R 06

KBOH-TNO Homologation Directive for hand propelled wheelchairs, electrically powered wheelchairs and scooters

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DEFINITIONS

Homologation Directive R 06, valid as of May 1, 1999
3rd impression, November 2003

In case of doubt, the Dutch text is definite.

KBOH, Stichting voor Kwaliteits- en Bruikbaarheidsonderzoek van Hulpmiddelen voor gehandicapten en ouderen

KBOH is an independent information and expertise centre specialising in technical aids. KBOH is responsible for defining the requirements that adequate technical aids must satisfy as well as providing objective information on the quality, efficiency and usability of technical aids.

Woerden, November 2003 ISO 9999: class 12 21

Notes to accompany the 3rd impression

The first publication of the R 06 homologation directive appeared in May 1999. As a result of an improved understanding of the subject matter and in response to the results of tests which have been carried out, a number of requirements have been changed with respect to the first version.

These changes have now been formally incorporated into this edition.

KBOH
Approvals Office, November 2003

Contents

1. Introduction

This section contains a list of definitions and terms which are used for the Homologation Directive R06. This publication renders all previous definitions obsolete. As soon as a new version of the homologation directive is issued, additional definitions, if necessary, will be included. The terms clarified by means of a definition relate not only to the wheelchair, but to the homologation directive as well. The explanations which are given for the requirements have been expanded to include where necessary any figures and testing procedures. The 'test methods' are described according to the way in which the property in question is ascertained. Terms are listed alphabetically. Chapter 3 includes information on measuring equipment, measuring conditions and extensive information on functional tests.

2. Definitions

A

Accessibility and operability of the recharging connector (C+3)

Definition	The way and the extent to which the battery recharging connector can be operated.
Purpose of test requirement	Assuming that a wheelchair user is unable to walk, or finds difficulty in doing so, the battery charger must be capable of being connected/disconnected from the wheelchair without actions that are complicated, dangerous (in the case of poor trunk balance and bending over to far forwards) or even impossible (in the case of having to stand up and this not being possible). With regard to scooters, it is assumed that in general their users are able to walk in some way and have a reasonable level of balance in the trunk. However, they must be able to reach the recharging connector without having to bend over too far. As far as the operating force is concerned a normal healthy working arm/hand (push and pull), which a 65 year old woman can summon from hip height is assumed in conformity with Burandt.
Test method	It is determined experimentally (from a sitting position in the wheelchair) whether the recharging connector is accessible and operable in conformity with the requirements. If a substantial amount of operating force is required, this is measured using a dynamometer. See **measuring forces**. The height is measured in relation to the floor.

Accessibility by attendant (T) of locking/release mechanism for armrests/legrests (C+24)

Definition	The extent to which the locking/release mechanism of the armrests/legrests are accessible by the attendant.
Purpose of test requirement	These controls are required to be at least within the reach of the attendant.
Test method	Experimental evaluation.

Accessibility by user (U) of locking/release mechanism for armrests/legrests

Definition	The extent to which the locking/release mechanism of the armrests/legrests are accessible by the user.
Purpose of test requirement	These controls are required to be at least within the reach of the attendant.
Test method	Experimental evaluation.

Accessibility of turning knob/lever for varying φ

Definition	The available space around the turning knob/lever for the required body parts to carry out the adjustment.
Purpose of test requirement	There must be sufficient space around the knob/lever for the hand and there must be sufficient space to turn the knob or switch the lever.
Test method	Experimental evaluation.

Accessibility of turning knob/lever for varying α

Definition	The available space around the turning knob/lever for the required body parts to carry out the adjustment.
Purpose of test requirement	There must be sufficient space around the knob/lever for the hand and there must be sufficient space to turn the knob or switch the lever.
Test method	Experimental evaluation.

Accessibility of variable setting for φ VU

Definition	The extent to which the control device is accessible.
Purpose of test requirement	Taking into consideration any possible poor balance in the trunk region, it is not permissible for the user to bend forwards any further than the level of the thorax in order to operate a switch, lever etc.
Test method	Experimental evaluation.

Accessibility/visibility of operating switches for variable sitting posture setting (C+6)

Definition	The extent to which the buttons/switches for varying the sitting posture are accessible and visible.
Purpose of test requirement	The user must be able to operate the control switch to set the sitting posture to another position, even, for example. from a reclining position.
Test method	It is determined experimentally whether the operating switches for the variable sitting posture setting are accessible from all sitting positions, visible and identifiable.

Accessories (compare with Adaptation and Ancillary equipment)

Definition	A non-essential addition to the wheelchair to improve user comfort.

Activation of service brake for determining max. deceleration (CGQ21)

Definition	The way in which the service brake is operated.
Purpose of test requirement	The necessary response time for making an emergency stop must be as short as possible.
Test method	Experimental evaluation.

Adaptation (compare with Accessories and Ancillary Equipment)

Definition	An essential modification to the wheelchair to meet the individual requirements of the user.

Added value

Definition	Added value the extent to which the quality of the technical aid exceeds the normal level of adequacy.

Additional technical information

Definition	Information which is required to contain the technical specifications.
Purpose of test requirement	The cluster designation gives an objective, verifiable description of the functional possibilities of the wheelchair.
Test method	Visual evaluation

Adhesion of coating

Definition	The quality of the adhesion of the coating.
Purpose of test requirement	In conformity with NEN 5337.
Test method	NEN 5337 (aggravated test, using adhesive tape in conformity with the guidelines of the TNO paint division). If one colour and one type of base material has been used per wheelchair, a minimum of two tests are carried out on various parts. If the coating has been applied to a number of base materials, or if different coatings (according to the manufacturer) and/or colours have been used, these should be tested individually.

Adjustability of armrest height

Definition	The extent to which the armrest height is adjustable with respect to the elbow height of the user.
Purpose of test requirement	An adjustable armrest height is necessary for supporting the user's arms adequately, especially when the user has to sit in the wheelchair for longer periods without making almost constant use of the handrims.
Test method	Visual and experimental evaluation.

Adjustability of sitting height

Definition	The extent to which the sitting height is adjustable in relation to the lower leg length of the user.
Purpose of test requirement	An adjustable sitting height is necessary to give an adequate level of support to the user's legs, particularly if the wheelchair is used by one individual.
Test method	Visual and experimental evaluation.

Adl = activities for daily living

Definition	These are activities carried out on a daily basis such as eating, drinking, going to the toilet and personal hygiene. NB. The properties of wheelchair for which the term is used are evaluated in relation to the aforementioned activities.

Ancillary equipment

Definition	A modification to the wheelchair essential to the individual where use is made of standard components.

Angle ß

Definition	The angle between the seat and the legrest (beta). This is comparable with the angle between the upper leg and the contact plane of the calf and heel. See figure 1; compare: ISO 7176/7 dimension 15.

Angle γ

Definition	The angle between the footplate and the legrest (gamma). This is comparable with the angle between the contact plane of the calf and heel with the contact plane of the foot. See figure 16; compare ISO 7176/7 dimension 14.

Angle α (B+4)

Definition	The angle between the seat and the backrest (alpha).
Purpose of test requirement	In conformity with EN 12183 and EN 12184. These test requirements are minimum values. If a wheelchair just manages to satisfy these values the quality of the sitting posture is acceptable.
Test method	Measurements in conformity with ISO 7176/7 dimension 6 (α'). The value a is calculated as follows: α = 90° + α' - φ (dimension 1). See figure 1.

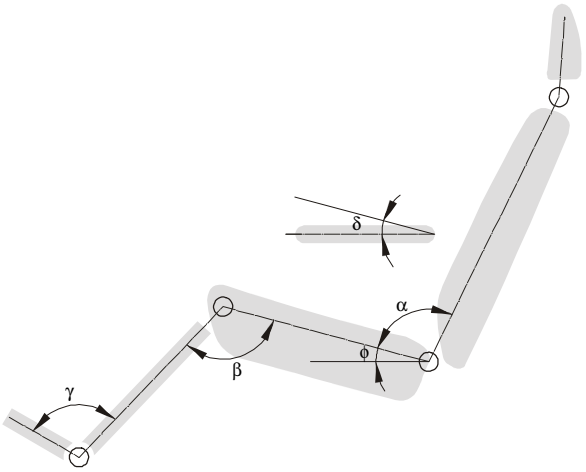

figure 1: Angles

Angle α, adjustable (B+5)

Definition	The angle between the seat and the backrest (alpha).
Purpose of test requirement	In conformity with EN 12183 and EN 12184. These test requirements are minimum values. If a wheelchair just manages to satisfy these values the quality of the sitting posture is acceptable.
Test method	Measurements in conformity with ISO 7176/7 dimension 6 (α'). The value a is calculated as follows: α = 90° + α' - φ (dimension 1). See figure 1.

Angle δ

Definition	The angle between the armrest and the seat (delta). This is comparable with the angle between the forearm and the upper leg. See figure 16; compare ISO 7176/7 dimension 20 (test in relation to horizontal).

Angle φ (B+1)

Definition	The angle between the seat and the horizontal plane (angle phi).
Purpose of test requirement	In conformity with EN 12183 and EN 12184. Friction will result if the upper leg bone makes a negative angle in relation to the horizontal plane: the user will slide forwards. This should not be accommodated for by using a seat cushion with a rough upholstery or by providing a counter-support on the wheelchair footplates. This will indeed stop the user sliding forwards but the frictional forces that are produced will heighten the risk of decubitus. In order to prevent this the upper leg bone must be horizontal at least. This is achieved by making an angle between the underside of the leg and the horizontal plane of 4°.
Test method	Testing in conformity with ISO 7176/7 dimension 1. See figure 1.

Angle φ_1 (B+2)

Definition	The initial setting for the angle which the seat makes with the horizontal plane for a tilt-in-space adjustment (phi one).
Purpose of test requirement	In conformity with EN 12183 and EN 12184. Friction will result if the upper leg bone makes a negative angle in relation to the horizontal plane: the user will slide forwards. This should not be accommodated for by using a seat cushion with a rough upholstery or by providing a counter-support on the wheelchair footplates. This will indeed stop the user sliding forwards but the frictional forces that are produced will heighten the risk of decubitus. In order to prevent this the upper leg bone must be horizontal at least. This is achieved by making an angle between the underside of the leg and the horizontal plane of 4°.
Test method	Testing in conformity with ISO 7176/7 dimension 1. See figure 16. In case of a tilt-in-space adjustment and an adjustable sitting angle φ_1, the centre position of the adjustment range of angle φ_1 is taken as a starting point.

Angle φ_1, adjustable (B+2)

Definition	The initial setting for the angle which the seat makes with the horizontal plane for a tilt-in-space adjustment (phi one).
Purpose of test requirement	In conformity with EN 12183 and EN 12184. For a wheelchair whose tilt mechanism has two settings it is possible that the φ_1 adjustment can be set by the set by the therapist beforehand.
Test method	Testing in conformity with ISO 7176/7 dimension 1. See figure 1.

Angle between the standing leg and the swivelling leg (= Angle λ) (CGQ6)

Definition	The angle that is made between the leg positioned on the ground and the leg in motion, when walking behind the wheelchair.
Purpose of test requirement	When evaluated experimentally, this appeared to be the smallest angle necessary on order to be able to manoeuvre the wheelchair.
Test method	The sitting posture is adjusted to its neutral setting. An attempt is then made to test whether the shape below fits behind the wheelchair where plane A is positioned against the extremity of the pushing handles or against the pushing bracket. If the (anti) tipping device can be removed by the attendant without any tools and without the user having to vacate the wheelchair, this should be removed. If the (anti) tipping device can be adjusted, the most centrally positioned setting should be assumed. See figure 2.

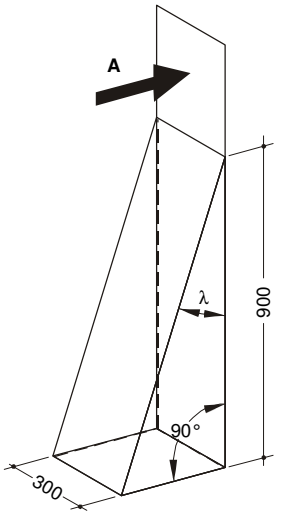

figure 2: Angle between the standing leg and the swivelling leg (= Angle λ)

Anti-tipping device

Definition	A device fitted to the rear of the wheelchair to stop the wheelchair tipping over backwards.

Arm support

Definition	The upper part of the armrest on which the arm is supported.

Apparent (5GQ1; 6GQ1)

Definition	Clear to see, obvious, striking.

Area of use

Definition	The area in which the user wishes to use the wheelchair. A distinction is made between: - area of use indoors - area of use indoors/ outdoors - area of use outdoors

Area of use: indoors

Definition	The area inside and directly around the house (garden, patio). This includes the adapted (in conformity with the Accessibility Manual) as well as the non-adapted environment (home/work/leisure) and the situation in health care institutions (old-aged persons homes, nursing clinics, hospitals etc.).

Area of use: indoors/outdoors

Definition	The indoor area of use (See: definition for "indoors") and the outdoor area of use covers a radius of 5 km from the home and in adapted environments such as public buildings, supermarkets, department stores, etc. The emphasis is on domestic activities as well as outdoor activities such as shopping, posting a letter, short 'walks' and access to the aforementioned buildings.

Area of use: outdoors

Definition	The outdoor area of use covers a range of 15 km from the home. The emphasis on excursions (on tarmacked surfaces), commuting to work, school, going to the hospital, etc. Access to public buildings, supermarkets, department stores, etc. is of lesser importance.

Armrest

Definition	The presence of a support element on which the arm can be supported.
Purpose of test requirement	The user's arms are required to be supported adequately.
Test method	Visual evaluation.

Armrest, type

Definition	Armrests are categorised into 6 types: Type 1: fixed, height NA Type 2: removable,* height NA Type 3: removable, height VU Type 4: removable, height SA/VT Type 5: removable, angle δ VT, height VT Type 6: removable, angle δ VU, height VU * Removable is also taken to mean: can be lowered to the same height as the seat or foldable. For types 2, 3 and 6, this means removable by user.

Armrest height NA

Definition	The height available in order to support the arms. The available space is determined by the configuration of the armrests and the seat.
Purpose of test requirement	The ideal relationship between armrest height A and elbow height is expressed as: armrest height A = elbow height. The level of tolerance for the ideal ratio has been determined as: - 30 mm to + 30 mm. A relationship is determined for the distance between the elbow heights and the upper leg lengths of users. The required relationship between the armrest height and the sitting depth is derived from this. (Corrected) elbow heights that most commonly occur in the general population are 185 - 295 mm. An armrest smaller than (185 - 30 =) 155 mm and larger than (295 + 30 =) 325 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7, dimension 16. Testing is carried out in the basic neutral position.

Armrest height SA/VT/VU

Definition	The height available in order to support the arms. The available space is determined by the configuration of the armrests and the seat.
Purpose of test requirement	The armrest height corresponds to the elbow height of the user in relation to the seat. The ideal relationship between armrest height B and elbow height is expressed as: armrest height B = elbow height. The level of tolerance for the ideal relationship has been determined as: - 10 mm to + 10 mm. A relationship is determined for the distance between the elbow heights and the upper leg lengths of users. The required relationship between the armrest height and the sitting depth is derived from this. (Corrected) elbow heights that most commonly occur in the general population are 185 - 295 mm. An armrest smaller than (185 - 10 =) 175 mm and larger than (295 + 10 =) 305 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7, dimension 16. Testing is carried out in the basic neutral position.

Attachment of anti-tipping device

Definition	The extent to which the anti-tipping device is able to resist incidental loads.
Purpose of test requirement	In conformity with EN 12183 and EN 12184.
Test method	Experimental evaluation.

Attachment of steering control unit

Definition	The extent to which the steering control unit can resist rotation in relation to the directional control wheel at a specific force.
Purpose of test requirement	Determined experimentally.
Test method	The directional control wheel is clamped when pointing straight ahead. A force of 200 N is applied to one end of the steering control unit. An inspection is made as to whether the steering control unit has been wrenched out of position.

Attachment points on the wheelchair for attachment in other means of transport

Definition	The way in which the attachment points, used to secure a user-occupied wheelchair by means of a Wheelchair Tie-down and Restraint system, have been constructed.
Purpose of test requirement	Since various forms of locking systems can be used, the attachment points used for this purpose are required to be clearly identifiable.
Test method	Visual evaluation.

Attendant (T)

Definition	The attendant is defined as the person who walks behind the wheelchair and carries out the VT adjustments for the user. NB: For evaluation purposes, the anthropometry and the strength of a physically able 65 year old woman is used as a basis.

Audible signal

Definition	The presence of an audible signal to warn other residents or road-users.
Purpose of test requirement	In conformity with EN 12184, supplemented by the requirements of the Road Traffic Act 1994 of 1994 WVW, clause 5.11.71.
Test method	Experimental evaluation.

B

Backrest height (requirement BGQ11, B)

Definition	The length which is available for supporting the back. The available space is determined by the configuration of the seat and backrest and the length and shape of the backrest.
Purpose of test requirement	The support is designed in such a way that the back can be reasonably supported and that the shoulder blades are free. To this end the backrest height matches the height of the thoracic part of the user's back. The ideal relationship between backrest height A and the height of the thoracic part of the back is determined in the following fashion: Backrest height B = height of thoracic part + 60mm The level of tolerance determined for the ideal relationship is set at: - 60 mm to + 160 mm. No relationship has been determined for distance between the height of the thoracic part and the upper leg length of the user. The backrest height must be suitable for the height of the thoracic parts of the back that occur in the gen
Test method	Testing in conformity with ISO 7176/7 dimension 7. Measurements are taken in the neutral position.
Remark	It is determined whether the backrest has an apparently nonsensical profile.

