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Basic human body measurements for technological design —

Part 1: Body measurement definitions and landmarks

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

Partie 1: Définitions des mesures du corps et repères

Reference number
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Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
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Foreword

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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).

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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.

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.

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Basic human body measurements for technological design —

Part 1:
Body measurement definitions and landmarks

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

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3.3
bi
prefix denoting connection with, or relation to, each of two symmetrical paired parts

EXAMPLE Biacromial, bitragion.

3.4
biceps femoris
one of the large *posterior* (3.16) muscles in the thigh of the leg

3.5
deltoid muscle
large muscle on the *lateral* (3.11) border of the upper arm in the shoulder region

3.6
distal
away from the main mass of the body

3.7
Frankfurt plane
standard horizontal plane at the level of the left tragion and the left orbitale (infraorbitale) when the midsagittal plane of the head is held vertically

3.8
gluteal fold
skin furrow between the buttock and the thigh

3.9
grip axis
axis of the fist corresponding with the longitudinal axis of a rod held in the hand

3.10
inferior
caudal
away from the head

3.11
lateral
towards the side of the body

3.12
longitudinal axis of the foot
imagined centre line of the foot, connecting a point between the ankle bones, and the tip of the second toe

Note 1 to entry: It is subject to interpretation because of the great variability in the shape of the foot.

3.13
medial
towards the midline of the body

3.14
metacarpal
pertaining to the long bones of the hand between the carpals (wrist bones) and the *phalanges* (3.15)

3.15
phalanx
phalanges, plural
bone(s) of the fingers or toes

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3.16
posterior
dorsal
towards the back of the body

3.17
process
marked prominence of a bone

3.18
proximal
towards the main mass of the body

3.19
radial
referring to the long bone in the forearm on the thumb side

3.20
sagittal
pertaining to the anteroposterior (front to back) median plane of the body (midsagittal), or to a plane parallel to the median (parasagittal) plane

3.21
superior
cranial
towards the head, towards the top

3.22
thyroid cartilage
prominent cartilage on the *anterior* (3.2) surface of the neck

3.23
ulnar
referring to the long bone in the forearm on the little finger side

4 Measuring conditions and instruments

4.1 Conditions

It is important that the following conditions be documented together with the numerical results of any survey.

Photographs or detailed sketches of measurements and procedures are recommended.

a) **Clothing of subject:** during measurement, the subject shall be nude or shall wear only minimal clothing and shall be bareheaded and without shoes.

b) **Support surfaces:** standing surfaces (floors), platforms or sitting surfaces shall be flat, horizontal and not compressible.

c) **Body symmetry:** for measurements which may be taken on either side of the body, it is recommended that both sides be measured. If this is not possible, it should be indicated on which side the measurement was taken.

d) **Body posture:** for standing measurements, the posture should generally include looking straight ahead, heels together, upper body relaxed and normal breathing. For sitting postures, the torso is erect, the shoulders relaxed, the subject looks straight ahead and the feet are supported so that the femora are horizontal and parallel to each other. Horizontal femora can be achieved with an adjustable foot platform, or with a series of platforms of varying thickness that can be combined to achieve the desired posture.

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4.2 Instruments

The standard measuring instruments recommended are the anthropometer, sliding calipers, spreading calipers, weighing scale and tape measure.

4.2.1 Anthropometer, this specialized tool is used for measuring linear distances between points on the body and standard reference surfaces, such as the floor or a seat platform.

4.2.2 Sliding and spreading calipers, these instruments are used for measuring the breadth and depth of body segments, as well as the distances between reference marks.

4.2.3 Tape measure, the tape measure is used for measuring body circumferences.

4.2.4 Measuring cube, a cube, 200 mm on each side, is used for determining the maximal posterior protrusion of a seated person.

4.2.5 Rod, a standard rod, 20 mm in diameter, and approximately 10 cm in length, is used for determining grip measurements.

NOTE For a detailed description of the measuring methods, see Reference [5].

4.3 Further conditions

Chest and other measurements affected by breathing should be taken during gentle breathing.

