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Service Center (Germany)
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(toll-free, in Germany)



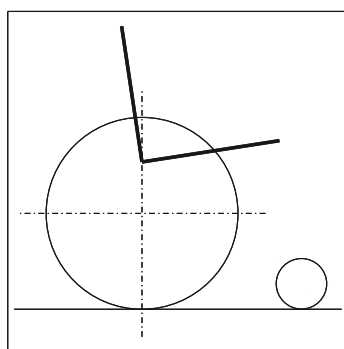
1. General Information

With actively powered wheelchairs, only the optimal adjustment allows for greatest possible mobility of the user. e-motion offers many options for tuning according to the individual demand. The following functions and properties permit you, individually or in combination, to make individual adjustments for the wheelchair driver:

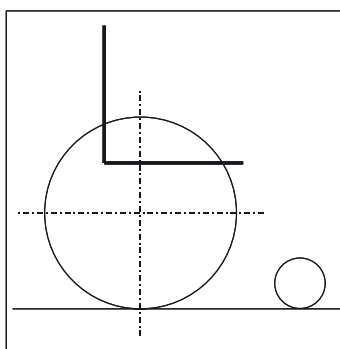
Variable attachment of the wheels

The fully integrated placement of the motors and functional elements in the wheel hubs permit realizing variable wheel positions depending on the wheelchair frame. For example, a greater angle of seat can be offered when first mobilizing the patient. On the other hand, different body proportions can be compensated for; this is important for an economic drive movement and good seating.

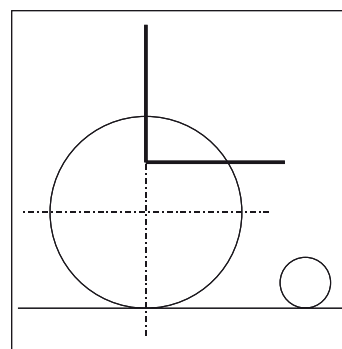
Examples:



Large angle of seat -
for mobilization



Front wheel position -
increased maneuverability



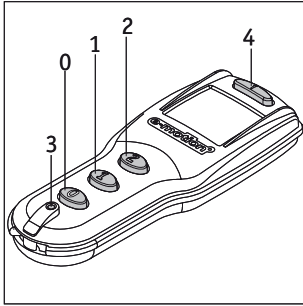
Low seat height -
using the tips of the toes

You can take advantage of the entire bandwidth of the "active" wheelchair adaptation and are still free to choose the suitable wheelchair model. The following sections shall help you configure the optimal adjustment of the e-motion using an incremental approach.



First read the operating instructions

Familiarize yourself with the functional elements and safety instructions!

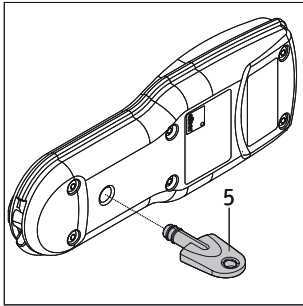


2. Adjustment options

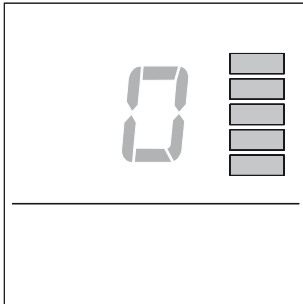
You must insert the battery packs in the wheel hubs before you can begin programming the e-motion wheels. Please follow the e-motion operating instructions included in the information and comments of Chapter 4.6.

Overview

- [0] = Button 0
- [1] = Button 1
- [2] = Button 2
- [3] = RESET button
- [4] = Info button
- [5] = Magnetic key



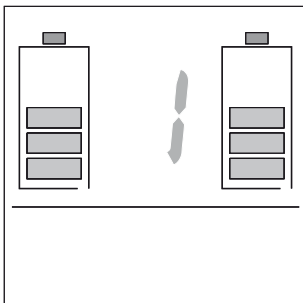
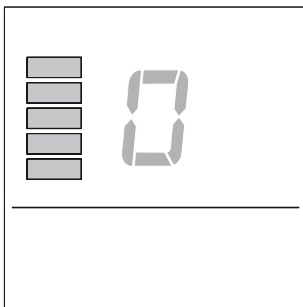
It does not matter for programming to which power stage (1 or 2) the wheels are currently set.

