Basic human body measurements for technological design - Part 1: Body measurement definitions and landmarks (ISO 7250-1:2017)

EESTI STANDARDIKESKUS
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NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 7250-1:2017 sisaldab Euroopa standardi EN ISO 7250-1:2017 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 7250-1:2017 consists of the English text of the European standard EN ISO 7250-1:2017.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 27.09.2017.	Date of Availability of the European standard is 27.09.2017.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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Basic human body measurements for technological design - Part 1: Body measurement definitions and landmarks (ISO 7250-1:2017)

Définitions des mesures de base du corps humain pour la conception technologique - Partie 1: Définitions des mesures du corps et repères (ISO 7250-1:2017)

Wesentliche Maße des menschlichen Körpers für die technische Gestaltung - Teil 1: Körpermaßdefinitionen und -messpunkte (ISO 7250-1:2017)

This European Standard was approved by CEN on 9 September 2017.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

This document (EN ISO 7250-1:2017) has been prepared by Technical Committee ISO/TC 159 “Ergonomics” in collaboration with Technical Committee CEN/TC 122 “Ergonomics” the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2018 and conflicting national standards shall be withdrawn at the latest by March 2018.

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Endorsement notice

The text of ISO 7250-1:2017 has been approved by CEN as EN ISO 7250-1:2017 without any modification.

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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).

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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.

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

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

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.

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.

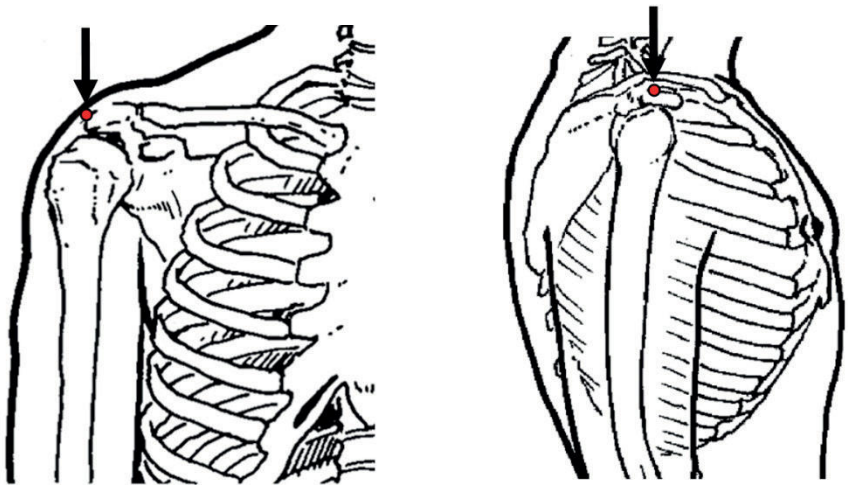

Figure 1 — Acromion

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.

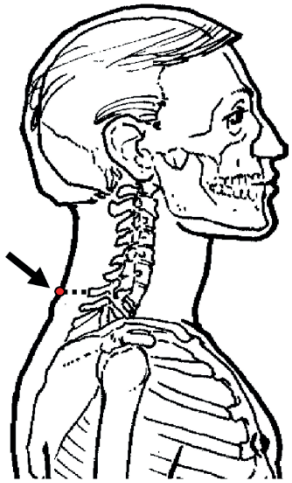

Figure 2 — Cervicale

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.

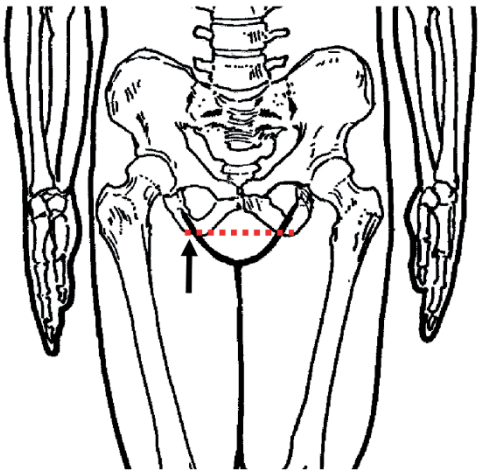

Figure 3 — Crotch level

5.5 Ectocanthus

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

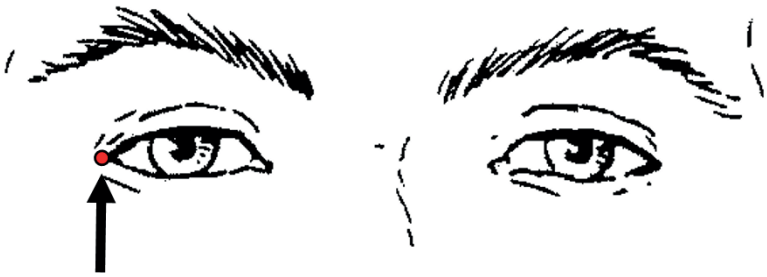

Figure 4 — Ectocanthus

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.

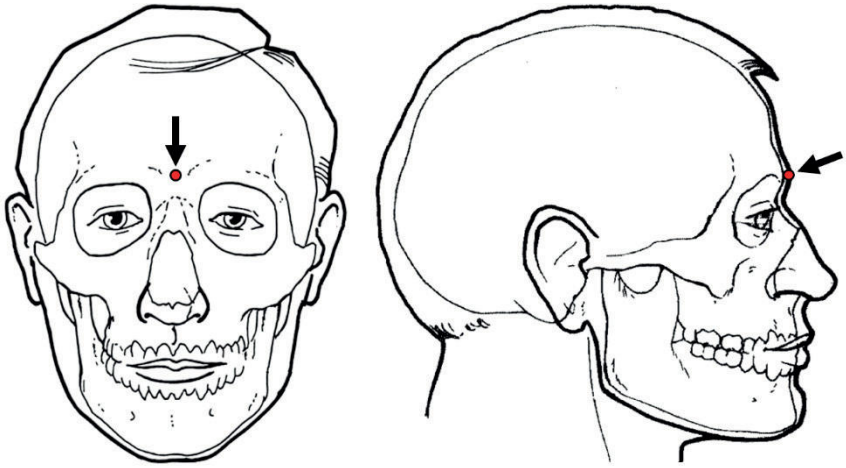

Figure 5 — Glabella

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.

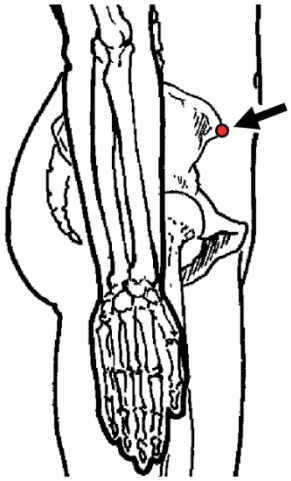

Figure 6 — Anterior superior iliac spine

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.

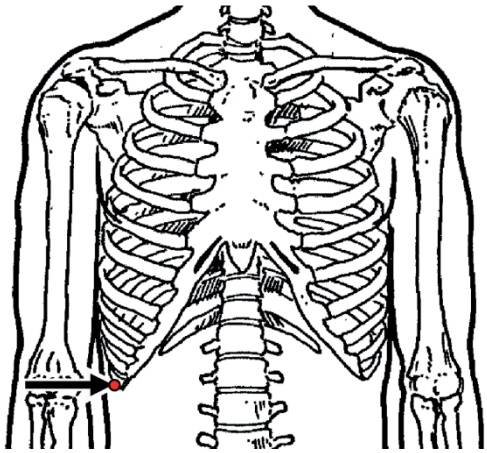

Figure 7 — Lowest point of the rib cage

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.

