

Invacare® Dragon

Invacare® Tiger

SERVICE INSTRUCTIONS



Edition: 09.07.2013



These instructions contain information about:

Testing work

Repair Instructions

This manual is part of the instructions for use.

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1 Introduction

1.1 General information

- Service and maintenance work must be carried out taking this service manual into account.
- It is imperative that you observe safety information.
- Information about operation or about general maintenance and care work on the mobility aid should be taken from the operating manual.
- You can find information about ordering spare parts in the spare parts catalogue.
- Only use original Invacare® spare parts. The guarantee will become invalid if other spare parts are used!
- We reserve the right to make any alterations on the grounds of technical improvements.
- The mobility aid may only be maintained and overhauled by qualified personnel.
- The minimum requirement for service technicians is suitable training, such as in the cycle or orthopaedic mechanics fields, or sufficiently long-term job experience.
 - Experience in the use of electrical measuring equipment (multimeters) is also a requirement.
 - Special Invacare® training is recommended.
- Alterations to the mobility aid which occur as a result of incorrectly or improperly executed maintenance or overhaul work lead to the exclusion of all liability on the side of INVACARE.
- If you have any problems or questions please contact Invacare® Service.

1.2 Notes on transport

- If the mobility aid has to be shipped back to the manufacturer for major repairs, you should always use the original packaging for transport.
- Please attach a precise description of the fault.

1.3 Definition and representation of information and safety information in this manual

Different types of information and signal words are used throughout this manual.



HAZARD!

The signal word "HAZARD!" refers to immediate hazards.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
-



WARNING!

The signal word "WARNING!" refers to possibly-occurring hazards which can lead to death or serious injuries if they are not avoided.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
-



ATTENTION!

The signal word "ATTENTION!" refers to possibly-occurring hazards which can lead to minor injuries and/or material damage if they are not avoided.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
-



CAUTION!

The signal word "CAUTION!" refers to hazards which could lead to material damage if they are not avoided.

- *The following lines in italics refer to actions which serve to avoid such hazards.*
-



Note

The signal word "Note" is used to denote general information which simplifies the handling of your product and refers to special functions.

1.4 Hazard symbols and symbols used

Different types of hazard symbols and symbols are used throughout this manual.



General hazards

This symbol warns you of general hazards!

- Always follow the instructions to avoid injury to the user or damage to the product!



BURN HAZARD!

This symbol warns you of the danger of chemical burns, for example due to the discharge of battery acids!

- Always follow the instructions to avoid injury to the user or damage to the product!



DANGER OF CRUSHING!

This symbol warns you of crushing hazards due to inattentive working with heavy components.

- Always follow the instructions to avoid injury to the user or damage to the product!



EXPLOSION HAZARD!

This symbol warns you of an explosion hazard, which can be caused by excessive tyre pressure in a pneumatic tyre.

- Always follow the instructions to avoid injury to the user or damage to the product!



Wear safety shoes

The symbol refers to the requirement for wearing safety shoes.

- Wear standardised safety shoes during all work.



Wear eye protection

This symbol refers to the requirement for wearing eye protection, for example when working with batteries.

- Wear eye protection when this symbol is shown.



Wear safety gloves

This symbol refers to the requirement for wearing safety gloves, for example when working with batteries.

- Wear safety gloves when this symbol is shown.



Note

This symbol identifies general information which is intended to simplify working with your product and which refers to special functions.



Requirements:

- This symbol identifies a list of various tools, components and items which you will need in order to carry out certain work. Please do not attempt to carry out the work if you do not have the listed tools available.



Always dispose used or damaged batteries correctly

The symbol refers to information for the correct disposal of used or damaged batteries.

1.5 Images in this manual

The detailed images in this manual are given digits to identify various components. Component numbers in text and operational instructions always relate to the image directly above.

2 Safety and fitting instructions

These safety instructions are intended to prevent accidents at work, and it is imperative that they are observed.

2.1 Before any inspection or repair work

- Read and observe this repair manual and the associated operating manual!
- Observe the minimum requirements for carrying out the work (see chapter entitled „General information“)

2.2 Personal safety equipment



Safety shoes

The mobility device, and some of its components, are very heavy. These parts can result in injuries to the feet if they are allowed to drop.

- *Wear standardised safety shoes during all work.*



Eye protection

It is possible that battery acid can be discharged when working on defective batteries or when handling batteries improperly.

