TECHNICAL REPORT

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2012-11-15

Office furniture — Office work chairs — Methods for the determination of dimensions

Mobilier de bureau — Sièges de travail pour bureau — Méthodes pour déterminer les dimensions

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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.

ISO/TR 24496 was prepared by Technical Committee ISO/TC 136, *Furniture*.

Introduction

The test methods in this Technical Report are based on the manner in which anthropometric measurements are measured.

Therefore, in order to be able to relate the dimensions of office seating to the anthropometric dimensions, a theoretical reference seating posture has been adopted. This posture does, however, not automatically correspond to the ideal or optimum seating posture.

The reference seating posture is as follows:

— the sole of the foot placed on the floor;

— the foot forms an angle of approximately 90° with the lower leg;

— the lower leg is approximately vertical;

— the lower leg forms an angle of approximately 90° with the thigh;

— the thigh is almost horizontal;

— the thigh forms an angle of approximately 90° with the trunk;

— the trunk is erect.

Further information on the anthropometric dimensions can be found in ISO 7250 (all parts) and ISO 14738.

This Technical Report is meant to be used in conjunction with requirements documents. Such documents will specify which of the dimensions must be measured. It is possible that not all of the measurements that can be taken by this Technical Report will be specified by the individual requirements document.

Office furniture — Office work chairs — Methods for the determination of dimensions

1 Scope

This Technical Report specifies methods for the determination of the dimensions of office chairs.

It does not contain dimensional specifications or requirements.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

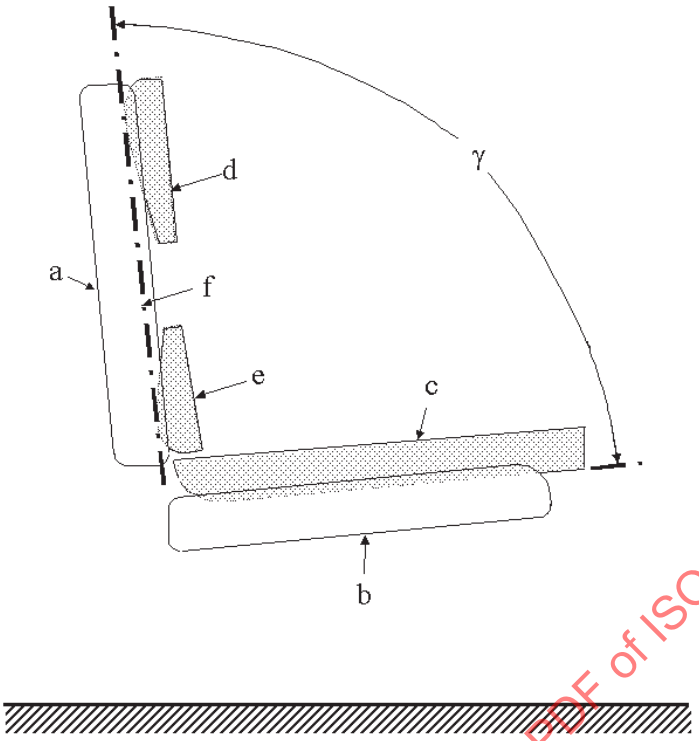
3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE They do not describe measurement procedures. Measurement procedures can be found in Clause 6.

3.1
angle between backrest and seat
angle γ between the loaded backrest and the loaded seat

Note 1 to entry: See Figure 1.



Key

a backrest
b seat
c Chair Measuring Device (CMD) buttocks pad
d CMD thoracic pad
e CMD pelvic pad
f backrest line
γ angle between backrest and seat

Figure 1 — Angle between backrest and seat

3.2
angle – origin and sign convention
angle sign convention viewed from the right side of the chair is: clockwise angle rotation is positive (+); counter-clockwise is negative (–)

Note 1 to entry: See Figure 2.

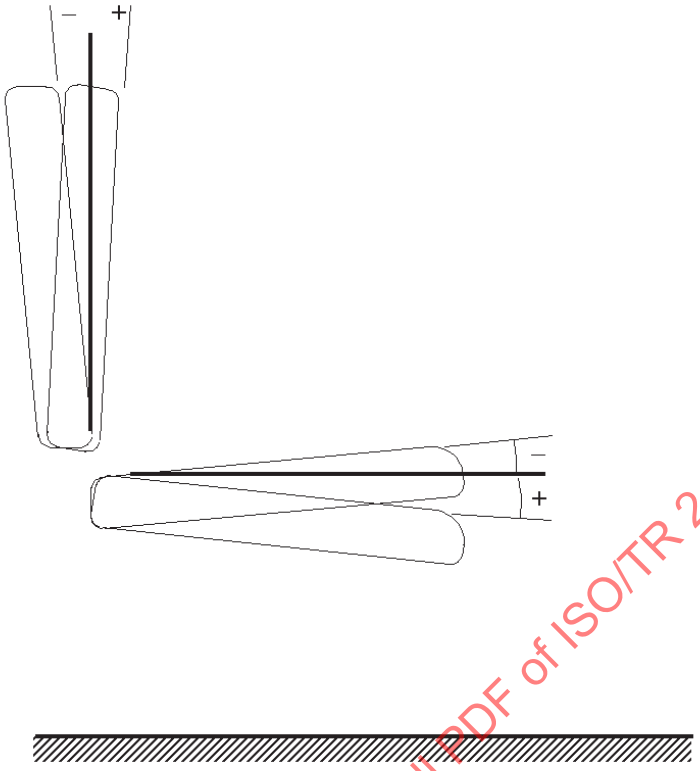
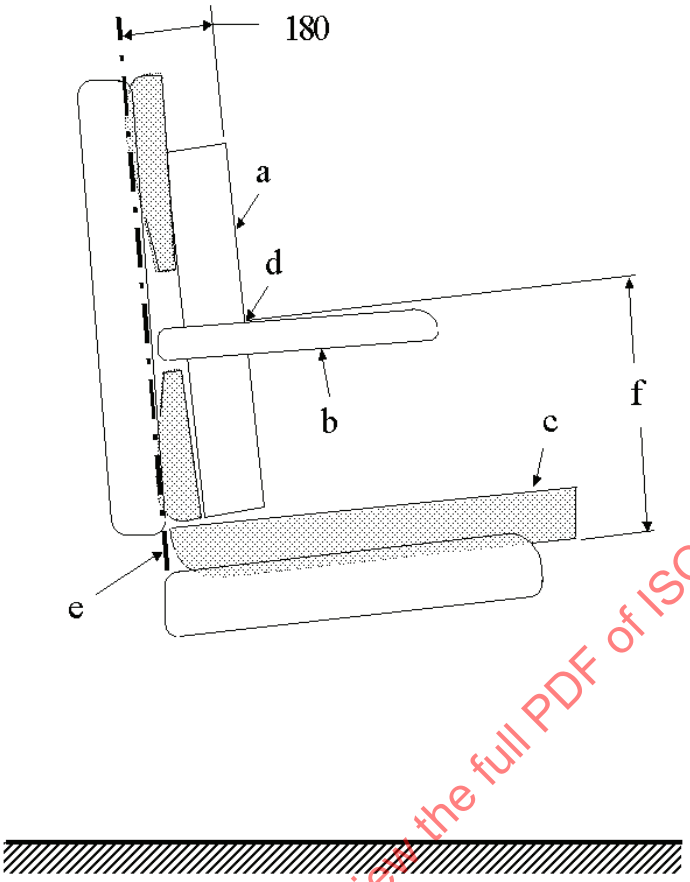


Figure 2 — Angle – origin and sign convention

3.3
armrest height
distance from the top surface of the armrest to the bottom of the loaded CMD buttocks pad parallel to the backrest line at a distance of 180 mm from the backrest line

Note 1 to entry: See Figure 3.

Dimensions in millimetres



Key

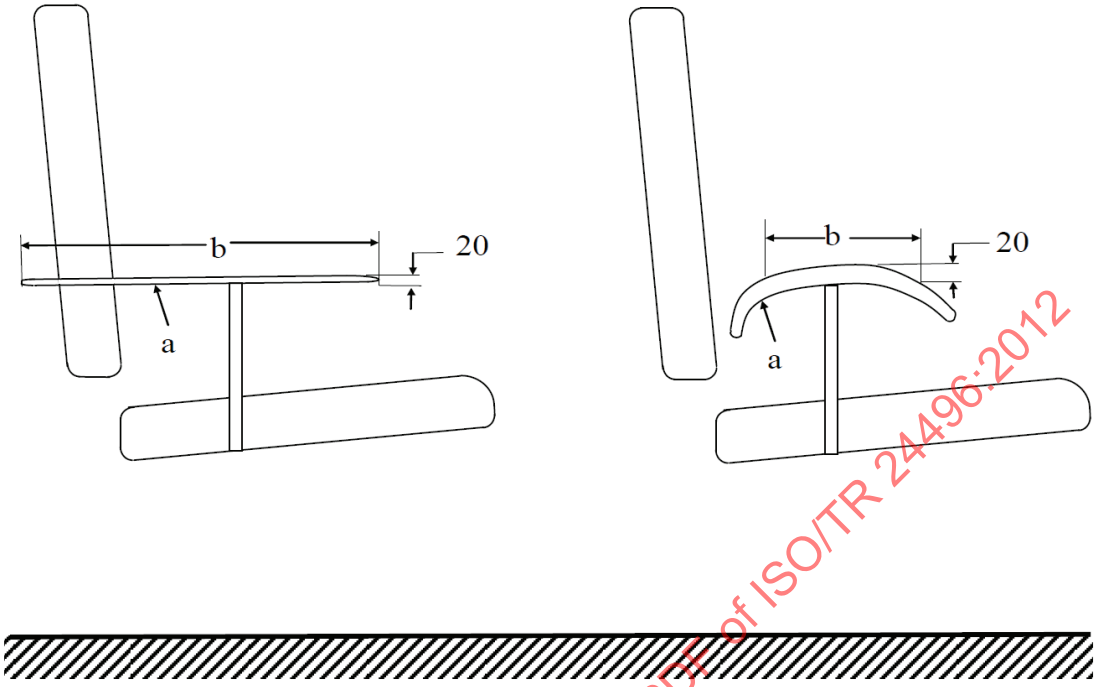
a CMD vertical member
b armrest
c CMD buttocks pad
d intersection of projection of vertical member front face and armrest
e backrest line
f armrest height

Figure 3 — Armrest height

3.4
armrest length
distance along the armrest within an envelope down from the top of the armrest that is 20 mm deep

Note 1 to entry: See Figure 4.

Dimensions in millimetres

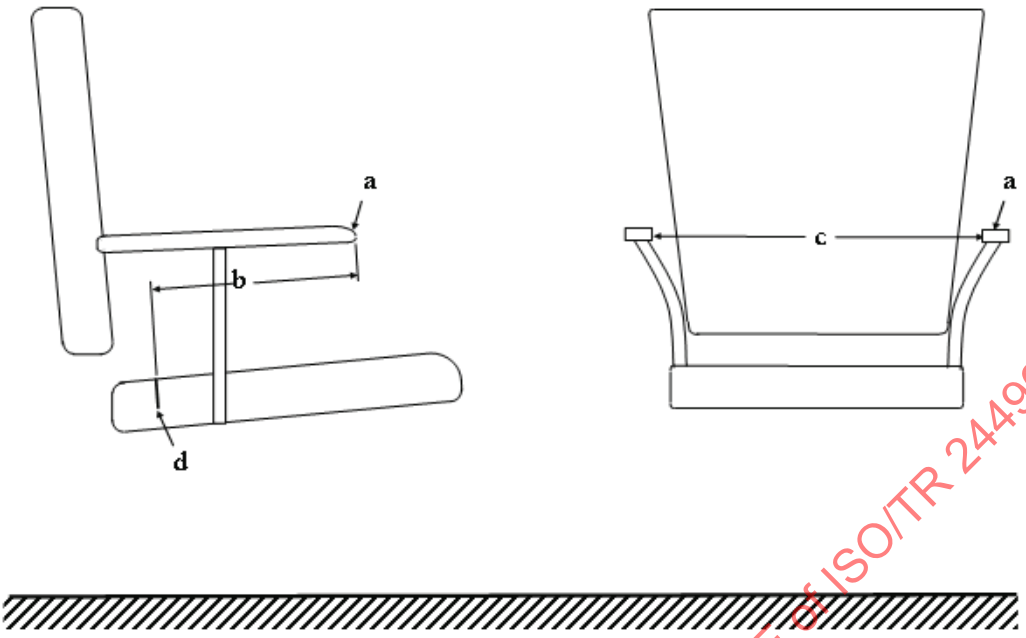


Key

a armrest
b armrest length

Figure 4 — Armrest length

3.5
armrest – clear distance between
smallest horizontal distance between armrest from the rear of the *seat surface width zone* (3.28) forward to the front edge of the seat (see Figure 5) within the measurement zone 5 mm down from the top of the armrest (see Figure 7)



Key

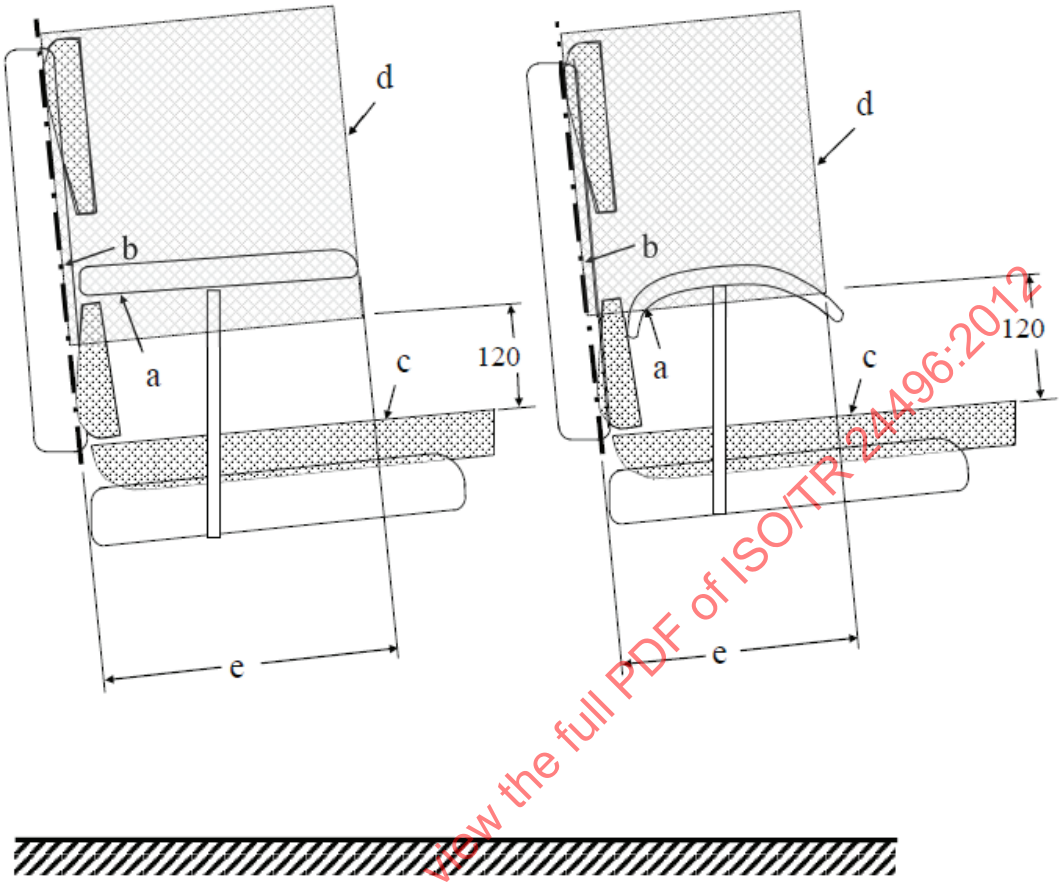
a armrest
b armrest pad measurement zone
c clear distance between armrest
d rear of seat width zone

Figure 5 — Armrest – clear distance between

3.6
armrest position – front of
perpendicular distance from the backrest line to the front of the armrest that is in the measurement zone 120 mm and greater above the top surface of the loaded CMD buttocks pad

Note 1 to entry: See Figure 6.