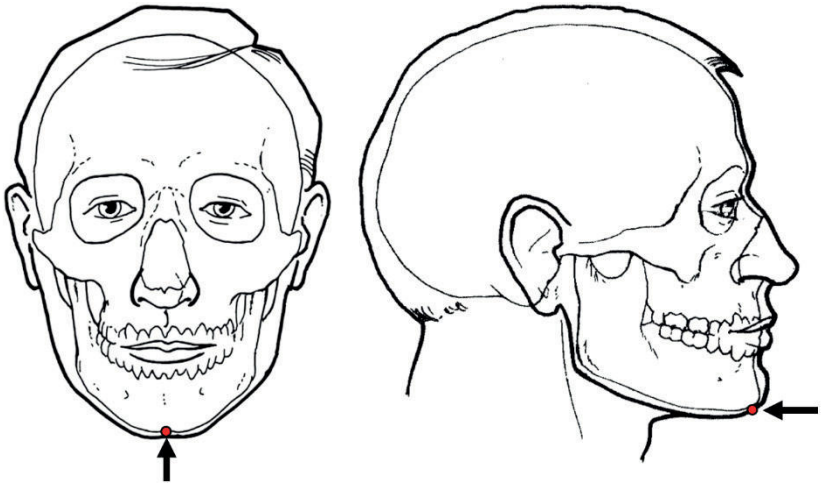

Figure 8 — Menton

5.10 Mesosternale

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

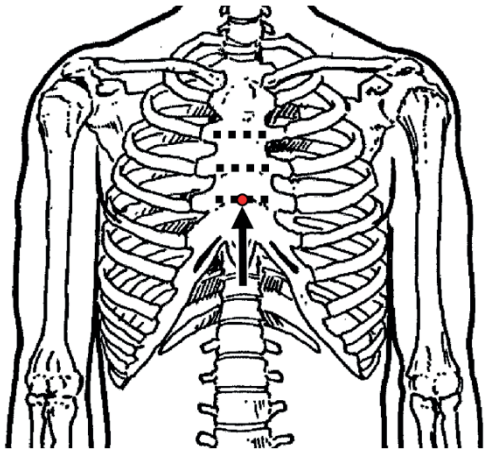

Figure 9 — Mesosternale

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.

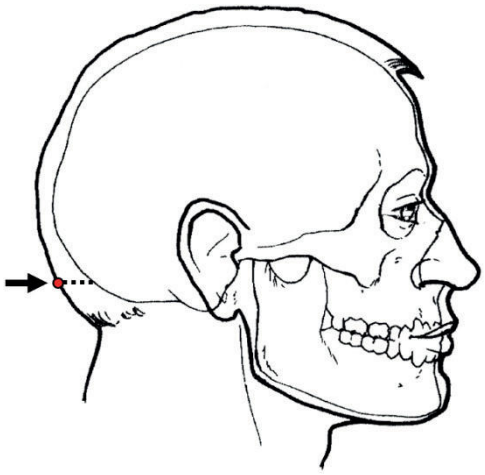

Figure 10 — Nuchale

5.12 Olecranon

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

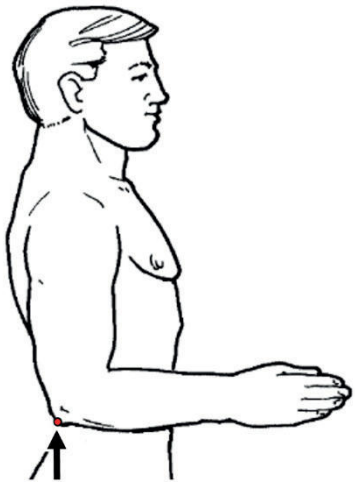

Figure 11 — Olecranon

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.

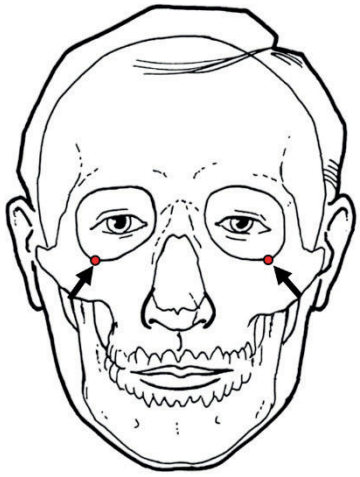

Figure 12 — Orbitale

5.14 Opisthocranion

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

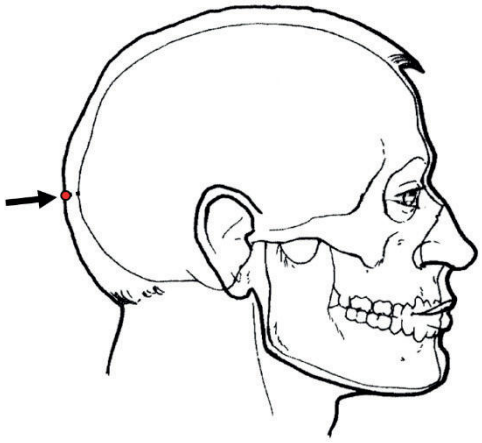

Figure 13 — Opisthocranion

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.

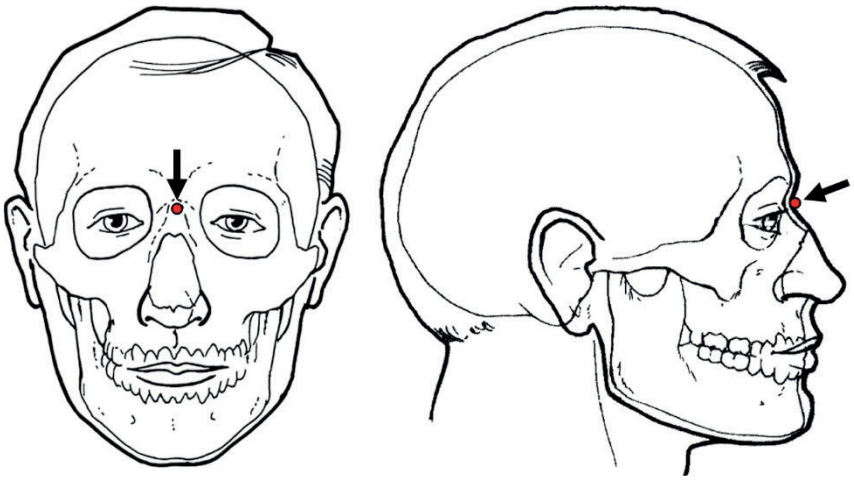

Figure 14 — Sellion

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.

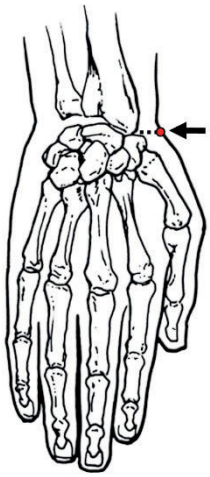

Figure 15 — Stylion (radial stylion)

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.

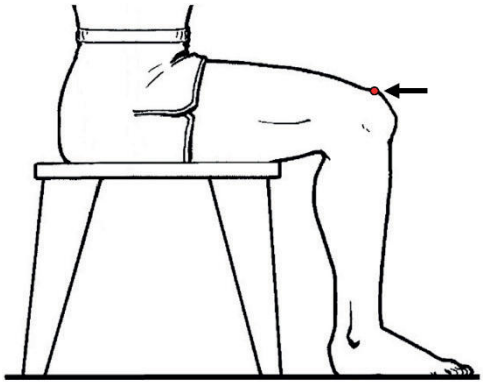

Figure 16 — Suprapatella

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.

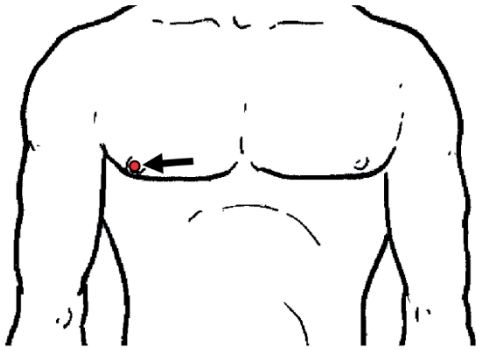

Figure 17 — Thelion

5.19 Tibiale

Superior point at the upper inside (medial) edge of the proximal end of the tibial bone of the lower leg, midway between the anterior and medial aspects of the knee projected horizontally to the surface of the skin at 45° from the parasagittal plane. See Figure 18.