- *Always wear eye protection when working on any defective or possibly defective batteries.*



Safety gloves

It is possible that battery acid can be discharged when working on defective batteries or when handling batteries improperly.

- *Always wear acid-proof safety gloves when working on any defective or possibly defective batteries.*

2.3 General safety information and information about fitting / removal



WARNING! Danger of crushing!

Various components such as the drive unit, batteries, seat etc are very heavy. This results in injury hazards to your hands!

- *Please note the high weight of some components! This applies especially to the removal of drive units, batteries and the seat.*



WARNING!

Injury hazard if the vehicle starts moving unintentionally during repair work!

- *Switch the power supply off (ON/OFF key)!*
- *Engage the drive!*
- *Before raising the vehicle, secure the wheels by blocking them with wedges!*



ATTENTION!

Fire and burn hazard due to electrical short-circuit!

- *The mobility device must be completely switched off before removal of voltage-carrying components! To do this, remove the batteries.*
- *Avoid short-circuiting the contacts when carrying out measurements on voltage-carrying components!*

**CAUTION!****Danger of burns from hot surfaces on the motor!**

- *Allow the motors to cool down before commencing work on them.*

**ATTENTION!****Injury hazard and danger of damage to vehicle due to improper or incomplete maintenance work!**

- *Use only undamaged tools in good condition.*
- *Some moving parts are mounted in sockets with PTFE coating (Teflon™). Never grease these sockets!*
- *Never use "normal" nuts instead of self-locking nuts.*
- *Always use correctly-dimensioned washers and spacers*
- *When reassembling, always replace any cable ties which were cut during dismantling.*
- *After completing your work / before renewed start-up of the mobility device, check all connections for tight fitting.*
- *After completing your work / before renewed start-up of the mobility device, check all parts for correct locking.*
- *Only operate the vehicle with the approved tyre pressures (see technical data).*
- *Check all electrical components for correct function. Please note that incorrect polarity can result in damage to the electronics.*
- *Always carry out a trial run at the end of your work.*

**Note**

Mark all current settings for the mobility aid (seat, armrests, backrest etc.), and the associated cable connecting plugs, before dismantling. This makes reassembly easier. All plugs are fitted with mechanical safety devices which prevent release of the connecting plugs during operation. To release the connecting plugs the safety devices must be pressed in. When reassembling ensure that these safety devices are correctly engaged.

**WARNING!****Any changes to the drive program can affect the driving characteristics and the tipping stability of the vehicle!**

- *Changes to the drive program may only be carried out by trained Invacare® specialist dealers!*
- *Invacare® supplies all mobility aids with a standard drive program ex-works. Invacare® can only give a warranty for safe vehicle driving behaviour - especially tipping stability - for this standard drive program!*

3 Tightening torques

The tightening torques stated in the following list are based on the thread diameter for the nuts and bolts for which no specific values have been determined. All values assume dry and de-greased threads.

Thread	M4	M5	M6	M8	M10	M12	M14	M16
Tightening torque in Nm $\pm 10\%$	3 Nm	6 Nm	10 Nm	25 Nm	49 Nm	80 Nm	120 Nm	180 Nm

**CAUTION!**

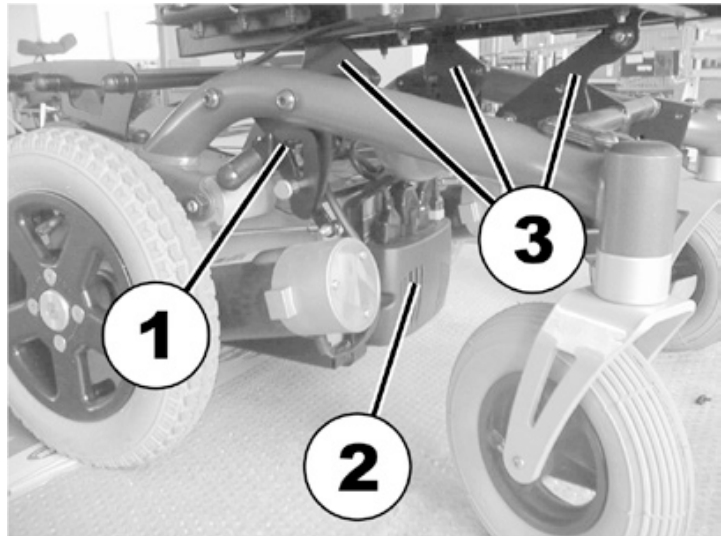
Damage can be caused to the mobility device due to improperly tightened screws, nuts or plastic connections.