Dimensions in millimetres



Key

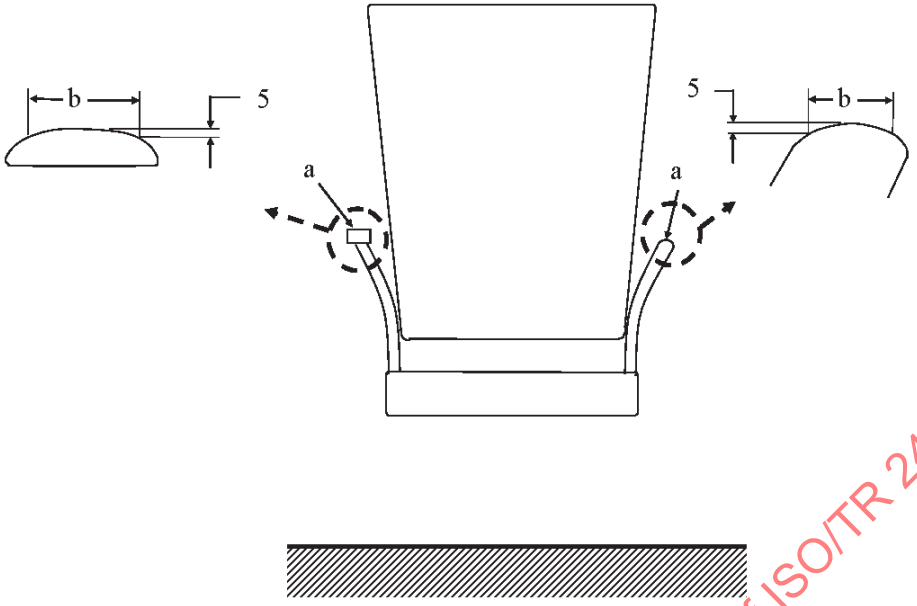
a armrest
b backrest line
c CMD buttocks pad
d measurement zone
e front of armrest position

Figure 6 — Armrest position – front of

3.7
armrest width
horizontal distance across the armrest within the measurement zone 5 mm down from the top of the armrest

Note 1 to entry: See Figure 7.

Dimensions in millimetres



Key

a armrest
b armrest width

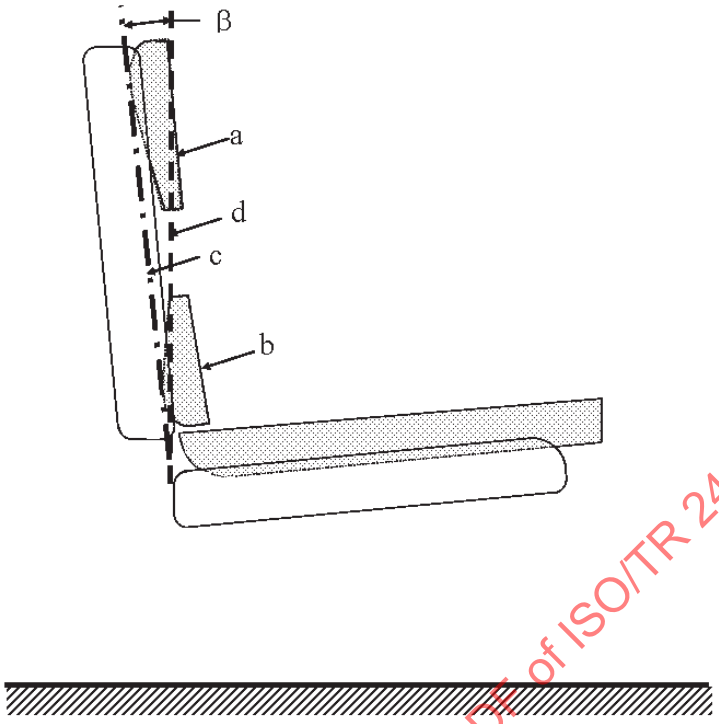
Figure 7 — Armrest width

3.8
back to seat movement ratio
ratio of change of the backrest angle relative to the change of angle of the seat that occurs when a seat and backrest move concurrently

Note 1 to entry: Not applicable to chairs with seat and/or back angles that only move independently.

3.9
backrest angle to vertical
angle β between vertical and the loaded backrest

Note 1 to entry: See Figure 8.



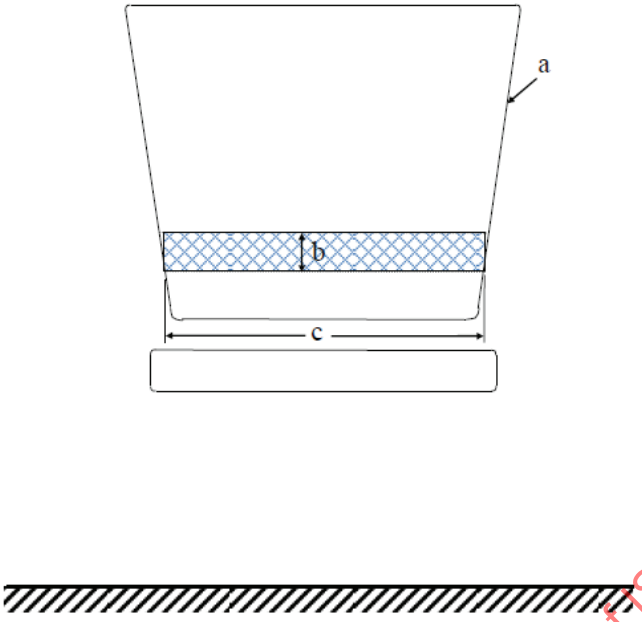
Key

a CMD thoracic pad
b CMD pelvic pad
c backrest line
d vertical
β backrest angle to vertical

Figure 8 — Backrest angle to vertical

3.10
backrest width
smallest horizontal dimension of the backrest within the *lumbar zone* (3.18)

Note 1 to entry: See Figure 9.



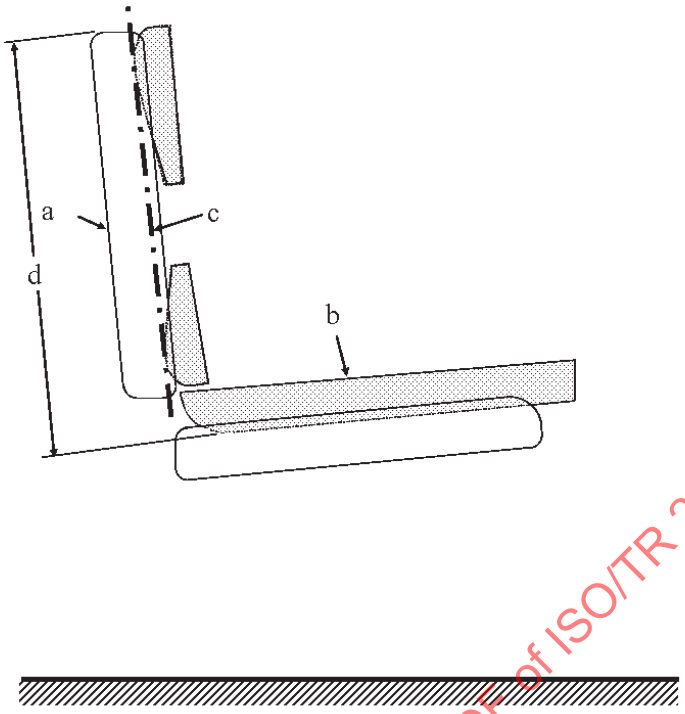
Key

a backrest
b lumbar zone
c backrest width

Figure 9 — Backrest width

3.11
backrest height
distance from the loaded seat to the top of the backrest, measured parallel to the backrest line

Note 1 to entry: See Figure 10.



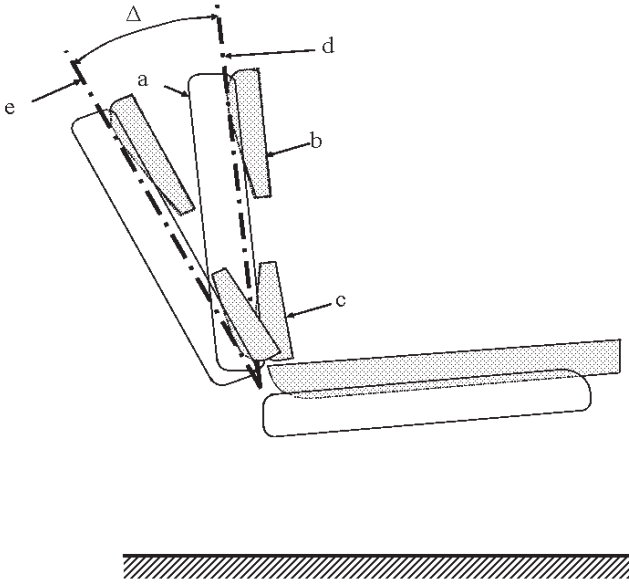
Key

a backrest
b CMD buttocks pad
c backrest line
d backrest height

Figure 10 — Backrest height

3.12
backrest inclination – range
tilt range of the backrest from its foremost inclination to its most rearward inclination

Note 1 to entry: See Figure 11.



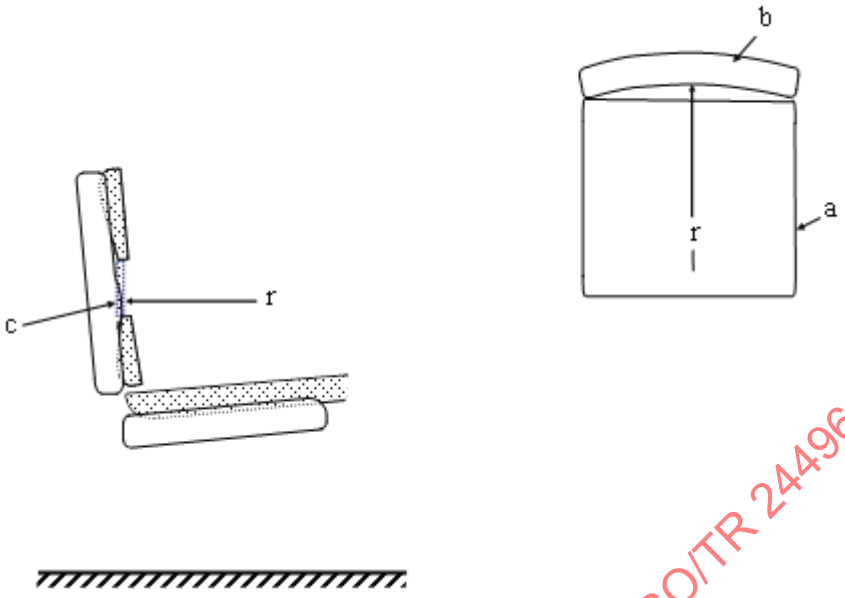
Key

a backrest
b CMD thoracic pad
c CMD pelvic pad
d forward most tilt backrest line
e rearward most tilt backrest line
Δ range of backrest inclination

Figure 11 — Backrest inclination – range

3.13
backrest radius – horizontal
horizontal radius of the backrest measured within the *lumbar zone* (3.18)

Note 1 to entry: See Figure 12.



Key

a seat
b backrest
c lumbar zone
r horizontal radius of backrest

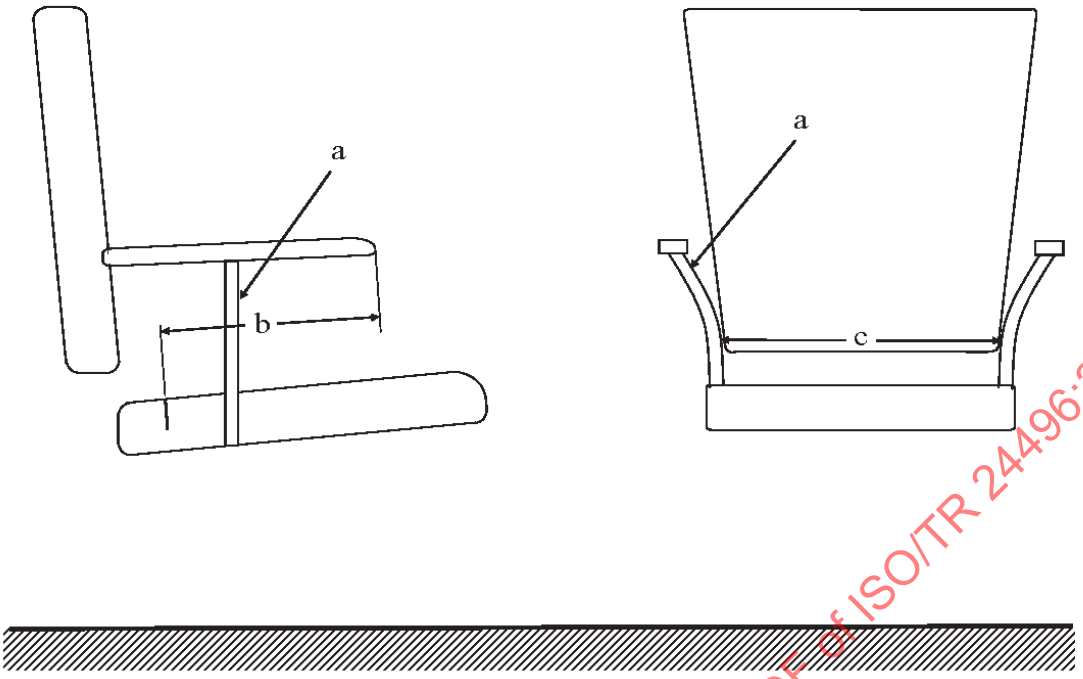
Figure 12 — Backrest radius – horizontal

3.14
chair measuring device
CMD
instrument for measuring dimensions of chairs

Note 1 to entry: Specified in Annex A.

3.15
hip breadth clearance
smallest horizontal distance between armrest assembly from the rear of the seat *width zone* (3.28) forward to the front edge of the armrest or armrest assembly as measured above the top of the seat surface

Note 1 to entry: See Figure 13.