Backrest height (requirement BGQ12, C)

Definition	The length which is available for supporting the back. The available space is determined by the configuration of the seat and backrest and the length and shape of the backrest.
Purpose of test requirement	The support is designed in such a way that the back can be reasonably supported and that the neck is free. To this end the backrest height matches the height of the cervical part of the user's back. The ideal relationship between backrest height C and the height of the cervical part of the back is determined in the following fashion: Backrest height C = height of cervical part The level of tolerance determined for the ideal relationship is set at: - 85 mm to + 0 mm No relationship has been determined for distance between the height of the cervical part and the upper leg length of the user. The most desirable dimensional ratio for the backrest in relation to the sitting height is derived from this. The (corrected) cervical heights that occur in the general population are 530 - 740 mm. A backrest height smaller than (530 - 85 =) 445 mm and larger than (740 + 0 =) 740 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7 dimension 7. Measurements are taken in the neutral position.
Remark	It is determined whether the backrest has an apparently nonsensical profile.

Backrest height (requirement BGQ9, D)

Definition	The length which is available for supporting the back. The available space is determined by the configuration of the seat and backrest and the length and shape of the backrest.
Purpose of test requirement	The support is designed in such a way that the lower part of the back can be reasonably supported and that the shoulder blades are completely free. To this end the backrest height matches the height of the thoracic part of the user's back. The ideal relationship between backrest height D and the height of the thoracic part of the back is determined in the following fashion: Backrest height D = height of thoracic part - 60 mm. The level of tolerance determined for the ideal relationship is set at: - 20 mm to + 20 mm The backrest height must be suitable for thoracic heights that occur in the general population. The (corrected) thoracic heights that occur in the general population are 400 - 520 mm. A backrest height smaller than (400 - 80 =) 320 mm and larger than (520 + 40 =) 480 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7 dimension 7. Measurements are taken in the neutral position.
Remark	It is determined whether the backrest has an apparently nonsensical profile.

Backrest height (requirement GQ10, A)

Definition	The length which is available for supporting the back. The available space is determined by the configuration of the seat and backrest and the length and shape of the backrest.
Purpose of test requirement	The support is designed in such a way that the back can be reasonably supported and that the shoulder blades are free. To this end the backrest height matches the height of the thoracic part of the user's back. The ideal relationship between backrest height A and the height of the thoracic part of the back is expressed as: Backrest height A = height of thoracic part -10mm. The level of tolerance determined for the ideal relationship is determined as: - 30 mm to + 50 mm No relationship has been determined for distance between the height of the thoracic part and the upper leg length of the user. The backrest height must be suitable for the height of the thoracic parts of the back that occur in the general population. Those that occur in the general population are 400 - 520 mm. A backrest height smaller than (400 - 40 =) 360 mm and larger than (520 + 40 =) 560 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7 dimension 7. Measurements are taken in the neutral position.
Remark	It is determined whether the backrest has an apparently nonsensical profile.

Basic neutral position

Definition	The basic neutral position is the position in which the wheelchair is set for testing procedures in conformity with the testing conditions as defined in the homologation directive.

Battery charger safety device (6GQ3)

Definition	A guarantee that a secure electrical safety device is incorporated in the battery charger.
Purpose of test requirement	KEMA uses internal (ISO) standards and associated measurements which guarantee a secure degree of protection. For this reason class 2 insulation is required. If the battery charger has been provided with an approval mark this is a guarantee that the safety requirement has been met.
Test method	Visual evaluation.

Battery cover (7.8GQ1)

Definition	A cover which protects batteries against damp and dirt.
Purpose of test requirement	Proper protection means less maintenance and a reduction in susceptibility to interference.
Test method	Visual evaluation.

Body parts required for removal/replacement of armrests/legrests by attendant (C+25)

Definition	The body parts required by the attendant to remove/replace a (support) element.
Purpose of test requirement	It is not acceptable, for example, to take hold of armrests/legrests with one hand, to operate the switch with the other hand and to restrain the wheelchair with the necessary force using another part of the body.
Test method	Experimental evaluation.

Body parts required for removal/replacement of armrests/legrests by user (C+29)

Definition	The body parts required by the attendant to remove/replace a (support) element.
Purpose of test requirement	It is not acceptable, for example, to take hold of armrests/legrests with one hand, to operate the switch with the other hand and to restrain the wheelchair with the necessary force using another part of the body.
Test method	Experimental evaluation.

Body parts required for varying α

Definition	The body parts that are required to carry out the adjustment.
Purpose of test requirement	The use of body weight in order to exert a force for varying the sitting posture increases the likelihood of this not being able to be done by the user/attendant.
Test method	Experimental evaluation.

Body parts required for varying φ

Definition	The body parts that are required to carry out the adjustment.
Purpose of test requirement	The use of body weight in order to exert a force for varying the sitting posture increases the likelihood of this not being able to be done by the user/attendant.
Test method	Experimental evaluation.

Brake

Definition	A brake/blocking mechanism which enables a stationary wheelchair to remain stationary or a mechanism which enables a user to slowly bring the wheelchair to a standstill and to regulate the speed.
Test method	Visual evaluation and inspection.

Buckle-free wheels (CGQ36)

Definition	The presence or absence of a warp in the wheel.
Purpose of test requirement	Excessive vertical or transversal deviation can lead to the wheelchair swaying from side to side.
Test method	Using a calliper rule, a measurement is taken of the distance from a fixed point to the rim, whilst turning the wheel slowly in a vertical and transversal direction. A recording is taken of the difference between the largest and smallest recorded distance per direction.

C

Calf support

Definition	A rigid support element on which the calf can be supported.

Castor wheel outside greatest width (7.5GQ4, 8.4GQ3)

Definition	The dimensions of the castor wheel when positioned transversally to the direction of travel, which fall outside the greatest width of the wheelchair.
Purpose of test requirement	The upper limit is determined experimentally.
Test method	The castor wheel is positioned transversally to the direction of travel whereupon a measurement of dimension x is taken in conformity with figure 3.

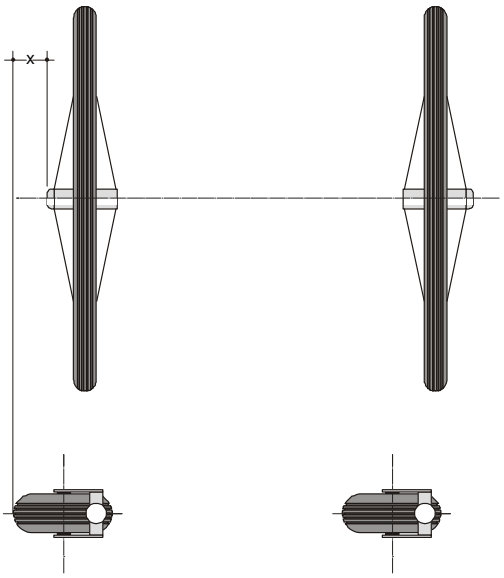

figure 3: Castor wheel outside greatest width

Centre of tipping device to inside of tyre (CGQ12, A+B)

Definition	The distance from the centre of the tipping device to the inside of the tyre.
Purpose of test requirement	The foot/shoe should not rest against or come between the spokes of the wheel. The basis for this requirement is the shoe width of a P50-man on the ball of the foot.
Test method	The distance from the centre of the side (nearest to the tyre) of the surface on which the foot is supported during tipping, to the inside of the tyre. See figure 4.

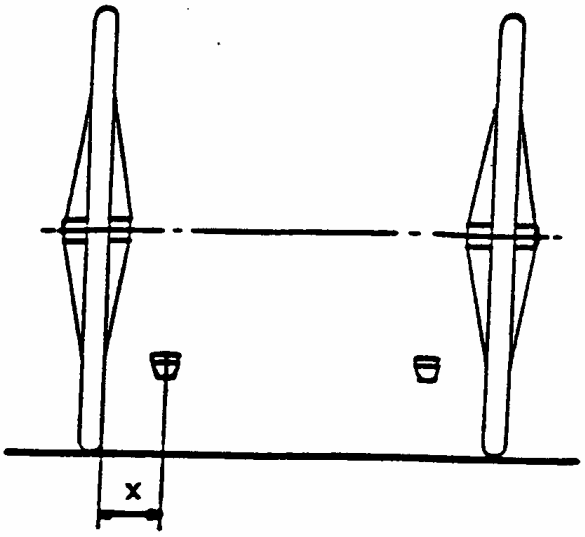

figure 4: Centre of tipping device to inside of tyre

Cluster

Definition	A cluster is a group of users with the same characteristics with respect to their functional limitations, anticipated use and the possible user circumstances, in so far as these are related to the characteristics of (a group of) technical aids. From the point of view of the technical aids: A cluster represents a group of users as large as possible for which all individual requirements can still be realised in one product.

Colour functions (10.3GQ2)

Definition	The colour of the functions on the control panel.
Purpose of test requirement	Red is an easily discernible colour associated with danger. Red can therefore be used on switches or equipment used e.g. in emergency situations. However the colour red should be used carefully. In the case of an emergency the necessary switch must be located at a glance, enabling a quick response to the emergency situation.
Test method	Visual evaluation.

Control panel

Definition	A box on which the control buttons, switches and levers are attached with which the functions can be activated and/or regulated

Course stability (8.4GQ4)

Definition	The extent to which the wheelchair possesses the characteristic of maintaining a straight course for a corresponding fixed position of the steering control unit.
Purpose of test requirement	There is still no objective testing method for determining course stability for electrically powered wheelchairs. The above requirement will be maintained until one has been found.
Test method	Experimental evaluation.

D

Design form of warning signal for dynamic stability

Definition	The way in which the warning signal is represented.
Purpose of test requirement	It is widely known that a flashing red light quickly attracts attention and is associated with danger.
Test method	Visual evaluation.

Design of freewheel setting (CGQ15)

Definition	The way in which the freewheel setting is designed (technically).
Purpose of test requirement	If parts or components have to be detached in order to engage the wheelchair into its freewheel setting, this might lead to problems in emergency situations.
Test method	Visual evaluation.

Design of lighting/lighting signals

Definition	The way in which lights/lighting signals have been designed for the purposes of visibility in traffic.
Purpose of test requirement	In conformity with the Road Traffic Act of 1994 (WVW), specified in clauses and EN 12184.Conform WVW 1994.
Test method	Visual evaluation.

Design of mirrors

Definition	The way in which the mirrors are designed.
Purpose of test requirement	Requirements for mirrors from the Road Traffic Act of 1994 (WVW) and EN 12184.
Test method	Visual and experimental evaluation.

Design of retro-reflective devices

Definition	The way in which retro-reflective devices are designed for purposes of visibility in traffic.
Purpose of test requirement	In conformity with the Road Traffic Act of 1994 (WVW), specified in clauses and EN 12184.
Test method	Visual evaluation.

Design of variable setting for angle φ

Definition	The way in which the variable tilt mechanism is designed.
Purpose of test requirement	For electrically powered wheelchairs with a tilt-in-space seat, a tilt mechanism with two settings is deemed to be inadequate, more setting are required.
Test method	Experimental evaluation.

Diameter of smallest wheel

Definition	The diameter of the smallest wheel of the wheelchair.
Purpose of test requirement	The basis for this is the ratio between the radius (r) and the height of the obstacle (h) : r=3h. The criterion of diameter ≥ 90 mm is based on a realistic obstacle height indoors of 15 mm.
Test method	A measurement is made of the diameter of the tyre (outside dimension) of the smallest wheel.

Dimension x See Sitting depth

Dimensions

Definition	The dimensions relate to the sitting dimensions and the adjustment possibilities with respect to the wheelchair's body support unit.

Dimensions of largest part (l x w x h) when taken by user on or behind car seat

Definition	The dimensions (l x w x h) of the largest part of the wheelchair for transport after it has been reduced in size.
Purpose of test requirement	These dimensions are the maximum dimensions which the wheelchair must have to fit either on the passenger's seat/rear seat or in the car boot without the rear seat having to be folded down. The dimensions are derived from the 1991GMD model car for group 5, the Nissan Micra.
Test method	The arm and legrests as well as any seat and backrest cushions are removed from the wheelchair, after which the remaining frame is reduced in size. This must be done without the use of any tools. The length, width and height of the largest remaining part are measured.

Dimensions of largest part (l x w x h), when taken by the user or attendant behind a car seat/in a car boot (req. 7.7GQ4 for electrically powered wheelchairs)

Definition	The dimensions (l x w x h) of the largest part of the wheelchair for transport after it has been reduced in size.
Purpose of test requirement	This requirement is based on the space available in a car boot in which the attendant can position a wheelchair after having been reduced in size. The standard car is taken to be the 1991 GMD model car for group 5, the Nissan Micra. The criteria have been adapted on the basis of current availability.
Test method	The arm and legrests as well as any seat and backrest cushions are removed from the wheelchair, after which the remaining frame is reduced in size. This must be done without the use of any tools. The length, width and height of the largest remaining part are measured.
Remark	Removal of the wheels, despite narrowing the width of the wheelchair, is not included in the term 'reduce in size', but falls under the concept of 'disassembly'. Sometimes the backrest is first removed (e.g. in the case of a fixed backrest cushion). The wheelchair is then evaluated on its capacity to be 'reduced in size'.

Dimensions of largest part (l x w x h), when taken by the user or attendant behind a car seat/in car boot (req. 6.7GQ4 for hand-propelled wheelchairs)

Definition	The dimensions (l x w x h) of the largest part of the wheelchair for transport after it has been reduced in size.
Purpose of test requirement	This requirement is based on the space which is available in a car boot or behind a car seat for positioning a wheelchair which has been reduced in size by the attendant. The standard car is taken to be the 1991 GMD model car for group 5, the Nissan Micra.
Test method	The arm and legrests as well as any seat and backrest cushions are removed from the wheelchair, after which the remaining frame is reduced in size. This must be done without the use of any tools. The length, width and height of the largest remaining part are measured.
Remark	Removal of the wheels, despite narrowing the width of the wheelchair, is not included in the term 'reduce in size', but falls under the concept of 'disassembly'. Sometimes the backrest is first removed (e.g. in the case of a fixed backrest cushion). The wheelchair is then evaluated on its capacity to be 'reduced in size'.

Dimensions of largest part (l x w x h), when taken in estate car (req. 6.7GQ5, for hand-propelled wheelchairs)

Definition	The dimensions (l x w x h) of the largest part of the wheelchair for transport after it has been reduced in size.
Purpose of test requirement	The wheelchair is reduced in height by means of removing or folding down the backrest. The maximum dimensions are derived from the space available in the luggage space of an estate car.
Test method	The arm and legrests as well as any seat and/or backrest cushions are removed from the wheelchair, after which all parts of the wheelchair are removed or folded which result in the wheelchair's reduction in length and/or width and/or height. This must be done without the use of any tools. The length, width and height of the largest remaining part is measured after reduction in height.

Dimensions of largest part (l x w x h), when taken in estate car (req. 7.7GQ5 and 7.7GQ6 for push chairs and scooters)

Definition	The dimensions (l x w x h) of the largest part of the wheelchair for transport after it has been reduced in size.
Purpose of test requirement	The scooter is reduced in height by means of removing or folding down the backrest and folding away the steering column. It is assumed that this is carried out by an attendant and that ramps are available. The maximum dimensions are derived from the space available in the luggage space of an estate car.
Test method	The arm and legrests as well as any seat and/or backrest cushions are removed from the wheelchair, after which all parts of the wheelchair are removed or folded resulting in the wheelchair's reduction in length and/or width and/or height. This must be done without the use of any tools. The length, width and height of the largest remaining part are measured after reduction in height.

Disassembly

Definition	Disassembly is defined as the disassembling of the wheelchair without the use of tools for the purpose of reducing the length and/or the width and/or the height of the wheelchair. Disassembly-U: disassembly is carried out by the user. The criteria are therefore based on the functional capacities of the user, and makes the assumption that, whatever the case, the wheelchair can also be disassembled by the attendant. Disassembly-T (U): disassembly is carried out by the attendant. The criteria are therefore based on the functional capacities of the attendant. This does not exclude the likelihood that disassembly cannot be carried out by the user in some cases.

Distance of steering control (C+34)

Definition	The distance from the steering control unit to testing reference point in a horizontal direction.
Purpose of test requirement	The elbow gripping length of a P50 woman and a P95 man is used as a basis.
Test method	A measurement is taken of the horizontal distance between a point 50 mm (1/2 hand-width) from the one end of the steering control unit (on the centre line) and the testing reference point (MRP) of the Reference Loader Gauge (RLG) from ISO 7176 part 7. If the distance to the steering control unit is variable, the following extreme setting are used as a basis for testing: handles not beyond the line of the castor stem housing; minimum setting: handles/steering column resting on RLG.

Distance to tyre (CGQ11, A+B)

Definition	The distance (viewed side on) from the extremity of the tipping device to the tyre, measured in the same direction as the wheel axle.
Purpose of test requirement	For a tipping device that protrudes more than 10 mm outside the tyre, there is a greater risk of hitting a curb or other obstacle.
Test method	If the tipping device protrudes outside the tyre, a measurement is taken in conformity with figure 5.

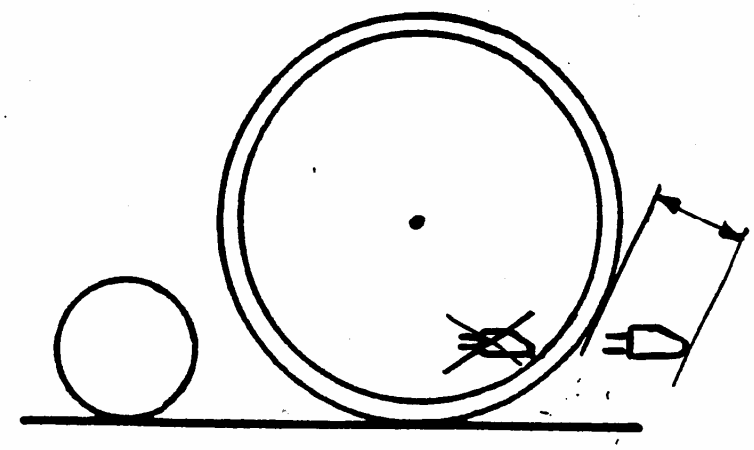

figure 5: Distance to tyre

Dynamic stability in neutral sitting posture

Definition	The stability when accelerating/braking and when changing direction.
Purpose of test requirement	The required minimum negotiable slope commonly occurs and therefore needs to be capable of being negotiated safely. For slopes steeper than the required minimum negotiable slope the user should be aware that tipping can occur.
Test method	- The maximum deceleration should be attained as quickly as possible using the service brake (not with a system for an emergency stop) when ascending the slope in both a forward and reverse direction and. - By setting the speed regulator to full power in a single movement, the wheelchair should be set in motion from a stationary position in both a forward and reverse direction facing upwards. The lowest speed is first engaged when reversing on the slope.

