Technical Report

ISO/TR 7250-2

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

Second edition
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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 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), which has 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 have been updated to harmonize with ISO 7250-1;

— statistics for the male and female combined data have been deleted;

— data from the Republic of Korea have been updated;

— new data from Sweden and Brazil have been added;

— scan-derived data not evaluated for comparability with traditional manual measurements from Canada have been included in Annex B (informative).

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 past few decades. The rate of increase differs from country to country. In areas experiencing significant secular change, the statistical summaries described in this document will become 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 between countries. However, 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. To ensure the reliability of statistical data, databases from which statistics are calculated adhere to ISO 15535:2012 and ISO 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, 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 change
change 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. Body measurements are described in millimetres (mm) or kilograms (kg).

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

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

The measured side (right or left) is described.

When measurements not described in ISO 7250-1 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 15535:2023, Annex F.

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, such data is not presented 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 measurement

Year(s) of measurement.

6.2.2 Location of measurement

Name of the country and city.

6.2.3 Demographic data

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

a) definition of the working age;

b) description of participants;

c) number of participants by gender;

d) 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 a measurement of the sampling method and can 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 occurring, information on the rate of change over the 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 3D scanners

When measurements are extracted from 3D 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 can contribute by contacting their ISO member body. When information is received, it is processed as described 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 Measurement of possible errors

7.5.1 General

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

7.5.2 Minima and maxima

The minima and maxima for each dimension are measured, 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 measured. 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 SD is compared to the SD submitted by other member bodies. If the 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 measured 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. 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 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 China are in Table 17 and Table 18.

— Data from 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.

8.3 Germany

Organization: Deutsches Institut für Normung - German Standardization Institute (DIN)

Name of study: —

Table 1 — Germany: Database

1 Measurement		
1.1	Measured side (right/left)	Right
1.2	Measurement definitions different from those described in ISO 7250-1	None
1.3	Substituted measurements	
1.4	Number of measurements not described in ISO 7250-1	
2 Age range		

Table 1 *(continued)*

2.1	Working age	18 to 65
2.2	Age range of participants	18 to 65
3 Background data		
3.1	Time period of measurement	1999 to 2002
3.2	Location of measurement	Different areas of Germany
3.3	Survey sample	Representative (regional, social, ethnic)
3.4	Publication	DIN 33402-2
4 Representativeness of the sample		
4.1	Sampling method	
4.2	Information on secular change	The secular trend in Germany has stopped.
5 Accuracy and reliability of measurements		
5.1	Intra- and inter-observer error rates	Exist
5.2	Measurements from 3D scanners	None
5.3	Other measurement not taken using instruments described in ISO 7250-1	None
5.4	Type of clothing	Without shoes, minimal clothing

Table 2 — Germany: Statistical summary

No.	ISO 7250-1:2017			Sample size *n*	Mean	SD	P1	P5	P50	P95	P99
	Sub-clause	Measurement									
		Age	Male								
			Female								
1	6.1.1	Body mass (weight), kg	Male					64	79	100	
			Female					52	66	87	
2	6.1.2	Stature (body height)	Male					1 650	1 750	1 855	
			Female					1 535	1 625	1 720	
3	6.1.3	Eye height	Male					1 530	1 630	1 735	
			Female					1 430	1 515	1 605	
4	6.1.4	Shoulder height	Male					1 345	1 450	1 550	
			Female					1 260	1 345	1 425	
5	6.1.5	Elbow height	Male					1 025	1 100	1 175	
			Female					960	1 020	1 080	
6	6.1.6	Iliac spine height, standing	Male								
			Female								
7	6.1.7	Crotch height	Male					760	830	905	
			Female					710	775	830	
8	6.1.8	Tibial height	Male					430	460	480	
			Female					400	425	450	