5 Landmarks

5.1 General

Measurements are often defined with respect to anthropometric landmarks. Often, these marks are drawn on the body prior to taking the measurements. In addition, these marks are often made prior to 3D scanning.

5.2 Acromion

Most lateral point of the lateral edge of the spine (acromial process) of the scapula, projected vertically to the surface of the skin. See Figure 1.

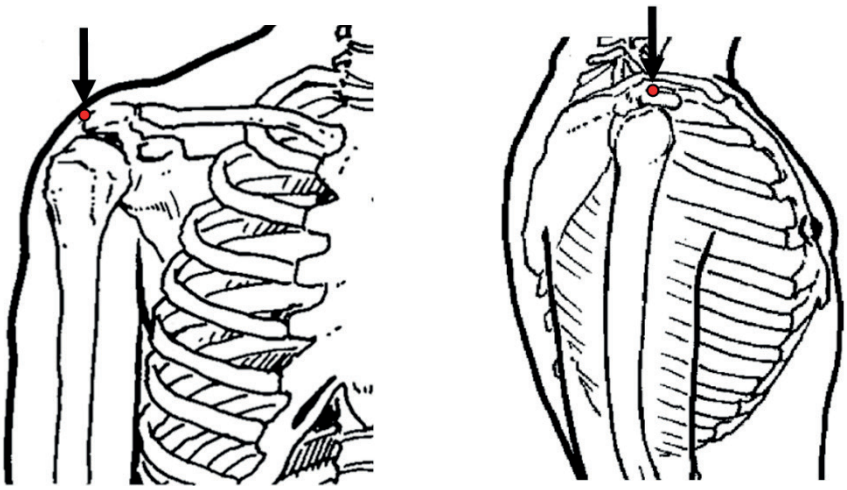

Figure 1 — Acromion

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5.3 Cervicale

Tip of the prominent bone at the base of the back of the neck (spinous process of the seventh cervical vertebra) in the midsagittal plane and projected posteriorly to the surface of the skin while the head is held in the Frankfurt plane. See Figure 2.

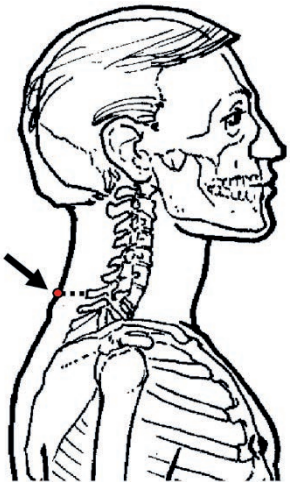

Figure 2 — Cervicale

5.4 Crotch level

Highest palpable point of the perineum. See Figure 3.

NOTE If marked, it is typically marked using the top of a horizontal straightedge.

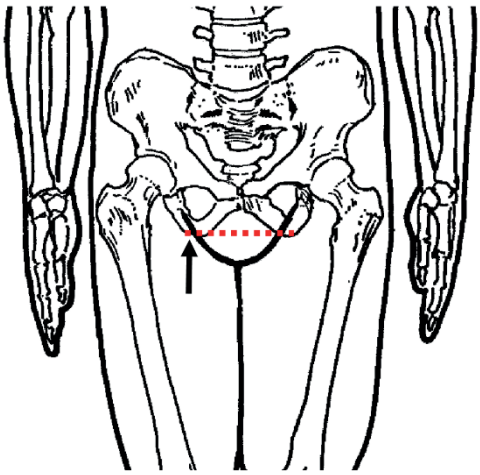

Figure 3 — Crotch level

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5.5 Ectocanthus

The lateral corner of the eye formed by the meeting of the upper and lower eyelids. See Figure 4.

Figure 4 — Ectocanthus

5.6 Glabella

Most anterior point of the forehead between the browridges in the midsagittal plane while the head is held in the Frankfurt plane. See Figure 5.