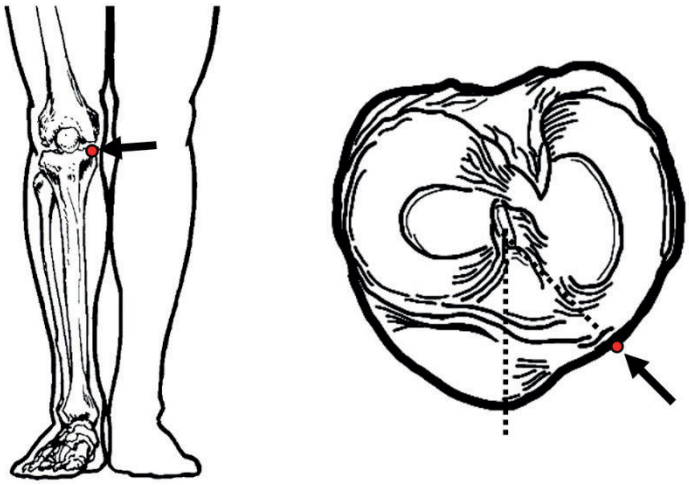

Figure 18 — Tibiale

5.20 Tragion

Notch just above the tragus (the small cartilaginous flap in front of the ear hole). See Figure 19.

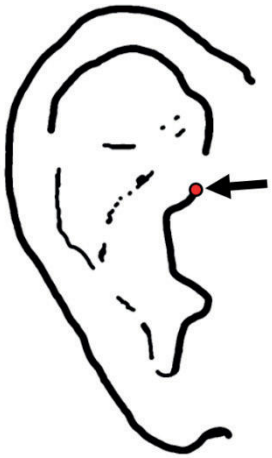

Figure 19 — Tragion

5.21 Ulnar stylion

Most distal point on the ulnar styloid, projected horizontally and posteriorly to the surface of the skin when the arms are held down and the palms are facing the thighs. See Figure 20.

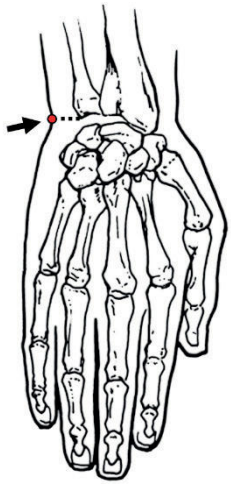

Figure 20 — Ulnar stylion

5.22 Vertex (top of head)

Highest point of the head in the midsagittal plane while the head is held in the Frankfurt plane. If the top of the head is flat, the vertex is on the bitragion arc. The point is on the scalp, not the top of the hair. See Figure 21.

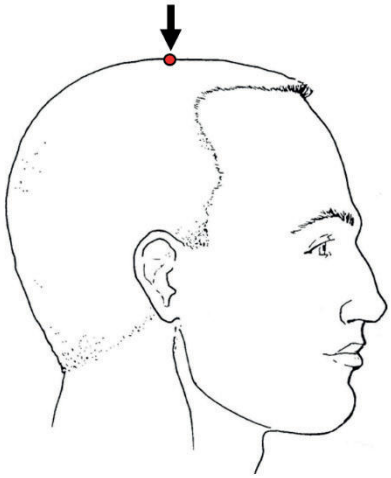

Figure 21 — Vertex (top of head)

6 Basic anthropometric measurements

6.1 Measurements taken while the subject stands

6.1.1 **Body mass** (weight)

Description: Total mass (weight) of the body.

Method: Subject stands on a weighing scale.

Instrument: Weighing scale.

6.1.2 **Stature** (body height)

Description: Vertical distance from the floor to the highest point of the head (vertex). See Figure 22.

Method: Subject stands fully erect with feet together. Head is oriented in the Frankfurt plane.

Instrument: Anthropometer.

Figure 22 — Stature (body height)

6.1.3 Eye height

Description: Vertical distance from the floor to the outer corner of the eye (ectocanthus). See Figure 23.

Method: Subject stands fully erect with feet together. Head is oriented in the Frankfurt plane.

Instrument: Anthropometer.

Figure 23 — Eye height

6.1.4 Shoulder height

Description: Vertical distance from the floor to the acromion. See Figure 24.

Method: Subject stands fully erect with feet together. Shoulders are relaxed, with arms hanging freely.

Instrument: Anthropometer.

Figure 24 — Shoulder height

6.1.5 Elbow height

Description: Vertical distance from the floor to the lowest bony point of the bent elbow. See Figure 25.

Method: Subject stands fully erect with feet together. Upper arm hangs freely downwards, with the forearm flexed at right angles to it.

Instrument: Anthropometer.

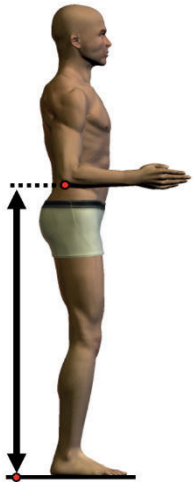

Figure 25 — Elbow height

6.1.6 Iliac spine height, standing

Description: Vertical distance from the floor to the most downward-directed point of the iliac crest (iliospinale anterius). See Figure 26.

Method: Subject stands fully erect with feet together.

Instrument: Anthropometer.

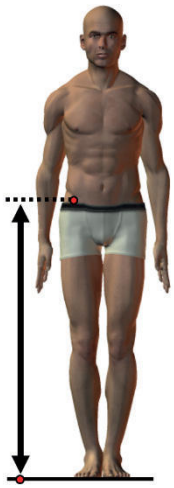

Figure 26 — Iliac spine height, standing

6.1.7 Crotch height

Description: Vertical distance from the floor to the crotch level (highest palpable level of the perineum). See Figure 27.

Method: Subject first stands with legs a maximum of 100 mm apart and the movable arm of the measuring instrument is placed against the inner surface of the thigh in such a way that, when pushed higher, it gently presses against the ischial bone. Subject then closes the legs and stands fully erect during the measurement. The moveable arm of the measuring instrument is corrected upwards after the subject is in the final posture.

Instrument: Anthropometer.

Figure 27 — Crotch height

6.1.8 Tibial height

Description: Vertical distance from the floor to the tibiale. See Figure 28.

Method: Subject stands fully erect with feet together.

Instrument: Anthropometer.

Figure 28 — Tibial height

6.1.9 Chest depth, standing

Description: Horizontal depth of the torso measured in the midsagittal plane at the level of mesosternale. See Figure 29.

Method: Subject stands fully erect with feet together. Arms hang freely downwards.

Instrument: Large sliding caliper with curved arms.

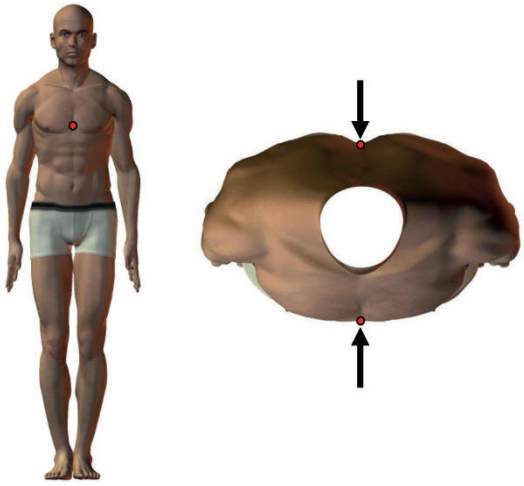

Figure 29 — Chest depth, standing

6.1.10 Body depth, standing

Description: Maximum horizontal depth of the body. See Figure 30.

Method: Subject stands erect against a wall with feet together and arms hanging freely downwards.

Instrument: Anthropometer.

Figure 30 — Body depth, standing

6.1.11 Chest breadth, standing

Description: Horizontal breadth of the torso measured at the level of mesosternale. See Figure 31.

Method: Subject stands fully erect with feet together and arms hanging freely downwards.

Instrument: Large sliding caliper.

Figure 31 — Chest breadth, standing

6.1.12 Hip breadth, standing

Description: Maximum horizontal distance across the hips. See Figure 32.