- *Always tighten screws, nuts etc. to the stated tightening torque.*
- *Only tighten screws or nuts which are not listed here finger tight.*

4 Arrangement of the assembly groups and components

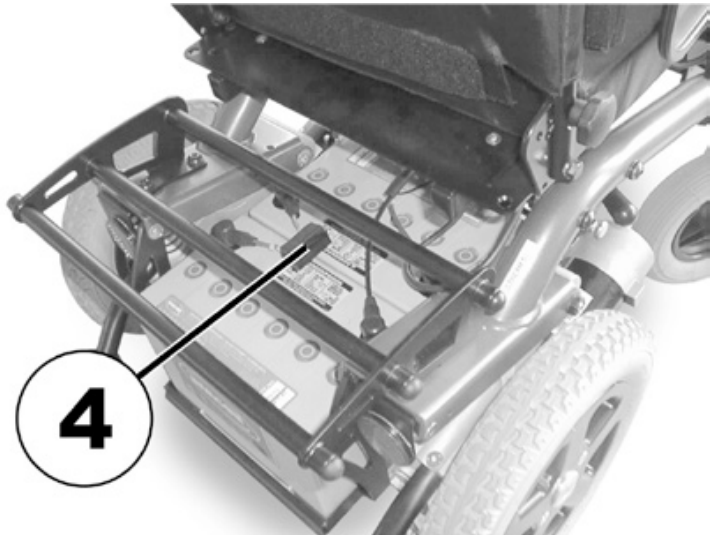
Under the seat:

- 1) Decoupling mechanism
- 2) Power module
- 3) Perforated plates for adjusting the seat height and seat angle



Under the battery cover

- 4) Main battery fuse



Under the seat frame

- 5) Operating hours counter (optional)



5 Service plan (1x annually)

Component	Check	Action	Notes	Ü
Armrests and side panels	- Armrest damage and fastening - Side panel damage and fixing	- Tighten screws, replace padding if damaged - Tighten screws, replace side panels if damaged		
Seat unit / seat angle adjustment	- Cushion - Check seat angle adjustment	- Replace covers / upholstery if damaged - Replace parts if damaged		
Backrest unit mechanical Backrest unit electrical (if installed)	- Damage and seams - Fixing - Check cabling - Check function	- Replace parts if damaged - Tighten screws - Replace cable or motor if necessary		
Frame (chassis) / battery box	Check fixings, welded seams and battery box	Tighten screws, replace components		
Wheel suspension and wheels	Check drive wheels for tight fit and side play	Adjust, replace wheel hubs	See " Replacing a drive wheel " on page 47	
	Check steering wheels for tight fit, float, side play and correct torque (15 Nm +/- 1.5 Nm)	Replace wheels, wheel fork or wheel bearings	See " Replacing the steering head bearings on the steering wheels " on page 41	
	Pneumatic tyres (if available)	Repair or replace if damaged	See " Repairing a flat tyre " on page 43	
Drive units, disengager	- Check functions in drive and push modes - Check disengager	- Replace motor if necessary - Tighten screws / nuts, adjust or replace if necessary		
Legrests	Check welded seams, interlocking, screws, footplates	Tighten, replace if necessary		
Electrical footrests (if installed)	- Check cabling - Check contacts - Check functions	Replace cable if necessary		
Lighting (if installed)	- Check cabling - Check function	Replace bulbs or cables if necessary		
Batteries	Check batteries for damage	Replace batteries if necessary	See " Changing the batteries " on page 28	
	Check battery charge	Charge batteries	See User Manual	

Component	Check	Action	Notes	Ü
	Check contacts and terminals for corrosion	Clean contacts and terminals	See " Changing the batteries " on page 28 for safety information when handling batteries	
Remote / electronics	- Remote, status display blinking - Fixing - Cable, connecting plug - Joystick function - Power supply	- Evaluate flash code - Tighten, replace - Replace - Replace joystick - Replace cable, connector plug or console		
Driving Programme	Check the programme version of the driving electronics. Is there a newer version available?	Update the software.	See " Updating the driving program " on page 27	

6 Operational Faults

6.1 Operational faults on a wheelchair fitted with Shark electronics

Please proceed as follows in the event of operational faults:

- First of all analyse the possible cause of the disorder on the basis of the following tables.
- Check the status display on the remote. Analyse the flashing error code.
- Carry out the necessary checks and repairs as recommended in the following table.

