

Australian/New Zealand Standard™

## **Safety of machinery**

### **Part 1701: Human body measurements — Basic human body measurements for technological design**



AS/NZS 4024.1701:2019

This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee SF-041, Safety of Machinery. It was approved on behalf of the Council of Standards Australia on 3 June 2019 and by the New Zealand Standards Approval Board on 3 July 2019.

This Standard was published on 31 July 2019.

The following are represented on Committee SF-041:

- Austmine
- Australian Industry Group
- Australian Manufacturing Technology Institute
- Australian Manufacturing Workers Union
- Australian Packaging and Processing Machinery Association
- Engineers Australia
- Human Factors and Ergonomics Society of Australia
- New Zealand Safety Council
- NSCA Foundation
- NSW Department of Planning and Environment
- Safety Institute of Australia
- SafeWork NSW
- SafeWork SA
- Swinburne University of Technology
- University of Melbourne
- Winery Engineering Association (Australia)
- Workplace Health and Safety Queensland
- WorkSafe New Zealand
- WorkSafe Victoria

This Standard was issued in draft form for comment as DR AS/NZS 4024.1701:2019.

### **Keeping Standards up-to-date**

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

[www.standards.org.au](http://www.standards.org.au)

[www.standards.govt.nz](http://www.standards.govt.nz)

ISBN 978 1 76072 532 7

Australian/New Zealand Standard™

## **Safety of machinery**

# **Part 1701: Human body measurements — Basic human body measurements for technological design**

Originated in Australia as part of AS 4024.1(Int)—1992.  
Previous edition AS 4024.1701—2006.  
Jointly revised and redesignated as AS/NZS 4024.1701:2014.  
Second edition 2019.

### **COPYRIGHT**

© ISO 2019 — All rights reserved

© Standards Australia Limited/the Crown in right of New Zealand, administered by the New Zealand Standards Executive 2019

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Cth) or the Copyright Act 1994 (New Zealand).

## Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-041, Safety of Machinery to supersede AS/NZS 4024.1701:2014, *Safety of machinery, Part 1701: Human body measurements — Basic human body measurements for technological design*.

The objective of this Standard is to provide a description of anthropometric measurements which can be used as a basis for comparison of population groups and for the creation of anthropometric databases (refer to ISO 15535). The basic list of measurements specified in this document is intended to serve as a guide for ergonomists who are required to define population groups and apply their knowledge to the geometric design of the places where people work and live. In addition, the list serves as a basis for extracting one- and two-dimensional measurements from three-dimensional scans (specified in ISO 20685-1).

This Standard also serves as a guide on how to take anthropometric measurements, but also gives information to the ergonomist and designer on the anatomical and anthropometrical bases and principles of measurement which are applied in the solution of design tasks.

This Standard is identical with, and has been reproduced from, ISO 7250-1:2017, *Basic human body measurements for technological design — Part 1: Body measurement definitions and landmarks*.

As this document has been reproduced from an International Standard, a full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

# Contents

Preface .....	ii
Foreword .....	v
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>1</b>
<b>4 Measuring conditions and instruments .....</b>	<b>3</b>
4.1 Conditions .....	3
4.2 Instruments .....	3
4.3 Further conditions .....	4
<b>5 Landmarks .....</b>	<b>4</b>
5.1 General .....	4
5.2 Acromion .....	4
5.3 Cervicale .....	5
5.4 Crotch level .....	5
5.5 Ectocanthus .....	6
5.6 Glabella .....	6
5.7 Iliospinale anterius — Anterior superior iliac spine .....	7
5.8 Lowest point of the rib cage .....	7
5.9 Menton .....	8
5.10 Mesosternale .....	8
5.11 Nuchale .....	9
5.12 Olecranon .....	9
5.13 Orbitale — Infraorbitale .....	10
5.14 Opisthocranion .....	10
5.15 Sellion .....	11
5.16 Stylion (radial stylion) .....	11
5.17 Suprapatella, sitting .....	12
5.18 Thelion .....	12
5.19 Tibiale .....	13
5.20 Tragion .....	13
5.21 Ulnar stylion .....	14
5.22 Vertex (top of head) .....	14
<b>6 Basic anthropometric measurements .....</b>	<b>15</b>
6.1 Measurements taken while the subject stands .....	15
6.1.1 Body mass (weight) .....	15
6.1.2 Stature (body height) .....	15
6.1.3 Eye height .....	16
6.1.4 Shoulder height .....	16
6.1.5 Elbow height .....	17
6.1.6 Iliac spine height, standing .....	17
6.1.7 Crotch height .....	18
6.1.8 Tibial height .....	18
6.1.9 Chest depth, standing .....	19
6.1.10 Body depth, standing .....	19
6.1.11 Chest breadth, standing .....	20
6.1.12 Hip breadth, standing .....	20
6.2 Measurements taken while the subject sits .....	21
6.2.1 Sitting height (erect) .....	21
6.2.2 Eye height, sitting .....	22
6.2.3 Cervicale height, sitting .....	22
6.2.4 Shoulder height, sitting .....	23
6.2.5 Elbow height, sitting .....	23