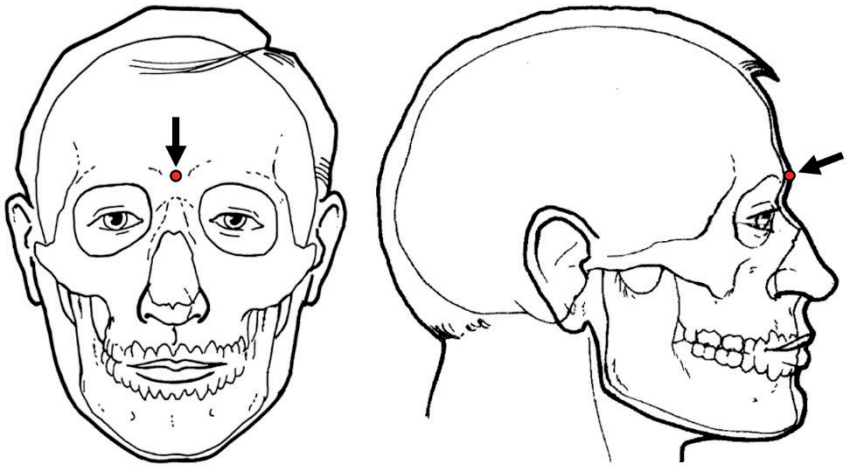

Figure 5 — Glabella

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5.7 Iliospinale anterius — Anterior superior iliac spine

Most downward-directed point of the iliac crest, projected anteriorly and horizontally to the surface of the skin. See Figure 6.

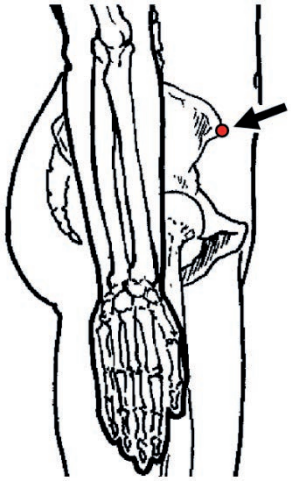

Figure 6 — Anterior superior iliac spine

5.8 Lowest point of the rib cage

Inferior point of the bottom of the rib cage (tenth rib), projected horizontally, 45° from the midsagittal plane, to the surface of the skin. See Figure 7.

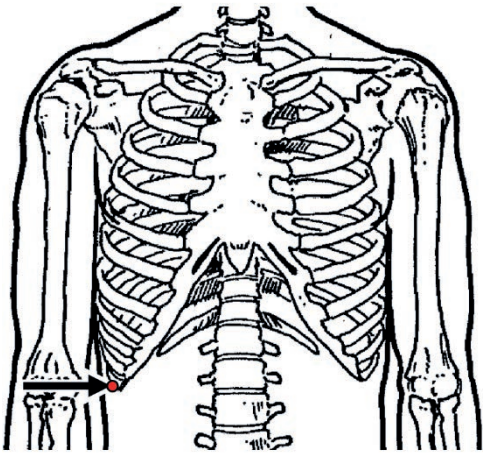

Figure 7 — Lowest point of the rib cage

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5.9 Menton

Lowest point of the tip of the chin in the midsagittal plane, projected anteriorly while the head is held in the Frankfurt plane. See Figure 8.

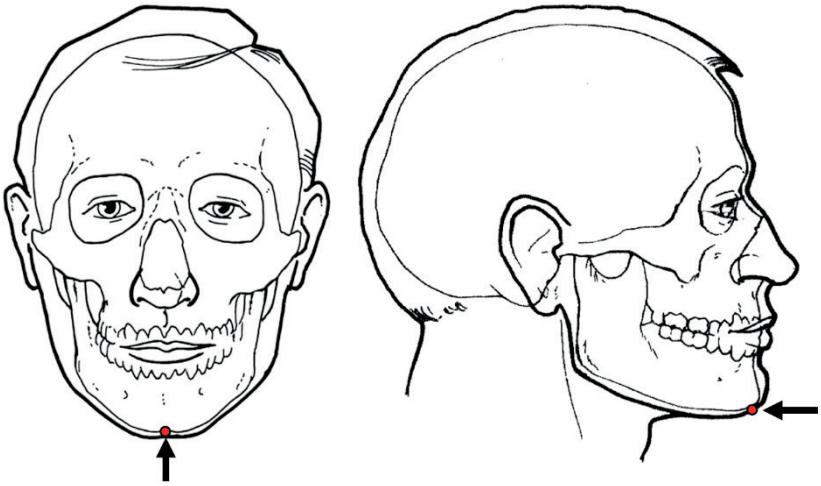

Figure 8 — Menton

5.10 Mesosternale

Point on the union of the third and fourth sternebrae in the midsagittal plane. See Figure 9.

