group, including all working-age people, is considered.

5.5 Body measurements for representative body forms

Measurements for body forms representing large, medium and small types are useful for technological design. While the medium type can be represented by P50 values for all measurements, fixed percentile options are problematic for extreme body forms, such as those derived from all P5 or P95 values. When sitting height and leg length are P5, height is smaller than P5. Though such a problem is well recognized, there is no consensus on the method for obtaining measurements for body forms statistically representing the variation in a population. Considering this lack of consensus, it was decided not to present such data in this document.

6 Background information

6.1 General

Statistics of body dimensions are described together with the following information for users to judge their reliability and context.

6.2 Background of database

6.2.1 Time period of examination

Year(s) of measurement.

² Under preparation. Stage at the time of publication: ISO/DIS 15535:2023.

6.2.2 Location of examination

Name of the country and city.

6.2.3 Demographic data

For demographic data (e.g. gender, age, etc.), information on the following items is provided:

- a) definition of the working age;
- b) description of participants;
- c) number of participants by gender;
- and) 10-year age groups.

When more than one subgroup based on criteria other than the age and gender is involved, the percentage of each subgroup is provided, if necessary.

6.2.4 Publication on the anthropometric research

The author, publication year, title of the publication and the name of publisher are provided when the data have been published.

6.3 Representativeness of the sample

6.3.1 Sampling method

A description is given of the grounds on which the sample was judged to be representative of the intended population. These include an examination of the sampling method and ~~may~~ also include the comparison of height and weight in the measured sample data with those from a large sample representing the intended population. If the data need to be weighted in order to be representative, then the weighting method is described.

6.3.2 Information on secular change

When significant secular changes are going on, information on the rate of change over the ~~last several~~ ~~past~~ ~~few~~ decades is presented, when available, and appropriate references are given.

6.4 Accuracy and reliability of measurements

6.4.1 Skill of measurers

The number of measurers and information on the skill of each measurer, such as intra-observer mean absolute difference or technical error of measurement (TEM) or repeated measurements, are shown when such data are available. When more than one measurer is involved, the methods used to control the quality of the measurement technique are documented. When the research is continued for more than one month, the method of quality control during the research period is documented.

6.4.2 Measurements from 3-D scanners

When measurements are extracted from 3-D scans, the results are compared to measurements obtained by traditional methods using the procedures in ISO 20685-1:2018, Clause 5. Similarly, measurements taken using instruments not described in ISO 7250-1 are compared to those obtained by traditional methods.

7 Procedure for presenting member body statistics

7.1 General

This clause describes how the statistics given in this document are gathered and checked.

7.2 Submission of data

Users of this document and ISO member bodies are encouraged to submit anthropometric data for this document. Users with knowledge of additional anthropometric data ~~may~~ contribute by contacting their ISO member body and copying the ISO/TC 159/SC 3 secretariat on the communication (e-mail addresses can be found on the ISO website: <https://www.iso.org/>). Member bodies ~~will~~ contact the ISO/TC 159/SC 3 committee manager directly. When information is received, it ~~will be~~ processed as described ~~below~~ in this clause.

7.3 One data set from each member body

In the case of countries with more than one possible database, the member body determines which of the databases is to be used. If more than one set of statistics is submitted, the member body will be asked to choose only one data set.

7.4 Meeting the criteria outlined in 5.2, 5.3 and 5.4

Member bodies will provide summary statistics that meet the criteria outlined in 5.2, 5.3 and 5.4. If the criteria are not met on the first submission, the member body will be asked to resubmit the statistics according to the criteria.

7.5 Examination of possible errors

7.5.1 General

Recognizing that errors can accidentally occur in any data set, the submitted summary statistics are examined for reasonableness. The steps used are ~~the following:~~ those in 7.5.2 to 7.5.5.

7.5.2 Minima and maxima

The minima and maxima for each dimension are examined, comparing them to minima and maxima from other member body submissions. If minima or maxima are likely to be the result of errors, the member body will be contacted to verify the submission.

7.5.3 Percentile values

The distance of the P1 and P99, P5 and P95 from the P50 percentile value are examined. If the distant percentiles are unusually distant from the P50, the member body will be contacted to verify the submission.

7.5.4 Standard deviation (SD)

The ~~standard deviation (SD)~~ is compared to the ~~standard deviation~~ SD submitted by other member bodies. If the ~~standard deviation~~ SD is unusually large or unusually small, the member body will be contacted to verify the submission.

7.5.5 Comparison of mean or P50 values from member bodies

The mean or P50 values are examined with respect to mean or P50 values from other member bodies to make sure that the dimension being reported is that described in ISO 7250-1:2017. If it appears that a

different measuring technique, or different measurement definition, has been used, the member body will be contacted to verify the measurement procedure.

7.6 Marks on values likely to be in error

If resubmitted summary statistics are still likely to be in error, the published values are marked with a footnote.

8 Statistics for ISO national members

8.1 General

Background information and a statistical summary from each member body are presented in separate tables ~~as follows in this clause~~. Data from Germany are in Table 1 and Table 2. Data from Italy are in Table 3 and Table 4. Data from Japan are in Table 5 and Table 6. Data from Kenya are in Table 7 and Table 8. Data from ~~the Republic of~~ Korea are in Table 9 and Table 10. Data from ~~The~~ Netherlands are in Table 11 and Table 12. Data from Thailand are in Table 13 and Table 14. Data from ~~the~~ United States ~~of America~~ are in Table 15 and Table 16. Data from ~~People's Republic of~~ China are in Table 17 and Table 18. Data from ~~Republic of~~ India are in Table 19 and Table 20. Data from Sweden are in Table 21 and Table 22. Data from Brazil are in Table 23 and Table 24.

8.2 Austria

~~Organization: Austrian Standards Institute Name of study: —~~

~~Austria adopts anthropometric data from DIN 33402-2:2005.~~

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