E

Ease of operation for fixing seat rotation mechanism (C+32)

Definition	The ease with which the seat can be fixed in a particular setting.
Purpose of test requirement	It is not permissible for the user to bend down any further than the level of the thorax in order to operate the buttons and switches. The basis for the operating force is the pushing and pulling power that a woman with a normal healthy working hand/arm can summon at the height of the hip in conformity with Burandt (0.6 x 100 N). If any fingers become trapped when the settings are adjusted, then this is deemed to be "apparently poor".
Test method	It is determined experimentally whether the settings of the seat can be reached or operated without the user becoming thoracically detached from the backrest. The operating force of any levers is measured with a dynamometer. See measuring force.

Ease of operation in folding away control panel

Definition	The possibility of being able to fold away the control panel for sitting at the table and the way in which this is carried out.
Purpose of test requirement	The basis for the operating force is the pushing and pulling power that a woman with a normal healthy working hand/arm can summon at the height of the hip in conformity with Burandt (0.6 x 100 N).
Test method	Using a dynamometer. See measuring force.

Ease of operation of freewheel setting for attendant

Definition	The ease with which the freewheel setting can be reached or operated by the attendant.
Purpose of test requirement	The basis for the operating force is the pushing and pulling power that a woman with a normal healthy working hand/arm can summon at the height of the hip in conformity with Burandt (0.6 x 100 N).
Test method	It is determined experimentally whether an attendant standing to the rear of the wheelchair can reach and operate the parking brake. The operating force is measured with a dynamometer. See measuring force.

Ease of operation of parking brake for attendant

Definition	The ease with which the parking brake can be reached or operated by the attendant.
Purpose of test requirement	The attendant is required to be able to reach the parking brake in order to operate it.
Test method	It is determined experimentally whether the parking brake can be reached and operated by an attendant when standing to the rear of the wheelchair.

Ease of operation of parking brake for user

Definition	The ease with which the parking brake can be reached or operated by the user.
Purpose of test requirement	Taking into consideration any possible poor balance in the trunk region, it is not permissible for the user to bend down any further than the level of the thorax in order to operate the brake.
Test method	It is determined experimentally whether the user can reasonably reach and operate the parking brake from a sitting position in the wheelchair.

Ease of operation when stationary

Definition	Whether a control can be reached or controlled by the user with one hand, whilst holding the steering controls with the other hand, such as is possible when the scooter is at a standstill.
Purpose of test requirement	It is not permissible for the user to bend down any further than the level of the thorax in order to operate the buttons and switches. The basis for the operating force is the pushing and pulling power that a 65-year-old woman with a normal healthy working hand/arm can summon at the height of the hip in conformity with Burandt (0.6 x 100 N).
Test method	It is determined experimentally whether the settings of the seat can be reached or operated without the user becoming thoracically detached from the backrest. The operating force of any levers is measured with a dynamometer. See measuring force.

Ease of operation whilst driving (C+7)

Definition	Whether the controls can be reached or operated by the user with both hands held on the steering unit, for example, whilst the wheelchair is in motion.
Purpose of test requirement	Whilst the wheelchair is being driven it is not permissible for the user to bend down forwards any further than the level of the thorax in order to operate the aforementioned buttons and switches. The basis for the operating force is the pushing and pulling power that a woman with a normal healthy working hand/arm can summon at the height of the hip in conformity with Burandt (0.6 x 100 N).
Test method	It is determined experimentally whether the control buttons/switches can be reached or operated without the user becoming thoracically detached from the backrest and with both hands supported on the steering control unit. The operating force of any levers is measured with a dynamometer. See measuring force.

Ease of operation/way in which scooters can be reduced in size

Definition	The ease with which the scooter can be reduced in size by the user or the attendant for transport.
Purpose of test requirement	Reduction in size must be a simple, one-off process which does not take much time. The attendant or user should not be expected to have to use any excessive force other than necessary when standing next to the car boot space.
Test method	Experimental evaluation.

Ease of operation/way in which wheelchair can be reduced in size by attendant (T) (C+14, C+16)

Definition	The ease with which the wheelchair can be reduced in size by the attendant for transport.
Purpose of test requirement	Reduction in size must be a simple, one-off process which does not take much time. The attendant should not be expected to have to use any excessive force other than necessary when standing next to the car boot space.
Test method	Experimental evaluation.

Ease of operation/way in which wheelchair can be reduced in size by user (U) (C+15, C+16)

Definition	The ease with which the wheelchair can be reduced in size by the user for transport.
Purpose of test requirement	Reduction in size must be a simple, one-off process which does not take much time. In addition, the user must be able to do this from a sitting position in the wheelchair.
Test method	Experimental evaluation.

Emergency (stop) function

Definition	A switch or auxiliary switch which enables the wheelchair to come to a standstill in the event of unexpected dangers occurring, in conformity with NEN 1010:2003, 28.4, Emergency stop on/off switch intended to prevent a manoeuvre which is hazardous. In relation to operations in emergency situations, NEN 1010 also refers to such terms as emergency stop, emergency start, emergency switch off and emergency switch on.
Purpose of test requirement	If an emergency (stop) switch is situated on the wheelchair this is required to be designed in conformity with the specified norms for purposes of identification.
Test method	Visual and experimental evaluation.

External handrim diameter (CGQ15)

Definition	The external diameter of the handrim.
Purpose of test requirement	If the handrim is the same as the wheel rim, the thickness of the (flat) tyre will ensure that the handrim will not touch the ground.
Test method	The largest diameter of the handrim is measured.

F

Foldability of control panel (CGQ17)

Definition	The possibility of folding away the control panel so that the user is able to sit at a table and the way in which this is performed..
Purpose of test requirement	In order to sit normally at a table or desk the control panel will have to be temporarily moved in one way or another. Removal of a control panel is not considered to be acceptable. Loose part may fall on the floor, so that the user is unable to reach them and may possibly lose them.
Test method	Experimental evaluation.

Footrest (A6.1GQ1; B7.1GQ1)

Definition	The presence of a support element on which the feet can be supported.
Purpose of test requirement	During use, the user’s feet are required to be provided with adequate support.
Test method	Visual evaluation

Functioning of freewheel brake

Definition	A brake/blocking system with which a wheelchair, engaged in its freewheel setting, can be brought to a stationary position in all situations by the user.
Purpose of test requirement	Without a freewheel brake it is not possible for the wheelchair to be brought to a stationary position in all situations.
Test method	Visual and experimental evaluation.

Functioning of freewheel setting

Definition	The way in which the freewheel setting works.
Purpose of test requirement	The freewheel setting is used when the wheelchair's motor has been switched off, the power supply has been cut off and the wheelchair has to be moved.
Test method	Experimental evaluation.

G

Ground clearance (requirement A.2+10, area of use: indoor/outdoor)

Definition	The free space between the ground and the underside of the electrically powered wheelchair, with the exception of the wheels and the axle unit.
Purpose of test requirement	The channels on vehicle access ramps usually have a rim height of approx. 50 mm. This should not present any problems for electrically powered wheelchairs with a ground clearance of 70 mm. EN 12184 specifies an upper limit of 60 mm.
Test method	A measurement is taken of the smallest distance between the floor and the scooter/wheelchair between the front wheel(s) and the rear wheels. The seat is loaded with a weighted dummy for the measurement. The lowest value is recorded. The measurement is carried out according to figure 1
Remark	In EN 12184 this is a combination of ground clearance and obstacle height.

Ground clearance (requirement A.2+11, area of use: outdoor)

Definition	The free space between the ground and the underside of the electrically powered wheelchair, with the exception of the wheels and the axle unit.
Purpose of test requirement	The requirement is equivalent to the maximum obstacle that an electrically powered wheelchair must be able to negotiate indoors. The upper limit is also specified in EN 12184.
Test method	A measurement is taken of the smallest distance between the floor and the scooter/wheelchair between the front wheel(s) and the rear wheels. The seat is loaded with a weighted dummy for the measurement. The lowest value is recorded. The measurement is carried out according to figure 6.
Remark	In EN 12184 this is a combination of ground clearance and obstacle height.

Ground clearance (requirement A.2+8, area of use: indoor)

Definition	The free space between the ground and the underside of the electrically powered wheelchair, with the exception of the wheels and the axle unit.
Purpose of test requirement	The requirement is equivalent to the maximum obstacle that an electrically powered wheelchair must be able to negotiate indoors. The upper limit is also specified in EN 12184.
Test method	A measurement is taken of the smallest distance between the floor and the scooter/wheelchair between the front wheel(s) and the rear wheels. The seat is loaded with a weighted dummy for the measurement. The lowest value is recorded. The measurement is carried out according to figure 6.
Remark	In EN 12184 this is a combination of ground clearance and obstacle height.

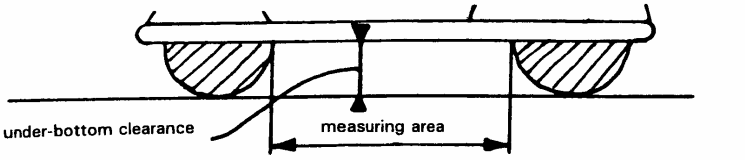

figure 6: ground clearance

Ground clearance (requirement A.2+9, hand propelled wheelchairs)

Definition	The free space between the wheels of the hand propelled wheelchair.
Purpose of test requirement	In conformity with EN 12183
Test method	The wheelchair is loaded with a weighted dummy. A measurement is taken of the distance between the floor and the lowest fixed part of the wheelchair with the exception of the anti-tipping device.

H

Handgrip width of brake lever (CGQ22)

Definition	The greatest distance which the hand must cover between the steering control unit and the brake lever..
Purpose of test requirement	In conformity with ISO and DIN this distance is required to be 90 mm at the most.
Test method	A measurement is taken of the distance at 25 mm from its extremity based on the position of the force measurement. - corresponds to the figures in the bicycle standard (ISO 4210) between points B and C - in the middle of the "handgrip part" of the brake lever.

Hand-operated variability at all times by user (VUh)

Definition	See: Variability/operability.

Handrim thickness (CGQ15)

Definition	The diameter of the tubing from which the handrim is made.
Purpose of test requirement	The basis for this is the minimum height of an (oval) handgrip.
Test method	A measurement is taken of the smallest diameter of the handrim.

Headrest

Definition	The presence of an element to support the head of the user.
Purpose of test requirement	For a tilt-in-space sitting unit with a considerable angle of tilt, the user's head needs to be capable of being adequately supported. A value of 10º has been experimentally determined.
Test method	Visual evaluation.

Headrest, type

Definition	There are different types of headrest: - type 1: a headrest that consists of an extended backrest or a support unit which is only adjustable in height - type 2: a headrest that consists of a separate detachable support unit. This headrest can be continuously adjusted in length and in depth by a therapist. Tilt-in-space VT. - type 3: a headrest that consists of a separate detachable support unit, VT in height. This headrest has an active-passive setting which is VU or automatically linked to the relevant sitting posture.

Height

Definition	The highest wheelchair size in working condition.
Purpose of test requirement	This value is based on the Road Traffic Act of 1994 (WVW) clause 5.10.6.c/5.11.6.c.

Height of tipping device (CGQ10)

Definition	The height from the top of the tipping device to the ground.
Purpose of test requirement	The basic assumption is made that an attendant can still operate with his or her heel on the ground, since some older attendants are not as well able to stand on one leg and exert a force with the other leg at the same time. A foot length of 2.5 percentile for a woman is assumed. It is assumed that the ball of the foot (= approx. 3/4 of the foot length) is supported on the tipping device and the foot is initially positioned at an angle of 45° against the tipping device.
Test method	A measurement is taken from the top of that part of the tipping device on which the foot is supported when tipping, to the floor.

Height variability See Seat Elevation

Holding force of parking brake (7.2 GQ2)

Definition	The force that a hand propelled wheelchair can withstand when the parking brake is engaged.
Purpose of test requirement	A holding force of 200 N guarantees sufficient blocking of the wheelchair including a load of 75 kg.
Test method	The reverse horizontal pulling force on the wheel axles is measured by means of a dynamometer. The wheelchair is loaded with a weighted dummy. The castor wheels are situated in a freewheel position.

Holding force of parking brake/automatic brake on the maximum negotiable slope (8.2.1+1)

Definition	The force that an electrically powered wheelchair can withstand when the parking brake or automatic brake is engaged.
Purpose of test requirement	An electrically powered wheelchair must be adequately held in a secure position on a maximum negotiable slope when the parking brake/automatic brake is engaged.
Test method	A measurement, up to a maximum of 15°, is taken of the slope on which the wheelchair remains stationary when held in a secure position by the parking brake/automatic brake. Measurements are taken uphill as well as downhill.

Horizontal pulling force on the pushing handles (CGQ9, A+B)

Definition	The maximum horizontal pulling force required on the pushing handles in order to be able to tip the wheelchair when loaded with a weighted dummy, with one foot supported at the same time on the tipping device.
Purpose of test requirement	The force which a P5 woman of 65 years or older is able to exert in the following position: with her weight suspended over the pushing handles at an angle of 30° with the body in a straight line. One foot is positioned on the floor, the other foot is positioned with the heel on the ground (as a result of moderate trunk balance) and with the front of the foot pushing on the tipping device.
Test method	The tipping device is blocked by a sloping surface (45°). The horizontal force necessary to raise the castor wheels from the ground is measured in the middle of the pushing handles/brackets. See figure 7.

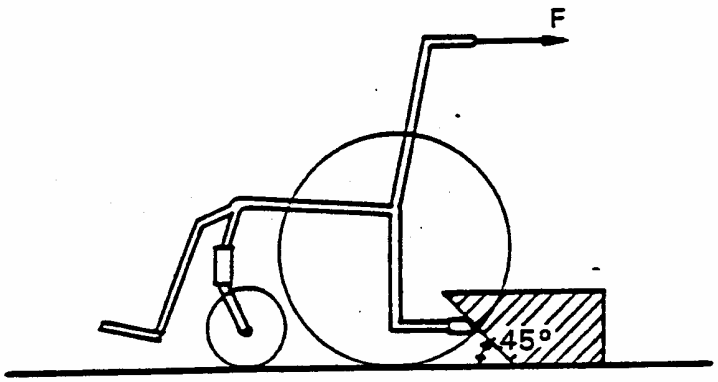

Figure 7: Horizontal pulling force on the pushing handles

I

Identifiability of battery charger

Definition	Easy identifiability of the make and type of battery charger used.
Purpose of test requirement	Because it is not possible to see from the exterior of the battery charger what its operation and make is, the aforementioned information is required to be specified on the battery charger for the purposes of the warranty and responsible.
Test method	Visual evaluation.

Identifiability of make of motor

Definition	The way in which the type of wheelchair's motor can be identified..
Purpose of test requirement	A nameplate stating the make and type will suffice in order to know what type of motor is used..
Test method	Visual evaluation.

Inconvenient protruding parts, transfer (A1.7+1)

Definition	The extent to which protruding parts above the seat can hinder transfer.
Purpose of test requirement	This value is determined experimentally.
Test method	The wheelchair is put into a position used for transfer by carrying out the necessary procedures: engaging the parking brake(s) and removing, lowering or folding away the armrest, clothing protector etc. A measurement is taken of the transfer height: the vertical distance measured perpendicular from the edge of the seat (side of seat) or the extension to this and the upper side of the protruding part when the seat is unoccupied.

Inconvenient protruding parts, walking space (CGQ7, A+B)

Definition	The presence of inconvenient protruding parts in the area used by the attendant behind the wheelchair.
Purpose of test requirement	The reason for this requirement is: - clothing and shoes can be entangled in protruding parts behind the wheelchair; - injury can be caused by these; - they can cause constant bumps and jolts whilst the wheelchair is being pushed.
Test method	Visual and, if necessary, experimental evaluation.

Indoor (see also: Area of use: indoor)

Definition	The wheelchair is used indoors. For electrically operated wheelchairs this means that specific requirements are laid down in the standards. In addition to 'indoor' there are other categories, i.e. indoor/outdoor and outdoor, for which specific requirements are made.

Indoor/outdoor (see also: Area of use: indoor/outdoor)

Definition	The wheelchair is used indoors and outdoors. For electrically operated wheelchairs this means that specific requirements are laid down in the standards. In addition to 'indoor/outdoor' there are other categories, i.e. indoor and outdoor, for which specific requirements are made.

Inflatability of pneumatic tyres

Definition	The possibility for the user of the attendant him or herself to inflate the pneumatic tyres, both front and rear, with one type of pump..
Purpose of test requirement	It is assumed that wheelchair tyres can be inflated using a suitable bicycle pump. One solution might be to supply a adapter valve. In this case it is easier for users if the adapter valve can remain on the valve during use. However, the adapter valve is required to be capable of staying permanently fitted and not be rendered unusable as a result of dirt and damp.
Test method	Experimental and visual evaluation. It is determined whether the adapter valve can remain connected to the valve when the wheelchair is in use, whether it has an integral valve and can be closed off in order to prevent any dirt from entering. in order to prevent any dirt. It is determined whether an suitable pump can be supplied for the valve..

Inscription and/or symbols on switches and equipment (10.3GQ1)

Definition	Inscription: a short text to signify the purpose of the switch and/or item of equipment; Symbol: an icon to signify the purpose of the switch or item and/or the equipment.
Purpose of test requirement	The purpose for which the switches and the equipment are used should be clear to see or it should be possible to deduce the purpose of the switch or equipment.
Test method	Visual and tactile evaluation.
Remark	Switch: all switches that the user has at his or her disposal to operate the wheelchair functions. Equipment: the reset fuse, the other fuse holders or fuse box and the operating lever on the motor decoupling unit.