6.2.6	Shoulder-elbow length .....	24
6.2.7	Shoulder (biacromial) breadth .....	24
6.2.8	Shoulder (bideltoid) breadth .....	25
6.2.9	Elbow-to-elbow breadth .....	25
6.2.10	Hip breadth, sitting .....	26
6.2.11	Popliteal height, sitting .....	26
6.2.12	Thigh clearance .....	27
6.2.13	Knee height, sitting .....	27
6.2.14	Abdominal depth, sitting .....	28
6.2.15	Thorax depth .....	28
6.2.16	Buttock-abdomen depth, sitting .....	29
6.3	Measurements on specific body segments .....	30
6.3.1	Hand length (stylion) .....	30
6.3.2	Palm length .....	31
6.3.3	Hand breadth at metacarpals .....	31
6.3.4	Index finger length .....	32
6.3.5	Index finger breadth, proximal .....	32
6.3.6	Index finger breadth, distal .....	33
6.3.7	Foot length .....	34
6.3.8	Foot breadth .....	34
6.3.9	Head length .....	35
6.3.10	Head breadth .....	35
6.3.11	Face length (menton-sellion) .....	36
6.3.12	Head circumference .....	36
6.3.13	Sagittal arc .....	37
6.3.14	Bitragion arc .....	37
6.3.15	Thumb length .....	38
6.3.16	Thumb breadth .....	38
6.3.17	Hand thickness .....	39
6.3.18	Hand breadth including thumb .....	39
6.3.19	Arm circumference flexed .....	40
6.3.20	Forearm circumference flexed .....	40
6.4	Functional measurements .....	41
6.4.1	Wall-acromion distance .....	41
6.4.2	Grip reach; forward reach .....	42
6.4.3	Elbow-wrist length .....	42
6.4.4	Elbow-grip length .....	43
6.4.5	Fist (grip axis) height .....	43
6.4.6	Forearm-fingertip length .....	44
6.4.7	Buttock-popliteal length (seat depth) .....	44
6.4.8	Buttock-knee length .....	45
6.4.9	Neck circumference .....	45
6.4.10	Chest circumference .....	46
6.4.11	Waist circumference .....	46
6.4.12	Wrist circumference .....	47
6.4.13	Thigh circumference .....	47
6.4.14	Calf circumference .....	48
<b>Annex A</b>	<b>(informative) Correspondence between ISO 7250-1 dimension names and numbers and ISO 14738 and ISO 15534 anthropometric dimension codes .....</b>	<b>49</b>
<b>Bibliography</b> .....		<b>51</b>

## 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](http://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](http://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 on 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 the following URL: [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*.

This second edition cancels and replaces the first edition (ISO 7250-1:2008), which has been technically revised.

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

# Australian/New Zealand Standard

## Safety of machinery

### Part 1701: Human body measurements — Basic human body measurements for technological design

#### 1 Scope

This document provides a description of anthropometric measurements which can be used as a basis for comparison of population groups and for the creation of anthropometric databases (see ISO 15535). The basic list of measurements specified in this document is intended to serve as a guide for ergonomists who are required to define population groups and apply their knowledge to the geometric design of the places where people work and live. In addition, the list serves as a basis for extracting one- and two-dimensional measurements from three-dimensional scans (specified in ISO 20685). It serves as a guide on how to take anthropometric measurements, but also gives information to the ergonomist and designer on the anatomical and anthropometrical bases and principles of measurement which are applied in the solution of design tasks.

This document is intended to be used in conjunction with national or international regulations or agreements to ensure harmony in defining population groups and to allow comparison of anthropometric data among member bodies. In its various applications, it is anticipated that the basic list will be supplemented by specific additional measurements. [Annex A](#) shows the correspondence of dimensions described here with their use in ISO 14738 and ISO 15534.

#### 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 terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

##### 3.1

##### **population group**

group of people having some common environment or activity

Note 1 to entry: These groups may be as diverse as geographically defined populations or specified age groups.

##### 3.2

##### **anterior**

##### **ventral**

towards the front of the body

##### 3.3

##### **bi**

prefix denoting connection with, or relation to, each of two symmetrical paired parts

EXAMPLE      Biacromial, bitragion.