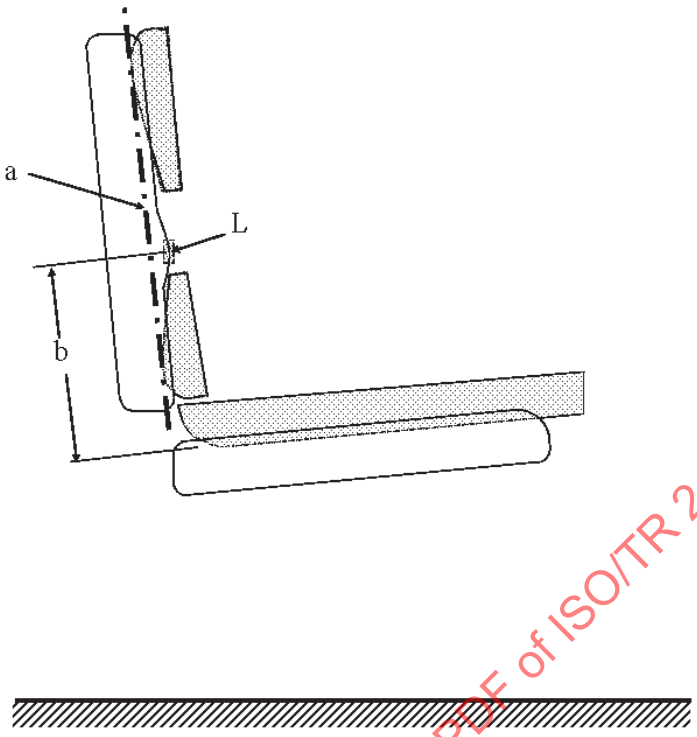


Key

a armrest assembly
b rear of seat surface width zone to front of armrest
c hip breadth clearance

Figure 13 — Hip breadth clearance

3.16
lumbar support – height
distance from the loaded seat to the most prominent segment (or segments) of the lumbar support as determined by the measuring indicators on the CMD (see Figure 35), measured parallel to the backrest line (see Figure 14)

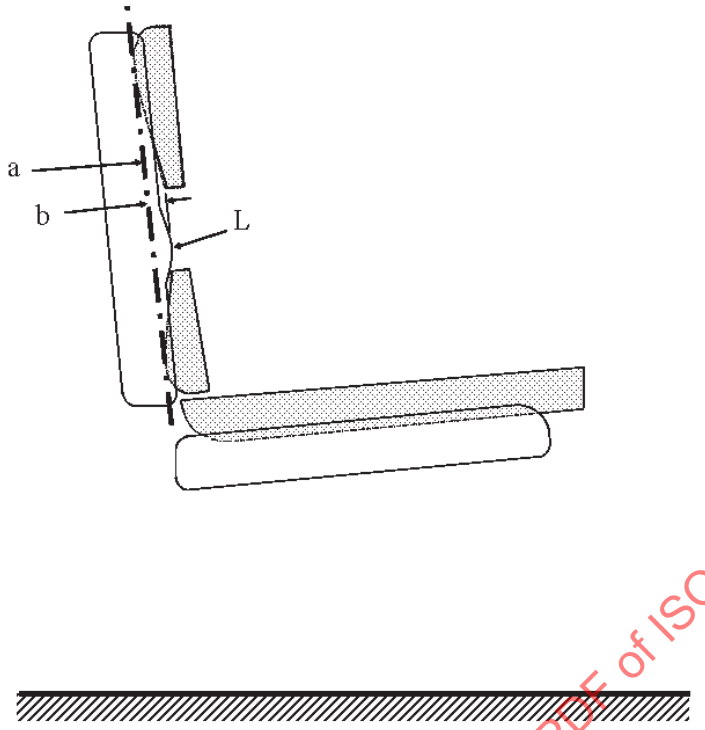


Key

a backrest line
b height of lumbar support
L the most prominent segment (or segments) of the lumbar support

Figure 14 — Lumbar support – height

3.17
lumbar support – protrusion
distance from the backrest line to the most prominent segment (or segments) of the lumbar support as determined by the measuring indicators on the CMD (see Figure 35), measured perpendicular to the backrest line (see Figure 15)



Key

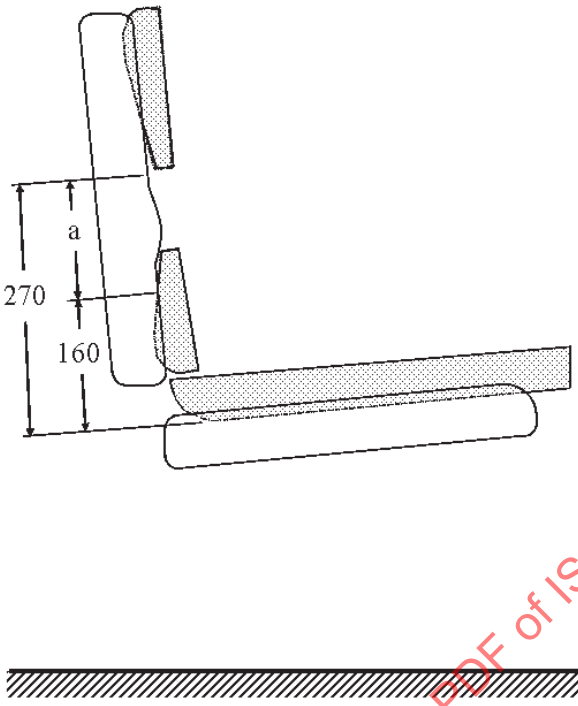
a backrest line
b protrusion of lumbar support
L most prominent segment (or segments) of the lumbar support

Figure 15 — Lumbar support – protrusion

3.18
lumbar zone
area parallel to the backrest line, 160 mm to 270 mm above the bottom of the loaded CMD buttocks pad

Note 1 to entry: See Figure 16.

Dimensions in millimetres

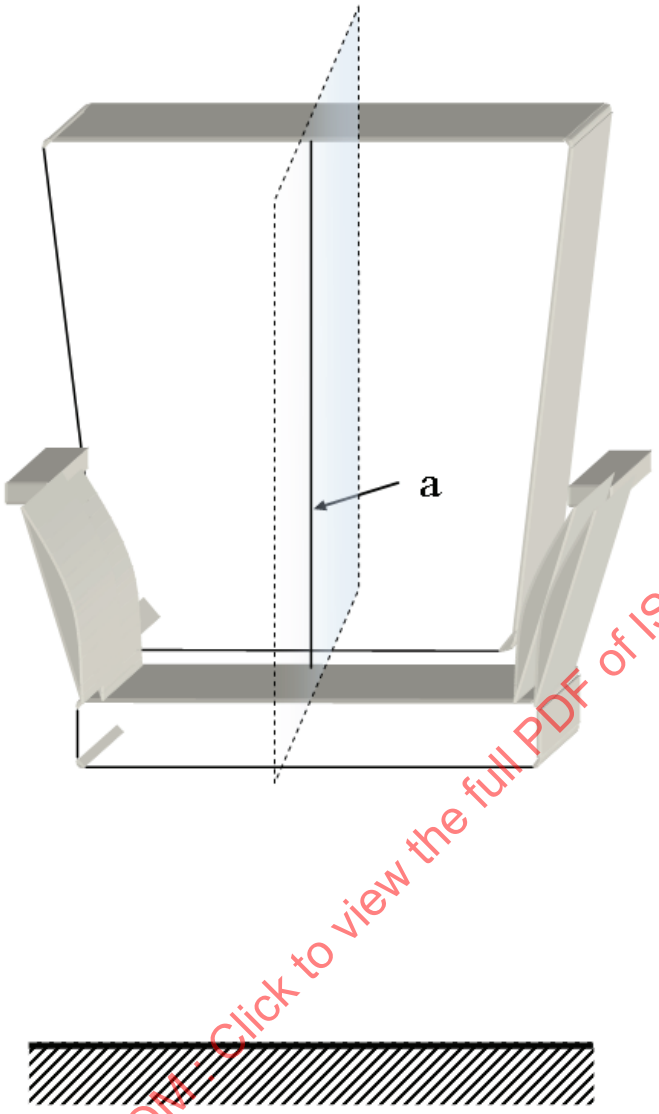


Key
a lumbar zone

Figure 16 — Lumbar zone

3.19
median plane
vertical plane dividing the chair into two generally symmetrical parts (right and left)

Note 1 to entry: See Figure 17.

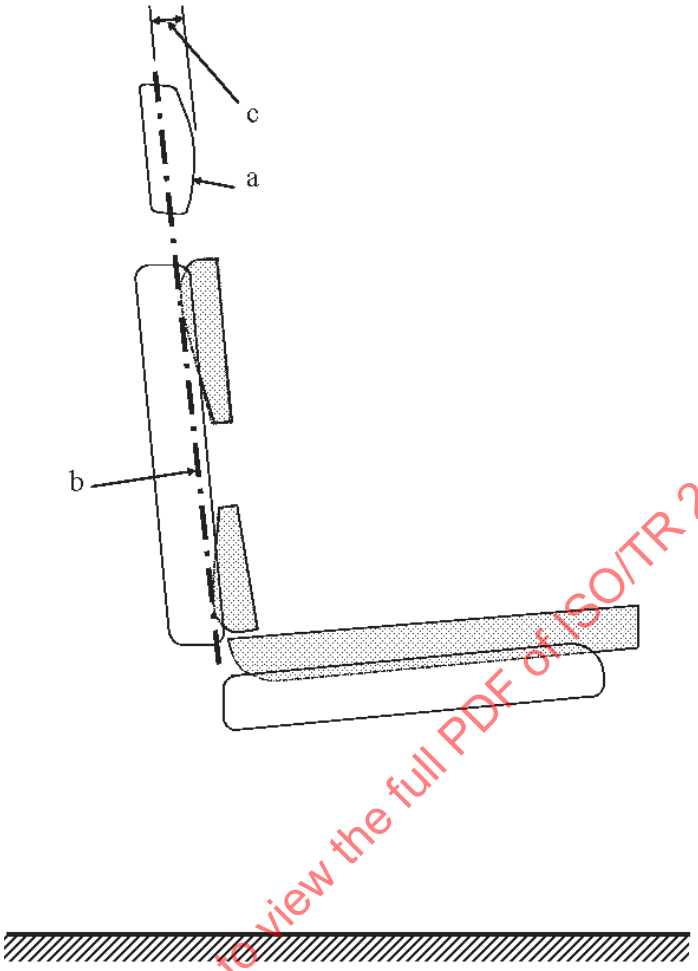


Key
a median plane

Figure 17 — Median plane

3.20
neck/head rest protrusion
perpendicular distance from the backrest line to the foremost protrusion on the neck/head rest

Note 1 to entry: See Figure 18.



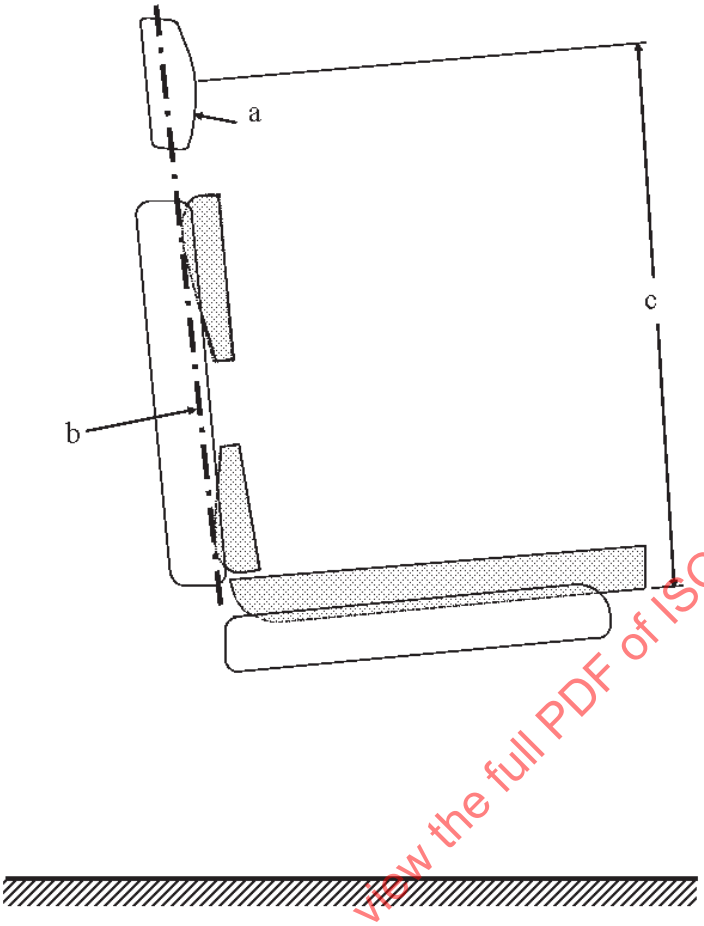
Key

a neck/head rest
b backrest line
c neck/head rest protrusion

Figure 18 — Neck/head rest protrusion

3.21
neck/head rest height
distance from the loaded seat to the most prominent segment of the neck/head rest, measured parallel to the backrest line when the neck/hear rest is in its most vertical position

Note 1 to entry: See Figure 19.



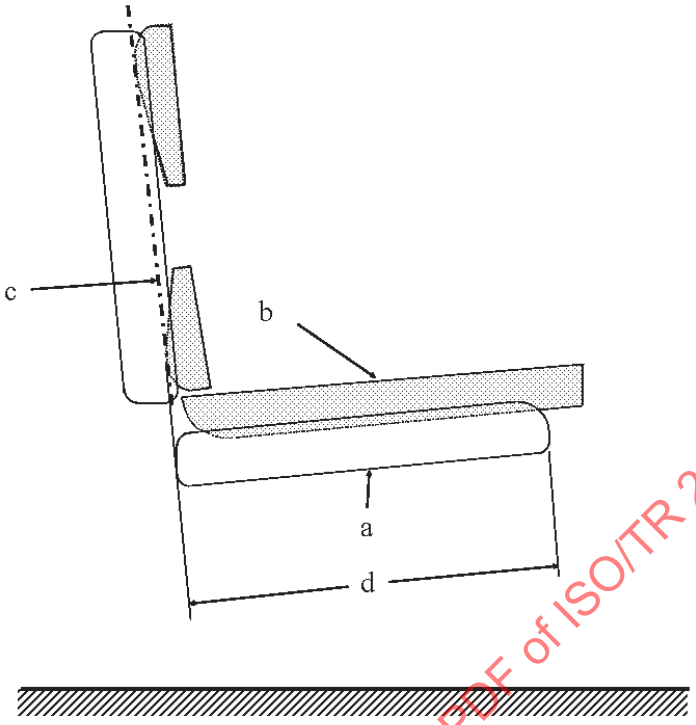
Key

a neck/head rest
b backrest line
c neck/head rest height

Figure 19 — Neck/head rest height

3.22
seat depth
distance from the backrest line measured parallel to the CMD buttocks pad to the front of the seat

Note 1 to entry: See Figure 20.



Key

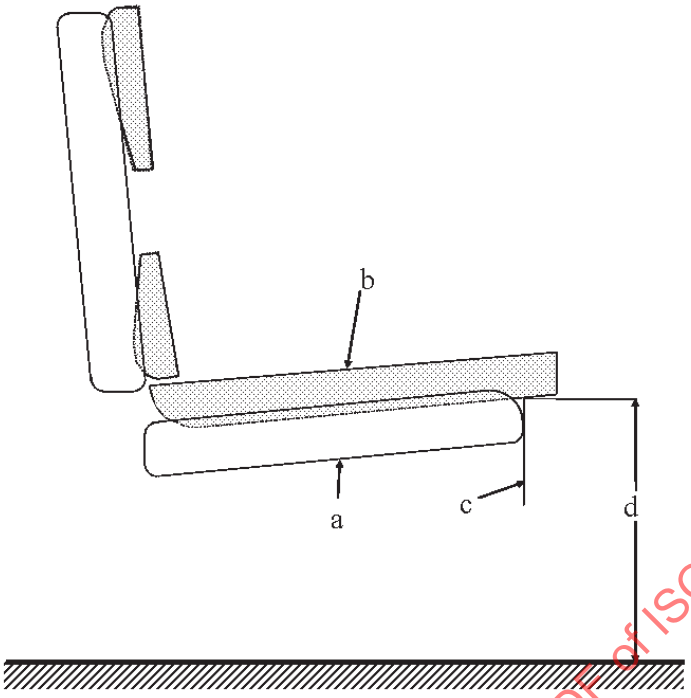
a seat
b CMD buttocks pad
c backrest line
d seat depth

Figure 20 — Seat depth

3.23
seat height
vertical distance, measured at the front of the seat, from the loaded seat to the floor

Note 1 to entry: See Figure 21.

Note 2 to entry: Adjustment of the seat inclination does not constitute a change in seat height.