L

Large wheels detachable (6.7GQ2)

Definition	The detachability or not of the large wheels of a wheelchair without requiring tools.
Purpose of test requirement	For wheelchairs with a fixed frame, after removal of the armrests and legrests, a relatively bulky and inconvenient entity remains for transport purposes even after the backrest has been folded. After the large wheels have been detached a more conveniently sized entity remains for placing on either the passenger seat or on the back seat by the user, or in the car boot by the attendant (depending on the size of the collapsed wheelchair).
Test method	Experimental evaluation.

Leg room (BGQ13)

Definition	The space available for stretching and supporting the legs on the plateau.
Purpose of test requirement	The size of 550 relates to the upper leg length. If the leg room is any more constricted the lower leg will not be able to be positioned at an angle of > 90° in relation to the upper leg.
Test method	For the scooter in its operational condition, a measurement is taken of the horizontal distance in the forward direction from the MRP (test reference point) to the furthest position on the plateau on which the feet can be placed. This position is determined by the furthest point of the plateau or the position at the furthest end of the plateau where it is 100 mm at its widest.

Legrest

Definition	The presence of a support element on which the legs and the feet can be supported.
Purpose of test requirement	The user's legs and feet are required to be supported adequately.
Test method	Visual evaluation.

Legrest type

Definition	Legrests are categorised into the following five types: - type 1: fixed, length NA, fixed/foldable footplate - type 2: fixed, length SA/VT, fixed/user-foldable footplate - type 3: removable/swivelling/user-foldable, length SA/VT, user-foldable footplate - type 4: removable/swivelling/foldable, length SA/VT, angle ß SA/VT, foldable footplate - type 5: removable/swivelling/user-foldable, length SA/VT, angle ß VU, user-foldable footplate.

Length

Definition	The longest dimension of the wheelchair when in working order.
Purpose of test requirement	the upper and lower limits are specified in EN 12183 and EN 12184.
Test method	Testing in conformity with ISO 7176-5.

Level of difficulty in positioning elements to be reattached by attendant or user (C+27, C+31, A+B)

Definition	The level of difficulty in positioning support elements intended for reattachment.
Purpose of test requirement	Difficult and/or accurate repositioning is understood to mean e.g. a positioning action that is not simple (repeatedly mistaking the front and rear end of an armrest so that an attempt is made to put the armrest on back to front) or a small pallet that needs to be positioned accurately in a hole.
Test method	Experimental evaluation.

Long term use

Definition	In the requirements, long term use is related a tilt-in-space sitting posture; see definition of Sitting posture.

Low voltage

Definition	The extent to which the battery charge satisfies low voltage guidelines.
Purpose of test requirement	Mandatory.
Test method	It is determined whether the battery charger meets the low voltage guidelines.

Lower leg support

Definition	The presence of a support element on which the lower leg can rest.
Purpose of test requirement	For tilt-in-space sitting postures, the lower legs of the user are required to be capable of being adequately supported.
Test method	Visual evaluation.

Lumbar region detached from the backrest (C+28, A+B)

Definition	This means that when carrying out an operation in the wheelchair, the user is detached from the backrest as far as the lumbar point (= about 2/3 of the back detached from the backrest.)

M

Manoeuvrability (requirement 7.5GQ1; 8.4GQ2, pushing handles)

Definition	The extent to which it is possible to carry out small movements of the wheelchair in any given direction in a controllable and fluent fashion in conformity with the commands of the user or attendant.
Purpose of test requirement	In order to determine the level of manoeuvrability, a measurement is taken of the force that is necessary on the pushing handles to turn the wheelchair through the mid-point of its turning radius and for changing direction of the wheelchair through 180º. The upper limit is based the fact that that a woman of 65 years is able to exert(reaction) force of 175 N with her arms by simply bending forwards at an angle of 30° (and being able to maintain her balance). The upper and lower limits are determined experimentally following modification of the test method.
Test method	The manoeuvrability of push chairs as well as self-propelling wheelchairs with handrims is determined in two ways: 1. By determining the force required to turn the wheelchair through the mid-point of its turning radius (rotation of the castor wheels in another direction of travel); 2. By determining the force required to change the direction of travel of the wheelchair from a stationary position (likewise rotation of the castor wheels in another direction of travel).

1. Rotation through the turning radius

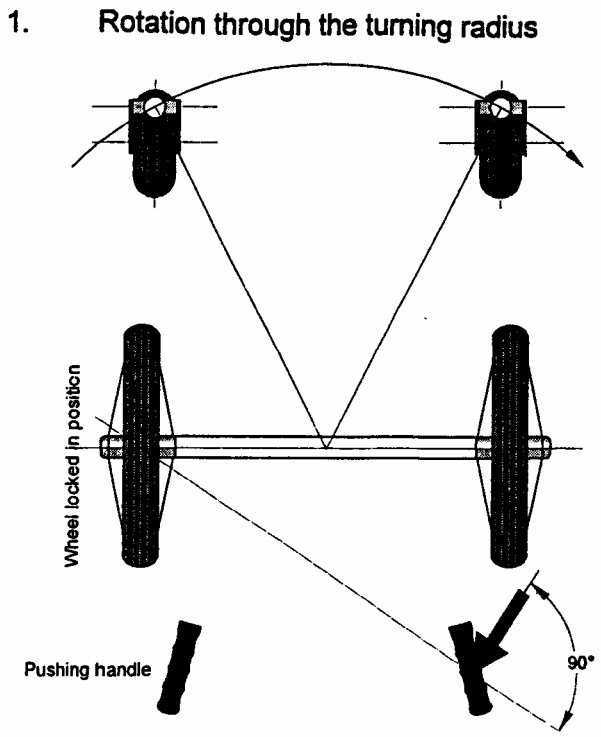

figure 8: Rotation through the turning radius for push chairs

Prior to testing, the wheelchair is required to be set to the position illustrated in the drawing (see figure 8). One of the wheels is also locked into position using the parking brake. An increasing level of force (F) is then applied to the pushing handle on the opposite side to the locked wheel. The gripping point is determined by drawing an imaginary line between the axle of the locked wheel and the centre of the opposite handle. The force is applied perpendicularly to this line.
The maximum force which is attained is recorded when the wheelchair begins to turn on its axis and when the castor wheels are roughly parallel with the turning radius.
The test is required to be carried out 3 times. The lowest recorded value is considered to be the approval value and needs to be checked with the testing requirement.

2. Changing direction through 180º

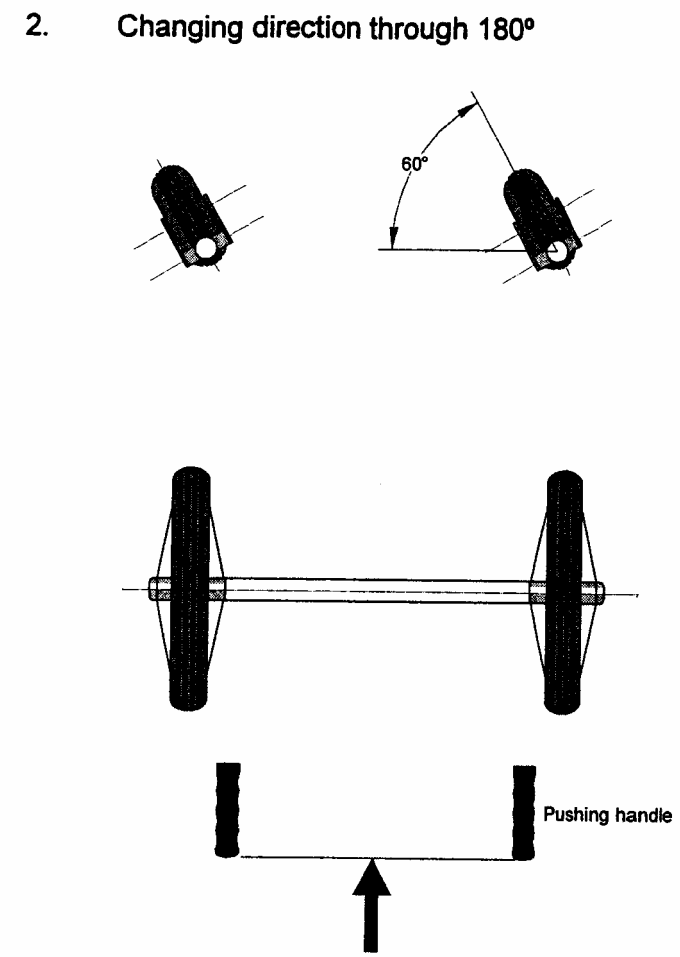

figure 9: Changing direction for push chairs

Prior to testing, the wheelchair is required to be set to the position illustrated in the drawing (see figure 9). An increasing level of force (F) is then applied near the pushing handle in the middle and the extension to the wheelchair until the direction of the wheelchair (the subsequent position of the castor wheels) has turned through 180º.
The test is required to be carried out 3 times. The lowest recorded value is considered to be the approval value and needs to be checked with the testing requirement.

Manoeuvrability (requirement 7.5GQ2, self-propelling transit, active pushing/self-propelling, semi-active)

Definition	The extent to which it is possible to carry out small movements of the wheelchair in any given direction in a controllable and fluent fashion in conformity with the commands of the user or attendant.
Purpose of test requirement	A measurement is taken of the force required to turn the wheelchair by the handrims through the mid-point of its turning radius and to rotate it through 180º. The upper and lower limits are determined experimentally.
Test method	The manoeuvrability for self-propelling wheelchairs is determined in two ways: 1. By determining the force required to turn the wheelchair through the mid-point of its turning radius (rotation of the castor wheels in another direction of travel); 2. By determining the force required to change the direction of travel of the wheelchair from a stationary position (likewise rotation of the castor wheels in another direction of travel).

1. Rotation through the turning radius

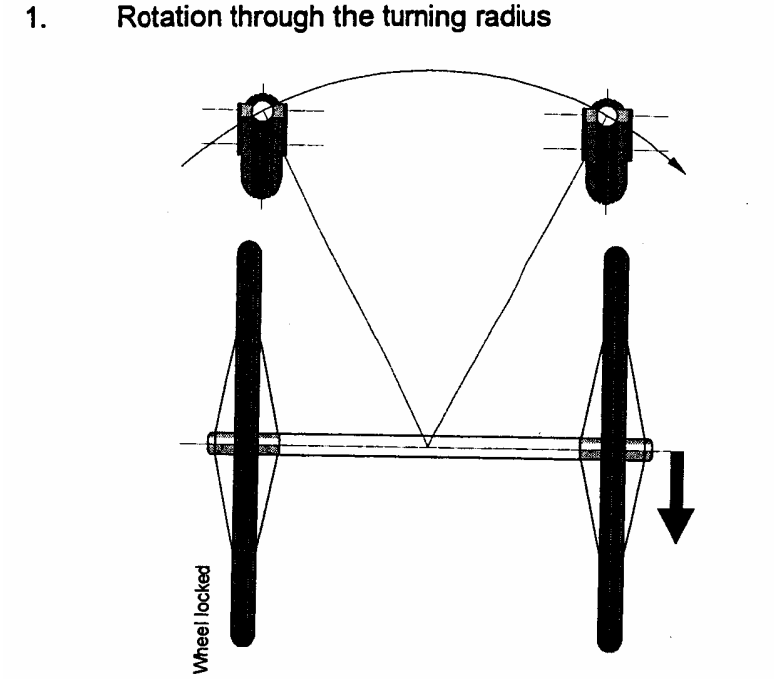

figure 10: Rotation through turning radius for self propelled wheelchairs

Prior to testing, the wheelchair is required to be set to the position illustrated in the drawing (see figure 10). One of the wheels is also locked into position using the parking brake.
An increasing level of force (F) is then applied to the handrim of the wheel that is not locked in a forward direction and at right angle to the handrim radius.
The maximum force which is attained is recorded when the wheelchair begins to turn on its axis and when the castor wheels are roughly parallel with the turning radius.
The test is required to be carried out three times. The lowest recorded value is considered to be the approval value and needs to be checked with the testing requirement.

2. Changing direction through 180º

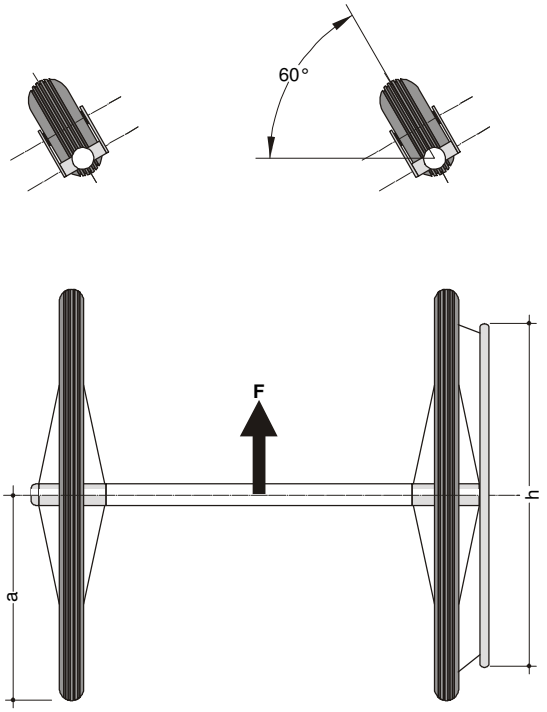

figure 11: changing direction for self propelled wheelchairs

Prior to testing, the wheelchair is required to be set to the position illustrated in the drawing (see figure 11). An increasing level of force (F) is then applied near the rear axle of the wheelchair until the direction of the wheelchair (the subsequent position of the castor wheels) has turned through 180º.
The test is required to be carried out 3 times. The lowest recorded value is multiplied by the factor a/h (radius of the drive wheel divided by the vertical distance from the top of the handrim to the ground).
The outcome of this is considered to be the approval value and needs to be checked with the testing requirement.

Manoeuvrability (requirement 7.5GQ3, self-propelling active self-propelling)

Definition	The extent to which it is possible to carry out small movements of the wheelchair in any given direction in a controllable and fluent fashion in conformity with the commands of the user or attendant.
Purpose of test requirement	A measurement is taken of the force required to turn the wheelchair by the handrims through the mid-point of its turning radius and to rotate it through 180º. The force on the handrims (≤ 45 N) is determined experimentally.
Test method	The manoeuvrability for self-propelling wheelchairs is determined in two ways: 1. By determining the force required to turn the wheelchair through the mid-point of its turning radius (rotation of the castor wheels in another direction of travel); 2. By determining the force required to change the direction of travel of the wheelchair from a stationary position (likewise rotation of the castor wheels in another direction of travel). 1. Rotation through the turning radius Prior to testing, the wheelchair is required to be set to the position illustrated in the drawing (see figure 10). One of the wheels is also locked into position using the parking brake. An increasing level of force (F) is then applied to the handrim of the wheel that is not locked in a forward direction and at right angle to the handrim radius. The maximum force which is attained is recorded when the wheelchair begins to turn on its axis and when the castor wheels are roughly parallel with the turning radius. The test is required to be carried out 3 times. The lowest recorded value is considered to be the approval value and needs to be checked with the testing requirement. 2. Changing direction through 180º Prior to testing, the wheelchair is required to be set to the position illustrated in the drawing (see figure 11). An increasing level of force (F) is then applied near the rear axle of the wheelchair until the direction of the wheelchair (the subsequent position of the castor wheels) has turned through 180º. The test is required to be carried out 3 times. The lowest recorded value is multiplied by the factor a/h (radius of the drive wheel divided by the vertical distance from the top of the handrim to the ground). The outcome of this is considered to be the approval value and needs to be checked with the testing requirement.

Manoeuvrability (requirement 8.4GQ1, electrically powered wheelchairs)

Definition	The extent to which it is possible to carry out small movements of the wheelchair in any given direction in a controllable and fluent fashion in conformity with the commands of the user or attendant.
Purpose of test requirement	In order to determine the level of manoeuvrability no objective test method has yet been drawn up. However, it is possible to determine the least acceptable situation experimentally.
Test method	Experimental evaluation. Particular consideration is given to unsteady driving at low speeds and poorly controllable movements.

Marking of freewheel setting (CGQ37)

Definition	The way in which the freewheel setting is constructed.
Purpose of test requirement	Only two freewheel positions are important: 1) with freewheel mode engaged and 2) without freewheel mode engaged. The possibility of (unintentionally) putting the freewheel setting into an intermediary mode causes confusion and can even be inconvenient when, after a period of time, the freewheel mode shifts to one of the two intended settings.
Test method	Visual and experimental evaluation.

Marking of tyres

Definition	The possibility that the material used for the tyres of the wheelchair is capable of leaving marks when driven and negotiated through the house.
Purpose of test requirement	Tyres that give off markings on the floor in the house are exceptionally inconvenient. It is often no longer possible to remove these marks from the floor covering.
Test method	It is determined whether the manufacturer provide a statement that the tyres do not leave any markings.

Mass of heaviest part, for transport by attendant behind car seat/in car boot

Definition	The weight of the heaviest remaining part of the wheelchair when it has been reduced in size for transportation purposes.
Purpose of test requirement	It is assumed that the attendant puts the wheelchair in the car. The upper limit is based on the weight that a 65 year old physically able woman can lift from the ground to waist height.
Test method	The frame and all parts of the wheelchair which are removed from the wheelchair when it is reduced in size are weighed separately. The weight of the heaviest part is recorded.

Mass of heaviest part, for transport by user behind car seat

Definition	The weight of the heaviest remaining part of the wheelchair when it has been reduced in size for transportation purposes.
Purpose of test requirement	After reducing the width of the wheelchair this is pulled into the car over the sill of the passenger's side of the car. At that moment the wheelchair is supported on its large wheels. The requirement is based on the test results of wheelchair availability. In doing so, the assumption is also made that the disabled user will be able to exert less lifting and pulling force from his sitting position than an physically able attendant.
Test method	The frame and all parts of the wheelchair which are removed from the wheelchair when it is reduced in size are weighed separately. The weight of the heaviest part is recorded.