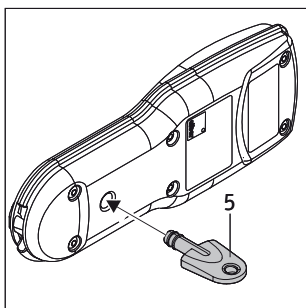


2.1 Adjusting the remote control to the e-motion wheels

To be able to proceed with programming, the remote control must first be configured for the two e-motion wheels. Perform the following steps in sequence.

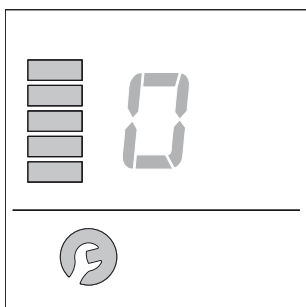
- First switch off the two e-motion wheels on their wheel hubs if not yet done (see operating instructions Chapter 2.4).
- Switch on the remote control by pressing the Info button [4]; all display elements will come on at this time for approx. 1 second.
- At the same time, press buttons [0] and [2] for approx. 5 seconds. A countdown (running from 5 to 0) is shown in the display.
- Briefly release the two buttons [0] and [2].
- Press buttons [0] and [2] again at the same time for approx. 5 seconds. A countdown running from 4 to 0 is now shown in the display.
- On the right side of the display, 5 flashing
- battery bars are now shown.
- Now switch on the right e-motion wheel on its wheel hub (see operating instructions Chapter 2.2).
- Press button [1]. On the left side of the display, 5 flashing battery bars are now shown.
- Now switch on the left e-motion wheel on its wheel hub (see operating instructions, Chapter 2.2).
- Press button [1] which completes the adjustment of the e-motion remote control.
- The following is now shown in the display:
 - the capacity of the left and right battery pack
 - the power stage currently set at the wheels (1 or 2)



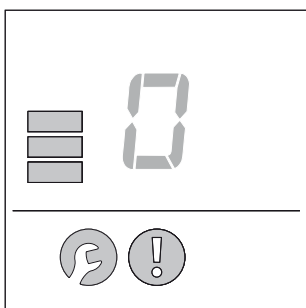


2.2 Programming the e-motion wheels with the remote control

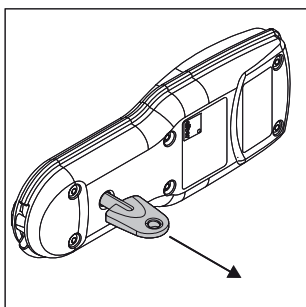
- Switch on the remote control by pushing the Info button [1]. All indicators now appear briefly in the display.
- Switch on the two e-motion wheels (see operating instructions, Chapter 2.3).
- Insert the magnetic key into the recess on the bottom of the remote control.



- The first parameter ("0"), its current programming status (symbolized by the bar) and the tool symbol (as visual verification for the activated programming mode) are shown in the display.
- Push the Info button [4] if the respectively shown parameter shall not be changed. Programming advances to the next parameter [1, 2, 3, ...] each time you press the Info button [4].



- On the remote control push the following if the parameter shown shall be changed:
 - button [1] to reduce the parameter (symbolized by the reduction of the associated bar display)
 - button [2] to enlarge the parameter (symbolized by the enlargement of the associated bar display)
- Each push on the buttons [1] or [2] decreases or increases the parameter to be set by one increment each. The respective current status is symbolized in the associated bar display.
- Push the button [0] if you want to accept the selected value. Now push the Info button [4] to reach the next parameter.
- Push the Info button [4] only to get to the next parameter if you do not want to accept the value and leave the parameter unchanged.
- You can close the programming mode after you have set all parameters according to the preferences of the wheelchair driver. Pull the magnetic key from the bottom of the remote control [5] to complete the process.
- The programming mode is closed automatically if no button is pushed for more than 15 seconds.



The programming mode can be closed at any time and regardless of the parameter shown in the display. Please remember that changed parameter settings are only accepted if the button "0" was pushed.



The "Exclamation mark" symbol appears in the display when a parameter value is changed. It only goes off after the set value was accepted or the next parameter was selected.

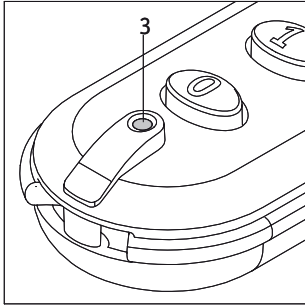


We recommend changing only one parameter if you program an e-motion wheel for the first time. This helps you to better learn the effects of the change on the driving behaviour.

Always perform a test run with the e-motion first after you have changed parameters and before handing the wheelchair to the wheelchair driver. Become familiar thereby with the changed parameter values and their effects on the driving behaviour and verify their correct setting at the same time.

