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Electric wheelchairs

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Assistive Products Association (JASPA)/ Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS T 9203 : 2006** is replaced with this Standard.

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Electric wheelchairs

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 7176-1** published in 1999, the second edition of **ISO 7176-2** published in 2001, the second edition of **ISO 7176-3** published in 2003, the third edition of **ISO 7176-4** published in 2008, the second edition of **ISO 7176-6** published in 2001, the first edition of **ISO 7176-8** published in 1998, the second edition of **ISO 7176-10** published in 2008, the first edition of **ISO 7176-11** published in 1992, the first edition of **ISO 7176-13** published in 1989, the second edition of **ISO 7176-14** published in 2008, the first edition of **ISO 7176-15** published in 1996, the first edition of **ISO 7176-22** published in 2000, the first edition of **ISO 7176-26** published in 2007 and the first edition of **ISO 7193** published in 1985 with some modifications of the technical contents.

The portions given dotted underlines or continuous sidelines are the matters in which the contents of the original International Standards have been modified. A list of modifications with explanations is given in Annex JI.

1 Scope

This Standard specifies electric wheelchairs, whose maximum speed is not exceeding 6 km/h, including user operated standard type (hereafter referred to as "standard type"), user-operated simple type (hereafter referred to as "simple type") and user operated adjustable seat position type equipped with reclining (see figure JA.1), lifting (see figure JA.2) and tilting (see figure JA.3) systems (hereafter referred to as "adjustable seat position type") as defined in type classification of electric wheelchairs (see Annex JA). However, handle type electric wheelchairs are excluded.

NOTE: The International Standards corresponding to this Standard are as follows.

ISO 7176-1:1999	<i>Wheelchairs—Part 1 : Determination of static stability</i>
ISO 7176-2:2001	<i>Wheelchairs—Part 2 : Determination of dynamic stability of electric wheelchairs</i>
ISO 7176-3:2003	<i>Wheelchairs—Part 3 : Determination of effectiveness of brakes</i>
ISO 7176-4:2008	<i>Wheelchairs—Part 4 : Energy consumption of electric wheelchairs and scooters for determination of theoretical distance range</i>
ISO 7176-6:2001	<i>Wheelchairs—Part 6 : Determination of maximum speed, acceleration and deceleration of electric wheelchairs</i>
ISO 7176-8:1998	<i>Wheelchairs—Part 8 : Requirements and test methods for static, impact and fatigue strengths</i>
ISO 7176-10:2008	<i>Wheelchairs—Part 10 : Determination of obstacle-</i>

climbing ability of electrically powered wheelchairs

ISO 7176-11:1992	<i>Wheelchairs—Part 11 : Test dummies</i>
ISO 7176-13:1989	<i>Wheelchairs—Part 13 : Determination of coefficient of friction of test surfaces</i>
ISO 7176-14:2008	<i>Wheelchairs—Part 14 : Power and control systems for electrically powered wheelchairs and scooters — Requirements and test methods</i>
ISO 7176-15:1996	<i>Wheelchairs—Part 15 : Requirements for information disclosure, documentation and labelling</i>
ISO 7176-22:2000	<i>Wheelchairs—Part 22 : Set-up procedures</i>
ISO 7176-26:2007	<i>Wheelchairs—Part 26 : Vocabulary</i>
ISO 7193:1985	<i>Wheelchairs—Maximum overall dimensions</i>

(Overall evaluation: MOD)

The symbols which denote the degree of correspondence in the contents between the relevant International Standards and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

2 Normative reference

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For standards with the year indication, only the editions of the indicated year shall be applied and any revisions (including amendments) made thereafter shall not be applied. For those without the indication of the year, the most recent edition (including amendments) shall be applied.

JIS B 0205-1	<i>ISO general purpose metric screw threads—Part 1 : Basic profile</i>
JIS B 0205-2	<i>ISO general purpose metric screw threads—Part 2 : General plan</i>
JIS B 0205-3	<i>ISO general purpose metric screw threads—Part 3 : Selected sizes for screws, bolts and nuts</i>
JIS B 0205-4	<i>ISO general purpose metric screw threads—Part 4 : Basic dimensions</i>
JIS B 0209-1	<i>ISO general purpose metric screw threads—Tolerances—Part 1 : Principles and basic data</i>
JIS B 0209-2	<i>ISO general purpose metric screw threads—Tolerances—Part 2 : Limits of sizes for general purpose external and internal screw threads—Medium quality</i>
JIS B 0209-3	<i>ISO general purpose metric screw threads—Tolerances—Part 3 : Deviations for constructional screw threads</i>
JIS B 0209-4	<i>ISO general purpose metric screw threads—Tolerances—Part 4 : Limits of sizes for hot-dip galvanized external screw threads to mate with internal screw threads tapped with tolerance position H or G after</i>

galvanizing

- JIS B 0209-5 *ISO general purpose metric screw threads—Tolerances—Part 5 : Limits of sizes for internal screw threads to mate with hot-dip galvanized external screw threads with maximum size of tolerance position h before galvanizing*
- JIS C 0920 *Degrees of protection provided by enclosures (IP Code)*
- NOTE: Corresponding International Standard: IEC 60529:2001 *Degrees of protection provided by enclosures (IP Code)* (IDT)
- JIS D 0203 *Method of moisture, rain and spray test for automobile parts*
- JIS D 5500 *Automobile parts—Lighting and light signalling devices*
- JIS D 9301 *Bicycles for general use*
- JIS D 9452 *Bicycles—Reflex reflectors*
- JIS T 0102 *Glossary of terms used in rehabilitation equipments for the physically disabled or handicapped persons*
- JIS Z 8401 *Guide to the rounding of numbers*
- JIS Z 9117 *Retroreflective sheeting and tape for safety*
- ISO 845 *Cellular plastics and rubbers—Determination of apparent density*
- ISO 2439 *Flexible cellular polymeric materials—Determination of hardness (indentation technique)*
- ISO 7176-8 *Wheelchairs—Part 8 : Requirements and test methods for static, impact and fatigue strengths*
- ISO 7176-13 *Wheelchairs—Part 13 : Determination of coefficient of friction of test surfaces*
- ISO 7176-22 *Wheelchairs—Part 22 : Set-up procedures*
- IEC 60601-1 *Medical electrical equipment—Part 1 : General requirements for basic safety and essential performance*

3 Terms and definitions

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

3.1 body support system

those parts of the electric wheelchair which directly contact or support the body of the user

It consists of a seat, a back support, arm support, foot support, leg support and other accessories.

3.2 driving system

combination of the parts consisting of a driving motor, reduction gear, and battery

3.3 controller

the unit consisting of operation box and controller

3.4 battery charging system

the unit for charging battery which consists of two types such as built-in type or separate type

3.5 wheels

the components consisting of driving wheels and castors or steering wheel(s)

3.6 frame

the component which supports and connects the respective other parts of the electric wheelchair

3.7 braking system

the device which gives wheels braking force

A manual brake and an automatic brake are available.