Key

a seat
b CMD buttocks pad
c front of seat
d seat height

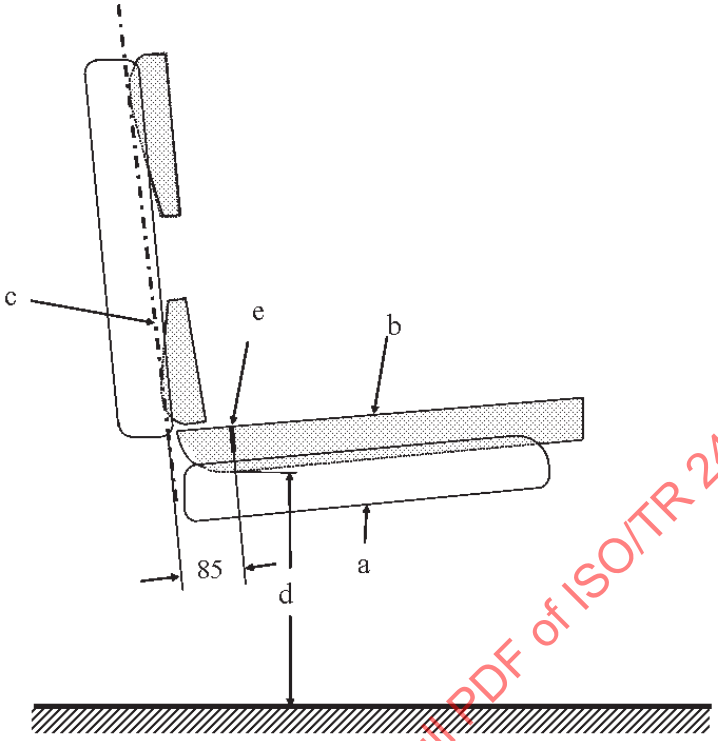
Figure 21 — Seat height

3.24
sitting height
vertical distance, measured 85 mm ahead of the CMD backrest line, from bottom of the loaded CMD buttocks pad to the floor

Note 1 to entry: See Figure 22.

Note 2 to entry: Adjustment of the seat inclination does not constitute a change in sitting height.

Dimensions in millimetres



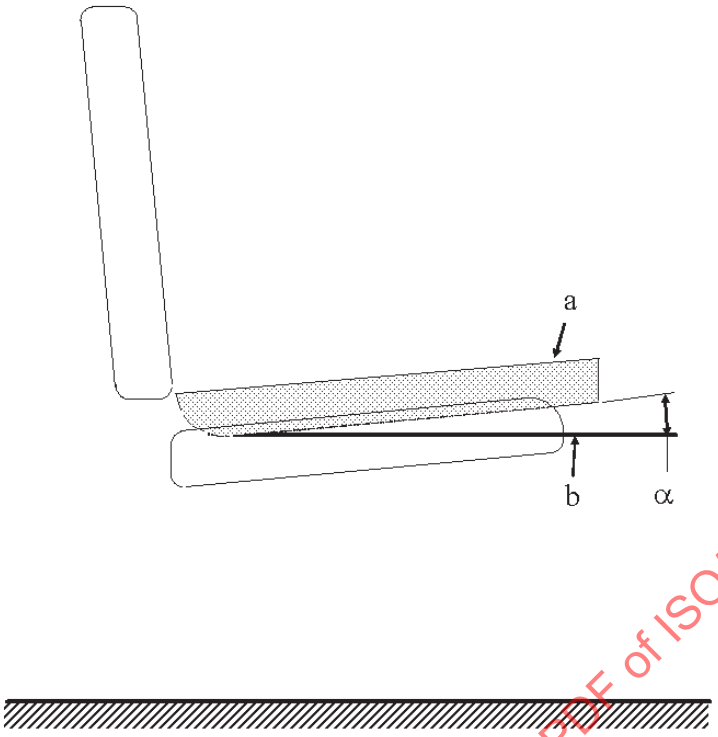
Key

a chair seat
b CMD buttocks pad
c backrest line
d sitting height
e sitting height line marked on the CMD

Figure 22 — Sitting height

3.25
seat inclination
angle between the loaded CMD buttocks and the horizontal

Note 1 to entry: See Figure 23.



Key

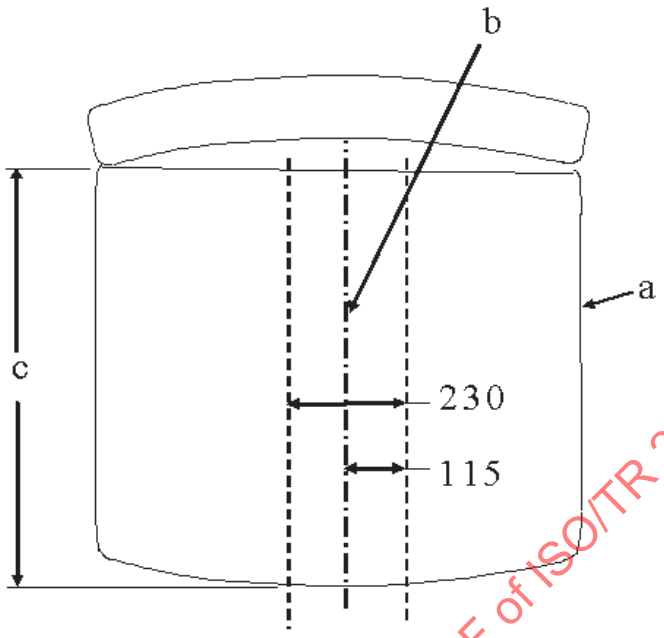
a CMD buttocks pad
b horizontal
α seat inclination

Figure 23 — Seat inclination

3.26
seat surface depth
dimension of the least seat depth within the zone 115 mm either side of the median plane

Note 1 to entry: See Figure 24.

Dimensions in millimetres



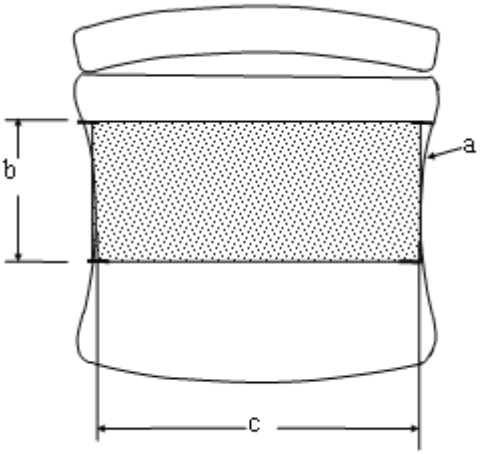
Key

a seat
b median plane
c seat surface depth

Figure 24 — Seat surface depth

3.27
seat surface width
smallest dimension of the seat surface within the *seat surface width zone* (3.28) marked on the CMD

Note 1 to entry: See Figure 25.



Key

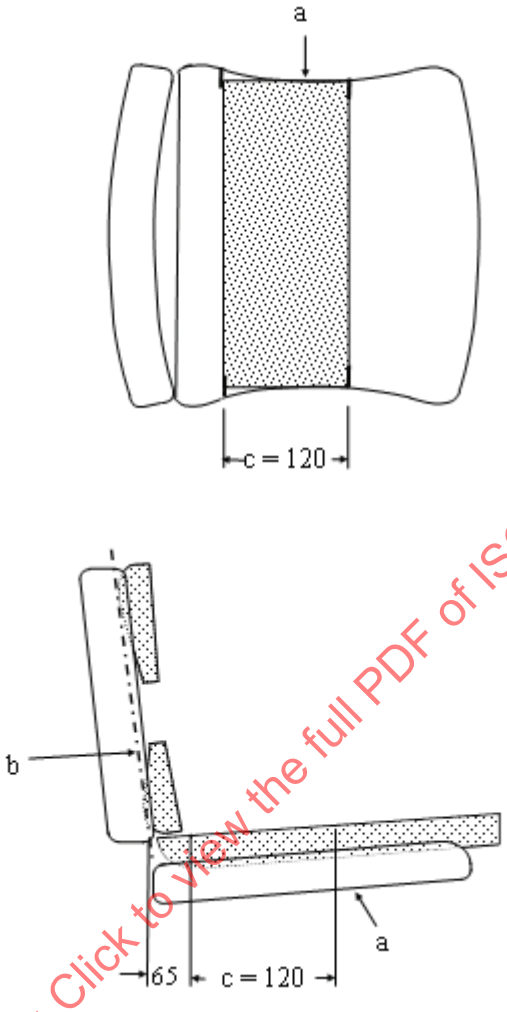
a seat
b seat surface width zone
c seat surface width

Figure 25 — Seat surface width

3.28
seat surface width zone
area along the seat surface, from 65 mm forward of the backrest line to 120 mm forward of the 65 mm line, that supports the user's buttocks as marked on the CMD

Note 1 to entry: See Figure 26.

Dimensions in millimetres



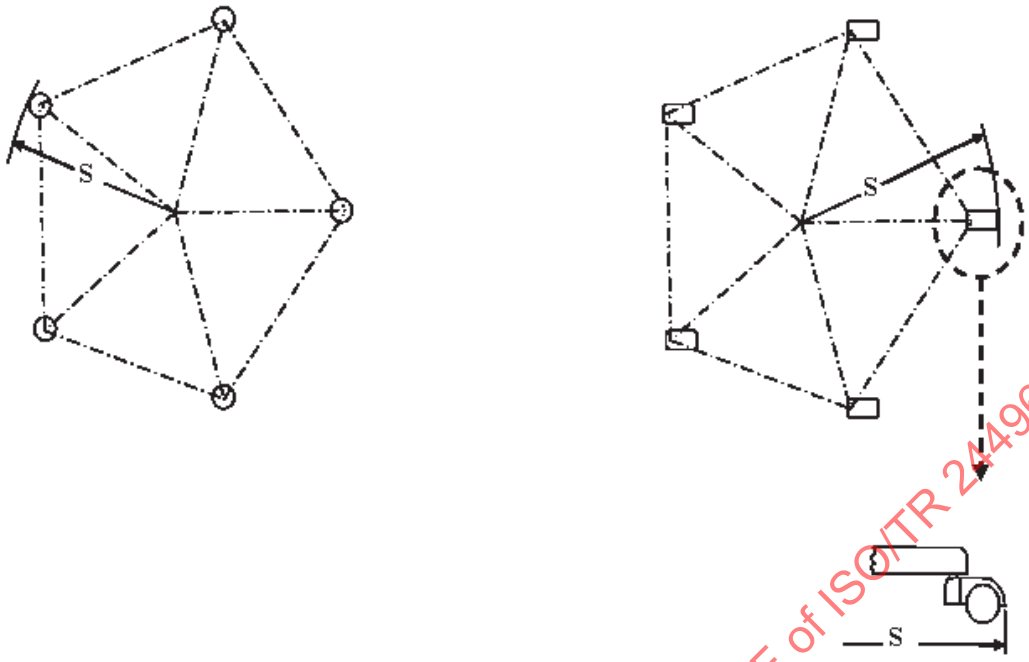
Key

a seat surface
b backrest line
c seat surface width zone (120 mm)

Figure 26 — Seat surface width zone

3.29
under-frame – maximum off-set
maximum off-set of the under-frame is the maximum distance between the outermost point of the under-frame including castors or glides and the axis of rotation

Note 1 to entry: See Figure 27.



Under-frame without castors **Under-frame with castors**

Key

s maximum off-set of under-frame

Figure 27 — Under-frame – maximum off-set

4 General measurement conditions

Caution must be used to assure that any chair movement, adjustments and/or applied forces do not dislodge the CMD causing injury to the user or damage to the CMD.

4.1 Preliminary preparation

The chair should be assembled and/or configured according to the instructions supplied with it. If mounting or assembly instructions are not supplied, the mounting or assembly method should be recorded in the report.

All adjustments should be operated through their range of adjustments at least one time before measurements are taken.

If a measurement cannot be taken as specified in the procedures due to the design of the product, it should be carried out as far as possible as described, and deviations from the measurement procedure should be recorded in the test report.

The test should be carried out in indoor ambient conditions. If during a test, the temperature is outside of the range of 15° C to 25° C the maximum and/or minimum temperature should be recorded in the test report.

4.2 Tolerances

The following equipment tolerances should be applicable unless otherwise specified:

— Forces: specified in the relevant clauses;

— Masses: ± 1 % of the nominal mass;

— Dimensions: ± 1 mm of the nominal dimension;

— Angles: ± 1° of the nominal angle.

Test weights, forces, dimensions and angles should be targeted at the nominal values specified.

4.3 Measurement uncertainty and compliance evaluations

Compliance evaluations should consider the measurement uncertainties in determining compliance to the recommendations or requirements of this Technical Report.

The following measurement uncertainties should be applicable unless otherwise specified:

— Backrest angles: ± 10 %, but not more than ± 2°;

— Backrest-to-seat angles: ± 15 %, but not more than ± 2°;

— Seat angles: ± 1,5°;

— All other dimensions: ± 5 %.

NOTE The uncertainty for this device and method will be evaluated and determined when round-robin evaluations are complete. The above uncertainties are based on BIFMA, International CMD-1-2002 Universal measurement procedure for the use of BIFMA chair measuring device (CMD).

5 Test equipment

5.1 Floor surface

A rigid, horizontal and flat surface.

5.2 CMD placement fixture

A fixture which holds the chair in position while applying the horizontal force and lowering the CMD into the chair. This device should not prevent adjustment of the chair. An example of the device (or devices) is shown in Figures 28 and 29.

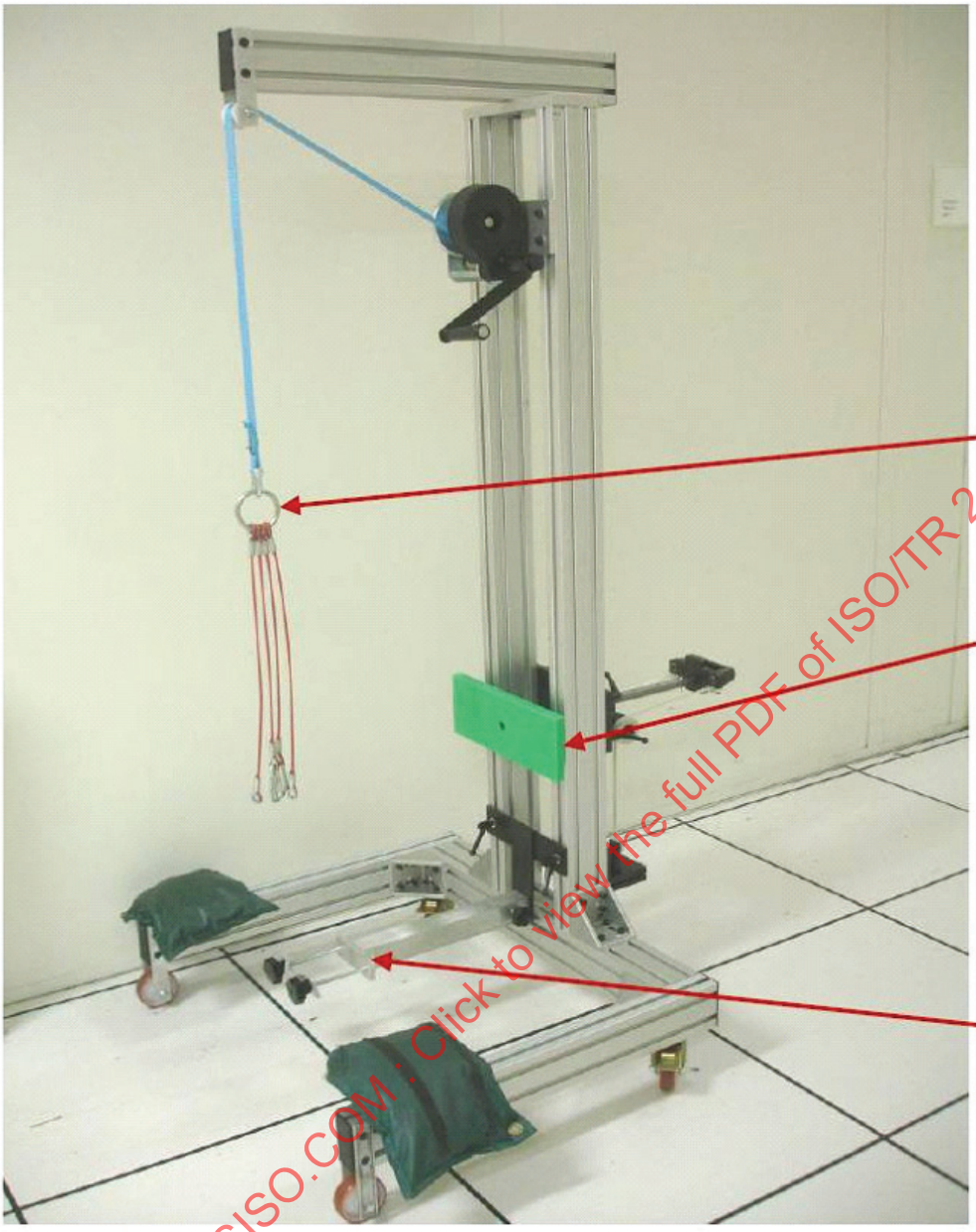
5.3 Chair measuring device (CMD)

Device as specified in detail in Annex A.