Pay special attention to the driving behaviour when changing parameters 5 and 8 (follow-up time in power stage 1 or 2). The motors of the e-motion wheels may run after longer than you may expect. Perform test drives only in a safe area free from obstacles and traffic.

Once all parameters have been set correctly and as desired, the wheelchair driver should perform a test drive according to your instructions. This will give the driver the opportunity to become familiar with the new driving behaviour; you can modify undesired parameter values once more, if necessary.



2.3 Parameter Reset

All parameters can be reset to their original factory settings at any time.

To do so, take a pointed object and push the RESET button [3] with it for 5 seconds. A brief acoustic signal indicates the successful restoration of the originally set parameters (see Chapter 2.6).



2.4 Parameter sets

The values of 10 parameters can be changed in 5 increments each and thus adapted to the individual preferences of the wheelchair driver. The respectively set parameter value is thereby always indicated in the display of the remote control.

Example:

The current parameter (in the adjacent example "0" = sensitivity of the push rim) is indicated in the center of the display.

Each of the parameter values set (level 1 to level 5) is shown at the left or right side of the display via the bar indicator (1 to 5 bars). The following applies hereby:

- For the parameter "0", the symbol is shown at the left side of the display (for the e-motion wheel mounted to the left side of the wheelchair).
- For the parameter "1", the symbol is shown at the right side of the display (for the e-motion wheel mounted to the right side of the wheelchair).
- With parameters "2" to "9", the bar symbols appear on the left and right side of the display since these parameters affect both wheels.

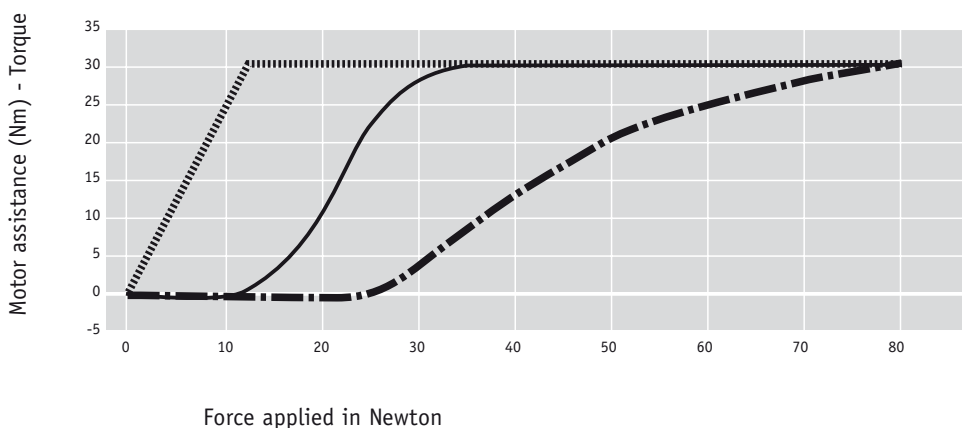
2.5 Information on the parameters

Sensitivity

The following diagram illustrates the force to be applied in relationship to the sensor setting of the push rim.

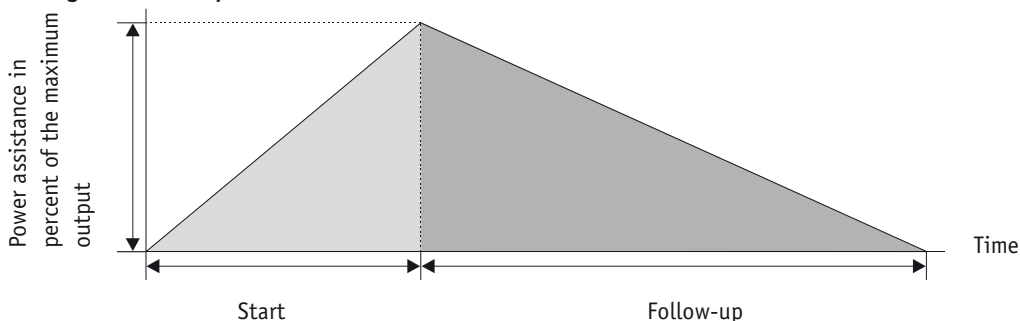
They mean:

- Minimum = Parameters 0 or 1, Parameter value 1 (20 % sensitivity)
- Medium = Parameters 0 or 1, Parameter value 3 (60 % sensitivity)
- Maximum = Parameters 0 or 1, Parameter value 5 (100 % sensitivity)



With a person weighing approx. 80 kg, only roughly 500 grams (5 Newton) of force introduction is required on level ground to begin moving from the standstill state. Subsequently, even less force is required to remain in a continuous forward or backward movement. The individual choice of the sensor setting also facilitates the support of therapeutic measures. The wheelchair driver can be gradually guided to use a higher force to be exerted by him. This happens by reducing the sensor sensitivity at regular intervals.