3.8 manual brake

the device of which braking force is applied through the user's will without a operation lever

3.9 automatic brake

the device of which braking force is automatically applied when the operation lever has been reset to the initial state

3.10 exclusive indoor electric wheelchair

an electric wheelchair intended to be used for travelling indoors only

3.11 exclusive outdoor electric wheelchair

an electric wheelchair intended to be used for travelling outdoors only

3.12 low-speed use

an electric wheelchair with the speed of not exceeding 4.5 km/h

3.13 middle-speed use

an electric wheelchair with the speed of not exceeding 6.0 km/h

3.14 preliminary travelling

a travelling of 1.5 km in length as a warming-up before the test

3.15 electric wheelchair ready to travel

an electric wheelchair which is in the state allowed to be driven only by operating the operation lever with the power turned on and the clutch engaged

3.16 full tip

the situation, unless supported by restraint device or the test personnel, in which the

electric wheelchair is completely inclined from the primary position with the angle of at least 90° or more

3.17 parking brake

the brake that keeps the wheelchair stationary

3.18 full power state

the state that the operation lever is held at the position capable of generating the maximum power of the electric wheelchair

3.19 user, occupant

a person who rides on the electric wheelchair

3.20 assistant

a person who helps controlling the electric wheelchair

3.21 maximum user mass

the maximum weight of the user capable of getting on the wheelchair (including the loaded matter)

3.22 trailing position

the position of castor wheels when the electric wheelchair is travelling forward, at which the touching point of the castor wheels to the ground surface shall be located right behind of the point at the intersection of the ground with the axis line of the castor to the travelling direction

3.23 battery pack

detachable container for the battery capable of containing one or more batteries

3.24 battery set

the battery connected in the situation capable of supplying the electric power

4 Classification and symbols

Electric wheelchairs shall be classified according to the types (see Annex JA) and speeds.

a) Types:

- 1) standard type;
- 2) adjustable seat position type;
- 3) simple type.

b) Classification according to speeds:

- 1) low-speed use; (LS);
- 2) middle-speed use (MS).

5 Names of respective parts

The names of the respective parts of electric wheelchairs shall be as given in Annex JB.

6 Performances

The function, strength, impact resistance, durability and water proofing of an electric wheelchair, when subjected to the tests in 11.1, 11.2 and 11.3, shall conform to the requirements given in table 1.

Table 1 Functions, strength, impact resistance, durability and water proofing

Items			Performances	Standard type or adjustable seat position type	Simple type	Test method (sub-clause No.)
Function	Maximum speed	LS (for low speed)	4.5 km/h max.	○	○	11.1.1
		MS (for middle speed)	6.0 km/h max.	○	○	
	Climbing ability		To be capable of climbing the slope of 10° straight ahead and starting moving forward. However, the simple type shall be tested on the slope of 7°.	○	○	11.1.2
	Descending ability		To be capable of descending the slope of 10° within a speed of 115 % of the maximum speed (measured value). However, the simple type shall be tested on the slope of 7°.	○	○	11.1.3
	Braking performance		On a flat road, it shall be capable of stopping within 1.5 m. On the descending slope of 10°, it shall be capable of stopping within 3 m, and the displacement from the reference line at the time of stoppage shall be within 0.5 m. The simple type shall be tested on the slope of 7°. However, the wheelchair without automatic brake will not be tested.	○	○	11.1.4
	Parking brake ability		To be capable of parking on a slope of 10°. However, the simple type shall be tested on the slope of 7°.	○	○	11.1.5
	Static stability		To be stable against the inclinations of each 20° towards front and rear, and 15° towards sides. However, the simple type shall be tested on the slope of 10° from all directions. Under the least stable condition, the same test as that carried out under standard condition shall be carried out and the obtained information shall be disclosed.	○	○	11.1.6
	Obstacle-climbing ability		To be capable of climbing over an obstacle for 25 mm high without a running approach, and 40 mm high with a running approach, in driving towards front or rear. However, the simple type will be tested with only an obstacle of 12 mm high without running approach.	○	○	11.1.7
	Travelling performance across groove		To be capable of travelling across the groove of 100 mm wide.	○	○	11.1.8
	Travelling performance on sloping road		To be capable of ascending and descending the S-shaped track in a slope of 6° in inclination without deviation and abnormality.	○	○	11.1.9
	Lateral slope travelling performance		Not to deviate from the track of 1.2 m wide on an inclined plane of 3°.	○	○	11.1.10
	Turning performance		To be capable of turning right-angle course of 0.9 m wide for standard type and simple type, and 1.2 m wide for other types.	○	○	11.1.11

Table 1 concluded)

Items		Performances	Standard type or adjustable seat position type	Simple type	Test method (sub-clause No.)
Function (concluded)	Forced stopping	There shall be no abnormality on the body, driving system, electric circuits, etc.	○	○	11.1.12
	Continuous travelling	To achieve the indicated continuous travelling distance or longer.	○	○	11.1.13
	Driving wheel and main wheel run-out	Both vertical and horizontal run-out shall be not longer than 2 mm.	—	○	11.1.14
	Handrim run-out	Vertical run-out shall be not longer than 5 mm, and horizontal run-out not longer than 3 mm	—	○	11.1.15
	Dynamic stability	It shall be tested according to Annex JG and the obtained information shall be disclosed.	○	○	11.1.16
	Safety for battery after discharge	Do not do running that deviates from back and forth by 1m or more. Moreover, motors other than driving motor shall not have the movement not intended.	○	○	11.1.17
Strength	Seat downward	It shall satisfy the requirements for evaluation in Annex JF	○	○	11.2.1
	Withstand downward loading of arm support		○	○	11.2.2
	Withstand upward loading of arm support		○	○	11.2.3
	Withstand upward loading of foot support		○	○	11.2.4
	Withstand load of tipping lever		○	○	11.2.5
	Withstand upward loading of push handle		○	○	11.2.6
	Pulling off resistance of grip		○	○	11.2.7
	Oblique impact resistance of back support		○	○	11.2.8
Impact resistance	Impact resistance of foot support	frontal	○	○	11.2.9
		lateral	○	○	
	Impact resistance of handrim		—	○	11.2.10
	Impact resistance of castor		○	○	11.2.11
	Impact resistance of parking brake		—	○	11.2.12
Durability	Travel endurance		○	○	11.2.13
	Drop resistance		○	○	11.2.14
Water proofing		After subjected to the test, electric wheelchairs shall meet the requirements of the braking performance on a flat road and the maximum speed and there shall be no abnormality in the body, driving system, electric circuits, etc.	○	○	11.3

7 Construction

7.1 Body support system

The body support system shall be as given in the following:

- a) The seat, back support, arm support, foot support and leg support shall support the body of the user securely.
- b) The seat, back support, arm support, foot support and leg support with an adjustable and/or detachable function shall not be detached during use, and shall be capable of being adjusted, attached and detached easily.
- c) The reclining system, the lifting system and the tilting system shall be so constructed as function easily to be capable of being fixed perfectly at an arbitrary angle and position, and shall support the body of the user securely.
- d) The electric wheelchairs equipped with a seat belt shall firmly hold the body of the user, and the seat belt shall be attached or detached easily.

7.2 Driving system

The driving system shall be as given in the following:

- a) The controls of the speed and steering shall be capable of being operated easily by hand or a part of human body.
- b) It shall allow the electric wheelchair to be manually transferred in ease.

7.3 Control unit

The construction of the control unit shall be as given in the following:

- a) A joystick type operation box shall be capable of being mounted on either right- or left-hand side.
- b) The travelling speed shall be controlled optionally up to the maximum speed.
- c) On the electric circuit, an appropriate protecting circuit shall be provided.
- d) It shall exhibit no strong impact to the user, at the time of starting of driving or stopping.