Mass of heaviest part, for transport by user on/behind car seat

Definition	The weight of the heaviest remaining part of the wheelchair when it has been reduced in size for transportation purposes.
Purpose of test requirement	After disassembling the wheelchair this is pulled into the car over the sill of the passenger's side of the car. The requirement is based on the test results of wheelchair availability. In doing so, the assumption is also made that the disabled user will be able to exert less lifting and pulling force from his sitting position than an physically able attendant.
Test method	The frame and all parts of the wheelchair which are removed from the wheelchair when it is reduced in size are weighed separately. The weight of the heaviest part is recorded.

Mass of part to be detached, for electrical propulsion

Definition	The weight of the parts of the wheelchair which are detached for transportation purposes.
Purpose of test requirement	The upper limit is based on the vale that Burandt indicates for lifting a weight with both hands from 20 cm to 60 cm (waist height) by a 65 year old woman: 0.4 x 600 = 240 N. It is assumed that this occurs occasionally, in which case an upper limit of 24 kg is acceptable.
Test method	All parts which can be detached from the wheelchair for the purpose of reducing the size of the wheelchair for transportation are weighed separately. The weight of the heaviest part is recorded.

Maximum obstacle forwards (requirement 8.4.1+1, area of use: indoor)

Definition	The maximum obstacle which can be negotiated by an electrically powered wheelchair in a forward direction.
Purpose of test requirement	In general, door sills are the highest obstacles which occur in the home. The Accessibility Manual assumes that door sills have a maximum height of 20 mm. In actual fact it possible for door sills to be higher than this e.g. from the house into the garden, but these are not quite high enough to render a ramp (or plank) necessary. EN 12184 specifies 15 mm, however this is too low.
Test method	Testing in conformity with ISO 7176-10

Maximum obstacle forwards (requirement 8.4.1+2, area of use: indoor/outdoor)

Definition	The maximum obstacle which can be negotiated by an electrically powered wheelchair in a forward direction.
Purpose of test requirement	On the basis of test results amongst wheelchairs available it has been determined that electrically powered wheelchairs for indoor/outdoor use should be able to negotiate an obstacle of 60 mm in a forward direction. Obstacles of such magnitude will only occur outdoors and shop door sills. EN 12184 specifies 50 mm as the requirement.

Maximum speed downhill

Definition	The maximum downhill speed that a wheelchair can attain.
Purpose of test requirement	In conformity with EN 12184.
Test method	The wheelchair is placed on a treadmill and horizontal power sensors are attached. The wheelchair is set to its maximum speed and the treadmill likewise set in motion. The speed is determined at which the sensors determine a force (maximum speed of wheelchair + treadmill speed) or the test is carried out on a slope by means of another validated test method.

Maximum speed limiter

Definition	The way in which the maximum speed can be limited.
Purpose of test requirement	This requirement is has been stipulated as a replacement for the old requirements with respect to maximum speed.
Test method	Visual and experimental evaluation.

Maximum speed regulator

Definition	The number of settings to which the maximum speed can be adjusted.
Purpose of test requirement	This requirement has been implemented to replace the old requirements with respect to maximum speed.
Test method	Visual and experimental evaluation.

Maximum unevenness (requirement 8.4GQ7, area of use: indoor and indoor/outdoor)

Definition	The unevenness which the wheelchair with one wheel can negotiate without any of the other wheels coming off the ground.
Purpose of test requirement	A test drive showed that obstacles of 30 mm regularly occur outdoors.
Test method	One (castor) wheel is raised at increments of 10 mm and a measurement is taken of the moment at which the second wheel is raised from the ground. The measurement is carried out with the wheelchair in the forward position.

Maximum unevenness (requirement 8.4GQ8, area of use: outdoor)

Definition	The unevenness which the wheelchair with one wheel can negotiate without any of the other wheels coming off the ground.
Purpose of test requirement	An electrically powered wheelchair specifically intended for outdoor use must be able to negotiate obstacles and pot-holes of 5 cm, which occur regularly outdoors.
Test method	One (castor) wheel is raised at increments of 10 mm and a measurement is taken of the moment at which the second wheel is raised from the ground. The measurement is carried out with the wheelchair in the forward position.

Measurement of force

Test method	When testing, the dynamometer is required to be positioned parallel to the direction of operation and on the middle of the push button, or, if no button is present, at a distance of 2.5 cm from the end of the operating lever. The (maximum) ensuing operating force is measured and recorded with the force being increased as slowly as possible. The test is carried out three times. The lowest value of the 3 is regarded as being the approval value. The operating force of turning knobs are measured using a torque meter. Using an aid the torque meter is positioned concentrically on the knob using an aid. The (maximum) ensuing operating force is measured and recorded with the force being increased as slowly as possible. The test is carried out three times. The lowest value of the 3 is regarded as being the approval value.

Measuring device

Definition	A simulation in the shape and size of the human form for measuring sitting postures in a wheelchair (Reference Loader Gauge in conformity with ISO 7176/7).

Mechanical functioning for removal and replacement of armrests/legrests by attendant (C+26)

Definition	The mechanical functioning of the release mechanism, removal, replacement and locking of the armrests/legrests.
Purpose of test requirement	Apparent poor functioning is understood to mean crossing, blocking, etc. in such a fashion that the action can be carried out only with great difficulty.
Test method	Experimental evaluation.

Mechanical functioning for removal and replacement of armrests/legrests by user (C+30)

Definition	The mechanical functioning of the release mechanism, removal, replacement and locking of the armrests/legrests.
Purpose of test requirement	Apparent poor functioning is understood to mean crossing, blocking, etc. in such a fashion that the action can be carried out only with great difficulty.
Test method	Experimental evaluation.
Remark	For scooters this requirement relates only to the removal, folding, swivelling, etc. of armrests.

Mechanical functioning of variable setting for φ (C+29)

Definition	The extent to which the sitting posture can be varied.
Purpose of test requirement	If the sitting posture can hardly or cannot be adjusted as a result of the mechanical functioning, the wheelchair is rejected.
Test method	Experimental evaluation.

Mechanical functioning of variable setting for α (C+26)

Definition	The extent to which the sitting posture can be varied.
Purpose of test requirement	If the sitting posture can hardly or cannot be adjusted as a result of the mechanical functioning, the wheelchair is rejected.
Test method	Experimental evaluation.

Minimum negotiable slope in neutral sitting posture (requirement 8.4GQ10, area of use: indoor/indoor and outdoor)

Definition	The slope which the electrically powered wheelchair must be able to negotiate without any unacceptable loss of speed.
Purpose of test requirement	For electrically powered wheelchairs/scooters also used for outdoor purposes gradients of 1:6 (= 9.5º) are assumed. These slopes occur for example on the public highway, such as on approaches to bridges.
Test method	The angle of the slope on which the wheelchair/scooter, when loaded with a dummy with the joystick fully extended can still maintain a speed of v=0.5 m.p.s. For practical reasons the slope must be measured up to a maximum of 15°. A slope of more than 15° is considered to be unsafe in connection with the stability.

Minimum negotiable slope in neutral sitting posture (requirement 8.4GQ9, area of use, indoor)

Definition	The slope which the electrically powered wheelchair must be able to negotiate without any unacceptable loss of speed.
Purpose of test requirement	The Accessibility Manual assumes a gradient of 1:10 (= 5.7°). The electrically powered wheelchair for indoor use must be able to negotiate this slope.
Test method	The angle of the slope on which the wheelchair/scooter, when loaded with a dummy with the joystick fully extended can still maintain a speed of v=0.5 m.p.s. For practical reasons the slope must be measured up to a maximum of 15°. A slope of more than 15° is considered to be unsafe in connection with the stability.

Minimum seat height, in highest position

Definition	Distance between the upper side of the seat and the floor, when the seat is set to its highest position.
Purpose of test requirement	The ideal height is one which a standing person can reach. A minimum seat height of 770 mm from the floor is based on the leg length of a P50 woman.
Test method	The weighted dummy is positioned in the wheelchair. A measurement of the distance from the upper side of the seat to the floor is taken.

Moisture resistance of control panel

Definition	The extent to which the control panel is resistant to moisture.
Purpose of test requirement	In the event of temperature fluctuations, any moisture in the control panel will lead to condensation. This may not occur to such an extent that the display panel is no longer legible.
Test method	It is determined whether the manufacturer has issued a statement specified that this requirement has been satisfied.
Remark	In ISO 7176-14 this subject is mentioned. In a new version of ISO 7176-9, which will appear in 1998, this item will be included. At the moment a decision is pending on whether this requirement can be done away with, since it is covered by requirement 8.7.1.

Mounting height (A1.7GQ4)

Definition	The height from the plateau to the ground at the position where the feet mount the plateau or the height to which the feet must be raised to be put on the plateau.
Purpose of test requirement	The mounting height should be as low as possible so that the user can turn round from his sitting position in one flowing movement. This height is nevertheless a compromise between the ideal mounting height and the ground clearance.
Test method	The mounting height is measured in an area from 0 to 150 mm in front of the back edge of the plateau, or the front side of the seat (if decisive), measured in a forward driving position in an area between 0 and 100 mm from the side of the plat-form in the transverse direction. The highest point of the plateau is measured. The seat is not loaded when testing is carried out.

N

Non-adjustable (NA)

Definition	See: Variability/ operability

O

Obstacle height (requirement A.2+12, area of use: indoor/outdoor)

Definition	The clearance between the ground and the underside of the electrically powered wheelchair at the level of the axle construction adjacent to the wheels.
Purpose of test requirement	This requirement is related to the thickness of a paving stone which may protrude above the level of the pavement. This requirement stipulates that an electrically powered wheelchair must be able to negotiate vehicle access ramps with a rim height of approx. 50 mm.
Test method	A measurement is taken of the smallest distance between the ground and the underside adjacent to the wheel(s) in the direction of the axle (wheels in forward position), where a measurement is taken in an area that is determined in one direction by placing an angle of 30° against the wheel, in the other direction by the width of part of the wheel protruding under the base. The seat is loaded with a weighted dummy for the test. The lowest value is recorded. Testing is performed in conformity with figure 12.
Remark	In EN 12184, a combination of ground clearance and obstacle height.

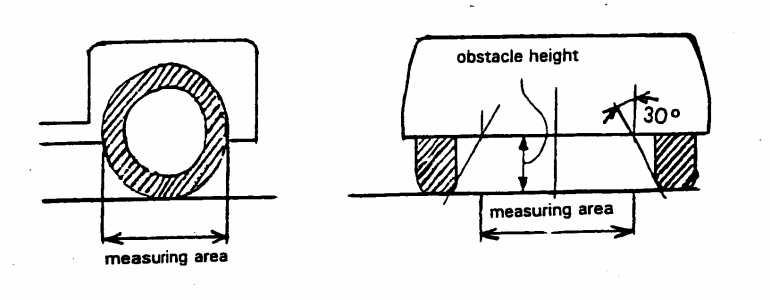

figure 12: Obstacle height

Obstacle height (requirement A.2+13, area of use: outdoors)

Definition	The clearance between the ground and the underside of the electrically powered wheelchair at the level of the axle construction adjacent to the wheels.
Purpose of test requirement	Electrically powered wheelchair for outdoor use can attain the same speeds as cyclists on a cycleway or on the road. The requirement is related to the thickness of a paving block which may protrude above the road surface.
Test method	A measurement is taken of the smallest distance between the ground and the underside adjacent to the wheel(s) in the direction of the axle (wheels in forward position), where a measurement is taken in an area that is determined in one direction by placing an angle of 30° against the wheel, in the other direction by the width of part of the wheel protruding under the base. The seat is loaded with a weighted dummy for the test. The lowest value is recorded. Testing is performed in conformity with figure 12.
Remark	In EN 12184, a combination of ground clearance and obstacle height.

Operability of angle φ by attendant (T)

Definition	The way in which the tilt-in-space angle is varied.
Purpose of test requirement	Possible situations may arise (e.g. in the case of mentally disabled users) where the sitting posture cannot be varied by the user but by the attendant.
Test method	Visual evaluation.

Operability of angle φ by user (U)

Definition	The way in which the tilt-in-space angle is varied.
Purpose of test requirement	Apart from in a few exceptional circumstances, the user him or herself must be able to operate the variable sitting posture setting.
Test method	Visual evaluation.

Operating force for brake lever (7.2GQ3)

Definition	The force which is necessary to activate the control device.
Purpose of test requirement	In conformity with EN 12184. 60 N is the force which a 60 year old woman can summon. The requirement also applies to service brakes on push chairs.
Test method	Testing in compliance with EN 12183/ EN 12184

Operating force for controls on electrically powered push chairs (C+9)

Definition	The force which is required to operate the control unit on electrically powered push chairs.
Purpose of test requirement	The same basis is applied to these forces as to those for hand operated electronic controls. However, the maximum value has been altered since handgrip levers also apply to the regulation.
Test method	See measuring forces.

Operating force for deceleration (service brake) (C+13)

Definition	The force which is necessary to activate the control device.
Purpose of test requirement	According to Kodak, 1983, the maximum force that can be exerted by a sitting person is equivalent to moving a 9N lever-mechanism forwards and backwards with one finger. When pressing a button, which involves use of the whole hand, a maximum force of 13.5 N (= 9 N + 50%) is assumed.
Test method	See measuring forces.

Operating force for hand operated electronic controls (C+5)

Definition	The force which is necessary to position and hold the hand operated electronic controls (joystick) in the maximum forward or backward settings.
Purpose of test requirement	According to Kodak, 1983, the maximum force that can be exerted by a sitting person is equivalent to moving a 9N lever-mechanism forwards and backwards with one finger. On the basis of the fact that a joystick is usually operated by at least two fingers, the maximum value has been set at 13.5 N (= 9 N + 50%).
Test method	Measurements are taken for forward and backward settings at the greatest force. See measuring forces.

Operating force for service brake button/switch (C+12)

Definition	The force which is necessary to activate the control device.
Purpose of test requirement	According to Kodak, 1983, the maximum force that can be exerted by a sitting person is equivalent to moving a 9N lever-mechanism forwards and backwards with one finger. When pressing a button, which involves use of the whole hand, a maximum force of 13.5 N (= 9 N + 50%) is assumed.
Test method	See measuring force.

Operating force of variable setting for α VUh/VT (C+23, A+B)

Definition	The force which is necessary to activate the control device.
Purpose of test requirement	The basis for the operating force is the pushing and pulling force and the turning moment which a 65 year old woman with a normal healthy working hand/arm can summon at the side of the body at waist height for a prolonged period (Burandt: 0.6 x 100N).
Test method	See measuring forces.

Operating force of variable setting for α Vum (C+22, B)

Definition	The force which is necessary to activate the control device.
Purpose of test	According to Kodak, the maximum resistance that a push

requirement	button may have is 11 N. For the test requirement a maximum value of 13.5 N has been selected for the time being.
Test method	See measuring forces.

Operating force of variable setting for φ VUh/VT (C+20, A+B)

Definition	The force which is necessary to activate the control device.
Purpose of test requirement	The basis for the operating force is the pushing and pulling force and the turning moment which a 65 year old woman with a normal healthy working hand/arm can summon at the side of the body at waist height for a prolonged period (Burandt: 0.6 x 100N).
Test method	See measuring forces.

Operating force of variable setting for φ VUm (C+21, A; C+19, B)

Definition	The force which is necessary to activate the control device.
Purpose of test requirement	According to Kodak, the maximum resistance that a push button may have is 11 N. For the test requirement a maximum value of 13.5 N has been selected for the time being.
Test method	See measuring forces.

Operation of freewheel setting (8.4GQ23)

Definition	The way in which freewheel setting is operated (technically).
Purpose of test requirement	The freewheel setting is used when the wheelchair's motor has been switched off, the current has been cut off, but the wheelchair nevertheless needs to be moved.
Test method	Experimental evaluation.

Operation of seat elevation mechanism

Definition	The way in which the height of the seat can be varied.
Purpose of test requirement	Because of the various activities that the user needs to carry out, the adjustment is required to be possible at all times. The majority of users will be able to make the adjustment by hand.
Test method	Visual and experimental evaluation

Operation of seat rotation mechanism

Definition	The way in which the seat rotation can be varied.
Purpose of test requirement	Because of the various activities that the user needs to carry out, the adjustment is required to be possible at all times. The majority of users will be able to make the adjustment by hand.
Test method	Visual evaluation.

Outdoor (see also: Area of use: outdoor)

Definition	The wheelchair is used outdoors. For electrically powered wheelchairs this means that specific requirements are laid down in the standards. In addition to 'outdoor' there are other categories, i.e. indoor and indoor/outdoor, for which specific requirements are made.

Overall wheelchair

Definition	The requirements with respect to functionality in the general sense.
Purpose of test requirement	The examples are based on experiences of testing wheelchairs.
Test method	Visual and experimental evaluation.

P

Position of anti-tipping device

Definition	The way in which the anti-tipping device is attached in connection with negotiation of curbs.
Purpose of test requirement	In conformity with EN 12183.
Test method	≥ 120 mm: the wheelchair is tipped backwards until it is checked. It is determined whether the distance between the underside of the front wheels and the ground is ≥ 120 mm. ≤ 120 mm: visual evaluation: the anti-tipping device is required to be fitted with small wheels.

Position of castor stem housing on castor wheel

Definition	The way in which the castor stem housing has been constructed to guarantee proper functioning of the castor wheel.
Purpose of test requirement	In order to manoeuvre the wheelchair properly in all directions, it is not possible to permit any extra resistance by means of incorrect castor wheel construction. If a number of axle positions can be selected on the wheelchair or different wheel diameters are possible, the position of the castor wheel needs to be adjusted accordingly.
Test method	The angle of the castor stem housing is measured.

Position of controls for electrically powered push chair

Definition	The distance between the floor and the control unit on the electrically powered push chair.
Purpose of test requirement	In conformity with EN 12184. The elbow height of a P5 woman + the heel height (lower limit) and of a P95 man + heel height (maximum limit) is assumed
Test method	A measurement is taken perpendicularly of the height perpendicularly from the floor to the centre of the control unit for regulating speed.