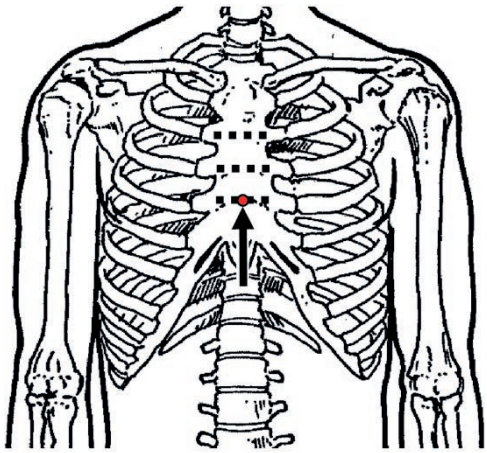

Figure 9 — Mesosternale

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5.11 Nuchale

Lowest point in the midsagittal plane of the occiput that can be palpated amid the nuchal muscles, projected posteriorly while the head is held in the Frankfurt plane. See Figure 10.

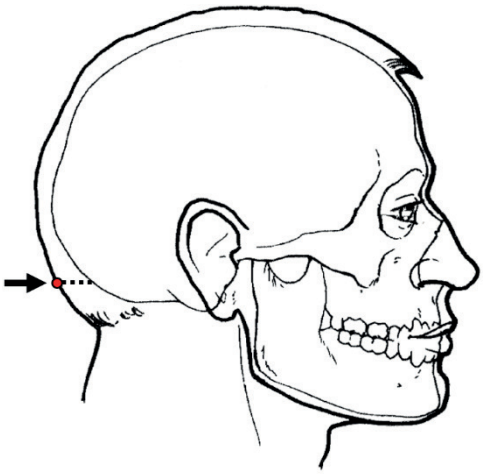

Figure 10 — Nuchale

5.12 Olecranon

Rearmost point of the elbow with the elbow flexed 90°. See Figure 11.

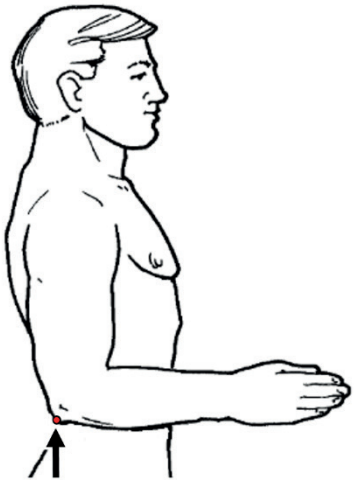

Figure 11 — Olecranon

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5.13 Orbitale — Infraorbitale

Lowest point on the anterior border of the bony eye socket while the head is held in the Frankfurt plane. See Figure 12.

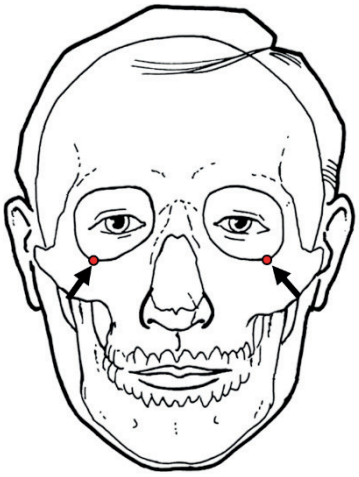

Figure 12 — Orbitale

5.14 Opisthocranion

Most distant point from glabella in the midsagittal plane while the head is held in the Frankfurt plane. See Figure 13.