7.4 Battery charging system

The construction of the battery charging system shall be as given in the following:

- a) The travelling speed shall be controlled optionally up to the maximum speed.
- b) On the electric circuit, an appropriate protecting circuit shall be provided.
- c) It shall exhibit no strong impact to the user, at the time of starting of driving or stopping.

7.5 Braking system

The construction of the braking system shall be as given in the following:

- a) The electric wheelchair shall be equipped with an automatic braking system. How-

ever, although introducing such a device to the simple type is optional, only the simple type without the automatic braking system shall be equipped with parking brake that is easily operated and capable of braking both of the right and left wheels securely.

- b) It shall be easy to be handled and shall be capable of braking wheels securely.
- c) It shall have the function capable of braking automatically when turning off the power. However, the simple type with no automatic braking system shall be excluded.

7.6 Screws

The screws to be normally used for fastening the respective parts of an electric wheelchair shall be those of the standard metric screws specified in JIS B 0205-1 to -4 and JIS B 0209-1 to -5.

7.7 Accessories

The following devices may be equipped as accessories.

- a) **Reflector** The reflector shall have the reflection performance in JIS D 9452 or JIS D 5500 and be equipped with the at most two red series reflection plates of not less than 2 000 mm² in total area at the rear surface. And it shall have the reflection performance in JIS Z 9117 and be equipped with white series reflector of not less than 1 000 mm² in area at the front and side surfaces. Or, it shall be that which is at least equal to it in performance.
- b) **Alarm** The alarm shall have the sound volume of not less than 67 dB at the position being apart by 2 m ahead from the front of alarm.
- c) **Head support**

7.8 Power and control system

7.8.1 Battery

The battery shall be as designated by the manufacturer of electric wheelchairs.

7.8.2 The colours and marks of electric wires connected to the battery

The electric wire for the power supply being connected to the (+) terminal of the battery pack shall be red and marked permanently with the symbol "+" and the electric wire being connected to the (−) terminal of the battery pack shall be of the colour except red and marked permanently with the symbol "−". Any wire being connected to (+) terminal of the battery pack but not for the power supply, shall be of the colour except red.

7.8.3 Insulation

The frames of the electric wheelchair, except the case of impedance circuit with the special purpose, shall not be connected to the battery set or any other part of electrical system of the wheelchair. The d.c. impedance shall be 10 kΩ or more and circuit current shall be 5 mA or less.

7.8.4 Fuse

The exchange of the fuse by the user or the assistant shall be carried out without tools, and on exchanging, the active lead wire and the terminal shall not touch other electrical parts.

7.8.5 Interchangeability of connectors

The connector that the user or the assistant attaches and detaches, shall be so constructed as to prevent the wrong connection that the manufacturer does not intend and shall be as given in the following:

- The shape that only the correct connection shall be allowed;
 - The length of wire to the plug shall be matched only when the connection is correct.
- The correct connection shall not be judged from only the colour of the wire.

7.8.6 Protection from non-insulated electrical parts

Apply the standard jointless test finger (see figure 1) specified in **IEC 60601-1** to all openings from every possible position with a force of $30\text{ N} \pm 1\text{ N}$. If the finger enters any opening, use the standard jointed test finger (see figure 2) in every possible position with all joints bent and then with all joints straightened to determine if any non-insulated electrical part can be touched. The test finger shall not touch non-insulated electrical parts except those protected by a circuit with a d.c. impedance of not less than $10\text{ k}\Omega$.

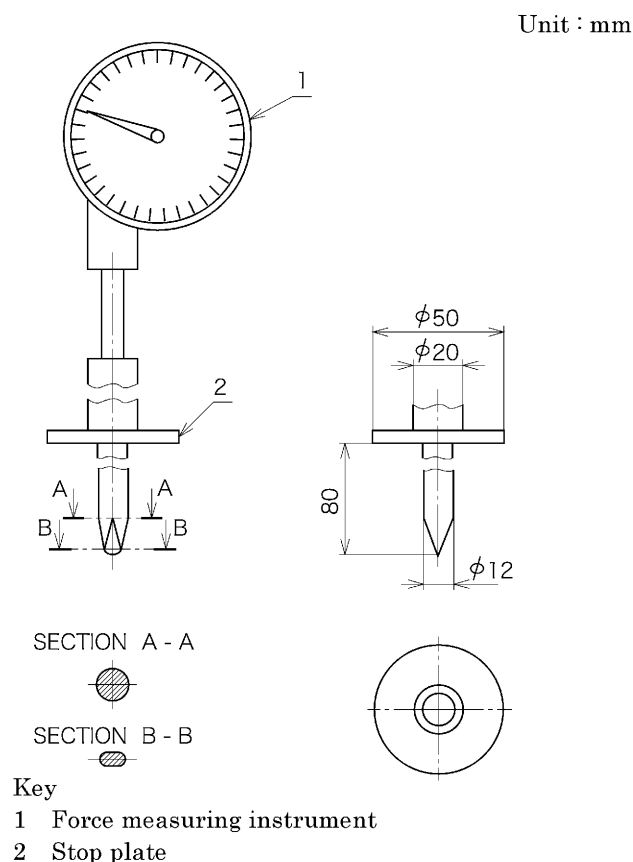
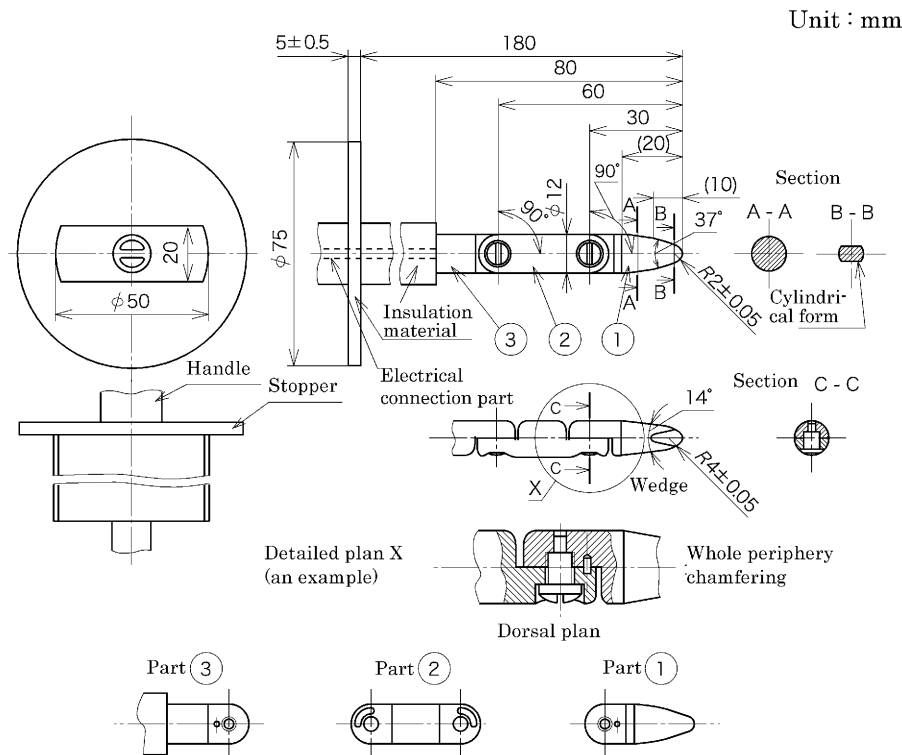


Figure 1 Standard jointless test finger



The other dimension tolerance than the specified tolerance: The tolerance of angle shall be -10° .