NOTE A common calibration procedure of the lumbar support measuring device is subject to current research.

5.4 High friction material

Friction cloth: for placing between the seat and the CMD in order to prevent the CMD from sliding on the seat during measurements. It can be e.g. anti-slip material used underneath carpets. The thickness of the material, when compressed by the CMD, should not exceed 1 mm.



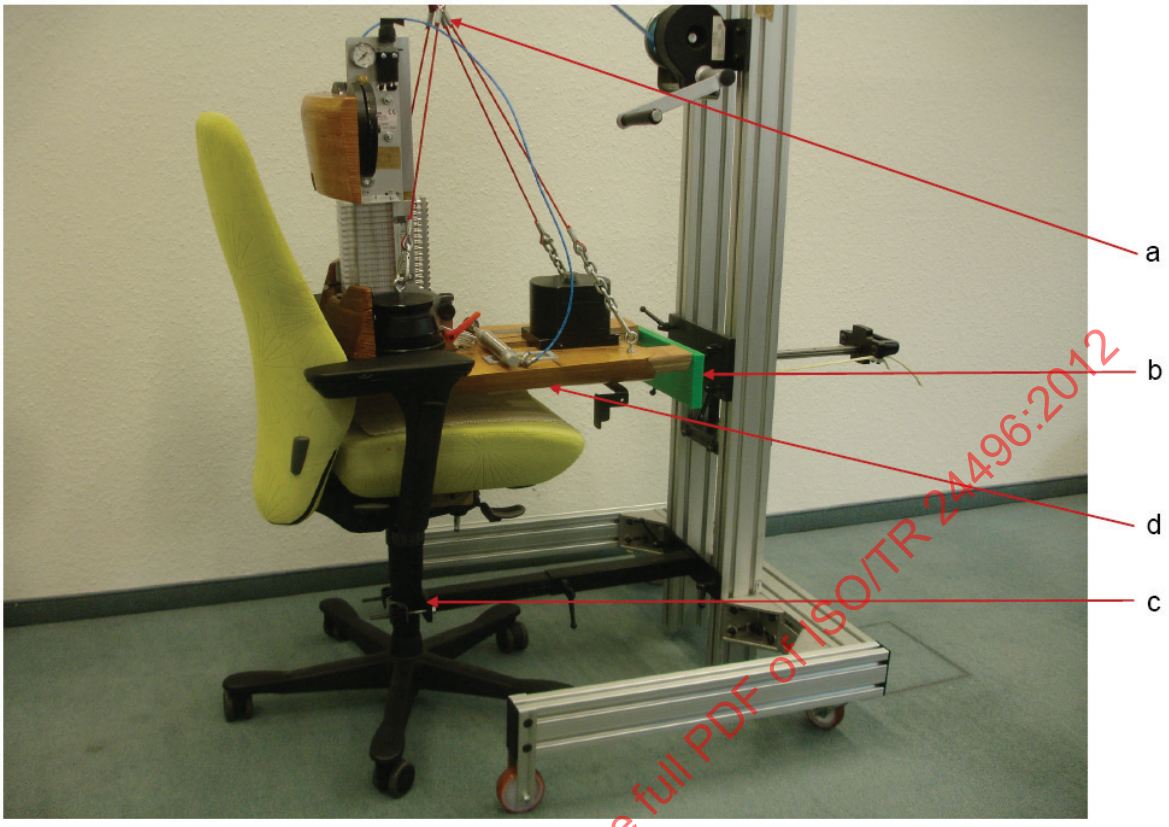
Key

a CMD lowering crane

b horizontal force loading device [see 6.2.2 e)]

c chair base restraint mechanism

Figure 28 — Example of CMD placement fixture without chair



Key

a CMD lowering crane
b horizontal force loading device [see 6.2.2 e)]
c chair base restraint mechanism
d CMD

Figure 29 — Example of CMD placement fixture with chair and CMD

6 Measurement methods and procedures

6.1 General

The measurements should be taken to determine the dimensions and angles of the chair.

After the chair set-up and the CMD placement (6.2) the measurements should be taken as specified in the measurement procedures (6.3).

6.2 Chair set-up and placement of CMD

6.2.1 Chair set-up

a) Position the chair on the floor surface (5.1) with the seat in the highest position.

b) Adjust all of the following to the mid position of their range: seat depth, back rest tilt tension, back rest height, and lumbar devices. If there are independently adjustable lumbar device(s), adjust the height to the approximate midpoint of the lumbar zone, then adjust the protrusion to its mid-position, if that can be done without altering the height setting.

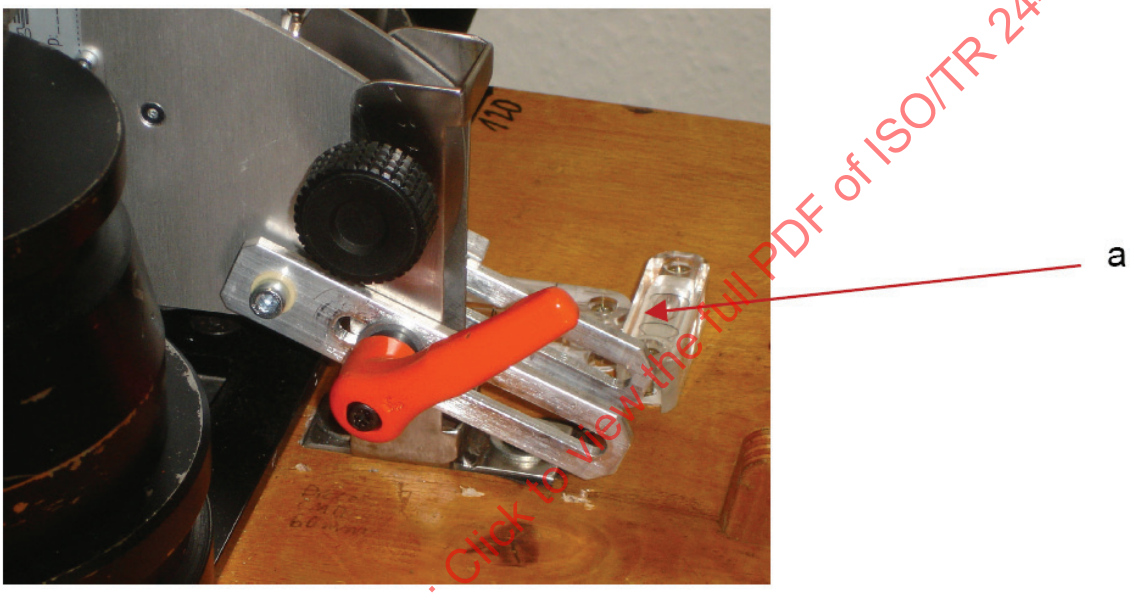
c) Adjust the seat so that it is approximately horizontal, without forcing the functions of the chair.

d) If independently adjustable, position the backrest so that the support surface is approximately vertical. If the adjustment of the backrest to a vertical position will change the seat inclination, the horizontal seat position should take precedence.

6.2.2 Initial placement of CMD on chair

a) Place a layer of high friction material (5.4) between the CMD and the seat in order to ensure that the CMD does not slide on the seat.

b) The vertical member of the CMD should be locked at 90° until step g), 6.2.2 (see Figure 30).



Key

a CMD vertical member to buttocks lock

Figure 30 — CMD vertical member locked

c) Place and attach the chair in the CMD placement fixture (5.2), so that CMD vertical member is close to, but not touching, the chair's backrest.

d) Ensure the CMD, chair and chair fixture are in alignment with the median plane. Ensure the CMD buttocks pad is approximately horizontal. Place the CMD seat depth indicator at a position that will be near, but not in contact with, the front edge of the seat as the CMD is lowered into the chair. Lower the CMD until it is just above seat (no part of the CMD should touch the seat) and just in front of the back rest (see Figure 31).

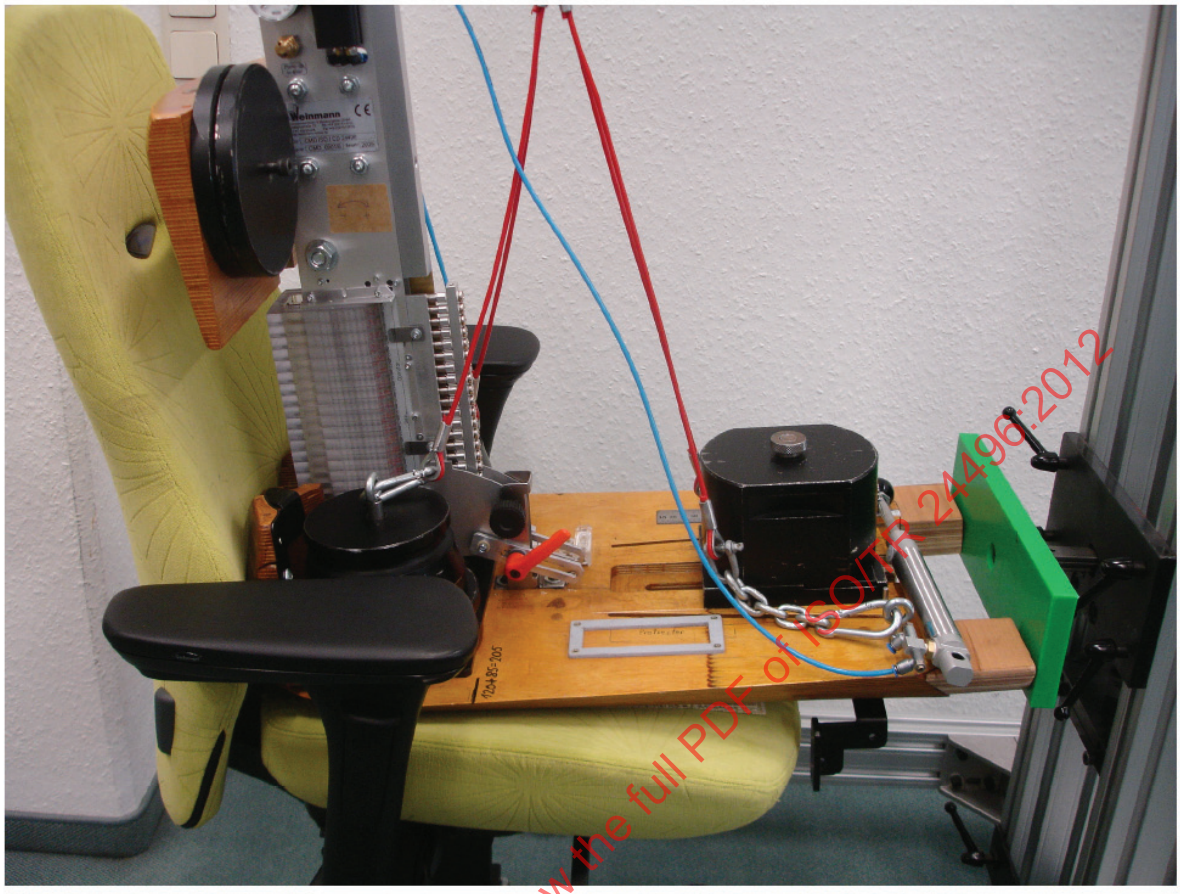
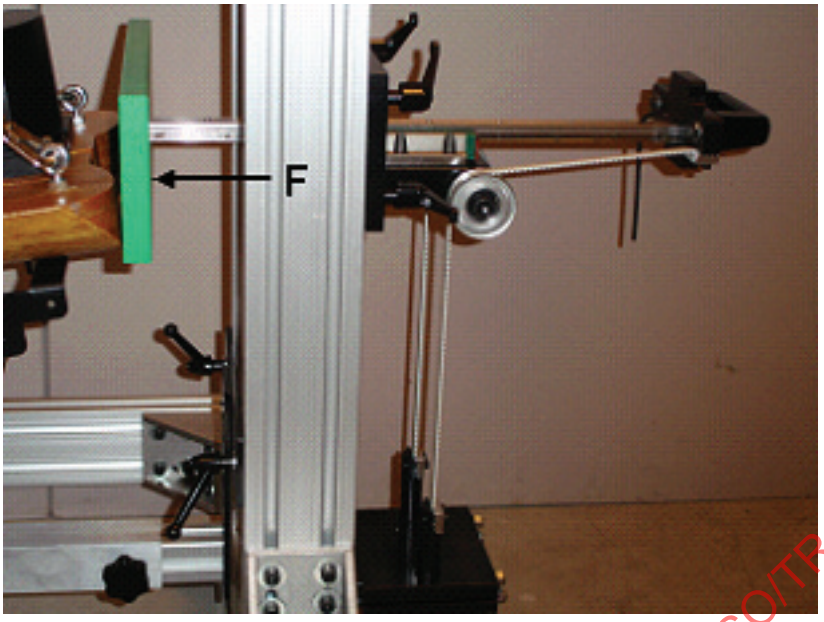


Figure 31 — CMD hovering above chair

e) Push the CMD towards the backrest with a force *F* of (40 ± 2) N (see Figure 32).

f) With this force acting, lower the CMD into the seat while maintaining CMD alignment with the chair. Ensure the seat depth indicator does not touch the chair during loading/placement.



Key
F force of (40 ± 2) N

Figure 32 — Installation fixture force application

g) Release the vertical member lock;

h) Remove the force *F*;

i) Position the CMD seat depth indicator so that it is just touching the front edge of the seat (see Figure 33).

Key
a seat depth indicator

Figure 33 — Location of the seat depth indicator

6.2.3 Final placement of CMD on chair

With the CMD fully resting on the seat, re-adjust the chair (typically by adjusting the seat inclination), if needed, so that the CMD buttocks pad is as horizontal as possible.

NOTE This may require removal and re-placing of the CMD.

If any adjustments to the chair were made, reclamp the vertical member at 90°, remove the CMD and follow the procedure in 6.2.2 to reposition the CMD in the chair.

Mark the chair with the seat surface width zone identified on the CMD (3.28).

Mark the lumbar zone (3.18) as defined.