Starting and follow-up time



Start:

Time between moving the push rim until reaching the desired motor output in seconds.

The longer the time period, the more sluggish the motor response to the impulse from the push rims. Higher settings are ideal for patients who are generally strong but restricted in the coordination of their arms (e.g. spastics).

Power assistance:

What is the max. applied percentage of the possible motor output?

Max. torque: 30 Nm (=100 %).

Higher assistance = lower range

Lower assistance = higher range

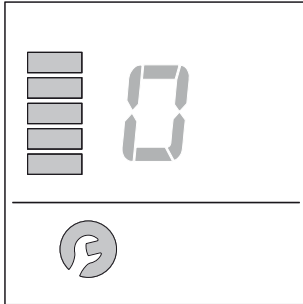
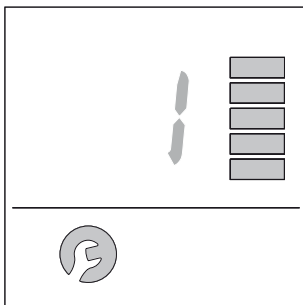
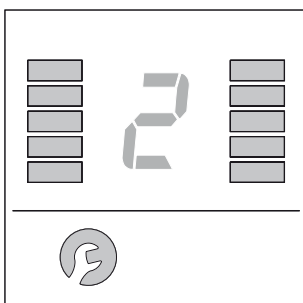
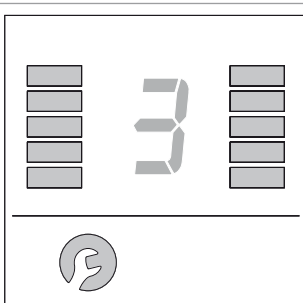
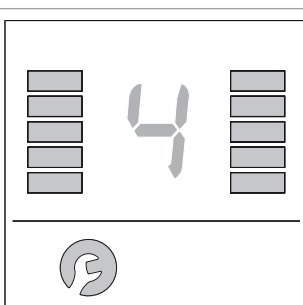
Follow-up:

How long does the motor "run after" (follow-up) after the push rim was operated and released again?

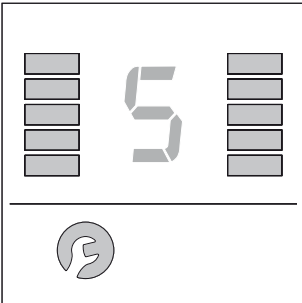
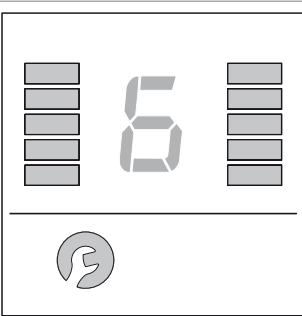
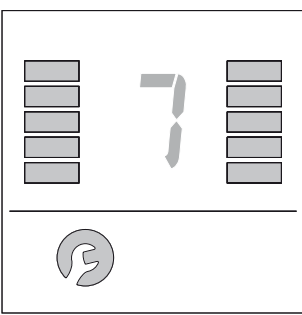
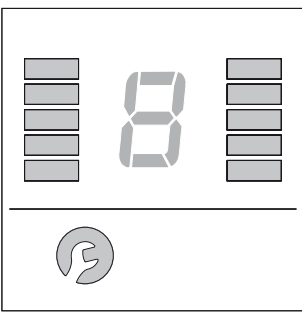
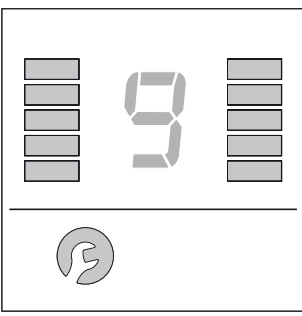
Obstacles (e.g. curbs) can be overcome more easily, significantly fewer pushes are required when driving uphill.