For the dimension of straight line, in the case of being not more than 25 mm, the tolerance shall be -0.06 mm and in the case of exceeding 25 mm, the tolerance shall be ± 0.2 mm.

Parts of ①, ② and ③ are made of metal (e.g. heat treated steel)

Two joints of this finger are enough if they can bend down to $90^\circ +10^\circ$ to one same direction.

The application of a pin and a groove is one way of limiting the bending angle to 90° . Therefore, in the detailed plan of this part, the dimensions and tolerance are not indicated. In the case of the practical planning, secure the bending angle of 90° within the tolerance from 0° to $+10^\circ$.

Figure 2 Standard jointed test finger

7.8.7 Short-circuit protection

Short-circuit protection device shall be provided as close as possible to each battery pack. Circuit protection devices shall not be of the automatic resetting type.

7.8.8 Reversed polarity at the battery

With the battery set connections reversed, there shall be no damage to the controller or any part of the driving system and the battery charger other than blown fuses. Even if the battery set connection is reversed, the wheelchair shall operate in accordance with the manufacturer's specification with no uncontrolled or unwanted movements. After circuit protection devices being resetted or replaced and battery set being reconnected to the original configuration, the wheelchair shall be able to run.

7.8.9 Controller overvoltage protection

When being connected to the voltage source 1.33 ± 0.05 times bigger than that of nominal voltage and being operated, the controller shall not fail or operate in a manner that results in uncontrolled movement and there shall be no abnormal movement of the wheels, other than stoppage, or any damage to the controller, other than blown fuses.

7.8.10 Setting up the voltage of battery charger

The voltage set-up shall be carried out using the tools, the combination of key entry, etc.

It shall not be applicable to the wheelchair equipped with the auto-adjustment function.

7.8.11 Setting up the charging property

The charging property shall be able to be modified by means of the tools or the combination of key entry.

It shall not be applicable to the wheelchair equipped with the auto-adjustment function.

7.8.12 Charging time

It is confirmed to charge from 100 % electrical discharge for 8 h, to discharge electricity by 0.2C (A), and not to reach the final voltage in 4 h. An environmental temperature is assumed to be a room temperature from 18 °C to 25 °C.

NOTE: 0.2 C is 20% of the 5 h rate capacity.

7.8.13 Heat resistance of terminal for the battery charger

In the case of the wheelchair with charging terminal, after leaving the terminal for 1 h under the environment with the temperature of $80\text{ °C} \pm 3\text{ °C}$, the terminal shall satisfy the initial performance and there shall not be any loosening, breakage, detachment, deformation harmful to use and other abnormalities on any part.

7.8.14 On-off of charger terminal

In the case of the electric wheelchair without battery charger, after carrying out on-off (attachment and detachment) operation 10 times with the maximum current between the charging terminal of electric wheel side and the charging terminal of battery charger side, the terminal shall satisfy the initial performance and there shall not be short-circuit and adhesion of contact points due to melting and other electrical or mechanical abnormalities.

7.8.15 Delayed performance of battery charger

Connect a current detection device with timing function between the battery charger and the battery set. The time taken for the charging current to flow after the battery charger is connected to the battery set shall be at least 0.5 s.

For the battery charger that gives off flammable gas, there shall be a delay of not

less than 0.5 s until the battery set is connected and charging commences after the charger has been switched on.

8 Dimensions and angles

The dimensions and angles of electric wheelchairs with adjustable function shall be specified in the standard conditions of wheelchair in table 5 or as close conditions as possible thereto, and shall be as given in table 2, table 3 and figure 3. However, these dimensions apply unless otherwise required.

The dimensional reference point A (see table 3), when the seat form is not flat but curved so as to fit the shape of human body, shall be that specified in the manufacturer's design.

Table 2 Maximum dimensions

Unit : mm

Division	Maximum dimensions ^{a)}
Overall length (L_0)	1 200
Overall width (W_0)	700
Overall height (H_0)	1 090

Note ^{a)} The electric wheelchair with a reclining system (see figure JA.1), lifting system (see figure JA.2) and tilting system (see figure JA.3) shall use the dimensions of standard conditions.