6.3 Measurement procedures

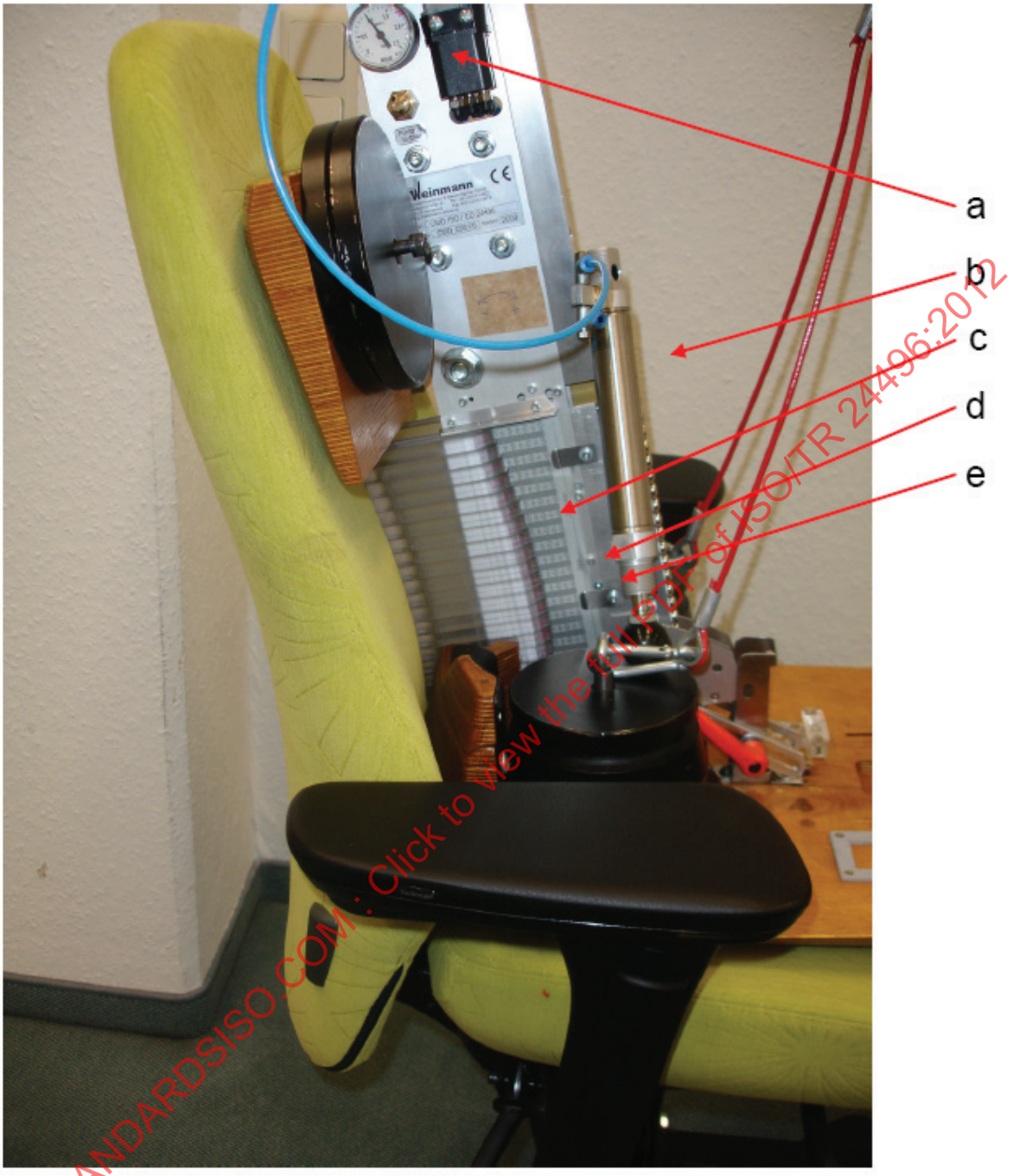
6.3.1 Initial chair measurements

6.3.1.1 Lumbar support protrusion and height (Probe method)

Lock the CMD vertical member to the CMD buttocks pad at the angle that it has taken after its release from 90°.

Apply a force perpendicular to the vertical member of the CMD simultaneously to 18 vertically stacked segments. The bottom of the lowest segment should start at 150 mm from the base of the buttocks pad. Each segment should apply a force of (3,5 ± 0,5) N against the backrest through a 10 mm high by 60 mm wide surface area. The scale on the CMD should be used to indicate the height and depth of the most prominent segment of the lumbar protrusion (see Figures 34 and 35).

Make the various lumbar support protrusion depth adjustments available to cause the lumbar protrusion to be its greatest dimension. If adjustments are made, remove the force and reapply it. Record this dimension as the maximum lumbar protrusion. Record the lumbar support height at this setting. If the greatest lumbar protrusion is the same over more than one height indication, record all those heights with the same protrusion.



Key

a Pressure gage
b Pressure pump
c Lumbar support protrusion and height measurement; vertically stacked segments
d Lumbar support protrusion scale
e Lumbar support height scale

Figure 34 — Lumbar support protrusion and height measurement (overall view)

Without adjusting the height, adjust the lumbar protrusion (horizontal adjustment), if any, to cause the lumbar support protrusion to be its least dimension. Reapply the force of (3,5 ± 0,5) N to the vertically stacked segments. Record this dimension as the minimum lumbar protrusion.

Calculate the difference between the maximum and minimum protrusion measurements and record the difference as the protrusion adjustment range.

Remove the force on the vertically stacked segments. Readjust the lumbar protrusion settings so that the lumbar protrusion depth is at its maximum.

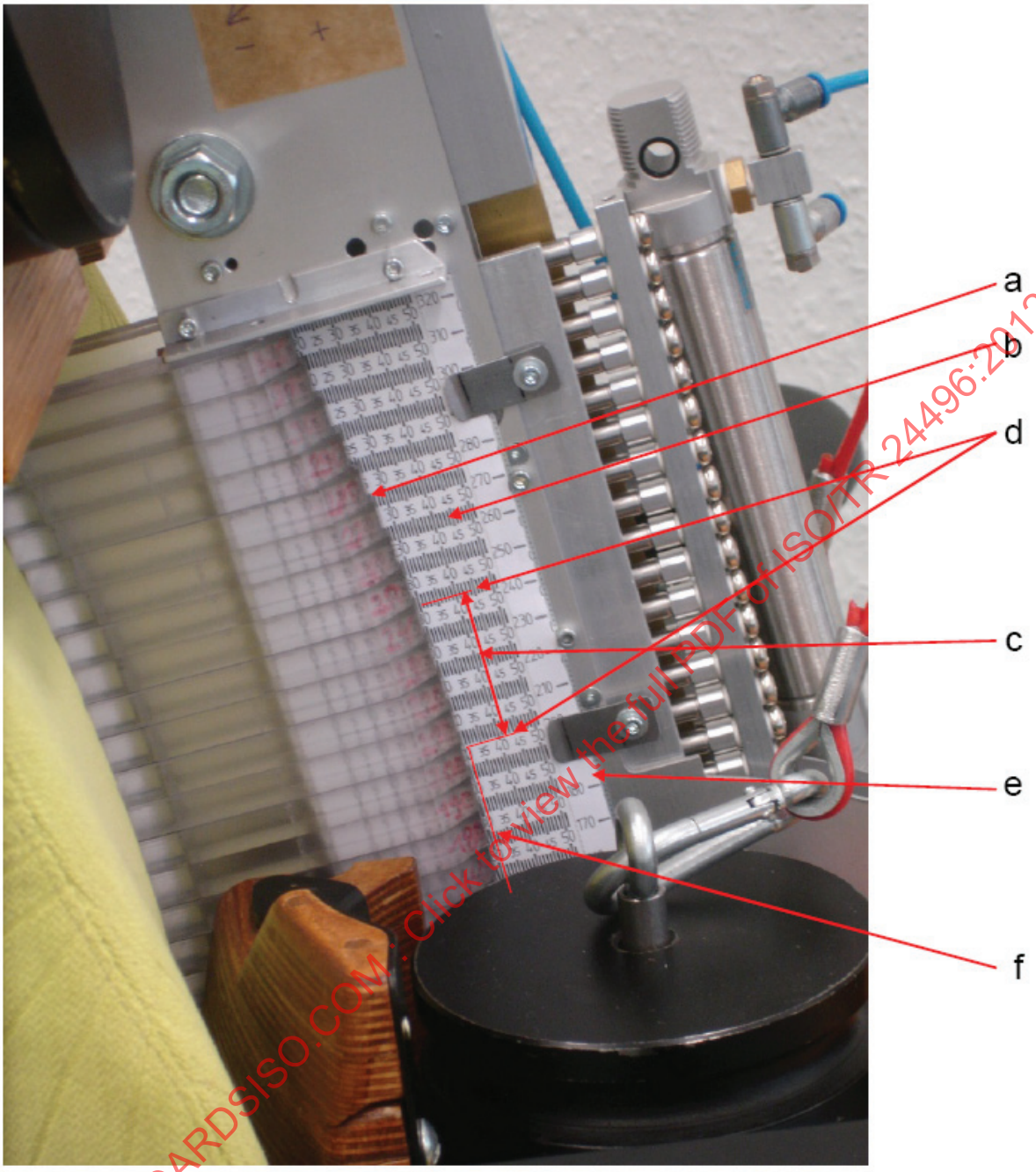
When available, make the various backrest adjustments including lumbar support so that the lumbar support is at the greatest height that can be attained. Reapply the force of (3,5 ± 0,5) N to the vertically stacked segments. Record this dimension as the maximum lumbar support height. If more than one segment is at a maximum protrusion, record the highest one as the maximum support height. Remove the force on the vertically stacked segments.

When available, make the various backrest adjustments including that lumbar support is at the least height that can be attained. Reapply the force of (3,5 ± 0,5) N to the vertically stacked segments. Record this dimension as the minimum lumbar support height. If more than segment is at a minimum protrusion, record the highest on as the minimum support height.

Calculate the difference between the maximum and minimum height measurements and record the difference as the lumbar support height adjustment range.

If the calculations above result in zero, then record the measured dimension as lumbar support protrusion and/or height as appropriate.

Remove the force on the vertically stacked segments. Reposition the lumbar support adjustments to the position used in 6.2.1 b).



Key

a Lumbar support protrusion and height measurement; vertically stacked segments
b Lumbar support protrusion scale
c Maximum lumbar support protrusion span
d Maximum lumbar support height
e Lumbar support height scale
f Maximum lumbar support protrusion

Figure 35 — Lumbar support protrusion and height measurement (close-up view)

6.3.1.2 Inclination of seat, backrest angle to vertical and angle between seat and backrest

Measure the angle of inclination of the seat to horizontal, backrest angle to vertical and angle between seat and backrest in the sequence given in Table 1.

The chair should be adjusted through each of the positions given in Table 1, in sequence, to assure appropriate positioning of the chair for each measurement. Record those measurements required in the applicable standards document.

NOTE 1 It may not be possible to take all of these measurements on some types of chairs.

NOTE 2 Prior to taking forward tilt measurements; the CMD may need to be secured to the chair to prevent dislodgement.

Table 1 — Angle measurement sequence

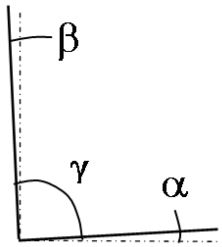
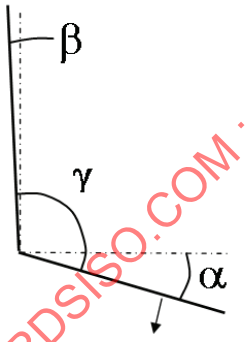
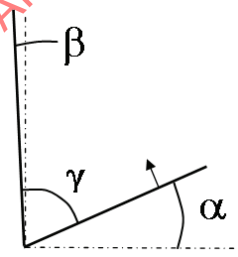
Measurement sequence	Graphical presentation of measurement	Settings	Inclination of seat α[a]	Backrest angle to vertical β[b]	Angle between backrest and seat γ[c]
1		— Set seat as horizontal as possible — Set backrest as vertical as possible			
2		— Set only the seat to its most forward tilt position — Backrest remains at the same adjustment as the prior step, but may move[e]			
3		— Set only the seat to its most rearward tilt position — Backrest remains at the same adjustment as the prior step, but may move			

Table 1 *(continued)*

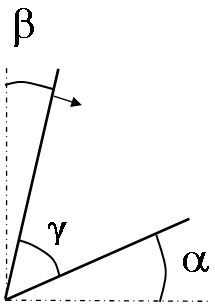
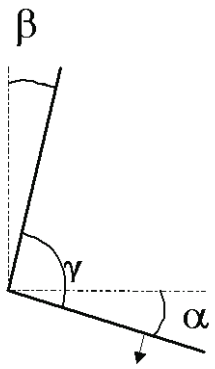
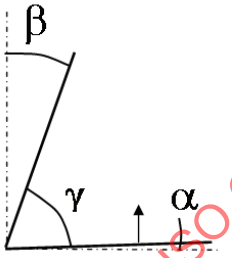
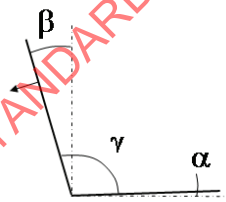
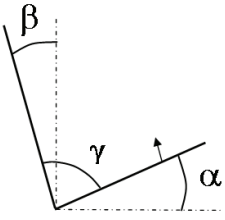
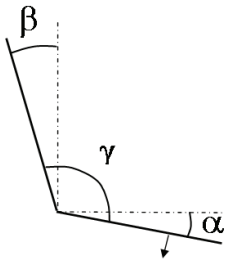
Measurement sequence	Graphical presentation of measurement	Settings	Inclination of seat α[a]	Backrest angle to vertical β[b]	Angle between backrest and seat γ[c]
4		— Backrest remains at the same adjustment as the prior step, but may move — Set backrest to its most forward position			
5		— Set seat to its most forward tilt position — Backrest remains at the same adjustment as the prior step, but may move[e]			
6		— Set seat as horizontal as possible — Backrest remains at the same adjustment as the prior step, but may move[e]			
7		— Backrest remains at the same adjustment as the prior step, but may move — Set backrest to its most rearward position[d]			
8		— Set seat to its most rearward tilt position — Backrest remains at the same adjustment as the prior step, but may move[d]			

Table 1 *(continued)*

Measurement sequence	Graphical presentation of measurement	Settings	Inclination of seat α[a]	Backrest angle to vertical β[b]	Angle between backrest and seat γ[c]
9		— Set seat to its most forward tilt position — Backrest remains at the same adjustment as the prior step, but may move[d,e]			

a α is read from the protractor positioned on the buttocks pad of the CMD.

b β is read from the protractor positioned on the front of the vertical member of the CMD.

c γ can be read directly from the angle indicator on the vertical member of the CMD or can be calculated from protractor readings.

d When measuring backrest angle at its most rearward position, set the backrest adjustment tension to minimum and move the top section of the rear buttocks weights (25 kg) to the top backrest. Additional force may be applied to the backrest to assure the full range of movement is attained.

e When measuring inclination of seat at its most forward position, if the seat tension is separately adjustable, set to minimum. Additional force may be applied to the seat to assure the full range of movement is attained.

6.3.1.3 Back to seat movement ratio

This measurement applies only to chairs that have angles between the seat and back that vary as the chair tilts (e.g. "synchro-tilts") (3.8).

Calculate the back to seat movement ratio as follows:

$$(\text{backrest angle}_{\text{most forward}} - \text{backrest angle}_{\text{most rearward}}) / (\text{seat angle}_{\text{most forward}} - \text{seat angle}_{\text{most rearward}})$$

6.3.2 Measurements with the chair components adjusted to their maximum positions

Reclamp the vertical member at 90° in the CMD.

Remove the CMD from the chair.

If independently adjustable, the lumbar protrusion should be set to its minimum depth. If independently adjustable, the lumbar height should be set at the approximate midpoint of the lumbar zone. Adjust the seat and backrest so that they are in their most horizontal and vertical position respectively. All other components, including head and backrest, except the lumbar height/depth should be set to their maximum position. Moving the backrest may move the lumbar away from the midpoint of the lumbar zone; this is acceptable.