Method: Subject stands erect with feet together. Measurement is taken without pressing into the flesh of the hips.

Instrument: Large sliding caliper or large spreading caliper.

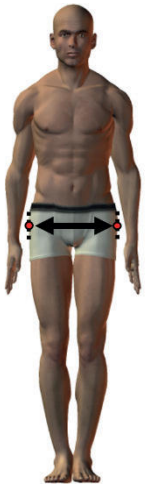

Figure 32 — Hip breadth, standing

6.2 Measurements taken while the subject sits

6.2.1 Sitting height (erect)

Description: Vertical distance from a horizontal sitting surface to the highest point of the head (vertex). See Figure 33.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other. The head is oriented in the Frankfurt plane.

Instrument: Anthropometer.

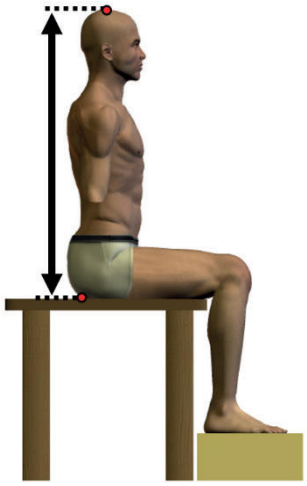

Figure 33 — Sitting height (erect)

6.2.2 Eye height, sitting

Description: Vertical distance from a horizontal sitting surface to the outer corner of the eye (ectocanthus). See Figure 34.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other. Head is oriented in the Frankfurt plane.

Instrument: Anthropometer.

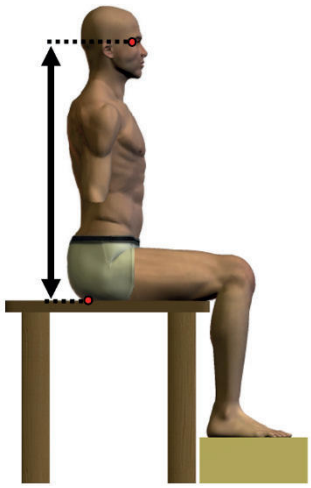

Figure 34 — Eye height, sitting

6.2.3 Cervicale height, sitting

Description: Vertical distance from a horizontal sitting surface to the cervicale. See Figure 35.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other. Head is oriented in the Frankfurt plane.

Instrument: Anthropometer.

Figure 35 — Cervicale height, sitting

6.2.4 Shoulder height, sitting

Description: Vertical distance from a horizontal sitting surface to the acromion. See Figure 36.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other. Shoulders are relaxed, with upper arms hanging freely.

Instrument: Anthropometer.

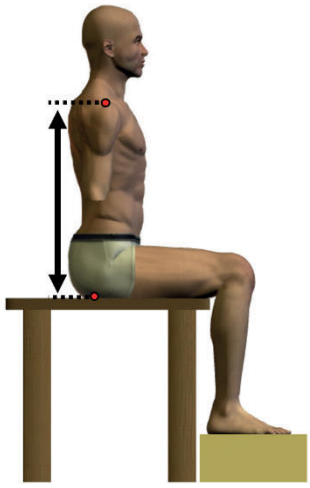

Figure 36 — Shoulder height, sitting

6.2.5 Elbow height, sitting

Description: Vertical distance from a horizontal sitting surface to the lowest bony point of the elbow bent at a right angle with the forearm horizontal. See Figure 37.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other. Upper arms hang freely downwards and forearms are horizontal.

Instrument: Anthropometer.

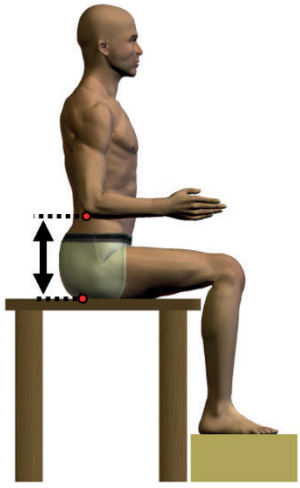

Figure 37 — Elbow height, sitting

6.2.6 Shoulder-elbow length

Description: Vertical distance from acromion to the bottom of the elbow bent at a right angle with the forearm horizontal. See Figure 38.

Method: Subject stands, or sits erect with the feet supported so that the femora are horizontal and parallel to each other. Upper arms hang freely downwards and forearms are horizontal.

Instrument: Large sliding caliper.

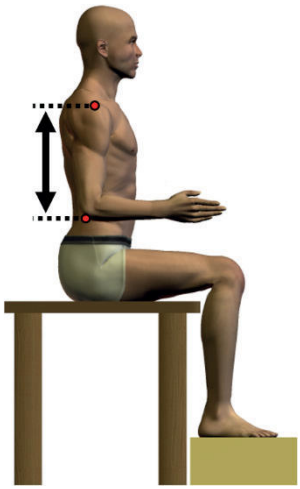

Figure 38 — Shoulder-elbow length

6.2.7 Shoulder (biacromial) breadth

Description: Distance along a straight line from acromion to acromion. See Figure 39.

Method: Subject sits or stands fully erect with shoulders relaxed.

Instrument: Large sliding caliper or large spreading caliper.

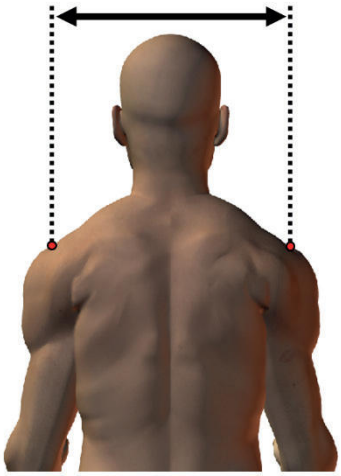

Figure 39 — Shoulder (biacromial) breadth

6.2.8 Shoulder (bideltoid) breadth

Description: Horizontal distance across the maximum lateral protrusions of the right and left deltoid muscles. See Figure 40.

Method: Subject sits or stands fully erect with shoulders relaxed.

Instrument: Large sliding caliper.

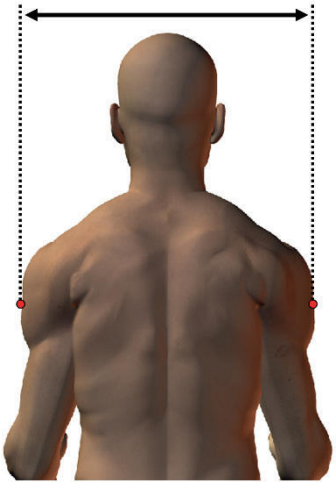

Figure 40 — Shoulder (bideltoid) breadth

6.2.9 Elbow-to-elbow breadth

Description: Maximum horizontal distance between the lateral surfaces of the elbow region. See Figure 41.

Method: Subject sits or stands erect with shoulders relaxed and upper arms hanging down. The upper portions of the upper arms are in contact with the sides of the body. Forearms are extended horizontally and parallel to each other and the floor. Measurement is taken without pressing into the flesh at the elbows.

Instrument: Large sliding caliper or large spreading caliper.

Figure 41 — Elbow-to-elbow breadth

6.2.10 Hip breadth, sitting

Description: Breadth of the body measured across the widest portion of the hips. See Figure 42.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal, but the feet and knees are together. Measurement is taken without pressing into the flesh of the hips.

Instrument: Large sliding caliper.

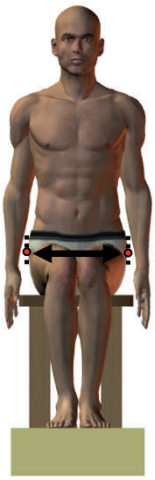

Figure 42 — Hip breadth, sitting

6.2.11 Popliteal height, sitting

Description: Vertical distance from the foot-rest surface to the lower surface of the thigh immediately behind the knee, bent at right angles. See Figure 43.

Method: Subject sits with the foot placed on a raised platform so the thigh and lower leg are at right angles during measurement. The movable arm of the measuring instrument is pushed gently against the tendon of the relaxed biceps femoris muscle.