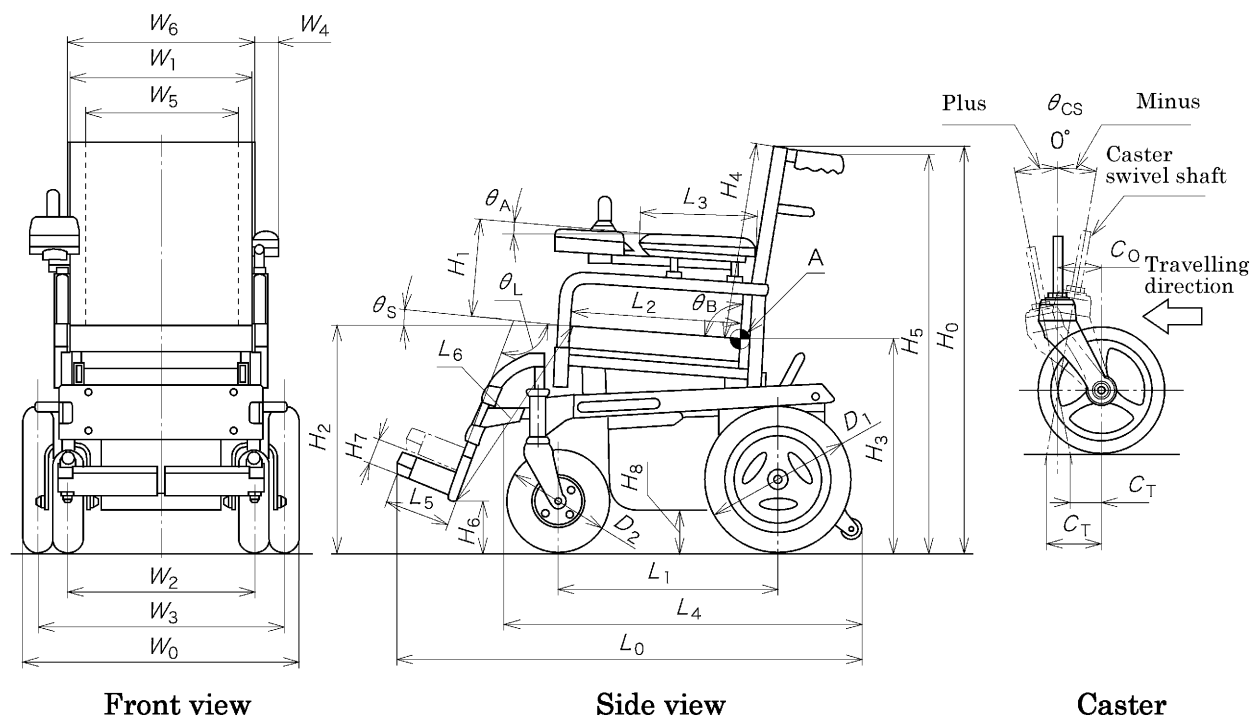


Figure 3 User operated standard type

Table 3 Name and definition of dimensions and angles of electric wheelchair

Terms	Symbol	Definitions	Remarks
Dimensional reference point	A	Point used as a reference of all dimensions of wheelchair, which is the intersection of front face of the back support or its extended plane and upper face of the seat or its extended plane	—
Overall width	W_0	The maximum outside dimension of left and right sides of the wheelchair during use	—
Seat width	W_1	The maximum width of the seat during use	—
Tread (front wheel)	W_2	Distance between the centres of the contact area of the ground and left and right tyres	—
Tread (rear wheel)	W_3	Distance between the centres of the contact area of the ground and left and right tyres	—
Arm support width	W_4	The width of arm support	—
Arm support interval	W_5	Dimension between the medial sides of the left and right arm support	—
Back support width	W_6	The maximum width of the back support during use	—
Overall width when folded	W_7	The maximum dimension of left and right lateral side of the wheelchair when folded	—
Overall length	L_0	The maximum longitudinal dimension of electric wheelchair during use	—
Wheelbase	L_1	The horizontal distance between front and rear wheel shafts. In the case that the front wheel is a caster, it is the trailing position.	In the case of wheelchairs with not less than 4 wheels, such as indoor type wheelchair, it means the distance between the contact point of the front wheel and the contact point of the most rearward driving wheel or main wheel.
Seat depth	L_2	Dimension between the dimensional reference point and the end of the seat	—
Arm support length	L_3	The length of arm support	—
Frame length	L_4	The maximum longitudinal dimension after the foot support and leg support being detached	—
Foot support length	L_5	Maximum length in longitudinal direction of foot support	—
Interval between foot support and seat	L_6	Minimum length between the upper surface of foot support and front edge of the upper surface of the seat attached to the seat holding frame	—
Overall length when folded	L_7	The maximum longitudinal dimension of wheelchair when folded	—
Overall height	H_0	The vertical distance between the highest point of the wheelchair and the floor during use	—
Height of arm support	H_1	The vertical distance between the dimensional reference point and the upper surface of arm support or its extended line	—

Table 3 (concluded)

Terms	Symbol	Definitions	Remarks
Front seat height	H_2	The vertical distance between the floor surface and the highest front end point of seat upper surface	—
Rear seat height	H_3	The vertical distance between the floor surface and the reference point of dimension	—
Back support height	H_4	The distance between the reference point of dimension and the upper end of the back support	—
Push handle height	H_5	The vertical distance between the floor surface and the upper end of the rear end of the push handle	—
Foot support and leg support height	H_6	The vertical distance between the floor surface and the lowest end of the foot support and leg support	—
Adjusting range of foot support	H_7	Adjusting range of foot support height	—
Minimum ground clearance	H_8	The height from the floor level to the lowest part	Antitip device is not included.
Overall height when folded	H_{11}	The vertical distance between the floor level and the highest point of the folded wheelchair	—
Diameter of driving wheel (main wheel)	D_1	The maximum diameter of the driving wheel or the main wheel (also applicable in inch)	In the case of wheelchairs with not less than 4 wheels, such as indoor type wheelchair, it means the biggest driving wheel or main wheel.
Diameter of caster	D_2	The maximum diameter of caster wheel (also applicable in inch)	—
Seat angle	θ_s	The angle of seat upper plane to horizontal plane	—
Back support angle	θ_B	The interior angle between the seat upper plane and the adjacent back support front plane	—
Seat and foot support angle	θ_L	The interior angle between the seat upper plane and the front plane of foot support and leg support	—
Arm support angle	θ_A	The angle of arm support surface to horizontal plane	—
Caster angle	θ_{CS}	Angle of swivel shaft of caster to the vertical line at longitudinal direction (inclination towards backside is "—" and inclination to the opposite direction "+")	—
Caster trail	C_T	The distance between the point of contact of extended line of the caster shaft to the ground and the point of contact of caster wheel to the ground	—
Caster offset	C_0	The horizontal distance between the centre of swivel shaft of caster and the centre of the caster wheel axis at the 90° position to the caster axis	—

9 Appearance

The appearance shall be as follows, and it shall not affect the safety of the user and the assistant.

- a) The electric wheelchair shall be well-finished and free from defects such as deformation, fissure and incomplete weld. The parts which may be touched with human body shall be free from fins, burrs and sharp protrusions.
- b) The precautionary measures to avoid burns shall be taken against the parts which may be touched with human body and may cause burns due to high temperatures.
- c) There shall be no defective parts such as bare substrate, peeling and rust on the surface to which surface treatment, etc. are applied.
- d) There shall be no defective parts such as rust and cracks on the surface to which surface treatment, etc. are not applied.

10 Test conditions

The test conditions shall be as given in the following:

- a) The temperature condition shall be $20\text{ }^{\circ}\text{C} \pm 15\text{ }^{\circ}\text{C}$ at the time of testing unless otherwise specified, and the temperature and humidity on each execution of test shall be recorded.
- b) The testing track shall be flat.

The coefficient of friction of the test surface shall be according to **ISO 7176-13**.

- c) For the function test in 11.1, the test dummies (hereafter referred to as "dummies") specified in figure JH.1 to figure JH.11 shall be used or a human test driver who gets on the electric wheelchair shall be participated. The maximum user mass shall be as specified in table 4. For the driver mass, the masses of sandbags used for adjustment and of his/her clothes shall be included. The sandbags are mounted on the seat uniformly in the left and right. The driver sits on the centre of the seat and makes his/her back right along the back support and puts his/her legs in the centre of the foot support and then, the test shall be carried out.

The mass distribution of weights is given in table JH.1.

Table 4 Maximum user mass of the electric wheelchair

Unit : kg	
Maximum user mass	Mass of dummy or test driver
Up to 25	25
Over 25 up to and incl. 50	50
Over 50 up to and incl. 75	75
Over 75 up to and incl. 100	100

- d) The battery to be used in the tests shall be charged by 75 % or more of the rated power. However, the test of 11.1.17 is excluded.

- e) The pneumatic tyres shall be inflated to the manufacturer's indication value. When the tyre pressure is indicated in a range, the maximum value shall be taken.
- f) An electric wheelchair with an adjusting function shall be tested under the standard conditions specified in table 5. If incapable of adjusting to the standard conditions specified in table 5, it shall be tested under as near the standard conditions as possible. For static stability test (11.1.6) and dynamic stability test (11.1.16), the test shall be carried out under the least stable conditions of table 6 within the range of adjustment. However, an electric wheelchair without adjustment function is not applicable to this case.

Table 5 Standard conditions of the electric wheelchair

Division	Standard conditions
Foot support and leg support height H_6	50 mm from floor level
Seat angle θ_s	4°
Back support angle (reclining) θ_B	100°
Foot support and leg support angle θ_L	90°

Table 6 Least stable conditions of electric wheelchair

Adjustment of wheelchair parts	Least stable conditions		
	Backwards stability	Forwards stability	Lateral stability
Seat position (vertical)	High	High	High
Back support angle (reclining)	Backwards	Forwards	Upright
Seat angle (inclined)	Backwards	Forwards	Upright

- g) If necessary, the tests shall be carried out after the electric wheelchair has pretravelled sufficiently.

11 Test methods

11.1 Function tests

11.1.1 Maximum speed test

The electric wheelchair shall pretravel sufficiently before the test and the maximum speed (V) shall be calculated by the following procedure as given in figure 4.