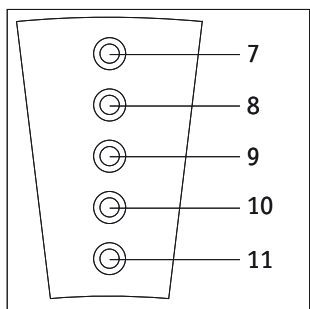
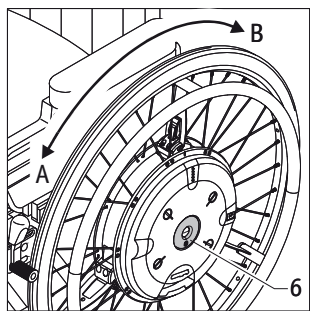
2.6 Parameter overview

The following table shows which parameters can be set with which values. Factory settings are marked in **bold**.

Parameters and presentation in the display	Function and setting option
	<p>Sensitivity of the push rim on the left wheel, adjustable from 20 % (little muscle power required to move the wheel) to 100 % (much muscle power required to move the wheel). Programmable stages:</p> <ul style="list-style-type: none"> • 20 % (display: 1 bar at the left side of the display) • 40 % (display: 2 bars at the left side of the display) • 60 % (display: 3 bars at the left side of the display) • 80 % (display: 4 bars at the left side of the display) • 100 % (display: 5 bars at the left side of the display)
	<p>Sensitivity of the push rim on the right wheel, adjustable from 20 % (little muscle power required to move the wheel) to 100 % (much muscle power required to move the wheel). Programmable stages:</p> <ul style="list-style-type: none"> • 20 % (display: 1 bar at the left side of the display) • 40 % (display: 2 bars at the left side of the display) • 60 % (display: 3 bars at the left side of the display) • 80 % (display: 4 bars at the left side of the display) • 100 % (display: 5 bars at the left side of the display)
	<p>Volume of the acoustic signal</p> <ul style="list-style-type: none"> • Level 1 (soft = display: 1 bar at both sides of the display) • Level 2 (display: 2 bars at both sides of the display) • Level 3 (display: 3 bars at both sides of the display) • Level 4 (display: 4 bars at both sides of the display) • Level 5 (loud = display: 5 bars at both sides of the display)
	<p>Starting time of power stage 1</p> <ul style="list-style-type: none"> • 0.3 seconds (display: 1 bar at both sides of the display) • 0.5 seconds (display: 2 bars at both sides of the display) • 0.75 seconds (display: 3 bars at both sides of the display) • 1 second (display: 4 bars at both sides of the display) • 1.2 seconds (display: 5 bars at both sides of the display)
	<p>Power assistance in power stage 1 Power with which the motor assists the drive movement of the driver Programmable stages:</p> <ul style="list-style-type: none"> • 30 % motor assistance (display: 1 bar at both sides of the display) • 40 % motor assistance (display: 2 bars at both sides of the display) • 50 % motor assistance (display: 3 bars at both sides of the display) • 60 % motor assistance (display: 4 bars at both sides of the display) • 70 % motor assistance (display: 5 bars at both sides of the display)

Parameter overview (continued)

Parameters and presentation in the display	Function and setting option
	<p>Follow-up time of power stage 1</p> <ul style="list-style-type: none"> 0.8 seconds (display: 1 bar at both sides of the display) 1 second (display: 2 bars at both sides of the display) 1.2 seconds (display: 3 bars at both sides of the display) 1.5 seconds (display: 4 bars at both sides of the display) 1.8 seconds (display: 5 bars at both sides of the display)
	<p>Starting time of power stage 2</p> <ul style="list-style-type: none"> 0.5 seconds (display: 1 bar at both sides of the display) 0.7 seconds (display: 2 bars at both sides of the display) 1 second (display: 3 bars at both sides of the display) 1.3 seconds (display: 4 bars at both sides of the display) 1.5 seconds (display: 5 bars at both sides of the display)
	<p>Power assistance in power stage 2</p> <p>Power with which the motor assists the drive movement of the driver</p> <p>Programmable stages:</p> <ul style="list-style-type: none"> 60 % motor assistance (display: 1 bar at both sides of the display) 70 % motor assistance (display: 2 bars at both sides of the display) 80 % motor assistance (display: 3 bars at both sides of the display) 90 % motor assistance (display: 4 bars at both sides of the display) 100 % motor assistance (display: 5 bars at both sides of the display)
	<p>Follow-up time of power stage 2</p> <ul style="list-style-type: none"> 1.8 seconds (display: 1 bar at both sides of the display) 2 seconds (display: 2 bars at both sides of the display) 2.5 seconds (display: 3 bars at both sides of the display) 3 seconds (display: 4 bars at both sides of the display) 4 seconds (display: 5 bars at both sides of the display)
	<p>Self shut-off time of the wheel</p> <p>Time until the automatic shut-off of the wheel if the push rim is not operated or the battery pack is not charged.</p> <p>The following times can be programmed:</p> <ul style="list-style-type: none"> 5 minutes (display: 1 bar at both sides of the display) 15 minutes (display: 2 bars at both sides of the display) 30 minutes (display: 3 bars at both sides of the display) 60 minutes (display: 4 bars at both sides of the display) 120 minutes (display: 5 bars at both sides of the display)