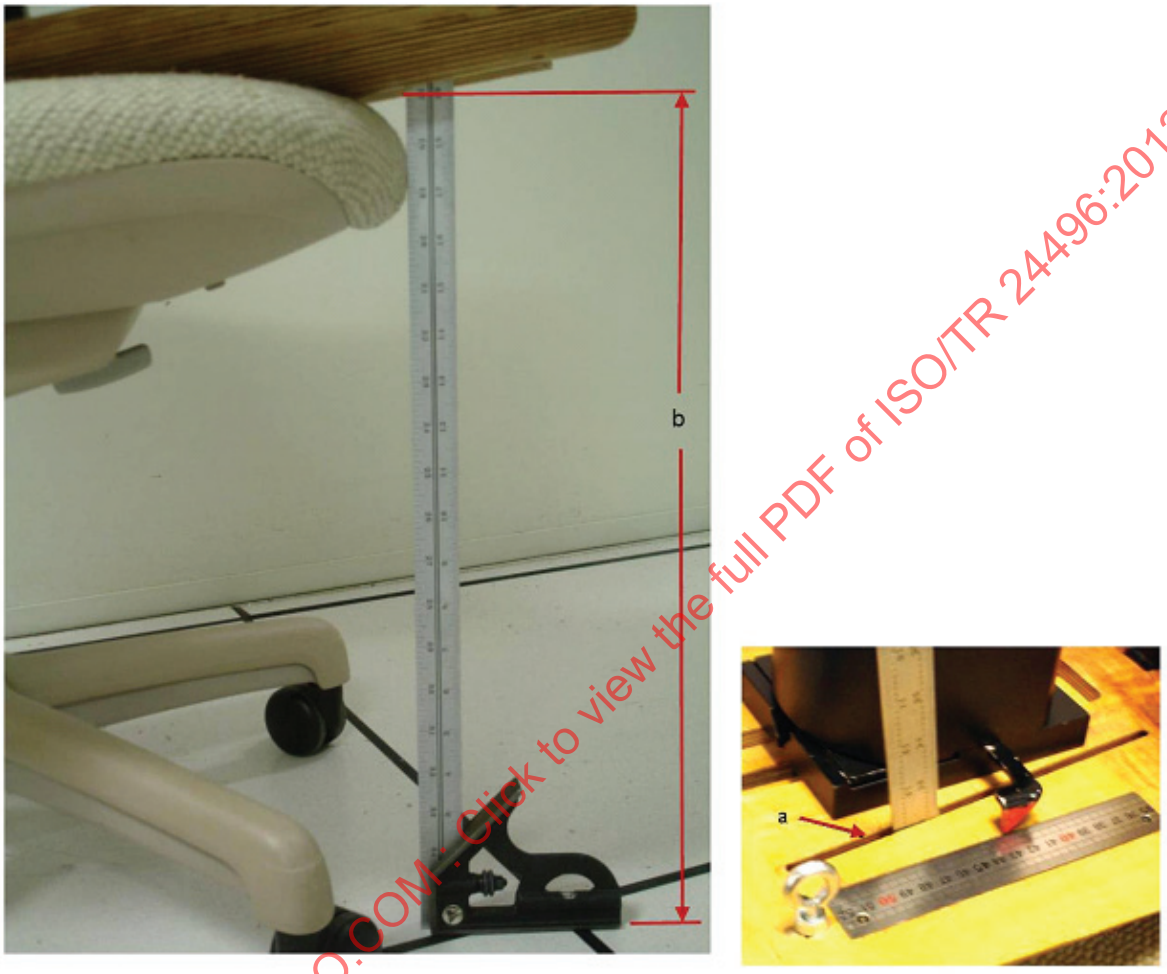
Position the CMD in the chair according to 6.2.2 and 6.2.3.

6.3.2.1 Seat height and sitting height

The seat height should be measured with the seat in its most horizontal position.

If the seat is not in a horizontal position, but can be moved to the horizontal position with little effort, then move the seat to horizontal position and secure it there. If the seat is secured in this manner, the technique should be noted in the test report.

Measure the seat height as the vertical distance from the underside of the CMD to the floor on a measuring scale placed through the seat height slot of the CMD at the front of the seat (see Figure 36).



Key

a seat height measurement slot
b seat height

Figure 36 — Seat height measurement (2 views)

Measure the sitting height point at the top of the CMD buttocks pad at the "sitting height point" marked on the buttocks pad to the floor and subtract 60 mm from the measurement (see Figure 38). When a chair arm interferes with the direct measurement of the height, place a spacer on the buttocks pad that is high enough that its height is greater than the arm. Measure the height of that stack and subtract both the spacer thickness and 60 mm from the measurement.

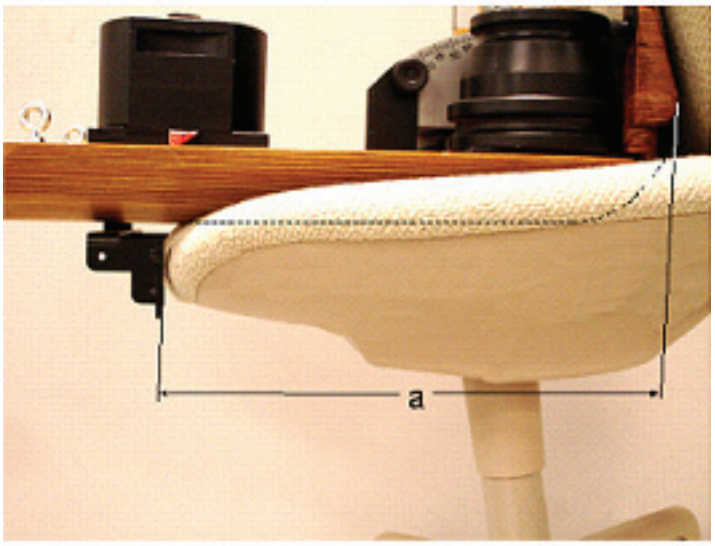
Key

a Sitting height line
b Sitting height plus 60 mm

Figure 37 — Sitting height measurement

6.3.2.2 Seat depth

Read the depth from the measuring scale on the top of the buttocks pad. Adjusting the seat inclination or angle of backrest does not constitute seat depth adjustment (see Figure 38).



Key
a seat depth

Figure 38 — Seat depth measurement

6.3.2.3 Backrest height

Slide the backrest height gauge until it touches the top of the backrest; read the height on the scale (see Figure 39).

Key
a backrest height scale
b backrest height

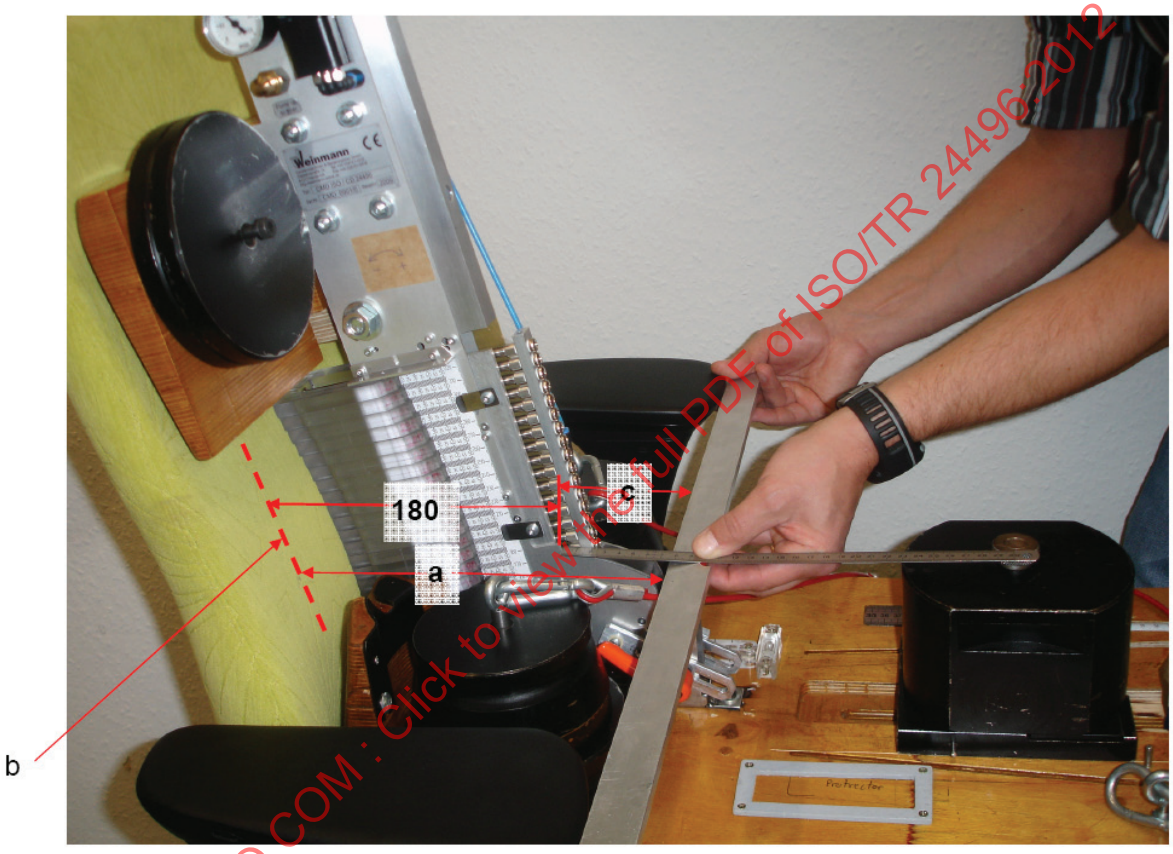
Figure 39 — Backrest height measurement

6.3.2.4 Front of armrest position

The armrest swivel, fore/aft movement and/or armrest clearance should be adjusted as required to achieve the most forward position within the armrest measurement zone (see 3.6).

Place a bar across the armrests at front edges. If the front edges of the armrest are less than 120 mm above the top surface of the loaded CMD buttocks pad, then place the bar at the front part of the armrest that is at the 120 mm high point. Measure the distance between the bar and the front part of vertical member of the CMD and add 180 mm (see Figure 40); (see 3.6 and Figure 6).

Dimensions in millimetres



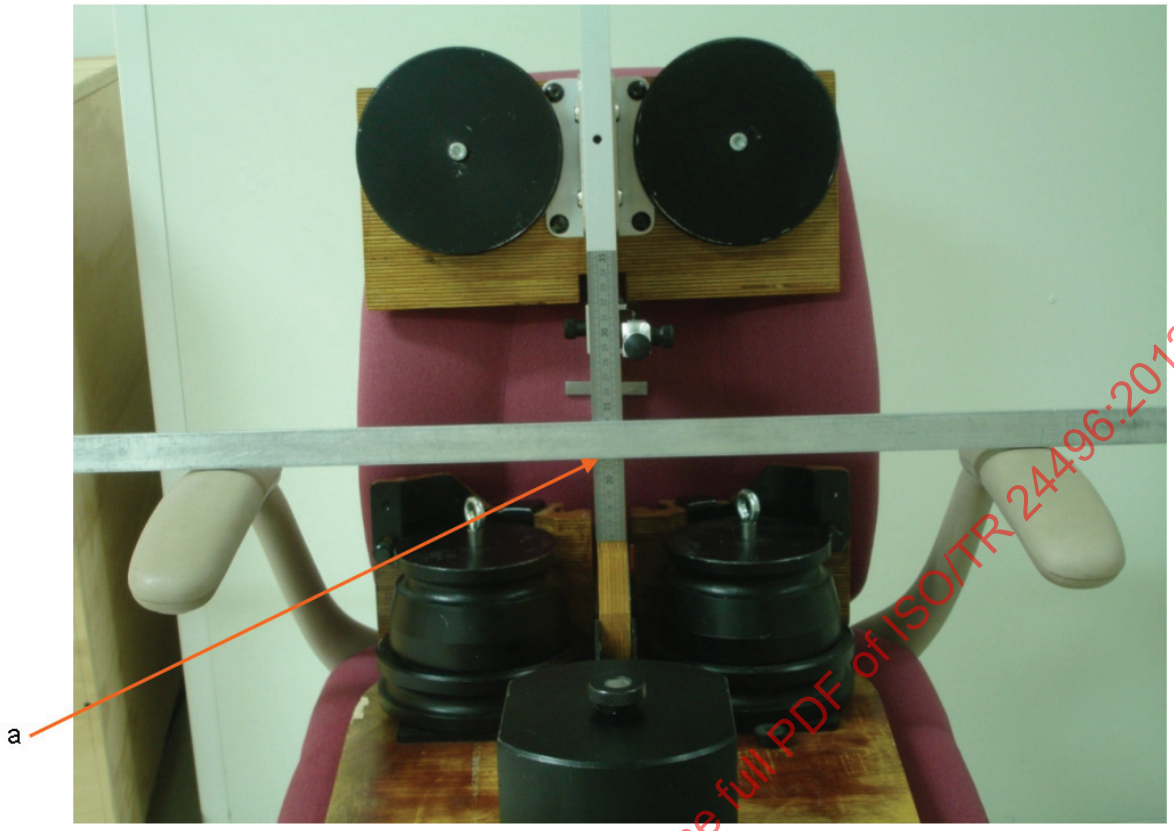
Key

a front of armrest position
b backrest line
c front of armrest to front of CMD vertical member

Figure 40 — Armrest position – front

6.3.2.5 Armrest height

Measure the armrest height based on a straight line between the top of the armrests where it crosses the scale on the front of the vertical member of the CMD (see Figure 41).

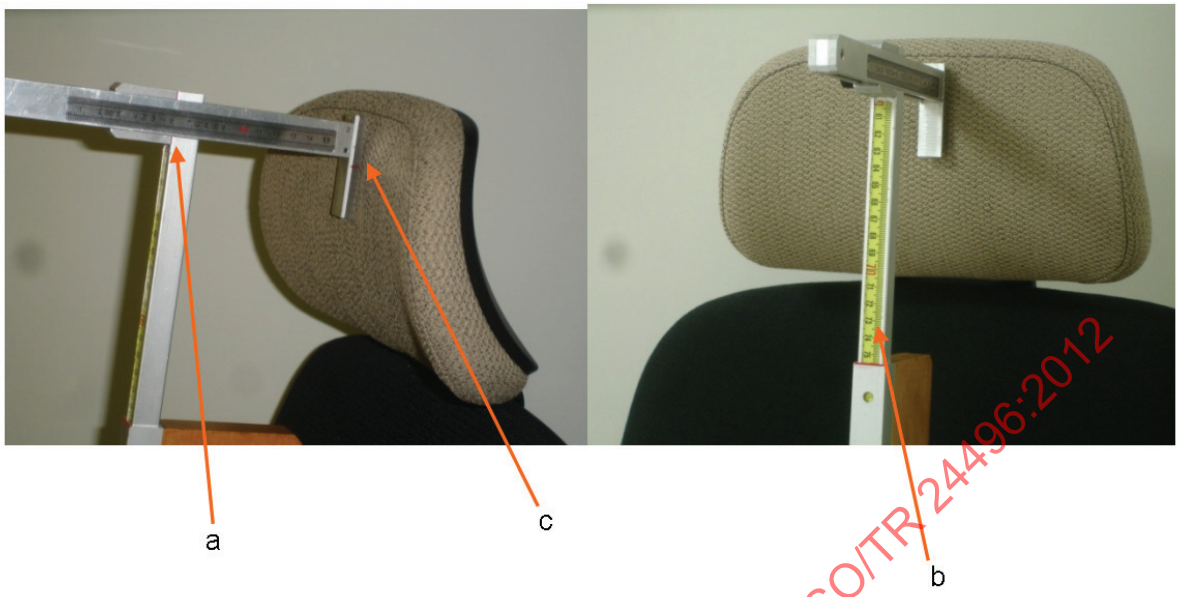


Key
a armrest height

Figure 41 — Armrest height

6.3.2.6 Neck/head rest height and protrusion

Align the marker on the neck/head rest measurement tool with the most forward point on the neck/head rest. Read the neck/head rest height from the ruler at the front of the vertical height adjustment tube and the protrusion from the ruler on the side of the horizontal adjustment tube (see Figure 42).



Key

a neck/head rest protrusion
b neck/head rest height
c most forward point of neck/head rest

Figure 42 — Neck/head rest height and protrusion

6.3.3 Measurements with the chair components in their minimum position

Reclamp the vertical member at 90° in the CMD. Remove the CMD from the chair. If independently adjustable, the lumbar protrusion should be set to its minimum depth. If independently adjustable, the lumbar height should be set at the approximate midpoint of the lumbar zone. Adjust the seat and backrest so that they are in their most horizontal and vertical positions respectively. All other components except the lumbar height/depth should be set to their minimum position. Moving the backrest may move the lumbar away from the midpoint of the lumbar zone; this is acceptable. Position the CMD in the chair according to 6.2.2 and 6.2.3.

6.3.3.1 Seat height and sitting height

Measure the seat height and sitting height as in 6.3.2.1.

6.3.3.2 Seat depth

Measure the seat depth as in 6.3.2.2.

6.3.3.3 Backrest height

Measure the height to the top of the backrest as in 6.3.2.3.

6.3.3.4 Front of armrest position

Measure the front of the armrest position as in 6.3.2.4.