Position of direction indicators

Definition	The position of the direction indicators in connection with visibility in traffic.
Purpose of test requirement	In conformity with EN 12184.
Test method	A measurement is taken of the height of the upper and lower sides of the direction indicators to the floor. A measurement is taken of the distance between the sides of the direction indicators and the front and rear side of the wheelchair.

Position of electronics (A4.2+2)

Definition	The position of the electronics on the wheelchair.
Purpose of test requirement	The less vulnerably the electronics are positioned, the smaller the risk they will unintentionally come into contact with other parts of the wheelchair or with the surroundings, thus causing possible malfunctioning. The requirement is also specified in EN 12184.
Test method	Visual evaluation.

Position of hand-operated electronic controls

Definition	The distance from the hand operated electronic control (joystick) to the test reference point.
Purpose of test requirement	The wheelchair user must be able to operate the joystick with his or her back against the backrest and with the forearm supported on the armrest. The elbow gripping length of a P50 woman and a P95 man is assumed, taking into account that the arm cannot be fully stretched given that it is supported on the armrest.
Test method	A measurement is taken of the horizontal distance between the centre line of the joystick and the test reference point (MRP) ISO 7176 part 7. The joystick is situated in its neutral position for this purpose.

Position of lighting

Definition	The position of the lighting in connection with visibility in traffic.
Purpose of test requirement	In conformity with EN 12184.
Test method	A measurement is taken of the height of the upper and lower sides of the lighting to the floor.

Possibility of driving after reduction in height, disassembly or reduction in width

Definition	The possibility to drive the remaining part of the frame after a reduction in size (height reduction/disassembly/width reduction) in order to facilitate transfer of the wheelchair to a means of transport.
Purpose of test requirement	A electrically powered scooter is too heavy to lift into a car. For this reason, it can be transferred by means of a vehicle access ramp after reducing it in size and is therefore required to be capable of being driven. This can be done by means of the electric motor, via the controls with the steering control unit, or by pushing once the freewheel setting has been engaged.
Test method	Experimental evaluation.

Possibility of driving after reduction in width/height

Definition	The possibility to drive the remaining part of the frame after a reduction in size (width/height reduction) in order to facilitate transfer of the wheelchair to a means of transport.
Purpose of test requirement	Not only is transfer into a car facilitated, but also manoeuvrability of the wheelchair in order to reduce it in size.
Test method	Experimental evaluation.

Power-assisted variability at all times by user (VUm)

Definition	See: Variability/operability.

Presence of adjustment facility for seat unit in relation to wheelbase

Definition	The presence of an adjustment facility for the seat unit in relation to the wheelchair's wheelbase.
Purpose of test requirement	With the aid of the adjustment facility for the seat unit in relation to the wheelbase it is possible to optimise the correlation between the user's centre of gravity and his/her driving ability.
Test method	It is determined whether the large wheels can be repositioned horizontally in relation to the occupant's centre of gravity (the area immediately in front of the backrest).

Presence of direct mechanical steering

Definition	The presence of steering controls operated by means of a mechanical transmission on the front wheels without electrical power assistance.
Purpose of test requirement	For testing, an electrically powered scooter with direct mechanical steering is assumed.
Test method	Visual evaluation.

Presence of direction indicators

Definition	The presence or not of direction indicators.
Purpose of test requirement	Direction indicators are essential for electrically powered wheelchairs and scooter for use outdoors, since the vehicle can be used on the public highway and the user is often unable to indicate the direction of travel using the hand or arm.
Test method	Visual evaluation.

Presence of freewheel setting (CGQ38)

Definition	The presence of a device to break the connection between the drive wheel and the motor, so that the wheelchair can be pushed by an attendant.
Purpose of test requirement	In some situations it may be preferable to have the wheelchair moved by the attendant, for example, when the battery is empty or the wheelchair has been switched off.
Test method	Visual evaluation of its presence

Presence of functions on the control panel

Definition	The presence of control switches on the control panel with which the various functions with respect to the wheelchair can be switched on and off, regulated and/or monitored.
Purpose of test requirement	From an ergonomic point of view, the aforementioned control switches are required to be grouped together so that the wheelchair can be operated by the user using one and the same hand from a seated position. An indication of the charging status is specified in EN 12184.
Test method	The presence of the said control switches by means of a visual evaluation.

Presence of hand operated electronic controls (CGQ2)

Definition	The presence of a hand-operated control unit with which the user can control the wheelchair electronically.
Purpose of test requirement	For testing, an electrically powered wheelchair with hand-operated controls (joystick controls) is assumed.
Test method	Visual evaluation.

Presence of lighting

Definition	The presence or not of lighting on an electrically powered wheelchair or scooter.
Purpose of test requirement	For wheelchairs for outdoor use which use cycleways or the public highway, the same rules apply as for bicycles and mopeds.
Test method	Visual evaluation.

Presence of lighting connections

Definition	The presence or not of (connections for) lighting on an electrically powered wheelchair or scooter.
Purpose of test requirement	If the user wishes or needs to use the wheelchair on a cycleway or the public highway, lighting equipment should be easy to attach.
Test method	Visual evaluation.

Presence of pushing handles

Definition	The presence of a handgrip or handgrips (protruding parts) which enable the attendant to take hold of and push and steer the wheelchair.
Purpose of test requirement	A good means of pushing is essential for the attendant.
Test method	Visual evaluation.

Presence of rear reflector

Definition	The presence or not of a rear reflector.
Purpose of test requirement	In conformity with the Road Traffic Act of 1994 (WVW), which assumes that electrically powered wheelchairs for outdoor use will be used on a cycleway or on the public highway.
Test method	Visual evaluation

Presence of steering/control panel

Definition	The identifiability of specific wheelchairs functions for the user.
Purpose of test requirement	From an ergonomic point of view the aforementioned operating switches are all required to be present on the control panel, operable by the user using one and the same hand when sitting in the wheelchair. The buttons/switches are required to be fitted with an identifiable indication of their function.
Test method	Visual evaluation.

Proportions of dimensions

Definition	The size-ratios of the dimensions of the support elements of one wheelchair.

Propulsion + steering: electrical propulsion and electronic steering

Definition	Propulsion is carried out electrically, steering electronically by separa-tely controlling the propulsi-on coupling unit (coupling steering) of the motors on the drive wheels.

Propulsion + steering: electrical propulsion, mechanical steering

Definition	Propulsion is carried out with the aid of an electro-motor, the steering is controlled by means of mechanical transmission without any electrical power assistance.

Propulsion + steering: non-power assisted steering

Definition	Propulsion and steering are carried out by means of pushing by an attendant.

Propulsion + steering: power-assisted pushing

Definition	The pushing force required by the attendant is substituted or supplemented by an (electrically powered) motor. The attendant operates the steering (mechanically) as well as the speed.

Propulsion + steering: two-sided, front handrim, centre or rear

Definition	Propulsion and steering using both hands without any transmission mechanism. In practice this means a handrim fixed to the drive wheel with three possible positions in relation to the frame: to the front, in the centre or to the rear.

Protection device for hand-operated electronic controls

Definition	
Purpose of test requirement	The extent to which the hand operated electronic control unit is protected against unintentional movements of the wheelchair.
Purpose of test requirement	This requirement is based on experience of safety aspects.
Test method	It is determined whether the hand operated electronic control unit can be unintentionally activated when approaching a table or adjusting the sitting posture whilst the control unit is positioned under a flat tabletop.

Pushing force (7.5.1+1)

Definition	The force which is necessary to set and maintain the wheelchair in motion.
Purpose of test requirement	The test requirement is based on the test results for the pushing force of active wheelchairs. The basis for this is that pushing force (in this case driving force) must be as low as possible so that the wheelchair can move the wheelchair with a minimum of effort.
Test method	In conformity with EN 12183: 7.5.2.

Pushing handle height (C+1)

Definition	The distance between the ground and the pushing handle or push bar or bracket.
Purpose of test requirement	In conformity with EN 12183 and EN 12184. The correct pushing handle height for the attendant means that the wheelchair is pushed with a straight back and relaxed shoulders. The force exerted by the hands is at waist height, which means that the elbows are angled at approx. 95-100°. The aforementioned values are based on the elbow height of a P5 woman + heel height (lower limit) and of a P95 man + heel height (upper limit). It is assumed that the wheelchair is pushed at elbow height (= waist height).
Test method	The height is measured from the floor to the mid-point of the pushing handle, to the centre of the horizontal push bar or to the vertical push bracket and to the highest point of the right hand part minus 50 mm (= half hand width).

Q

Quality of bearings (7.6GQ3, 8.4GQ19)

Definition	The quality of the bearings and the ball head.
Purpose of test requirement	Poor quality bearings will mean that extra energy will be expended in controlling the wheelchair. Any dirt and dust that gets into open bearings will also lead to more difficult conditions of use.
Test method	Visual evaluation.

Quality of suspension points for support elements (7.1GQ2, 8.4GQ20)

Definition	The technical quality of a part's point of attachment to the wheelchair.
Purpose of test requirement	Unsafe situations likely to be caused by unreliable suspension points should be avoided.
Test method	Experimental evaluation.

Quality of brake operating cable (7.2GQ1, 8.2GQ1)

Definition	The influence of the operating cables on the functioning of the brake.
Purpose of test requirement	Any twists and/or kinks in brake cables can result in more difficult operation and increases wear and tear on the cable.
Test method	Visual evaluation.

R

Range of adjustability See Angle φ_1, adjustable

Reduction in height

Definition	Reduction in height is defined as the lowering of the frame so that the total height of the wheelchair can be reduced. For clarification: for scooters the removal of the seat is not considered to be a reduction in height but as disassembly. Reduction in height-G means that the wheelchair can be reduced in size by the user. The criteria are therefore based on the functional capacities of the user assuming that, whatever the case, reduction in height can also be carried out by the attendant. reduction in height-T (G): reduction in height is carried out by the attendant. The criteria are therefore based on the functional capacities of the attendant. This does not mean that reduction in height cannot be carried out by the user in some cases.
Test method	The armrest and the legrests and the seat and/or back cushions are removed if this is necessary in order to reduce the height of the wheelchair, after which the remaining frame is reduced in height by folding inwards or outwards those parts of the frame that reduce its height. This must be performed without the use of tools.

Reduction in width

Definition	Reduction in height is defined as the narrowing of the frame so that the total width of the wheelchair can be reduced. Reduction in width-G means that the wheelchair can be reduced in size by the user. The criteria are therefore based on the functional capacities of the user assuming that, whatever the case, reduction in width can also be carried out by the attendant. Reduction in width -T (G): reduction in width is carried out by the attendant. The criteria are therefore based on the functional capacities of the attendant. This does not mean that reduction in width cannot be carried out by the user in some cases.
Test method	The armrest and the legrests and the seat and/or back cushions are removed, after which the remaining frame is reduced in width. This must be performed without the use of tools. (The removal of wheels, although this will lead to a smaller width, do not constitute a "reduction in width", but is categorised as "disassembly".)

Reliability of frame construction (7.1GQ1; 8.1GQ1)

Definition	The extent to which the construction meets with a generally accepted level of quality
Purpose of test requirement	Any level of tolerance in the hinged parts will cause little inconvenience for the user. However, what is inconvenient is the excessive level of tolerance in the fittings for the variable sitting posture setting such as for the backrest.
Test method	Visual and experimental evaluation. Particular attention will be paid to any apparently inferior parts of the construction (excessive level of tolerance, poor or poorly finished welding, etc.).

Reliability of steering controls (8.4GQ21; 8.4GQ22)

Definition	The reliability of the constructional part of the wheelchair which enables mechanical steering of the wheel(s).
Purpose of test requirement	Any level of tolerance in the hinged parts will cause little inconvenience for the user. Excessive level of tolerance in the steering frame will adversely influence driving performance and should be avoided. It is apparent that, for driving purposes, the steering frame must be sufficiently well attached once the height and depth settings have been fixed, or after having been folded to enable a reduction in size.
Test method	Visual and experimental evaluation.

(Re)movability of armrests

Definition	The possibility to (re)move the armrests in order to create space for making a transfer.
Purpose of test requirement	For sideways transfers from standing to sitting positions or otherwise, armrests should not impede this transfer and are therefore required to be (re)moved.
Test method	It is determined experimentally whether the armrests can be (re)moved.

(Re)movability of footplates

Definition	The possibility to (re)move the legrests in order to create space for making a transfer.
Purpose of test requirement	For transfers from standing to sitting positions, footplates should not impede this transfer and are therefore required to be (re)moved.
Test method	It is experimentally determined whether the footplates can be (re)moved, for example by folding them away.
Remark	The removal of the footplates by means of removal of the legrests is permitted.

(Re)movability of legrests

Definition	The possibility to (re)move the legrests in order to create space for making a transfer.
Purpose of test requirement	For sideways transfers from standing to sitting positions or otherwise, legrests should not impede this transfer and are therefore required to be (re)moved, if they protrude in front of or above the seat. The protrusion values are experimentally determined.
Test method	The horizontal distance between the legrest (construction) and the front of the seat is measured. A measurement is taken of the distance between the edge of the seat (side of seat) or an extension of this and the top of the legrest (construction). It is determined experimentally whether the legrests can be (re)moved.

Resistance to corrosion (7.4+1)

Definition	The extent to which the product is resistant to corrosion.
Purpose of test requirement	In conformity with DIN 53210. Use of the wheelchair is possible in wet conditions, such as outdoors, or indoors in a damp space at home.
Test method	Salt mist test DIN 50021 and DIN 53210

Restraint in other means of transport (6.5+1; 7.5+1)

Definition	The securing of the wheelchair in a vehicle, whilst occupied, by means of a Wheelchair Tie-down and Restraint system.
Purpose of test requirement	The Wheelchair Tie-down and Restraint system indicated as suitable by the manufacturer should indeed be applicable.
Test method	The applicability is determined using manufacturer/importer specifications and experimentally. The manufacturer/importer is requested to specify for which Wheelchair Tie-down and Restraint system the wheelchair can be made suitable. The necessary standard points of attachment are also required. Using these as a basis, it is determined as to whether the methods are applicable.

Restraint system (see also Restraint in other means of transport)

Definition	A system by which the wheelchair can be secured in a wheelchair taxi or mini-bus for the purposes of transportation.

Rigid

Definition	A support element that retains its shape in its unloaded condition through the presence of a frame.

Rotation of sitting unit (A1.7GQ2)

Definition	The possibility to rotate the wheelchair in relation to the frame in order to facilitate transfer and (dis)mounting.
Purpose of test requirement	If the seat can be rotated to the left and the right, it is possible to (dis)mount on either side. If the seat is rotated to 90°, i.e. at right angles to the direction of travel, (dis)mounting is required to take place without any obstruction by the steering control unit and the steering column..
Test method	A measurement is taken of the angle through which the seat can rotate and can be positioned in relation to the neutral position (0°, seat in driving position).

S

Scooter

Definition	A scooter is characterised by a horizontally positioned flat plateau which supports the feet and to which the seat is secured. A proper sitting height is achieved by varying the height of the seat. Propulsion is carried out electrically and steering mechanically.

Speed regulation

Definition	The ease with which the speed can be varied.
Purpose of test requirement	This requirement has been established in response to user evaluation.
Test method	It is experimentally determined whether the speed can be varied properly for all setting of the maximum speed regulation.

Seat elevation

Definition	Adjustment (with fixed or variable settings) of the while sitting unit including footrests, legrests, armrests an headrest, in relation to its height from the floor.

Seat lock (A1.7 GQ3)

Definition	A device to lock the seat rotation mechanism in position.
Purpose of test requirement	The seat is required to be set in its two most important positions, namely in the position used for driving the wheelchair and the one which is used most often for mounting/dismounting.
Test method	It is determined whether the seat rotation mechanism can be fixed and if so, in which settings in relation to the neutral position (0°, seat in position used for driving).

Seat wedge angle adjustment

Definition	Adjustment of the angle of the seat in relation to the horizontal so that the user can adopt a safe, well-supported sitting posture. NB. The possibility to adjust the angle of the seat by an axle adjustment is deemed acceptable for the seat wedge angle adjustment.

Sharp parts

Definition	The extent to which parts of the wheelchair have been carefully designed in relation to road use.
Purpose of test requirement	This requirement is based on The Road Traffic Act of 1994 (WVW) cl. 5.9.48/5.11.48.
Test method	Visual and tactile evaluation.

Short term use

Definition	In the requirements, short term use is related the (non) adjustability of the sitting posture; see definition of Sitting posture.

Single adjustment (SA)

Definition	See: Variability/operability.

Sitting depth (BGQ1)

Definition	The depth of the seat unit of the wheelchair which is available for supporting the upper leg and the buttocks. The depth available is determined by the configuration of the seat length and the backrest.
Purpose of test requirement	The sitting depth corresponds to the upper leg length of the user' in such a way that the buttocks upper legs and back are capable of being supported adequately without the front edge of the seat jutting into the back of the knee. (Corrected) upper leg lengths that most commonly occur in the general population are 425 - 595 mm. The ideal relationship between the sitting depth and the upper leg length is determined in the following fashion: sitting depth = upper leg length -50 mm. The level of tolerance determined for the ideal relationship is set at: - 70 mm to + 20 mm. A sitting depth smaller than (425-120 =) 305 mm and larger than (595-30 =) 565 mm does not have much purpose. Size x indicates a (possible) restriction in the available sitting depth when calf supports are present. The max. upper leg length for which a seat depth is suitable is determined by a maximum of 120 mm space between the seat and the back of the knees. The min. upper leg length for which a seat depth is suitable is influenced negatively by an x value > 0. Where x = 50 mm the sitting depth is only usable for 40% of the population of users for commonly occurring upper leg lengths.
Test method	Testing in conformity with ISO 7176/7 dimension 2. Where calf supports are present the LRP is determined along the calf support. Size x is therefore the distance between a line that dissects LRP/SRP and the front edge of the seat, measured along the SRP (see figure 19).