Instrument: Anthropometer.

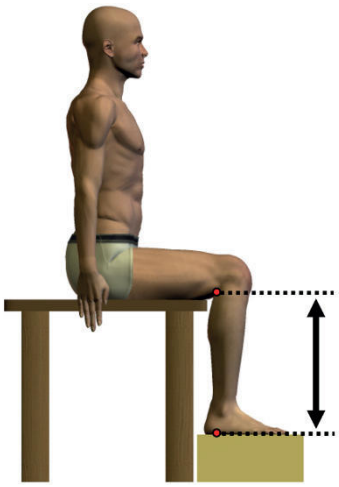

Figure 43 — Popliteal height, sitting

6.2.12 Thigh clearance

Description: Vertical distance from the sitting surface to the highest point on the thigh. See Figure 44.

Method: Subject sits erect with knees bent at right angles, supporting the feet flat on the floor.

Instrument: Anthropometer.

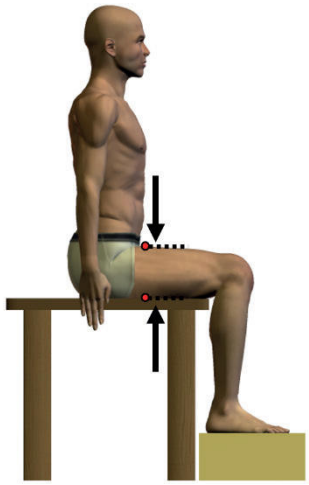

Figure 44 — Thigh clearance

6.2.13 Knee height, sitting

Description: Vertical distance from the floor to the highest point of the superior border of the patella (suprapatella, sitting). See Figure 45.

Method: Subject sits erect with knees bent at right angles, supporting the feet flat on the floor.

Instrument: Anthropometer.

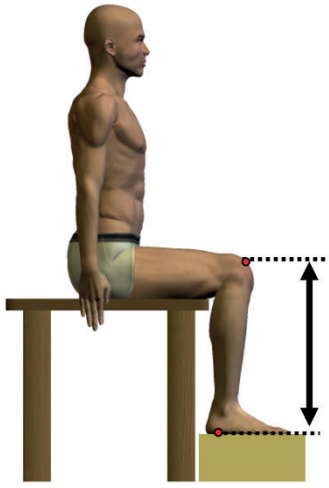

Figure 45 — Knee height

6.2.14 Abdominal depth, sitting

Description: Maximum depth of the abdomen while sitting. See Figure 46.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other and with the muscles of the abdomen relaxed.

Instrument: Large sliding caliper.

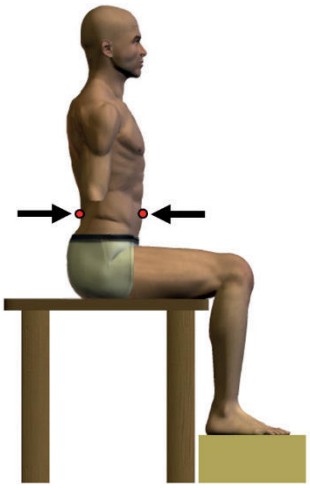

Figure 46 — Abdominal depth, sitting

6.2.15 Thorax depth

Description: Maximum horizontal depth of the thorax at the level of the nipple (thelion). See Figure 47.

Method: Subject sits or stands fully erect, arms hanging freely downwards. Females wear their usual brassiere and the measurement is taken at bust point.

Instrument: Large sliding caliper.

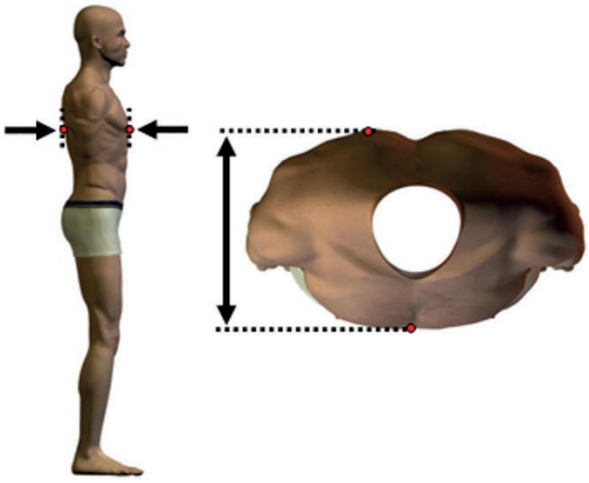

Figure 47 — Thorax depth at the nipple

6.2.16 Buttock-abdomen depth, sitting

Description: Projected maximum horizontal depth of the lower torso between the maximum anterior protrusion of the abdomen and the maximum posterior protrusion of the buttock. See Figure 48.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other with the rearmost point of the buttocks touching the surface of a vertical panel. Distance is measured from the vertical panel to the maximum anterior protrusion of the abdomen.

Instrument: Anthropometer.

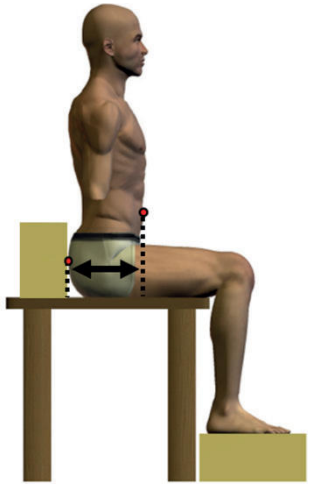

Figure 48 — Buttock-abdomen depth, sitting

6.3 Measurements on specific body segments

6.3.1 Hand length (stylion)

Description: The distance from the tip of the middle finger, along its long axis, to a line connecting the radial and ulnar styloid processes. See Figure 49.

Method: Subject holds the forearm horizontal with hand stretched out flat, palm up. The point of measurement at the styloid process corresponds approximately to the middle of the skin furrow at the wrist.

Instrument: Sliding caliper.

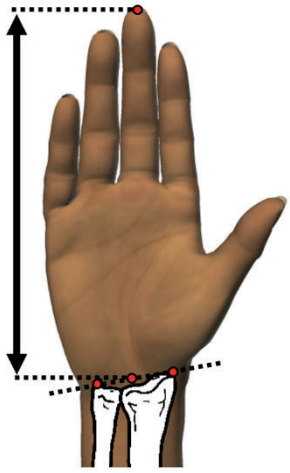

Figure 49 — Hand length

6.3.2 Palm length

Description: The distance on the palm of the hand, from a line connecting the radial and ulnar styloid processes to the proximal finger crease of the middle finger, measured parallel to the long axis of the outstretched middle finger. See Figure 50.

Method: Subject holds the forearm horizontal with the hand stretched out flat, palm up. Measurement is taken on the palmar surface of the hand.

Instrument: Sliding caliper.

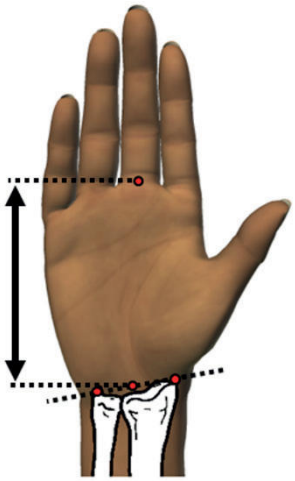

Figure 50 — Palm length

6.3.3 Hand breadth at metacarpals

Description: Projected distance between radial and ulnar metacarpals at the level of the metacarpal heads from the second to the fifth metacarpal, measured perpendicular to the long axis of the middle finger. See Figure 51.

Method: Subject holds the forearm horizontal with the hand stretched out flat, palm up.

Instrument: Large sliding caliper.

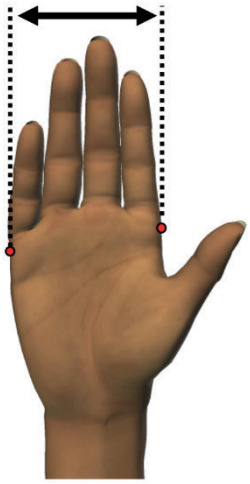

Figure 51 — Hand breadth at metacarpals

6.3.4 Index finger length

Description: Distance from the tip of the second finger to the proximal finger crease on the palm of the hand. See Figure 52.