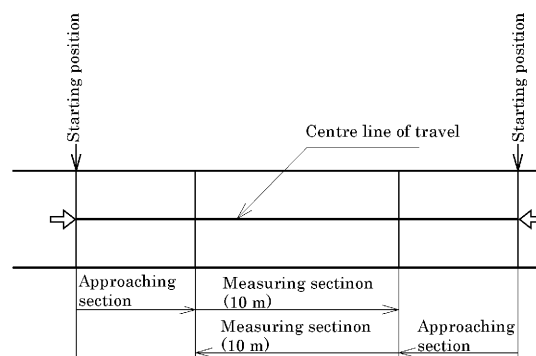


Figure 4 Maximum speed test

- a) An electric wheelchair ready to go forward travels on the centre line of travel and attain the maximum speed within the approaching section.
- b) It travels through the measuring section (10 m) with keeping the maximum speed of the approach section.
- c) Measure the time required for passing through the measuring section (10 m), using a stopwatch, etc. to the nearest second decimal place.
- d) Measure the time of round-way trips twice within the measuring section and calculate the average of required time (T) for passing through from the total four measured values.
- e) Obtain the maximum speed (V) from the following formula calculating to the nearest two decimal places and round off to the nearest first decimal place as specified in JIS Z 8401.

$$V = \frac{36}{T}$$

where, V : maximum speed (km/h)
 T : average required time for passing through (s)

- f) The value obtained by the procedure e) shall be the maximum speed (V) when travelling forwards.
- g) Obtain the maximum speed (V) from the formula in e) when travelling backwards by using the procedures a) to f) as well as the case of travelling forwards.

11.1.2 Slope climbing test

Position an electric wheelchair ready to be driven on a sloping plane of 10° , and after setting the climbing section of 5 m in length, as given in figure 5, carry out slope climbing forwards starting from standstill. When the electric wheelchair has stopped naturally or by an operation of safety device for electric circuit and when the wheelchair has fallen down completely at the time of starting, consider the electric wheelchair to be incapable of climbing the slope. The test for the simple type of wheelchair shall be carried out on a sloping plane of 7° . However, the travelling speed is not specified.

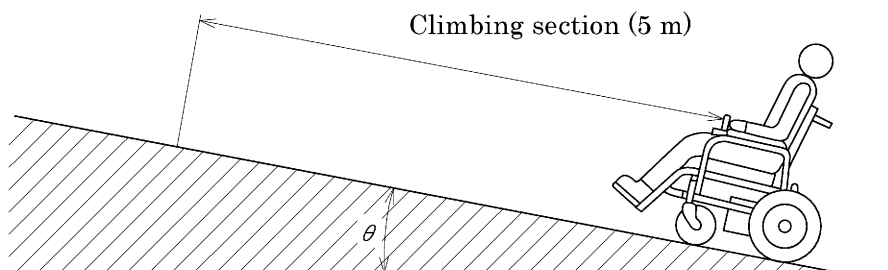


Figure 5 Slope climbing test

11.1.3 Slope descending test

Position an electric wheelchair ready to be driven on a sloping plane of 10° , and after

setting the descending section of 5 m in length as given in figure 6, carry out slope descending forwards with the maximum power starting from standstill. Travel through the approaching section of 4 m and obtain the average speed through the measuring section of 1 m.

The tests shall be repeated 3 times and obtain the average speed from these three measurements. The test for the simple type shall be carried out on a sloping plane of 7°.

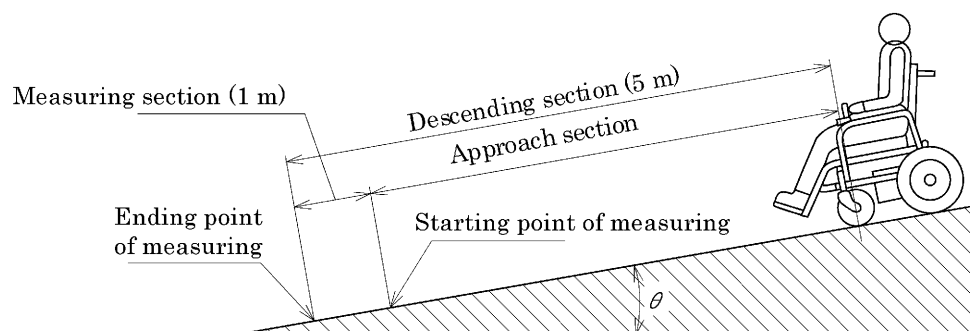


Figure 6 Slope descending test

11.1.4 Running brake test

The breaking performance test is the test in which an automatic brake operates and braking is operated by returning the operating lever of electric wheelchair under the condition capable of travelling to the initial condition, and shall be as follow.

In addition, the brake other than the automatic brake shall not be used.

- a) **Horizontal plane running brake test** Setting a travelling section of 5 m in length on a horizontal road surface as given in figure 7, measure the stopping distance and the amount of displacement ¹⁾ when the electric wheelchairs stop by braking, after passing through the travelling section forwards with full power.

Note¹⁾ The amount of displacement shall be the maximum amount of displacement between the point of wheel's passing through at the starting point and the point of wheel's touching the ground surface at the stopping point.

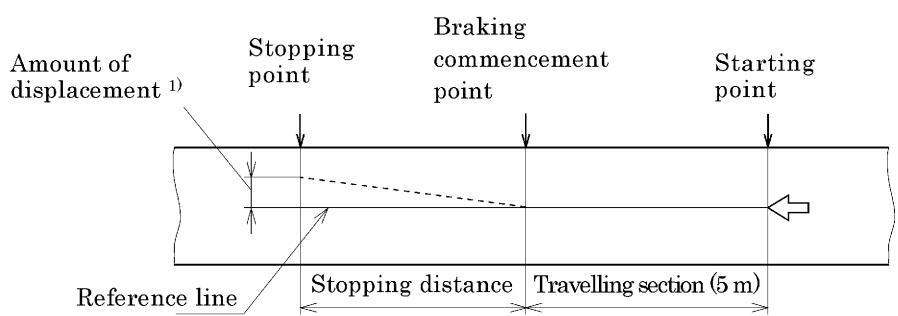


Figure 7 Horizontal plane running brake test

- b) **Downhill plane running brake test** Position the electric wheelchair on a track surface of 10° in inclination angle, as given in figure 8, start it forwards with full power, and after passing through 2 m, brake to measure the stopping distance and the amount of displacement ¹⁾. The test for the simple type shall be carried out on a sloping plane of 7° . The simple type equipped with no automatic brake shall be excluded from the test.