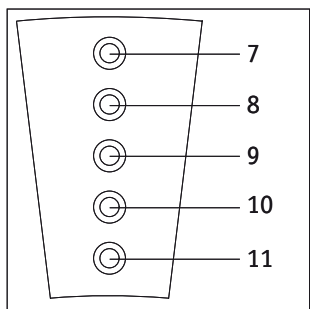
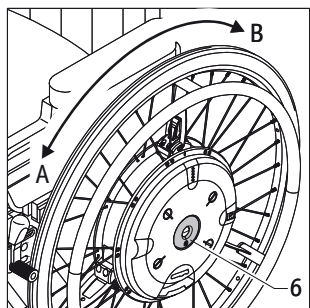


2.7 Adjustment activities on the wheel

2.7.1 Setting the sensitivity of the push rim

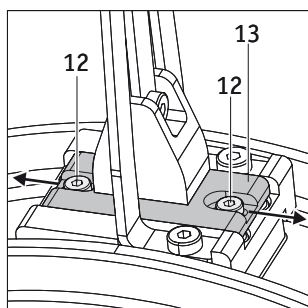
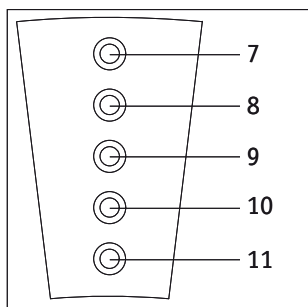
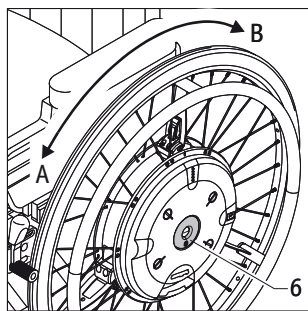
- Push the On/Off button [6] on the e-motion wheel for approximately 5 seconds.
- 3 signal tones will sound if the service mode is active and the green LED [7] comes on.
- Push the On/Off button [6] on the e-motion wheel again for approximately 5 seconds.
- 1 signal tone sounds after 5 seconds.
- Displace the push rim to set the desired sensitivity value (see table, Chapter 2.6).
Displacement in direction A increases the value to be set,
displacement in direction B reduces it.
- The LEDs indicate the set value as follows:
 - 20 % sensitivity LED 7 comes on
 - 40 % sensitivity: LED 8 comes on
 - 60 % sensitivity: LED 9 comes on
 - 80 % sensitivity: LED 10 comes on
 - 100 % sensitivity: LED 11 comes on
- Once you have set the desired value, push the On/Off button [6] on the e-motion wheel again for approximately 5 seconds.
- A signal tone sounds after 5 seconds and the programmed value is stored in the wheel.
- This completes the programming process and the wheel is switched off automatically.

The adjustment activities described in Chapters 2.7.2 and 2.7.8 are only necessary if you have performed repairs on the electronics or the sensor. The rotor position or the sensor must be readjusted in these cases.



2.7.2 Manual rotor position adjustment

- Make sure that the wheel to be adjusted can be freely moved.
For this purpose, you can either leave the e-motion wheel on the wheelchair and raise it with the Alber anti-tippers (refer to the operating instructions in Chapter 10.2) or remove the e-motion wheel from the wheelchair and hold it by an appropriate device, e.g. on a workbench.
- Push the On/Off button [6] on the e-motion wheel for approximately 5 seconds.
- 3 signal tones will sound if the service mode is active and the green LED [7] comes on.
- Displace the push rim toward the front (A) or rear (B) until the red LED [11] comes on.
- Push the On/Off button [6] on the e-motion wheel again for approximately 5 seconds.
- 1 signal tone sounds after 5 seconds.
- The rotor position adjustment is not carried out automatically.
The wheel hereby initially turns 1 time completely by 360 degrees and then in 16 increments although by 360 degrees.
- The automatic adjustment is completed when 1 signal tone sounds.
The wheel is then switched off automatically.