Method: Subject holds forearm the horizontal with the hand stretched out flat and fingers spread, palm up. Measurement is taken on the palmar surface of the hand.

Instrument: Sliding caliper.

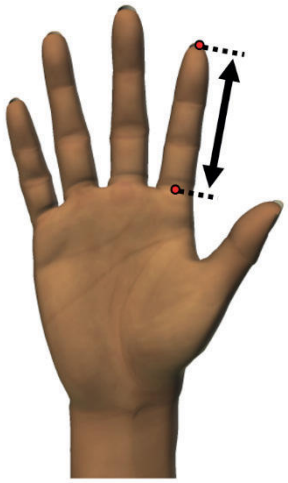

Figure 52 — Index finger length

6.3.5 Index finger breadth, proximal

Description: Maximum breadth of the second finger in the region of the joint between middle and proximal phalanges. See Figure 53.

Method: Subject holds the forearm horizontal with the hand stretched out flat and fingers spread, palm up.

Instrument: Sliding caliper.

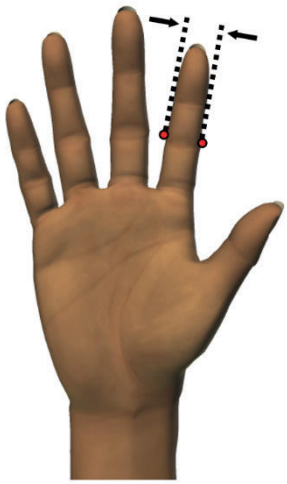

Figure 53 — Index finger breadth, proximal

6.3.6 Index finger breadth, distal

Description: Maximum breadth of the second finger in the region of the joint between middle and distal phalanges. See Figure 54.

Method: Subject holds the forearm horizontal with the hand stretched out flat and fingers spread, palm up.

Instrument: Sliding caliper.

Figure 54 — Index finger breadth, distal

6.3.7 Foot length

Description: Maximum distance from the rear of the heel to the tip of the longest (first or second) toe, measured parallel to the longitudinal axis of the foot. See Figure 55.

Method: Subject stands with weight equally distributed on both feet.

Instrument: Large sliding caliper.

Figure 55 — Foot length

6.3.8 Foot breadth

Description: Maximum distance between medial and lateral surfaces of the foot perpendicular to the longitudinal axis of the foot. See Figure 56.

Method: Subject stands with weight equally distributed on both feet.

Instrument: Large sliding caliper.

Figure 56 — Foot breadth

6.3.9 Head length

Description: Distance along a straight line between glabella and opisthocranion. See Figure 57.

Method: Position of the head has no influence on the measurement.

Instrument: Spreading caliper.

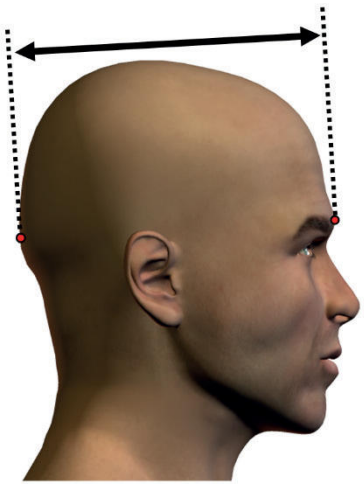

Figure 57 — Head length

6.3.10 Head breadth

Description: Maximum breadth of head above the level of the ears, measured perpendicular to the midsagittal plane. See Figure 58.

Method: Position of the head has no influence on the measurement.

Instrument: Spreading caliper.

Figure 58 — Head breadth

6.3.11 Face length (menton-sellion)

Description: Distance between sellion and menton. See Figure 59.

Method: Subject keeps mouth closed. Head is oriented in the Frankfurt plane.

Instrument: Sliding caliper.

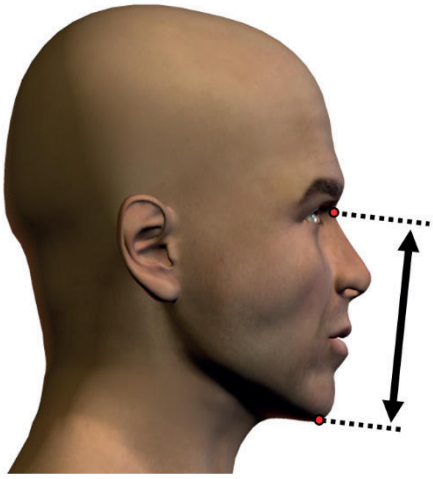

Figure 59 — Face length (menton-sellion)

6.3.12 Head circumference

Description: Maximum, approximately horizontal, circumference of head measured above the glabella and crossing the rearmost point of the skull. See Figure 60.

Method: Tape measure is placed above the browridges and led around the head so as to pass over the rearmost point of the skull. Hair shall be included in the measurement. Ask the subject to change the hairstyle if it substantially affects the measurement. If that is impossible, make a note on the measurement.

Instrument: Tape measure.

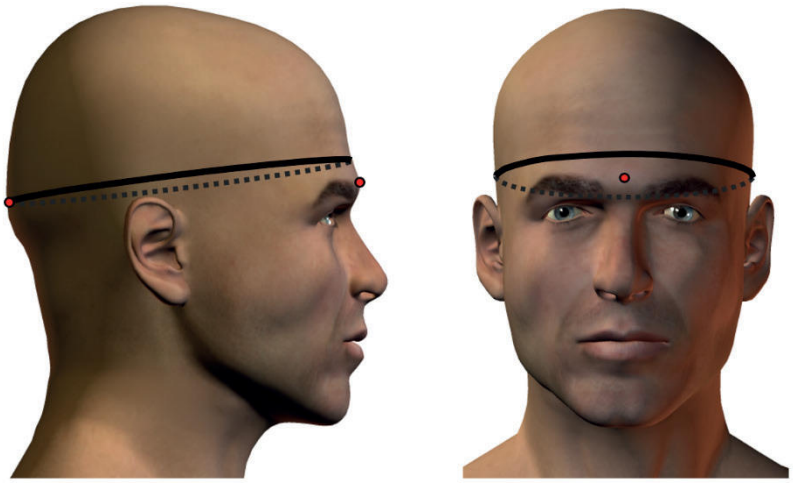

Figure 60 — Head circumference

6.3.13 Sagittal arc

Description: Arc from the glabella over the skull to the nuchale. See Figure 61.

Method: Tape measure is held on the glabella and led over the head so as to pass over the rearmost point of the skull to the nuchale. Hair shall be compressed. Ask the subject to change the hairstyle if it substantially affects the measurement. If that is impossible, make a note on the measurement.

Instrument: Tape measure.

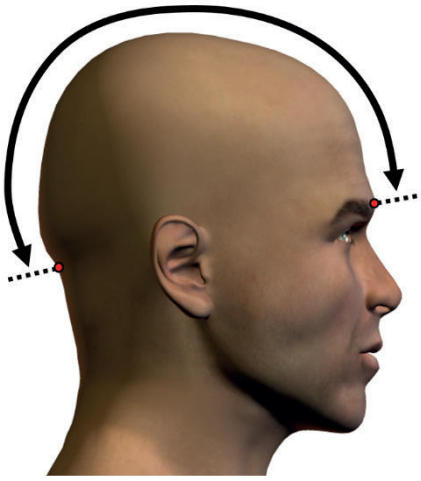

Figure 61 — Sagittal arc

6.3.14 Bitragion arc

Description: Arc from one tragion over the crown of the head to the other tragion perpendicular to the Frankfurt plane and sagittal arc. See Figure 62.

Method: Tape measure is held on the tragion of one side of the head and led over the crown to the tragion on the other side. Hair shall be included in the measurement. Ask the subject to change the hairstyle if it substantially affects the measurement. If that is impossible, make a note on the measurement.

Instrument: Tape measure.