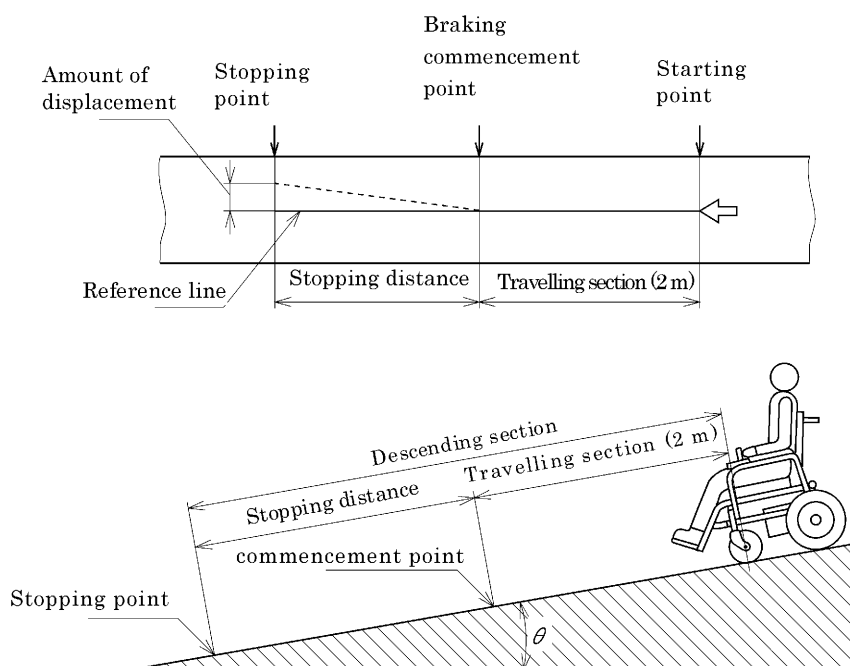


Figure 8 Downhill plane running brake test

11.1.5 Parking brake test

Position an electric wheelchair on a sloping plane of 10° upwards and downwards to the slope under being automatically braked condition, as given in figure 9 and figure 10, and examine whether it is capable of continuing to stand still for 1 min in both cases. The test for the simple type wheelchair shall be carried out on a sloping plane of 7° .

Turn back the operation lever of the electric wheelchair ready to travel to the initial state, and brakes other than the automatic brake shall not be used. The simple type equipped with no automatic brake shall be tested through the operation of the parking brake.

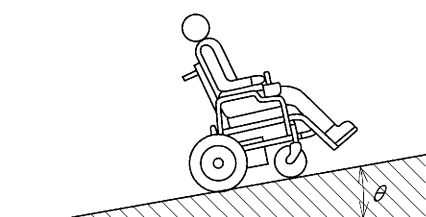


Figure 9 Parking brake test (upward)

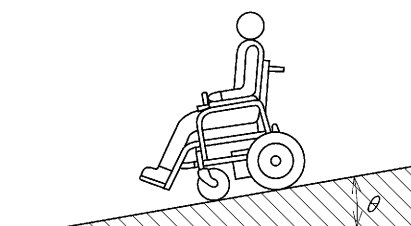


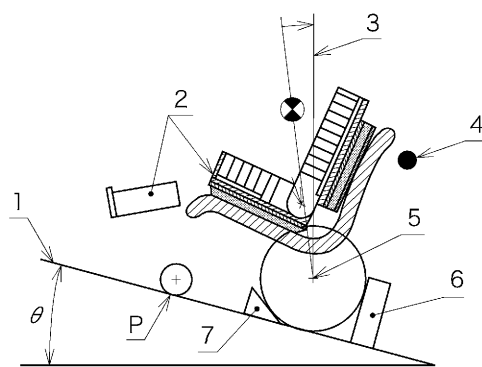
Figure 10 Parking brake test (downward)

11.1.6 Static stability test

Position an electric wheelchair upwards (rear stability), downwards (front stability), and transversely (lateral stability) in respect to the inclined plane and examine whether two wheels in the mountain side of the electric wheelchair get out of the inclined plane.

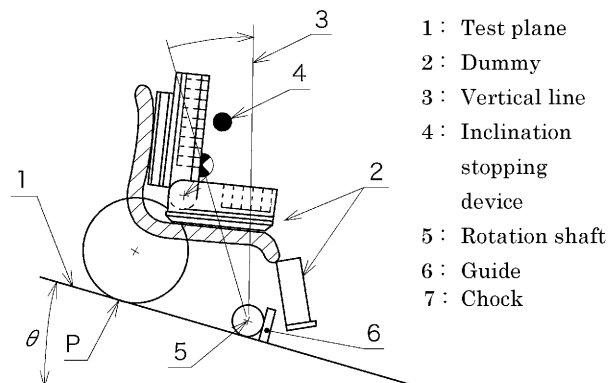
Moreover, in the lateral side test, the electric wheelchair shall be placed so that when an electric wheelchair is tipped, the rotation axis of the electric wheelchair becomes in parallel $\pm 3^\circ$ in angle to the rotation axis of the inclined surface.

- a) In the case of electric wheelchair incapable of locking the wheels, as specified in figures 11 and 12, turn off power switch of the electric wheelchair, place it on the inclined plane with wheels unlocked, and measure the angle of inclination in both upwards and downwards situation. Then, set up the condition of the wheelchair as given in table 6 so that the adjustable and least stable position shall be maintained, and examine in the same way and disclose the respective results according to the table 7.



(Upwards with no wheels locked)

Figure 11 Static stability test



(Downward with no wheels locked)

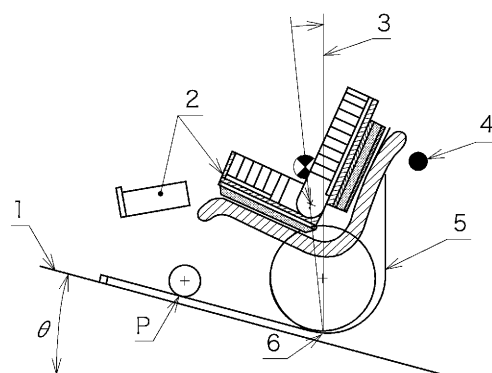
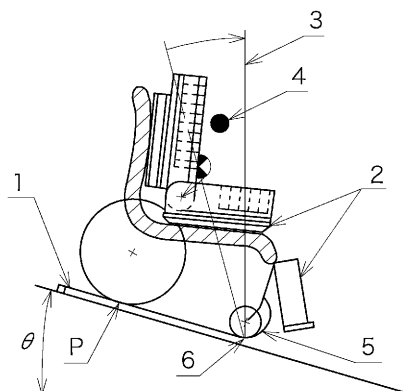
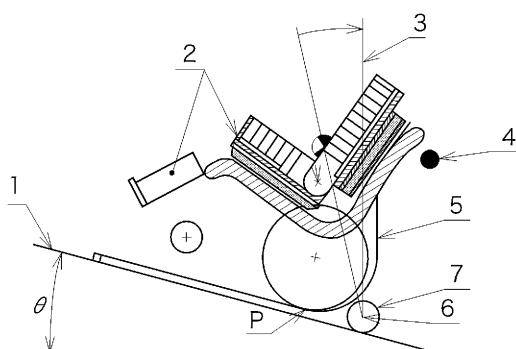
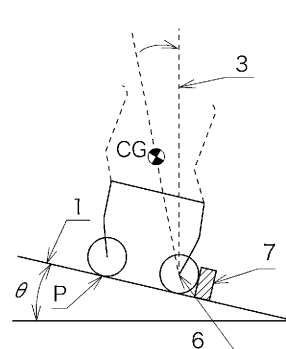
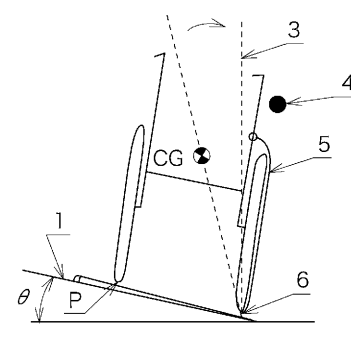
Figure 12 Static stability test

- b) In the case of the electric wheelchair capable of locking the wheels, turn off the power switch, and place the wheelchair as specified in figures 13 to 16, attach the straps, etc. so that the electric wheelchair shall not slip on the testing plane, and examine the stability at the upward, downward, and transverse position.