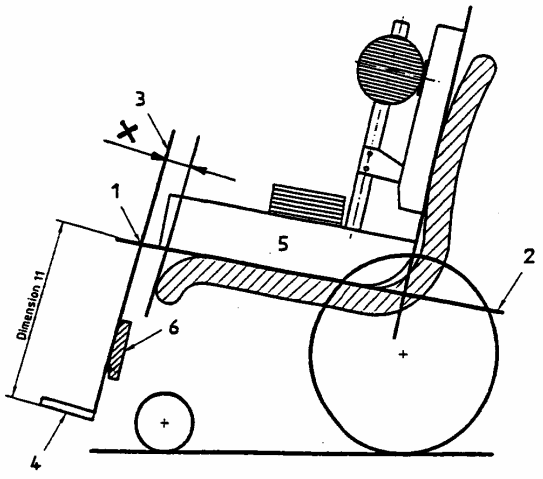

figure 13: Sitting depth size X

Remark	When calf supports are present the LRP is determined along the length of the calf support. In this case, size x is determined. This size is important for determining the eventual area of operation of the sitting depth.

Sitting height for scooters(BGQ6)

Definition	The height available for supporting the lower legs and for supporting the feet. The space available is determined by the configuration of the seat and the footrests.
Purpose of test requirement	The sitting height corresponds to the lower leg length of the user in such a way that the feet and the upper legs are capable of being supported adequately. The ideal relationship between the sitting height and the lower leg length is determined in the following fashion: sitting height = lower leg length. The level of tolerance determined for the ideal relationship is set at: - 20 mm to + 20 mm. A relationship is determined between the lower leg lengths and the upper leg lengths of the users. The required dimensions for sitting height are derived from this. (Corrected) lower leg lengths that most commonly occur in the general population are 390 - 560 mm. A sitting height smaller than (390-20 =) 370 mm and larger than (560+20=) 580 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7 dimension 11, with modified LRP. Testing is carried out in the basic neutral position.

Sitting height for use indoors and presence of tilt mechanism (BGQ 5)

Definition	The height available for supporting the lower legs and for supporting the feet. The space available is determined by the configuration of the seat and the footrests.
Purpose of test requirement	The sitting height corresponds to the lower leg length of the user in such a way that the feet and the upper legs are capable of being supported adequately. The ideal relationship between the sitting height and the lower leg length is expressed as: sitting height = lower leg length. The level of tolerance determined for the ideal relationship is set at: - 20 mm to + 20 mm. A relationship is determined between the lower leg lengths and the upper leg lengths of the users. The required dimensions for sitting height are derived from this. (Corrected) lower leg lengths that most commonly occur in the general population are 390 - 560 mm. A sitting height smaller than (390-20 =) 370 mm and larger than (560+20=) 580 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7 dimension 11, for free space under the footrests of 30 mm (or the nearest higher value).

Sitting height for use outdoors (BGQ 4)

Definition	The height available for supporting the lower legs and for supporting the feet. The space available is determined by the configuration of the seat and the footrests.
Purpose of test requirement	The sitting height corresponds to the lower leg length of the user in such a way that the feet and the upper legs are capable of being supported adequately. The ideal relationship between the sitting height and the lower leg length is determined in the following fashion: sitting height = lower leg length. The level of tolerance determined for the ideal relationship is set at: - 20 mm to + 20 mm. A relationship is determined between the lower leg lengths and the upper leg lengths of the users. The required dimensions for sitting height are derived from this. (Corrected) lower leg lengths that most commonly occur in the general population are 390 - 560 mm. A sitting height smaller than (390-20 =) 370 mm and larger than (560+20=) 580 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7 dimension 11, for free space under the footrests of 70 mm (or the nearest higher value).

Sitting posture

Definition	The sitting posture is the posture that the user adopts in the wheelchair. NB: The sitting posture is determined primarily by the angle between the seat (angle α) and the angle of the seat in relation to the horizontal plane (angle φ) (See figure 16).

Sitting posture adjustable

Definition	An active single adjustment sitting posture intended for relatively short-term use or long periods of active use.

Sitting posture adjustments

Definition	The adjustment of support elements to enable the user to attain the desired sitting posture.

Sitting posture: non-adjustable

Definition	An active non-adjustable sitting posture intended for short-term use.

Sitting posture: tilt-in-space

Definition	A wheelchair whose seat can alternately be set to two or more settings by the user or the attendant, namely an active/transfer setting and a semi-active stable or relaxed setting.

Sitting width (requirement BGQ2, A/B)

Definition	The width of the seat unit of the wheelchair which is available for supporting the upper leg and the buttocks. The width available is determined by the configuration of the seat width, side panels and armrests.
Purpose of test requirement	The sitting width corresponds to the user's hip width in such a way that the buttocks and the upper legs are capable of being supported adequately with a sufficient freedom of movement so that direct hand propulsion can easily be managed. The ideal relationship between the sitting width and the hip width is determined in the following fashion: sitting width A/B= hip width + 40 mm. The level of tolerance determined for the ideal relationship is set at: - 40 mm to + 40 mm. A relationship is determined between the hip width and the upper leg length of users. The required dimensions for sitting width are derived from this. (Corrected) hip widths that most commonly occur in the general population are 320 - 490 mm. A sitting width smaller than (320 + 0 =) 320 mm and larger than (490 + 80 =) 570 mm does not have much purpose.
Purpose of test requirement	Testing in conformity with ISO 7176/7 dimension 3 (seat width) (figure 14 and 15). Testing in conformity with ISO 7176/7 dimension 4 (side panels) (figure 13). Testing in conformity with ISO 7176/7 dimension 21 (armrests) (figure 3). Sitting width = the lowest value of dim.3 + 40 mm; dim.4; dimension 21 + 40 mm. Testing is carried out in the basic neutral position.

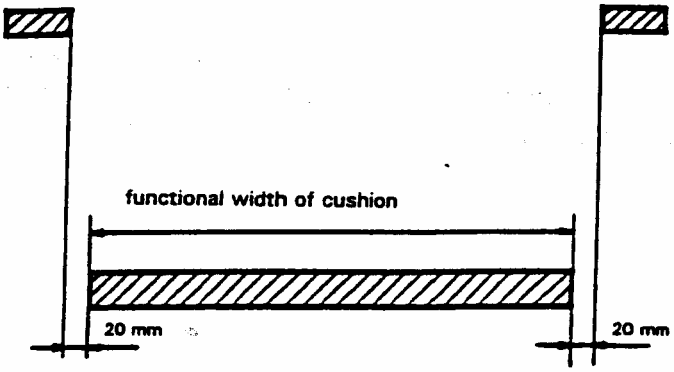

figure 14:Sitting width, the seat width is the smallest width

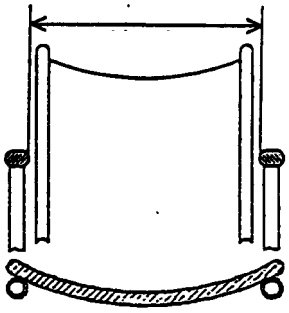

figure 15: Sitting width, the width between armrests is the smallest

Sitting width (requirement BGQ3, C)

Definition	The width of the seat unit of the wheelchair which is available for supporting the upper leg and the buttocks. The width available is determined by the configuration of the seat width, side panels and armrests.
Purpose of test requirement	The sitting width corresponds to the user's hip width in such a way that the buttocks and the upper legs are capable of being supported adequately with a sufficient freedom of movement. The ideal relationship between the sitting width and the hip width is determined in the following fashion: sitting width C= hip width + 80 mm. The level of tolerance determined for the ideal relationship is set at: - 40 mm to + 40 mm. A relationship is determined between the hip width and the upper leg length of users. The required dimensions for sitting width are derived from this. (Corrected) hip widths that most commonly occur in the general population are 320 - 490 mm. A sitting width smaller than (320 + 40 =) 360 mm and larger than (490 + 120 =) 610 mm does not have much purpose.
Test method	Testing in conformity with ISO 7176/7 dimension 3 (seat width) (figure 14 and 15). Testing in conformity with ISO 7176/7 dimension 4 (side panels) (figure 13) Testing in conformity with ISO 7176/7 dimension 21 (armrests) (figure 3) Sitting width = the lowest value of dim.3 + 40 mm; dim.4; dimension 21 + 40 mm. Testing is carried out in the basic neutral position.

Size of angle Δφ

Definition	The range of the tilt mechanism. (delta phi or tilt-in-space angle range).
Purpose of test requirement	A tilt-in-space angle of approx. 10° at a φ1 between 4° and 14° (transfer position) provides a stable sitting position between 14° and 24°. In practice this appears to be the correct angle φ for relaxed sitting for watching television, reading, etc. In EN 12183 and EN 12184 values are also specified for tilt-in-space angle range.
Test method	Measure of angle φ in conformity with ISO 7176/7, dimension 1 in the most extreme positions of the tilt mechanism. The difference between these positions is calculated. See figure 16.

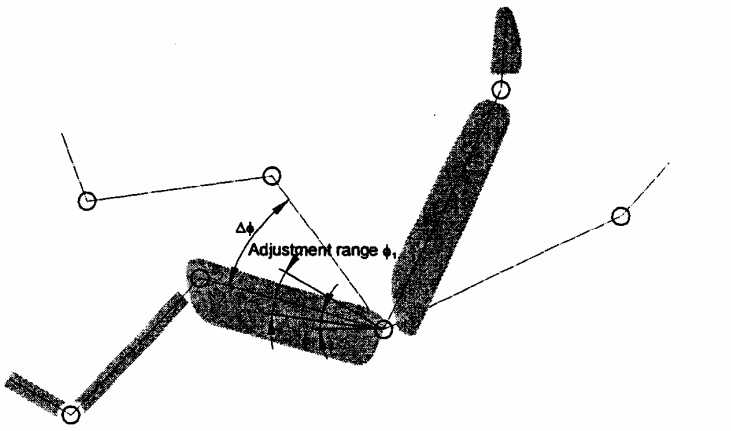

figure 16: Size of angle Δφ

Standard design form

Definition	The design form of a make and type of product which satisfies the needs of the largest part of the user population for a particular cluster.

Static stability in four directions in a neutral sitting position (requirement 6.8GQ1, hand-propelled wheelchairs)

Definition	The slope on which a stationary wheelchair just manages not to tip over. The wheelchair should remain with at least three wheels on the ground whereby the product can continue to be driven and steered.
Purpose of test requirement	A wheelchair must not fall over when negotiating an uphill or downward slope, neither in a forwards direction nor reverse nor sideways. The requirement has been determined using a maximum gradient of 1:10 (5.7°) in conformity with the Accessibility Manual.
Test method	Testing takes place on a test slope (to a max. angle of 15°), whereby a wheelchair, loaded with a weighted dummy, just manages not to tip over when stationary with the brakes applied. The measurement is performed with the wheelchair facing uphill, facing downhill and at right angles to the direction of the slope.
Remark	For active wheelchairs, the stability is determined in three directions: forwards, left and right.

Static stability in four directions in a neutral sitting position (requirement 8.4GQ11, electrically powered wheelchairs)

Definition	The slope on which a stationary wheelchair just manages not to tip over. The wheelchair should remain with at least three wheels on the ground whereby the product can continue to be driven and steered.
Purpose of test requirement	The test requirement is linked to the requirement specific to the maximum negotiable slope to a maximum angle of 15°. When driving on the steepest slope (< 15°) which the wheelchair/scooter can negotiate in terms of power, the wheelchair must not fall over, neither in a forwards direction nor reverse nor sideways.
Test method	Testing takes place on a test slope (to a max. angle of 15°), whereby a wheelchair, loaded with a weighted dummy, just manages not to tip over when stationary with the brakes applied. The measurement is performed with the wheelchair facing uphill, facing downhill and at right angles to the direction of the slope. The scooter is positioned in such a way that the tendency to fall over occurs over the tipping line.

Steering lock (A1.10+1)

Definition	The angle which the wheel which controls the direction of the scooter can make in relation to the neutral position (0°, forwards direction).
Purpose of test requirement	If the steering control unit can be turned through 90° when driven, the scooter with a rear wheel drive might be turned too quickly with the likelihood of tipping over.
Test method	The maximum position in relation to the neutral position is determined for the wheel that controls the direction of the wheelchair. See figure 17.

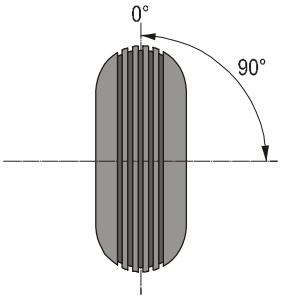

figure 17: Steering Lock

System of dimensions

Definition	The system of dimensions relates to the various dimensions in which a wheelchair can be made available.

T

Test status

Definition	A test status or testing registration form is a list of properties on which the test results for the various properties have been/are recorded.

Testing reference point

Definition	The line that dissects the reference plane of the seat and the reference plane of the backrest of the measuring device (Reference Loader Gauge in conformity with ISO 7176/7).

Therapist (T)

Definition	A therapist is defined as the person who positions the wheelchair to the correct settings for the user. This can also be the attendant.
Remark	For evaluation purposes, the anthropometry and strength of a physically able P50 man is used as a basis for the SA adjustments. For a VT adjustment it is assumed that this can be done by the attendant and therefore the anthropometry and strength of a physically able 65 year old woman is used as a basis for the evaluation.

Thoracic region detached from the wheelchair

Definition	This means that when an operation is carried out in the wheelchair, the user is detached from the backrest as far as chest height (= about 1/3 of the back detached from the backrest).

Tilt mechanism (B+6, B+7)

Definition	Angle adjustment of the complete sitting unit in relation to the horizontal plane, with the aim of varying the sitting posture of the user whilst the wheelchair is occupied.

Tipping

Definition	One or more wheels becoming detached from the ground whilst negotiating a slope.

Tipping device (CGQ8, A+B)

Definition	Device attached to the wheelchair on which the attendant can position one foot whilst pulling on the pushing handles in order to tip the two rear wheels backwards.
Purpose of test requirement	Push chairs are propelled by means of pushing by an attendant. Without the aid of a tipping device most push chairs cannot be tipped (or tipped only with great difficulty).
Test method	The presence of a tipping device is determined by means of visual evaluation.

Tipping line

Definition	The horizontal tangent between the perpendicular from the centre of the front wheel and the centre of the left-hand or right-hand rear wheel.

Turning radius (A2+7; A2+14)

Definition	The turning radius is the half of the mid-line which dissects the smallest circle made by the extremity of the wheelchair when turned.
Purpose of test requirement	The value of the turning radius is determined on the basis of the test results. In doing so, a radius which comes as close as possible to 1500 mm in free space, as indicated in the Accessibility Manual, should be attained.
Test method	Measurement in conformity with ISO 7176-5.

Turning radius and turning space (requirement 8.4.1+3, area of use: indoor)

Definition	The turning radius is the half of the mid-line which dissects the smallest circle made by the extremity of the wheelchair when turned. The turning space is the distance within which a wheelchair can reverse by reversing once only (for example between two parallel walls).
Purpose of test requirement	The value of the turning radius is determined on the basis of the test results. In doing so, a radius which comes as close as possible to 1500 mm in free space, as indicated in the Accessibility Manual, should be attained. The requirement for turning space is in conformity with EN 12184.
Test method	Measurement in conformity with ISO 7176-5.

Turning radius and turning space (requirement 8.4.1+4, area of use: outdoor)

Definition	The turning radius is the half of the mid-line which dissects the smallest circle made by the extremity of the wheelchair when turned. The turning space is the distance within which a wheelchair can reverse by reversing once only (for example between two parallel walls).
Purpose of test requirement	The requirement for turning radius is in conformity with EN 12184. The Accessibility Manual assumes a outer space of 2000 mm. The requirement for turning space is based on this.
Test method	Measurement in conformity with ISO 7176-5.

Turning radius, rotation of seat

Definition	The space that is necessary to rotate the seating unit on a vertical axis around the carrier.
Purpose of test requirement	The turning radius of the seat may not be any greater than the turning radius of the complete product. The seat will be rotated in situations where the wheelchair is used between e.g. a kitchen worktop and the kitchen table. The upper limit is determined experimentally.
Test method	A measurement is taken of the projection of the turning radius on the floor within which the whole seat can rotate.

Type of backrest

Definition	The way in which the backrest is designed: rigid or non-rigid.
Purpose of test requirement	For electrically powered wheelchairs with a tilt-in-space seat and for scooters a rigid support is required.
Test method	Visual evaluation. The following designated types apply: Type 1: upholstered Type 2: anatomically shaped Type 3: non-rigid Type 4: detachable Type 5: foldable Type 6: stretch adjustable Type 7: height adjustable Type 8: extended/high

Type of seat

Definition	The way in which the seat is designed: rigid or non-rigid (hammock).
Purpose of test requirement	For electrically powered wheelchairs with a tilt-in-space seat and for scooters a rigid support is required.
Test method	Visual evaluation. The following designated types apply: Type 1: upholstered Type 2: anatomically shaped Type 3: hammock Type 4: arthrodesis Type 5: sprung seat Type 6: rotating seat Type 7: webbed Type 8: separate cushion Type 9: stretch adjustable

Type of variable setting for α

Definition	Whether, and in which way the sitting posture can be varied.
Purpose of test requirement	Typical for a wheelchair which is not just used for transfers over short distances is that the angle α must at least have a single adjustment, with which the sitting posture of the individual user can be optimised. A VT is also permitted. This might particularly apply to push chairs for adjustments for which there a number of different users. For each wheelchair user, the person who pushes can vary the backrest angle α. An non-adjustable angle φ (NA) is sufficient as long as the size of the angle is within the proper limits.
Test method	Visual and experimental evaluation.

Type of variable setting for φ_1/α

Definition	Whether, and in which way the sitting posture can be varied.
Purpose of test requirement	Characteristic of a tilt mechanism with two settings is the single adjustment for φ and α, where a VT adjustment is also permitted. If the wheelchair is adjusted once only to a specific (ideal) φ_1/α setting, a choice can be made between either of these two settings.
Test method	Visual and experimental evaluation.