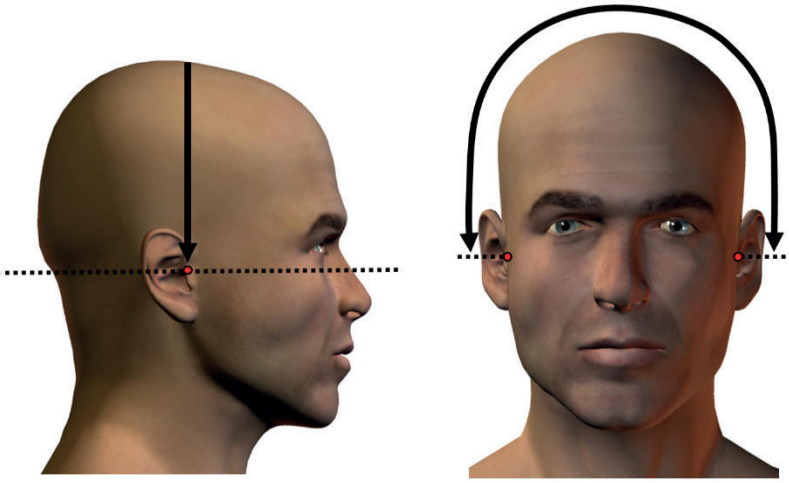

Figure 62 — Bitragion arc

6.3.15 Thumb length

Description: Length of the thumb from the proximal thumb crease to the tip of the thumb. See Figure 63.

Method: The thumb is abducted and outstretched. The measurement is from the proximal crease where the thumb meets the hand to the tip of the thumb. Subject holds the forearm horizontal with the hand stretched out flat, palm up, with the thumb abducted and outstretched. Measurement is taken on the palmar surface of the thumb.

Instrument: Sliding caliper

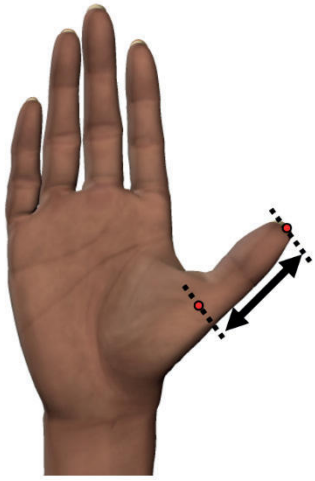

Figure 63 — Thumb length

6.3.16 Thumb breadth

Description: Maximum breadth of the thumb in the region of the joint between the two phalanges. See Figure 64.

Method: Subject holds the forearm horizontal with the hand stretched out flat, the thumb abducted and outstretched and fingers spread, palm up, with the thumb abducted and outstretched.

Instrument: Sliding caliper.

Figure 64 — Thumb breadth

6.3.17 Hand thickness

Description: Maximum thickness of the hand, measured across the knuckles. See Figure 65.

Method: Subject holds the hand flat, palm down, with the fingers together. The measurement captures the thickest part of the hand.

Instrument: Sliding caliper.

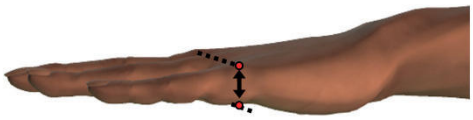

Figure 65 — Hand thickness

6.3.18 Hand breadth including thumb

Description: The breadth of the hand measured diagonally from the first metacarpo-phalangeal joint to the fifth metacarpo-phalangeal point. See Figure 66.

Method: Subject holds the hand flat, palm down, with the fingers and thumb together.

Instrument: Sliding caliper.

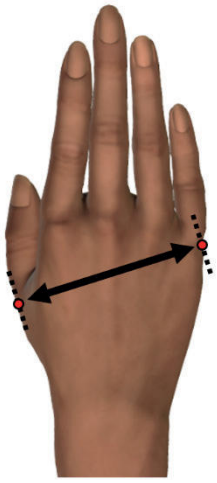

Figure 66 — Hand breadth including thumb

6.3.19 Arm circumference flexed

Description: The maximum circumference of the upper arm. See Figure 67.

Method: Subject stands with the right upper arm extended forward horizontally and the elbow flexed about 90°. The fist is clenched and held facing the head.

Instrument: Tape measure.

Figure 67 — Arm circumference, flexed

6.3.20 Forearm circumference flexed

Description: The maximum circumference of the forearm, one-third of the distance from olecranon to ulnar styloid. See Figure 68.

Method: Subject stands with the right upper arm extended forward horizontally and the elbow flexed about 90°. The fist is clenched and held facing the head. Note the surface distance between the olecranon and ulnar styloid landmarks, and place the tape at one-third the distance.

Instrument: Tape measure.

Figure 68 — Forearm circumference, flexed

6.4 Functional measurements

6.4.1 Wall-acromion distance

Description: Horizontal distance from a vertical surface to the acromion. See Figure 69.

Method: Subject stands with both shoulder blades in firm contact with a vertical surface, and arms hanging relaxed at the side. Reliable results may be difficult to obtain, especially in cases of large buttocks, or much muscle mass or body fat on the back.

Instrument: Anthropometer.

Figure 69 — Wall-acromion distance

6.4.2 Grip reach; forward reach

Description: Horizontal distance from a vertical surface to the grip axis of the hand while the subject leans both shoulder blades against the vertical surface. See Figure 70.

Method: Subject stands fully erect with both shoulder blades in firm contact with a vertical surface, the arm fully extended horizontally. Hand holds the measuring rod with a vertical grip axis. Reliable results may be difficult to obtain, especially in cases of subjects with large buttocks.

Instrument: Anthropometer, 20 mm diameter rod for determining grip axis.

Figure 70 — Grip reach; forward reach

6.4.3 Elbow-wrist length

Description: Horizontal distance from olecranon to ulnar stylion. See Figure 71.

Method: Subject sits or stands erect, with the upper arms hanging freely downwards and the forearms horizontal.

Instrument: Large sliding caliper

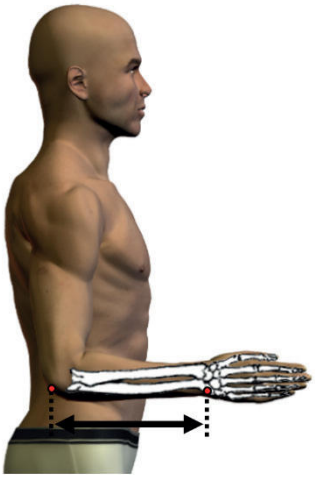

Figure 71 — Elbow-wrist length

6.4.4 Elbow-grip length

Description: Horizontal distance from olecranon (back of the elbow) to grip axis with the elbow bent at right angles. See Figure 72.

Method: Subject sits or stands erect, the upper arm hanging freely downwards and forearms horizontal. Hand holds the measuring rod with a vertical grip axis.

Instrument: Large sliding caliper, 20 mm diameter rod for determining grip axis.

Figure 72 — Elbow-grip length

6.4.5 Fist (grip axis) height

Description: Vertical distance from the floor to the grip axis of the fist. See Figure 73.

Method: Subject stands fully erect with feet together, shoulders relaxed, arms hanging freely downwards. Hand holds the measuring rod in the sagittal plane with a horizontal grip axis.

Instrument: Anthropometer, 20 mm diameter rod.

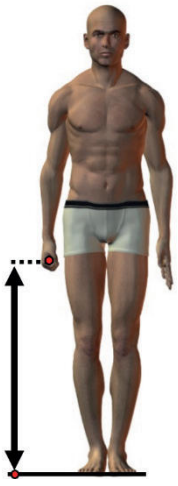

Figure 73 — Fist (grip axis) height

6.4.6 Forearm-fingertip length

Description: Horizontal distance from olecranon (back of the elbow) to the tip of the middle finger, with the elbow bent at right angles. See Figure 74.

Method: Subject sits or stands erect with the upper arm hanging downwards, the forearm horizontal and the hand extended.

Instrument: Large sliding caliper.