The indication values are 20° in upward and downward positions and 15° in transverse position for the standard type, 10° in upwards, downwards and transverse positions for the simple type. Then, obtain the maximum inclination angle through setting up the adjustable and least stable position as shown in table 6. Disclose the results according to table 7. In the case of the electric wheelchair equipped with antitip device, maximum inclination angle is defined as the angle when the antitip device is the only supporting device (wheels) for the wheelchair.

Table 7 Disclosure items of static stability test

Items	For wheels unlocked	For wheels locked
Rear stability	Maximum angle in the standard and least stable conditions	Maximum angle in the least stable condition.
Front stability		
Lateral stability		
Upper limit of maximum angle shall be the prescribed value.		

**(Upwards: wheels locked)****Figure 13 Static stability test****(Downwards: wheels locked)****Figure 14 Static stability test****Figure 15 Static stability test (with antitip device)****Front wheel side (without lock)****Rear wheel side (with lock)****Figure 16 Static stability test (lateral side)**

11.1.7 Obstacle-climbing test

Install an offset board as given in figure 17 and examine whether the electric wheelchair ready to travel is capable of surmounting the board in driving forward or rearward. The test shall be performed from a state of the wheelchair of which the wheels are coming in contact with the board (without approach) and at a speed of approaching with full power from a point with the distance of 50 cm horizontally apart from the contacting point of the wheels and the board (with approach). The simple type shall be tested under the condition without approach and the height of board shall be 12 mm. However, the travelling speed is not specified.

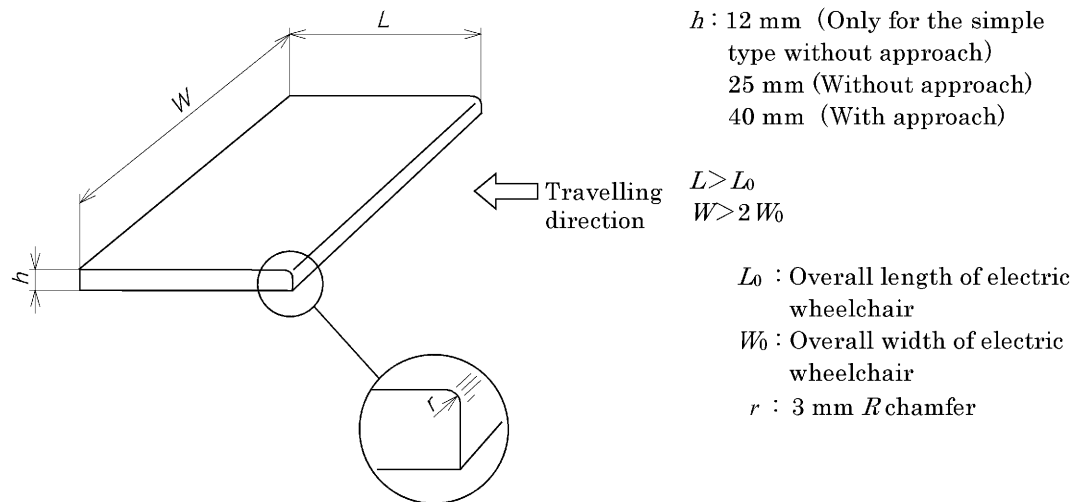


Figure 17 Obstacle-climbing test

11.1.8 Crossing groove test

With an electric wheelchair ready to travel stopped at 2 m in front of a groove of 10 mm C chamfer, 100 mm wide and 100 mm deep as given in figure 18, allow it to advance at right angles to the groove and examine whether it is capable of travelling over the groove.

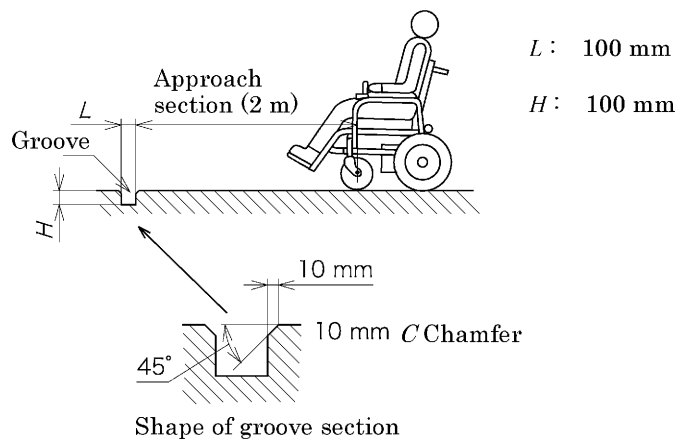


Figure 18 Crossing groove test

11.1.9 Slope travelling test

Set a S-shape track 1.2 m wide on a slope of 6° in inclination angle, as given in figure 19. With an electric wheelchair ready to travel, start it forwards with full power and carry out ascending and descending travels on this track.

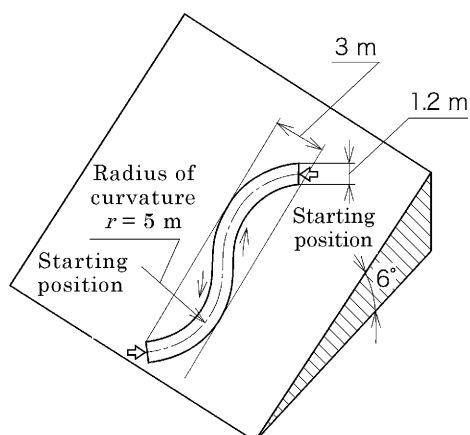


Figure 19 Slope travelling test

11.1.10 Lateral slope travelling test

Setting a track of 1.2 m wide and 5 m long in parallel to a contour line on a slope of 3° in inclination angle, as given in figure 20, drive the electric wheelchair ready to travel forwards and backwards in the advancing direction with full power.

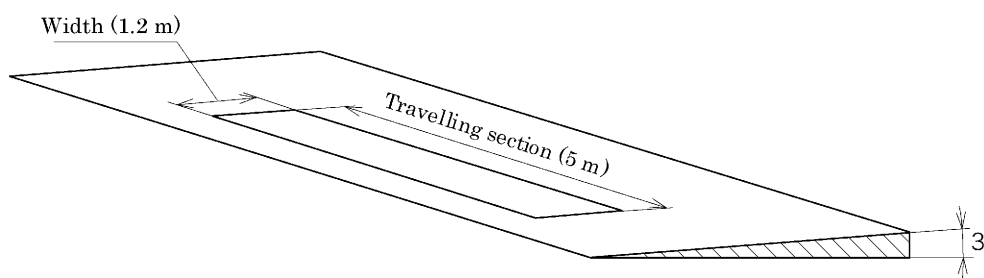


Figure 20 Lateral slope travelling test

11.1.11 Turning performance test

Set a rectangular course enclosed with screens of 1.5 m in height, as given in figure 21, and after stopping the electric wheelchair ready to travel before the course, travel forwards and backwards without switchback on the rectangular course. Under this condition, the electric wheelchair shall not get in touch with the screen. The travelling speed is not specified.