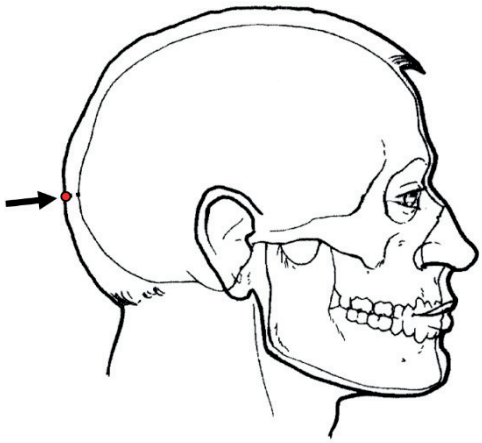

Figure 13 — Opisthocranion

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5.15 Sellion

Point of greatest indentation of the nasal root depression, in the midsagittal plane, while the head is held in the Frankfurt plane. See Figure 14.

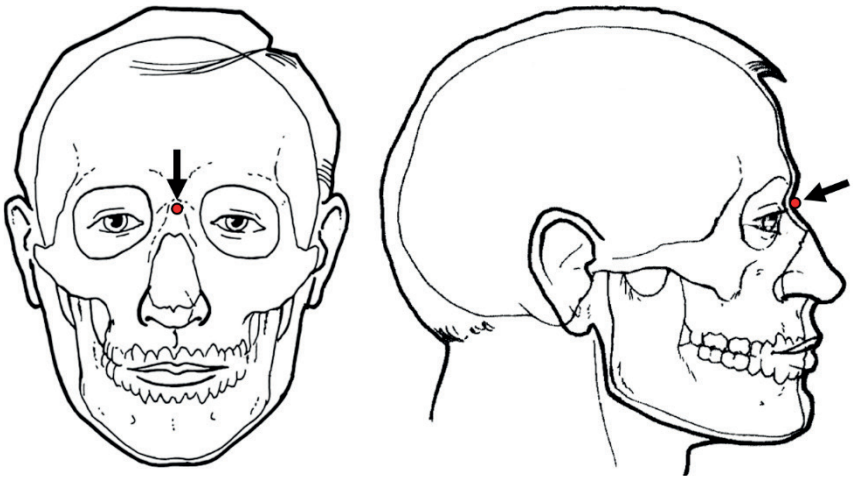

Figure 14 — Sellion

5.16 Stylion (radial stylion)

Distal point of the radial styloid, projected horizontally and anteriorly to the surface of the skin when the arms are held down at the sides and the palms are facing the thighs. See Figure 15.

Figure 15 — Stylion (radial stylion)

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5.17 Suprapatella, sitting

Superior point of the patella (kneecap) projected vertically to the surface of the skin, when the subject is seated and the feet are parallel with each other. See Figure 16.

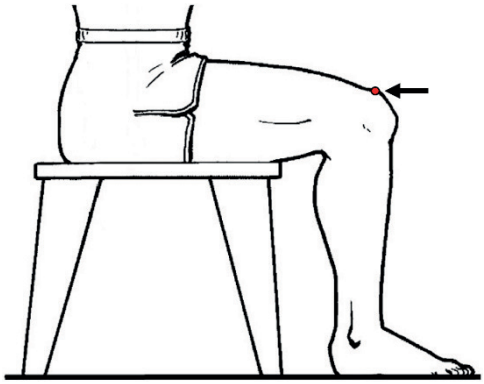

Figure 16 — Suprapatella

5.18 Thelion

Centre of the nipple. In females, the corresponding point is the most anterior projection of the bust (bust point). See Figure 17.

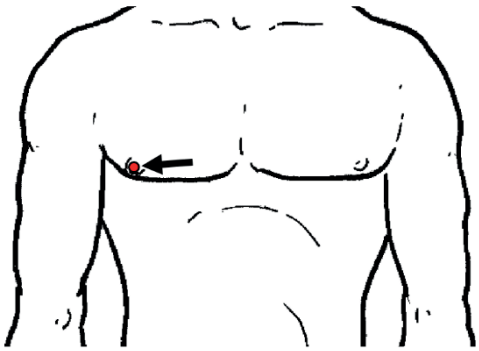

Figure 17 — Thelion

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