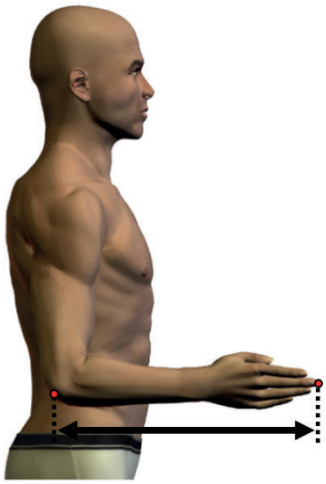

Figure 74 — Forearm-fingertip length

6.4.7 Buttock-popliteal length (seat depth)

Description: Horizontal distance from the hollow of the knee to the rearmost point of the buttock. See Figure 75.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other and the sitting surface extending as far as possible into the hollow of the knee. The position of the rearmost point of the buttock is vertically projected onto the sitting surface by means of a measuring cube which touches the buttocks. Distance is measured from the measuring block to the forward edge of the sitting surface.

Instrument: Anthropometer, measuring cube.

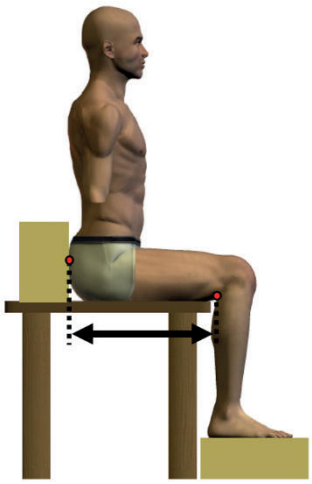

Figure 75 — Buttock-popliteal length (seat depth)

6.4.8 Buttock-knee length

Description: Horizontal distance from the foremost point of the knee-cap to the rearmost point of the buttock. See Figure 76.

Method: Subject sits fully erect with the feet supported so that the femora are horizontal and parallel to each other. The position of the rearmost point of the buttock is vertically projected onto the sitting surface by means of a measuring block which touches the buttocks. Distance is measured from the measuring cube to the foremost point of the knee-cap.

Instrument: Anthropometer, measuring cube.

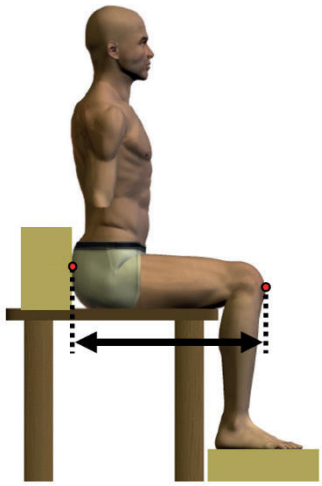

Figure 76 — Buttock-knee length

6.4.9 Neck circumference

Description: Circumference of the neck at a point just below the bulge at the thyroid cartilage, perpendicular to the long axis of the neck. See Figure 77.

Method: Subject sits or stands erect with the head in the Frankfurt plane.

Instrument: Tape measure.

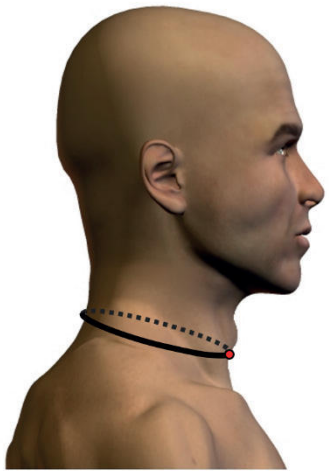

Figure 77 — Neck circumference

6.4.10 Chest circumference

Description: Circumference of the torso measured at the nipple level. See Figure 78.

Method: Subject stands fully erect with feet together, arms hanging freely downwards. Females wear their usual brassiere.

Instrument: Tape measure.

Figure 78 — Chest circumference

6.4.11 Waist circumference

Description: Horizontal circumference of the trunk at a level midway between the lowest ribs and the upper iliac crest. See Figure 79.

Method: Subject stands fully erect with feet together and is asked to relax the abdominal muscles.

Instrument: Tape measure.

Figure 79 — Waist circumference

6.4.12 Wrist circumference

Description: Minimum circumference of the wrist at the level of the radial styloid, with the hand outstretched. The tape passes just distal to the ulnar styloid. See Figure 80.

Method: Subject holds the forearm horizontal with the hand outstretched and fingers extended.

Instrument: Tape measure.

Figure 80 — Wrist circumference

6.4.13 Thigh circumference

Description: Maximum circumference of the thigh. See Figure 81.

Method: Subject stands erect. Measurement is taken by passing the tape horizontally around the thigh at its maximum circumference, usually just below the gluteal fold.

Instrument: Tape measure.

Figure 81 — Thigh circumference

6.4.14 Calf circumference

Description: Maximum circumference of the calf. See Figure 82.

Method: Subject stands erect. Measurement is taken by passing the tape horizontally around the maximum circumference of the calf.

Instrument: Tape measure.

Figure 82 — Calf circumference

Annex A
(informative)

Correspondence between ISO 7250-1 dimension names and numbers and ISO 14738 and ISO 15534 anthropometric dimension codes

See Table A.1.

Table A.1 — Names, numbers and codes for anthropometric dimensions

ISO 7250-1		ISO 14738 code	ISO 15534 code
Number/Subclause	Dimension name		
6.1.1	Body mass (weight)		
6.1.2	Stature (body height)	h_1	h_1
6.1.3	Eye height		
6.1.4	Shoulder height		
6.1.5	Elbow height	h_4	
6.1.6	Iliac spine height, standing		
6.1.7	Crotch height	h_6	
6.1.8	Tibial height		
6.1.9	Chest depth, standing		
6.1.10	Body depth, standing		b_1
6.1.11	Chest breadth, standing		
6.1.12	Hip breadth, standing		
6.2.1	Sitting height (erect)	h_{11}	
6.2.2	Eye height, sitting	h_{12}	
6.2.3	Cervicale height, sitting		
6.2.4	Shoulder height, sitting	h_{13}	
6.2.5	Elbow height, sitting		
6.2.6	Shoulder-elbow length		
6.2.7	Shoulder (biacromial) breadth	a_2	
6.2.8	Shoulder (bideltoid) breadth		
6.2.9	Elbow-to-elbow breadth		a_1
6.2.10	Hip breadth, sitting	a_{17}	
6.2.11	Popliteal height, sitting	h_{16}	
6.2.12	Thigh clearance	b_{18}	
6.2.13	Knee height, sitting		
6.2.14	Abdominal depth, sitting		
6.2.15	Thorax depth at the nipple		
6.2.16	Buttock-abdomen depth, sitting	b_{15}	
6.3.1	Hand length		t_4
6.3.2	Palm length		
6.3.3	Hand breadth at metacarpals		a_4

Table A.1 *(continued)*

ISO 7250-1		ISO 14738 code	ISO 15534 code
Number/Subclause	Dimension name		
6.3.4	Index finger length		t_6
6.3.5	Index finger breadth, proximal		a_5
6.3.6	Index finger breadth, distal		
6.3.7	Foot length	c_2	c_2
6.3.8	Foot breadth		a_6
6.3.9	Head length		
6.3.10	Head breadth		
6.3.11	Face length (menton-sellion)		
6.3.12	Head circumference		
6.3.13	Sagittal arc		
6.3.14	Bitragion arc		
6.3.15	Thumb length		
6.3.16	Thumb breadth		
6.3.17	Hand thickness		b_3
6.3.18	Hand breadth including thumb		a_3
6.3.19	Arm circumference flexed		d_1
6.3.20	Forearm circumference flexed		
6.4.1	Wall-acromion distance		
6.4.2	Grip reach; forward reach	b_2	b_2
6.4.3	Elbow-wrist length		
6.4.4	Elbow-grip length		
6.4.5	Fist (grip axis) height		
6.4.6	Forearm-fingertip length		
6.4.7	Buttock-popliteal length (seat depth)		
6.4.8	Buttock-knee length	c_1	c_1
6.4.9	Neck circumference		
6.4.10	Chest circumference		
6.4.11	Waist circumference		
6.4.12	Wrist circumference		
6.4.13	Thigh circumference		
6.4.14	Calf circumference		

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