2.7.3 Manual sensor adjustment

- Make sure that the push rim of the wheel can be freely moved. Neither tensile nor compression forces may be applied to the push rim.

For this purpose, you can either leave the e-motion wheel on the wheelchair and raise it with the Alber anti-tippers (refer to the operating instructions in Chapter 10.2) or remove the e-motion wheel from the wheelchair and hold it by an appropriate device, e.g. on a workbench.

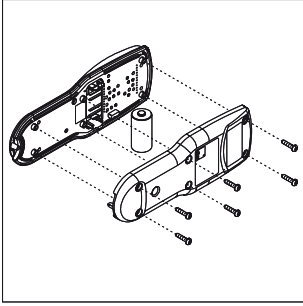
- Push the On/Off button [6] on the e-motion wheel for approximately 5 seconds.
- 3 signal tones will sound if the service mode is active and the green LED [7] comes on.
- Displace the push rim toward the front (A) or rear (B) until the orange LED [9] comes on.
- Push the On/Off button [6] on the e-motion wheel again for approximately 5 seconds.
- 1 signal tone sounds after 5 seconds.
- Loosen the two adjustment screws [12] on the e-motion wheel **only now** so that the sensor [13] can be moved.
- You have reached the correct position of the sensor [13] as soon as the middle orange LED [9] comes on. Retighten both adjustment screws [12] again in this position.
Tightening torque: 1.1 Nm
- Push the On/Off button [6] on the e-motion wheel again for approximately 5 seconds. A zero-adjustment of the sensor is now performed on the push rim.
- 1 signal tone sounds after 5 seconds which completes the sensor adjustment.
- This completes the programming process and the wheel is switched off automatically.



With each of the steps described in Chapters 2.7.1 to 2.7.3, the wheel sensor transmits pulses to the wheel electronics.

The entire programming process is terminated if the wheel electronics does not receive a pulse over a period of 30 seconds (regardless at which point in the process you are currently positioned).

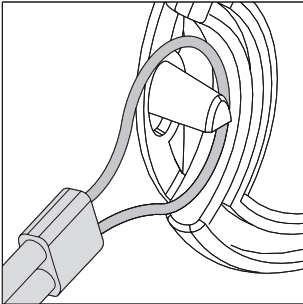
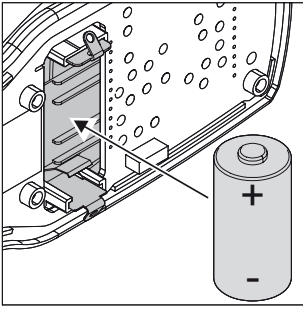
The programming process must then be started all over again.



3. Replacing the battery of the remote control

Under normal use, the battery must be replaced after approx. 5 years. Proceed as follows:

- Loosen and remove the six screws accessible at the bottom of the housing.
- Remove the used up battery.
- Insert a new battery in the battery compartment in the top part of the housing (pay attention to correct polarity!).
- Make sure that the string, as shown in the graphic illustration, is routed around the pin of the top section of the housing.
- Join the top and bottom section of the housing again. Make sure that the rubber seal has been correctly inserted between the two sections of the housing.
- Screw both halves of the housing together with the six screws accessible at the bottom of the housing.
(Attention: Tighten the screws **hand-tight!**)
- Dispose of the used up batteries properly according to the applicable regulations of your country.



You will come into contact with electronic components of the printed circuit board when replacing the battery. Therefore pay attention to the ESD precautions during battery replacement.



Use only batteries of the type CR123A (lithium battery, 3 Volt, at least 1500 mAh) to operate the remote control.
Using other batteries may damage the electronics.

4. Starting to drive

Make sure that the anti-tippers are installed on the wheelchair before beginning to drive; this is required for safety reasons.

To start, choose a level floor with smooth surface such as stone, PVC or parquet and preferably no carpet floor. This is necessary because the fibers of a carpet floor usually already define a direction and a slight curve is therefore usually already driven. The curve effect is enhanced with high pile carpets.

Allow the user to drive a few meters straight ahead, stop and then accelerate again.



When driving straight ahead, pay attention that the user pushes the left and right push rim uniformly. Switching from a manual wheelchair to an active power assistance represents an initial adjustment of the wheelchair driver.