6.3.3.5 Armrest height

Measure the armrest height as in 6.3.2.5.

6.3.3.6 Neck/head rest height and protrusion

Measure the neck/head rest height and protrusion as in 6.3.2.6.

6.3.4 Measurements without the CMD in the chair

Reclamp the vertical member at 90° in the CMD. Remove the CMD and carry out the measurements given in the following sub-clauses.

6.3.4.1 Seat surface width

Measure the narrowest seat surface width within the seat surface plane width zone.

6.3.4.2 Seat surface depth

Measure the least seat surface depth within the span 115 mm either side of the median plane (see Figure 24).

6.3.4.3 Backrest width

Measure the narrowest backrest width within the lumbar zone.

6.3.4.4 Backrest horizontal radius

Measure the backrest horizontal radius within the lumbar zone.

6.3.4.5 Armrest length

Measure the greatest length in the fore and aft direction of the armrests horizontally within 20 mm below the top surface using callipers with jaws 20 mm long (see Figure 43).

Figure 43 — Armrest length callipers

6.3.4.6 Width of armrests

Measure the greatest width in the side to side direction of the armrests horizontally within 5 mm below the top surface using callipers with jaws 5 mm long (see Figure 44).

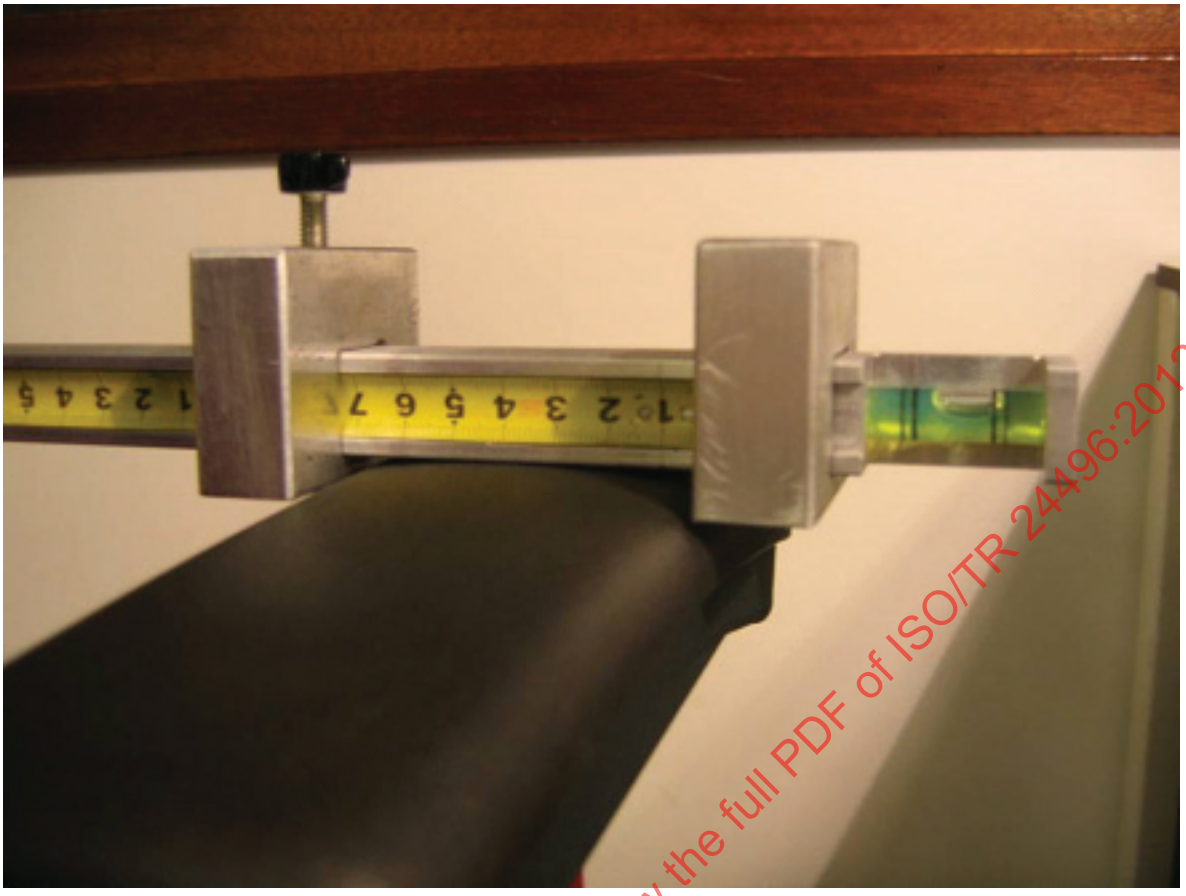


Figure 44 — Armrest width callipers

6.3.4.7 Hip breadth clearance

Adjust the armrests to their widest possible position. Measure the minimum width between the armrest assembly from 85 mm forward of the backrest line to the front edge of the armrest above the top of the seat surface (see Figure 45).

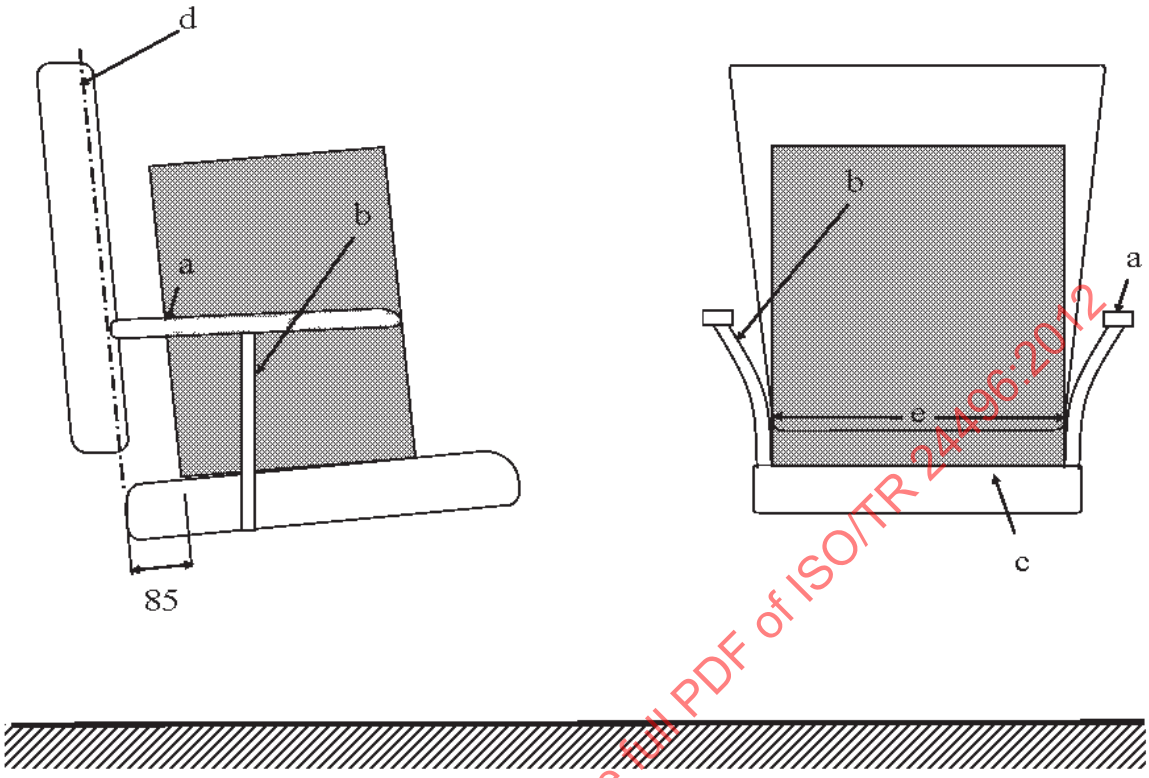
6.3.4.8 Armrests – clear distance between

Adjust the armrests to their widest possible position and then to their narrowest possible position. Measure and record the smallest horizontal distance between the armrests in each position from the rear of the seat width zone forward to the front edge of the seat (see Figure 21 c) within the measurement zone 5 mm down from the top of the armrest (see Figure 7).

6.3.4.9 Maximum offset of the under-frame

Measure the maximum offset of the under-frame as the distance from the axis of chair rotation to the outermost point of the base/castor/glide.

Dimensions in millimetres



Key

a armrest
b armrest assembly
c seat
d backrest line
e hip breadth

Figure 45 — Hip breadth clearance

7 Test report

The test report should include at least the following information:

a) reference to this Technical Report, i.e. ISO/TR 24496:2012;

b) details of the chair tested and the name of the manufacturer;

c) manner of assembly/mounting, if applicable;

d) the dimensions according to 6.3;

e) details of any deviations from this Technical Report;

f) name and address of the test facility;

g) date of the tests.

Annex A
(informative)

Drawings and specifications, PDF files

A.1 CMD with 18 stacked segment lumbar support measurement method

The CMD is fabricated according to the drawings and specifications contained in the electronic PDF files which can be accessed separately.

Table A.1 lists the CMD-drawings for the convenience of users. The drawings in .pdf and .igs format can be found in the CD-ROM in which this Technical Report is published.

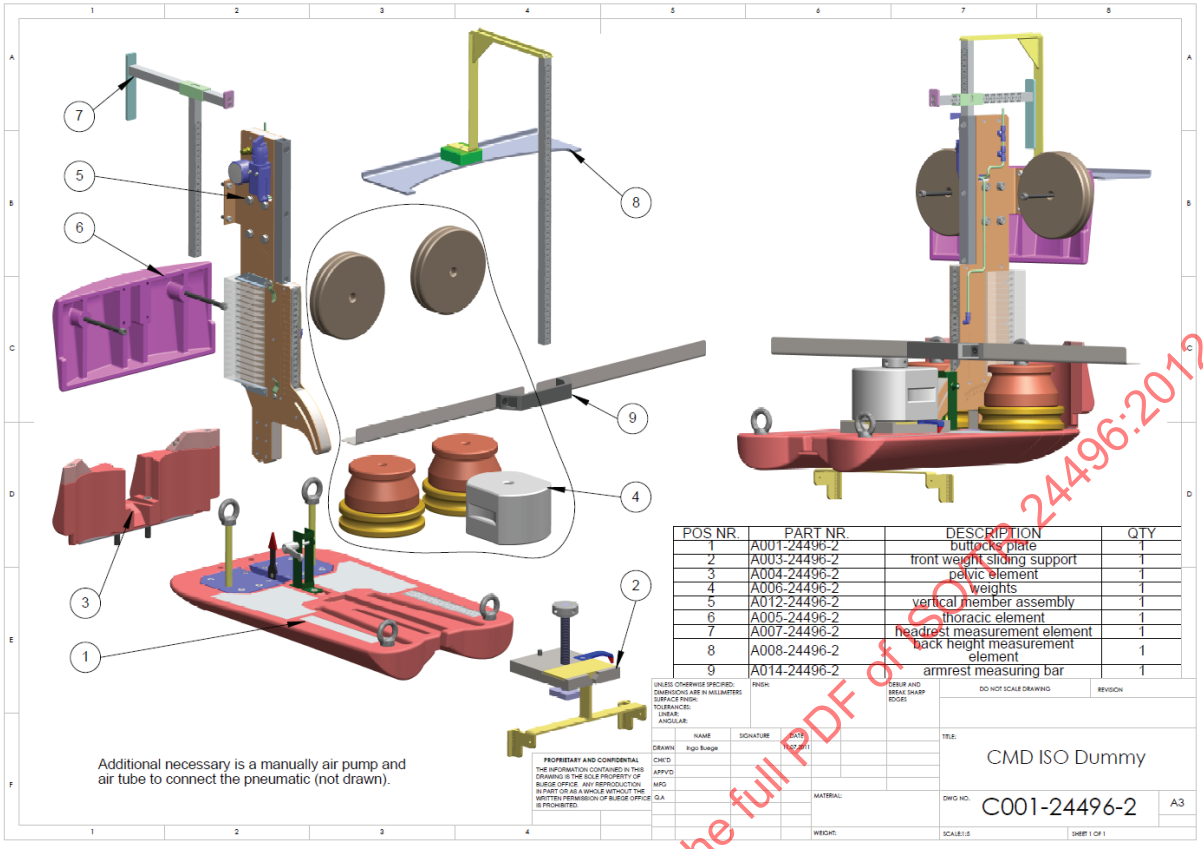
Table A.1 — CMD (Alternative A) drawing list

Description		Drawing No.	Electronic File Format	
			*.pdf	*.igs
ISO CMD		C001-24496-2	×	
1. Buttocks pad		A001-24496-2	×	
	buttocks form	P001-24496-2	×	×
	ruler seat depth	P002-24496-2	×	
	type plate	P003-24496-2	×	
	cover	P004-24496-2	×	
	rack	P005-24496-2	×	
	weight stand	A002-24496-2	×	
	weights stand left	P006-24496-2	×	
	weights stand right	P007-24496-2	×	
	weights axle	P008-24496-2	×	
	axle vertical member	P009-24496-2	×	
	stroke block	P010-24496-2	×	
	pointer for angle	P011-24496-2	×	
2. Front weight sliding support		A003-24496-2	×	
	support stand	P012-24496-2	×	
	clamp	P013-24496-2	×	
	pointer for seat depth	P014-24496-2	×	
	axle front weight	P015-24496-2	×	
	seat stop	P016-24496-2	×	
3. Pelvic element		A004-24496-2	×	
	pelvic form	P017-24496-2	×	×
	square	P018-24496-2	×	
	pelvic form add on l/r	P044-24496-2	×	×
4. Weights		A006-24496-2	×	

Table A.1 *(continued)*

Description		Drawing No.	Electronic File Format	
			*.pdf	*.igs
	front weight	P020-24496-2	×	
	thoracic weight	P021-24496-2	×	
	lower pelvic weight	P022-24496-2	×	
	higher pelvic weight	P023-24496-2	×	
5. Vertical member assembly		A012-24496-2	×	
	side wall left and right	P034-24496-2	×	
	top plate middle	P035-24496-2	×	
	lower plate middle	P036-24496-2	×	
	angle top and bottom	P037-24496-2	×	
	glide tub middle	P038-24496-2	×	
	ruler	P039-24496-2	×	
	measuring box	A009-24496-2		
	valve connector	P040-24496-2		
	plate valve box	P041-24496-2		
	measuring pin	P042-24496-2		
	paper clamp	P043-24496-2		
	slotted pan head screw M 5x12, mod.	P048-24496-2		
	cylinder A CJ2B6-60R SMC – milling	A011-24496-2		
6. Thoracic element		A005-24496-2	×	
	thoracic form	P019-24496-2	×	×
7. Headrest measurement element		A007-24496-2	×	
	vertical glide	P024-24496-2	×	
	measuring slot	P025-24496-2	×	
	horizontal glide	P026-24496-2	×	
	measuring stop collar	P027-24496-2	×	
	block	P028-24496-2	×	
	ruler vertical	P029-24496-2	×	
	extension vertical glide headrest	P046-24496-2	×	
8. Back height measurement element		A008-24496-2	×	
	vertical glide	P030-24496-2	×	
	support plate	P031-24496-2	×	
	arm	P032-24496-2	×	
	flat	P033-24496-2	×	
	extension vertical glide back height	P045-24496-2	×	
9. Armrest measuring bar		A012-24496-2	×	
	bar	P047-24496-2	×	

Figure A.1 shows details of the ISO CMD including the designation of the components.



POS NR.	PART NR.	DESCRIPTION	QTY
1	A001-24496-2	buttocks plate	1
2	A003-24496-2	front weight sliding support	1
3	A004-24496-2	pelvic element	1
4	A006-24496-2	weights	1
5	A012-24496-2	vertical member assembly	1
6	A005-24496-2	thoracic element	1
7	A007-24496-2	headrest measurement element	1
8	A008-24496-2	back height measurement element	1
9	A014-24496-2	armrest measuring bar	1

Figure A.1 — ISO CMD