Table 2 *(continued)*

No.	ISO 7250-1:2017			Sample size *n*	Mean	SD	P1	P5	P50	P95	P99
	Sub-clause	Measurement									
9	6.1.9	Chest depth, standing	Male					195	225	270	
			Female					165	190	235	
10	6.1.10	Body depth, standing	Male					260	285	380	
			Female					245	290	345	
11	6.1.11	Chest breadth, standing	Male								
			Female								
12	6.1.12	Hip breadth, standing	Male					340	360	385	
			Female					340	365	400	
13	6.2.1	Sitting height (erect)	Male					855	910	965	
			Female					810	860	910	
14	6.2.2	Eye height, sitting	Male					740	795	855	
			Female					705	755	805	
15	6.2.3	Cervical height, sitting	Male								
			Female								
16	6.2.4	Shoulder height, sitting	Male					570	625	670	
			Female					540	590	630	
17	6.2.5	Elbow height, sitting	Male					210	240	285	
			Female					185	230	275	
18	6.2.6	Shoulder-elbow length	Male					330	365	400	
			Female					290	320	350	
19	6.2.7	Shoulder (biacromial) breadth	Male					370	405	435	
			Female					345	370	400	
20	6.2.8	Shoulder (bideltoid) breadth	Male					440	480	525	
			Female					395	435	485	
21	6.2.9	Elbow-to-elbow breadth	Male					415	480	555	
			Female					395	485	555	
22	6.2.10	Hip breadth, sitting	Male					350	375	420	
			Female					360	390	460	
23	6.2.11	Popliteal height, sitting	Male					410	450	490	
			Female					375	415	450	
24	6.2.12	Thigh clearance	Male					130	150	180	
			Female					125	145	175	
25	6.2.13	Knee height, sitting	Male					495	535	585	
			Female					460	500	545	
26	6.2.14	Abdominal depth, sitting	Male					200	280	330	
			Female					205	250	325	
27	6.2.15	Thorax depth	Male								
			Female								
28	6.2.16	Buttock-abdomen depth, sitting	Male								
			Female								
29	6.3.1	Hand length (stylion)	Male					175	189	207	
			Female					162	177	193	

Table 2 *(continued)*

No.	ISO 7250-1:2017			Sample size *n*	Mean	SD	P1	P5	P50	P95	P99
	Sub-clause	Measurement									
30	6.3.2	Palm length	Male					104	111	121	
			Female					92	100	108	
31	6.3.3	Hand breadth at metacarpals	Male					80	87	94	
			Female								
32	6.3.4	Index finger length	Male					68	75	83	
			Female					62	69	77	
33	6.3.5	Index finger breadth, proximal	Male					19	21	23	
			Female					17	19	21	
34	6.3.6	Index finger breadth, distal	Male					17	18	20	
			Female					14	16	18	
35	6.3.7	Foot length	Male					245	265	285	
			Female					225	245	260	
36	6.3.8	Foot breadth	Male					92	101	111	
			Female					83	92	102	
37	6.3.9	Head length	Male					185	195	205	
			Female					170	185	195	
38	6.3.10	Head breadth	Male					145	155	165	
			Female					140	150	160	
39	6.3.11	Face length (menton-sellion)	Male					105	115	130	
			Female					95	110	125	
40	6.3.12	Head circumference	Male					545	570	600	
			Female					520	545	570	
41	6.3.13	Sagittal arc	Male					330	350	375	
			Female					310	330	360	
42	6.3.14	Bitragion arc	Male					340	365	385	
			Female					320	335	360	
43	6.3.15	Thumb length	Male								
			Female								
44	6.3.16	Thumb breadth	Male								
			Female								
45	6.3.17	Hand thickness	Male								
			Female								
46	6.3.18	Hand breadth, including thumb	Male								
			Female								
47	6.3.19	Arm circumference flexed	Male								
			Female								
48	6.3.20	Forearm circumference flexed	Male								
			Female								
49	6.4.1	Wall-acromion distance	Male								
			Female								
50	6.4.2	Grip reach; forward reach	Male					685	740	815	
			Female					625	690	750	