Observe the following points to ensure the optimal use of the product properties:

- The push rim needs to be operated relatively shortly and lightly - the drive takes care of the actual work when required
- Do not "pull" on the push rim or guide it too long
- Operate the left and right push rim at the same time and uniformly when driving straight ahead

12

The following exercises will help in the initial phase when learning the new type of motion:

First exercise:

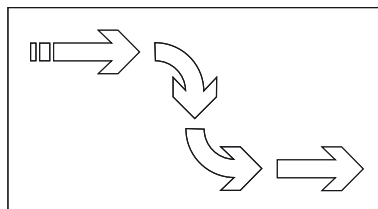
Driving straight ahead - push the push rim at the same time with both hands. Pushing and holding.



Once driving straight ahead and braking or decelerating has been mastered, driving through curves and turning on the spot should be exercised.

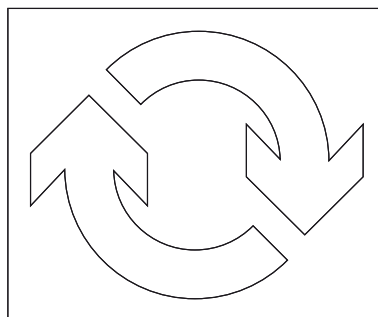
Second exercise:

Driving through curves/turning



Third exercise:

Turning on the spot



When the push rim is manually delayed, the system also supports the braking process with the help of the electric motor. This means for the occupant that less power is required even when braking the wheelchair.

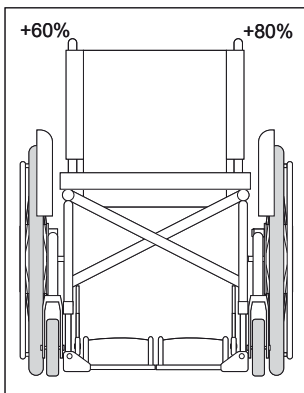
5. Individual adjustment of the power assistance

Once the simple driving maneuvers are mastered safely, the power assistance can be increased from stage 1 to stage 2. The system now responds with much more assistance than in stage 1.

The programmed "follow-up" also increases with increasing power assistance. (follow-up is the time during which the motor continues to assist and drive after a drive movement). The more the motor follows up after a drive movement, the less often must the wheelchair driver apply force via the push rim to cover a given distance. The effect has a particularly great advantage when driving uphill. Contrary to manual operation, the driver must use the push rims less often. This promotes a smooth motion sequence and saves physical strength.

Uniform pushing is particularly important in stage 2 to drive straight ahead in a precise manner. The driver sometimes drives in a wiggly pattern especially when starting in stage 2. This has to do with the follow-up of the wheel described above and also with the individual motion pattern of the driver. However, user tests have shown that novices securely master the function process after 1-2 days of getting used to the new equipment.

Now allow the user to perform the driving exercises as described above also with power assistance in stage 2.



6. Compensating for differences of force

To ensure uniform driving, the sensitivity [2], see page 4, must be adjusted between both e-motion wheels so that possibly applied force differences of the driver are compensated. You can test this while driving a straight course: If the driving patterns seems irregular and repeated pushing is required on one side, more force is necessary on that side.

Increase or reduce the sensitivity of the one or other wheel to adjust the imbalance. The driver should drive a short straight stretch after each adjustment process to be able to judge the effects of the adjustment.

If different settings of the sensitivity are chosen, the supplied labels "R" for the right wheel and "L" for the left wheel must be affixed to the respective wheel to prevent them from being mixed up when removing and re-installing them. If the setting is the same, the e-motion wheels can be installed at either side.

7. Important information on the range

The greatest possible range can be achieved when driving on smooth, level ground and uniform speed. Frequent acceleration and deceleration as well as constant steering correction can reduce the range significantly. Rugged roads, wind conditions, hilly terrain but especially maneuvering with large power assistance in tight spaces causes additional energy consumption which minimizes the range.

The energy consumption and thus the range also depend largely on the driving style of the user. Some wheelchair drivers move with many short drive movements, allowing the push rims to slide permanently slide through the palms of their hands thereby slowing them down again. The resulting displacement of the sensor against the direction of travel feeds braking currents to the motor. The driver pushes and brakes all the time but does not necessarily notice this. However, this driving patterns shortens the range significantly.

The sensitivity should be markedly reduced for these user groups.

The impact of the rolling friction is also essential (e.g. in case of insufficient tire pressure of the steering wheels of the wheelchair). For example, if the rolling friction is 6 % instead of only 3 %, this reduces the range by one half. The range is also reduced by one half if 3 % uphill travel is added to a rolling friction of 3 %. At an incline of 12 %, for example, the range is finally only 1/5 of the range on horizontal terrain.

Naturally, actual travel normally covers a mix of uphill driving, downhill slopes and level terrain which have a combined impact on the range.

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