U

Unobstructed rotation of wheels

Definition	The danger of the wheels coming into contact with other parts of the wheelchair.
Purpose of test requirement	Rubbing on wheels causes extra wear and tear and increases resistance to the motion of the wheelchair.
Test method	Visual evaluation.

User

Definition	The user is defined as the person who sits in the wheelchair.

User manual for battery charger

Definition	Information which is required to be included in the user manual.
Purpose of test requirement	This additional information is required to be available to the end user so that use can be optimised.
Test method	Visual evaluation.

User manual for electrically powered wheelchairs

Definition	Information which is required to be included in the user manual.
Purpose of test requirement	This additional information is required to be available to the end user so that use can be optimised.
Test method	Visual evaluation.

User manual for hand propelled wheelchairs

Definition	Information which is required to be included in the user manual.
Purpose of test requirement	This additional information is required to be available to the end user so that use can be optimised.
Test method	Visual evaluation.

V

Variability/operability

Definition	PV: Can be varied at all times, i.e. it is adjustable at any given moment without the use of tools and with the user in the wheelchair. VU: Can be varied at all times by the user. VUh A VUh control is so-called when the variable setting is mechanical and the user him or herself can position the (loaded) support element in a particular setting. VUm: A VUm control is so-called when the variable setting is power assisted whereby the user only exerts a small amount of force with the arm or hand in order to position the loaded support element in a particular setting. VT: Can be varied at all times by the therapist/attendant, whereby the anthropometry and strength of a physically able 65 year old woman is taken as a basis. SA: An adjustment is considered to be a single adjustment (SA) only when the setting of a (loaded or unloaded) support element must be carried out with the aid of tools, or if the setting can be performed without the use of tools but only when the user is not in the wheelchair. NA: A support element setting is considered to be non-adjustable when this is not VU, VT or SA.

Variable at all times by therapist (VT)

Definition	See: Variability/operability.

Variant

Definition	The design of a make and type of product which satisfies the needs of a significant part of the user population for a specific cluster.
Remark	A standard design is defined per cluster. In addition to these, optional designs are available which can be included for approval testing.

Visibility

Definition	The extent to which the user is properly visible in traffic.
Purpose of test requirement	The quickest wheelchair (15 k.p.h.) must be able to stop within 3.5 m in conformity with EN 12184. A response time of 1 sec. is equivalent to a distance of approx. 4 m. EN 12184 specifies a distance of 20 m, but for the time being this is not feasible. The light intensity is in conformity with ISO/CD 6742-1, data with respect to the light beam are derived from the German standard StVzo § 67.
Test method	Visual evaluation for lighting of the road surface. It is determined whether the manufacturer has issued a statement specified that the requirement for the dispersion of light intensity has been satisfied.

W

Weighted dummy

Definition	A simulated load when carrying out experiments on wheelchairs. The load simulates the weight of specific groups of users for whom the wheelchairs have been designed. Note: ISO dummy for 25, 50, 75 and 100 kg loads, designed for static tests (ISO 7176/11). Note: RLG ”dummy" (Reference Loader Gauge), has been designed for measuring sitting postures (ISO standard 7176/7 and is called the Test Instrument.

Weighting

Definition	A statistical evaluation with respect to the importance that a characteristic of a product has in relation to its use for a specific cluster.

Wheelchair

Definition	A chair which is fitted with wheels and designed to improve the transfer possibility of a person with a walking disability.

Wheelchair Tie-down and Occupant Restraint System (WTORS)

Definition	See: restraint system

Width (requirement A.2+1, area of use: indoor)

Definition	The widest dimension of the wheelchair when in working order.
Purpose of test requirement	The Accessibility Manual indicates that the width of a door opening is 850 mm. For indoor wheelchairs a smaller width is assumed with 10 mm of free space on either side since it involves continuous manoeuvring in constricted spaces and between narrow openings (e.g. between furniture). This upper limit is also specified in EN 12184.

Width (requirement A.2+2, area of use indoor/outdoor)

Definition	The widest dimension of the wheelchair when in working order.
Purpose of test requirement	The Accessibility Manual indicates that the width of a door opening is 850 mm. For passageways without oncoming vehicles a width of 900 mm is assumed. For indoor/outdoor wheelchairs a smaller width is assumed with 10 mm of free space on either side since the wheelchair can be widely used in indoor spaces. This upper limit is also specified in EN 12183 (ISO 7176-5) and EN 12184.

Width (requirement A.2+3, area of use: outdoor)

Definition	The widest dimension of the wheelchair when in working order.
Purpose of test requirement	The basis for this dimension is the Road Traffic Act of 1994 (WVW) which stipulates a maximum width of 110 cm. For passages of this width at least 15 cm of free side on either side remains. This upper limit is also specified in EN 12184.

Width between pushing handles (CGQ4)

Definition	The width between the pushing handles or the handgrips, or the length of the push bar.
Purpose of test requirement	The basis for this dimension is the width between the shoulders of a P5 woman (= 35 cm) with a margin of - 50 mm and the width between the shoulders of a shoulders of a P95 man (= 50 cm) with a margin of + 50 mm.
Test method	In the case of pushing handles (incl. push bar with handgrips) centre-to-centre distance between the pushing handles is measured. Push bar without handgrips: the distance is the longest straight part minus 100 mm (= 2 times the size of half a hand width).

Width between tipping device (CGQ5)

Definition	The free space, available for walking, between the tipping device.
Purpose of test requirement	The basis for this dimension is the hip width of a P50 woman (= 365 mm).
Test method	The smallest distance between the tipping device is measured.

Width of tipping device (CGQ13, A+B)

Definition	The width of the tipping device on which the foot is supported in the event of tipping.
Purpose of test requirement	The basis for this dimension is the shoe width of a P50-man under the ball of the foot. It is assumed that the foot will not slide off the tipping device or cut into the plane of the shoe with a minimum tipping device width of 20 mm (flat)

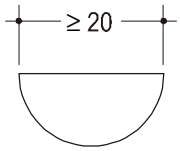

figure 18: width of tipping device

Test method	A measurement is taken of the greatest width (perpendicular to the wheelchair's direction of travel) of the contact plane between a hard sole and the tipping device.

Working condition

Definition	The wheelchair when fitted with tyres at the right tyre pressure, assembled and adjusted in conformity with the specifications of the manufacturer or importer with the wheelchair in corresponding design form and in an adequate condition for the specific cluster.

3. Measuring equipment and measuring conditions

3.1. Test limits

The measuring accuracy is in accordance with the nature of the measured values. When determining the test limits the measuring accuracy is taken into account.

3.2. Testing and measuring equipment

In addition to generally used measuring equipment for (standard) quantities such as angle, power, mass, air pressure, electric current and length, the following specific appliances are used in this test instruction

- test plane, as specified in ISO7176 standard
- test plank (length 1.2 m, angle adjustable form 0° to ≥ 45°)
- test obstacle (from 40 to 120 (±2 mm), adjustable in steps of 10 mm, radius of obstacle's upper front edge 3 mm (± 1 mm))

3.3. Measuring conditions wheelchair

If a wheelchair is to be tested against the requirements of this test instruction, it should be performed with the wheelchair subjected to the following measuring conditions unless it is stated otherwise with respect to the measurement concerned:

- wheelchair ready for use
- adequately acclimatised (temperature and humidity test lab)
- castors in following position for driving forwards
- wheelchair loaded with a test dummy in the spirit of ISO 7176-11. The choice of dummy weight is determined on the basis of the recommended maximum weight specified by the manufacturer.

Before the measurements are started, the wheelchair to be tested is set in the neutral basic position.
In principle, the supplied ready for use condition of the wheelchair is taken as a starting point, unless the position of a component is adjustable. If so, a position is elected for each of these components in conformity with the neutral basic position which is selected as follows:

- under footrest clearance 50 mm
- seat angle 8° ± 2° in relation to the horizontal (or nearest smaller angle), measured according to ISO 7176-7 [6]
- backrest angle 10° ± 2° in relation to the vertical (or nearest
- smaller angle), measured according to ISO 7176-7 [6]

- legrest angle 90° ± 2° in relation to the seat (or nearest larger
- angle) measured according to ISO 7176-7 [6]
- if the whole sitting position can be rotated: according to forward direction
- if the whole sitting support unit is horizontally adjustable: in
- central position
- armrest angle as much as possible corresponding to seat angle
- headrest height and depth in central position
- large (driving) wheels, as supplied or according to instruction of manufacturer. If adjustable, without tools, in central position
- pushing facility, as high as possible up to a maximum of 1050 mm
- tipping and/or anti-tipping facility in central position
- as concerns all adjustable parts for which no end stop has been indicated, a minimum clamping length of 50 mm is taken into account, if applicable.
- if the seat is adjustable in height in relation to the footrest:
- this must be placed in the centre as concerns the height or front/rear for the neutral basic position. For dynamic stability measurements it must be placed in the highest and most rear travelling position
- If the steering unit of the scooter is adjustable, measuring is effected with the steering unit in such a position that the steering distance is 580 mm or the nearest value. The height-adjustment is set to the central position
- other (relevant) parts in central position
- tyre pressure according to statement of wheelchair or tyre manufacturer. If the pressure stated by the wheelchair manufacturer is higher than the pressure indicated on the tyre, the statement on the tyre is taken into account.
- (If no indication is available the following is taken into account: large wheels 3 bar, castors 2.5 bar).

If the seat height can be varied at all times by the user in relation to the ground, the seat has to be placed in the lowest position for the neutral basic position.
For measuring the dynamic stability the seat must be placed:

1 in the highest and most rear travelling position;
2 in the highest and most rear travelling position, at which position the speed has no declined yet.

The worst situation is applicable.

Before a wheelchair is tested against the requirements the activities mentioned below are performed:

- general technical inspection (expert's evaluation)
- reading the manual or instruction booklet
- charging the batteries of electric wheelchairs and scooters.

Measuring room

If the wheelchair is to be tested against the requirements mentioned in this test interaction, it should be performed in such a way as to correspond with the test conditions for EN 12184 and the ISO 7176-series, unless stated otherwise with respect to the measurement concerned.

Unless stated otherwise for the measurement concerned measuring takes place on the following surface:

- for rolling tests with electric wheelchairs and scooters in neutral situation: surface according to ISO 7176-13.
- for rolling tests with manually propelled wheelchairs (e.g. track stability, pushing force) and electric wheelchairs and scooters (e.g. velocity, power consumption, brake deceleration, max. obstacle): rigid, flat surface.
- for measuring on the gradient and sloping board (e.g. static stability, dynamic stability, holding force brake etc.): friction coefficient of the surface between 0.75 and 0.1 measured according to ISO 7176-13 [5].
- for measuring on measuring floor (e.g. sitting position measurements, overall dimensions, turning radius): rigid, flat, horizontal surface
- for sound measuring: surface according to ISO 7176-13.

Measuring accuracy

Overview of the required measuring and reading accuracy for which in the EN 12183 and 12184 nothing is declared:
For tolerances the mathematical tolerance is used (for example: the requirement states x<20. This means a tolerance of ±0,5. The x measured has to be smaller than 20,5. For example: the requirement states x>2,0. Than the x measured has to be smaller than 1,95).

quantity	**Designation**	**Reading accuracy**
length	overall and sitting posture dimensions	1 mm
	e.g. handrim thickness	0.1 mm
angles	Protractor reading	0.5°
forces	Operation buttons, pushing force	0.5 N
	holding force brake (force ≥ 60 N)	2.5 N
acceleration	brake deceleration	n.a.
velocity	Maximum velocity	0.01 m/s
time	Disassembly	1 s
mass	mass of parts	0.2 kg
sound pressure	sound pressure level [dBA]	1 dBA

3.4. General

3.4.1. Functional tests

In principle, the test methods and conditions required for a proper implementation of this test instruction have been included in chapter 2 of this part. This chapter deals more extensively with the test methods and conditions applicable to a number of conditions.

Operating force

For as for as the test methods and conditions are not included in EN 12183 and 12184 the here mentioned test methods and conditions for operating force have to be used.

Handles

The operating force of handles is measured by means of a dynamometer. During the measurement the dynamometer should be placed parallel to the operating direction and on the heart of the control knob or if no knob is present, at 2.5 cm from the tip of the control handle.

With the use of an as slowly as possible increasing force the (maximum) occurring operating force and the result is recorded in the test report.
This measurement is to be made three times. The lowest measuring value of these three measurements is taken as the test value.

Knobs

The operating force of turning knobs is measured with the use of a momentmeter. The momentmeter is placed concentrically on the turning knob with the use of an attachment.
During an increasing moment, the (maximum) occurring operating moment is measured and the result is recorded in a test report.
The measurement is to be made three times. The lowest value of these 3 measurements is considered the test value.

Transfer height (sideward)

Transfer height sideward in the largest occurring difference in height between a part of the wheelchair projecting from the top and the side of the wheelchair seat after the wheelchair has been placed in a transfer situation (except for the drive wheels and possible fixed splashboard).
The transfer height is measured at right angles from the seat edge (side of the seat) or its extension to the top of the projection.
The wheelchair is placed in the transfer situation by performing the operations required for that purpose; activating the parking brake(s), e.g. removing and/or lowering and/or folding back the armrest, clothing protector etc.

Holding force parking brake physically propelled wheelchairs

The force is measured which the wheelchair blocked by a parking brake, can resist. With the use of a pulling force recorder an as slowly as possible force is exerted in the backward direction on a wheelchair blocked by a parking brake, until the moment that the brake or the wheelchair starts to slip or a maximum pulling force is reached of 225 N.

The pulling force is applied horizontally in the centre and at the level of the (drive)wheel axles. The castors should be positioned in the following position for driving straight backward. The load in the wheelchair is the complete ISO Test dummy. For wheelchairs meant for cluster 15b(R05) and for cluster Active self propelling adjustable(R06), an additional measurement is made for which the heaviest point is placed more to the front by placing the weights from the back section to the sitting section (see figure 16.4).

This measurement is to be made three times. The average of the 3 measurements should be considered the test value.

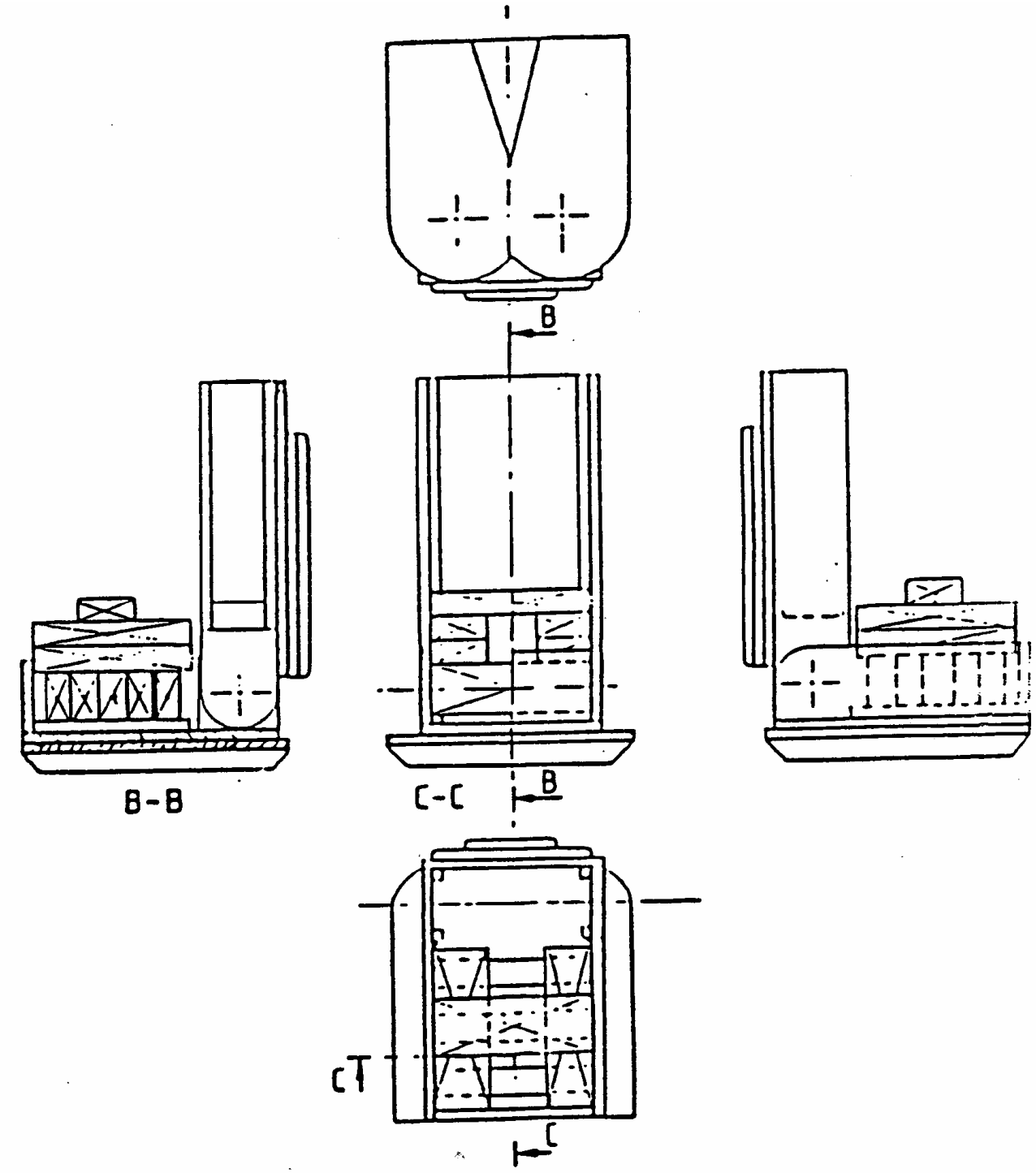

figure 19 *distribution of mass ISO dummy in order to determine holding force of parking brake (cluster 15b/R05) and for cluster Active self propelling adjustable(R06)*