6.1.1 Diagnosis of actuation disorders

Problem	Other Symptoms	Possible Cause	Solution	Documentation
Wheelchair will not start up	Status display on the remote illuminated as normal and does not indicate a disorder code	Actuation motors may be disengaged	· Clutch in actuation motors	See operating instructions
	Status display on the remote is not illuminated	Batteries may be faulty	· Replace the batteries	See " Changing the batteries " on page 28
		Batteries may be almost empty	· Charge batteries	See User Manual
		Power supply to the remote may be interrupted	· Check the main fuse	See " Checking and replacing the main fuse " on page 31
			· Check the cable between the modules for any loose connections or damage	Siehe " Checking the cables " on page 33
		Remote may be faulty	· Change the remote on the wheelchair to be able to exclude the remote being the cause of the fault.	See " Replacing the Shark Remote " on page 35
	Status display on remote flashing	Various causes	· Analyse error code	See " Shark error codes and diagnostic codes " on page 19

Problem	Other Symptoms	Possible Cause	Solution	Documentation
Wheelchair jerky in drive operation	None	Batteries may be faulty (instable voltage)	· Replace the batteries	See " Changing the batteries " on page 28
		Actuation motor(s) may be faulty	· Replace motor(s)	See " Replacing the motor " on page 21
Batteries not being charged	None	Batteries may be faulty	· Replace batteries	See " Changing the batteries " on page 28
	LEDs flashing on charger	Charger may be faulty	· Replace charger	See operating instructions for battery charger
Wheelchair drives too slowly	None	Batteries may be faulty	· Replace batteries	See " Changing the batteries " on page 28

6.1.2 Shark error codes and diagnostic codes

The actuation electronics can automatically remedy certain disorders. In this case the status display will stop flashing. Please switch the remote on and off several times. Please wait about 5 seconds every time before switching the remote on again. If the error is not remedied by this, please diagnose the cause on the basis on the following flashing codes.

Flashing Code	Meaning	Solution	Documentation
1	Operational error	Please ensure that the joystick is in neutral central position (simply release joystick) and switch on again.	
2	Battery error	Check battery and power cable.	See " Checking the cables " on page 33
		Charge batteries. If you switch the wheelchair off for a few minutes the batteries are often able to re-charge sufficiently to enable a short journey. You should, however, only use this solution in an emergency as this leads to the batteries discharging excessively.	See operating instructions
		Replace the batteries	See " Changing the batteries " on page 28
3	Error on the left motor (M2)	- Check the motor cable and U-connector. - Check the motor.	See " Checking the cables " on page 33 See " Replacing the motor " on page 21
4	Error on the right motor (M1)	- Check the motor cable and U-connector. - Check the motor.	See " Checking the cables " on page 33 See " Replacing the motor " on page 21
5	Fault on the left (M2) motor brake	Check cable and connector.	See " Checking the cables " on page 33
6	Fault on the right (M1) motor brake	Check cable and connector.	See " Checking the cables " on page 33
7	Fault on the Shark remote	- Check the bus cable on the remote and U-connector. - Replace the remote.	See " Checking the cables " on page 33 See " Replacing the Shark Remote " on page 35
8	Fault on Shark main module	- Check all cables and connectors on the Shark system. - Replace the main module.	See " Checking the cables " on page 33 See " Replacing the Shark Electronics " on page 25

Flashing Code	Meaning	Solution	Documentation
9	Communication error on the Shark system	· Check all cables and connectors on the Shark system. · Replace the remote.	See " Checking the cables " on page 33 See " Replacing the Shark Remote " on page 35
10	Unknown error	· Check all cables and U-connectors.	See " Checking the cables " on page 33
11	Incompatible remote	· An incorrect remote has been connected. Ensure that main module and remote code are concordant.	See " Replacing the Shark Remote " on page 35 See " Replacing the Shark Electronics " on page 25

7 Repair Work

7.1 General warning information on installation work

**CAUTION!**

Danger of damage to vehicle! Collisions can be caused if the adjusting washers are removed during fitting work to the drive wheels!

Adjusting washers are often fitted between the drive shaft and the wheel hub to even out tolerances. If these adjusting washers are removed and not replaced again, collisions can be caused!

- Always replace the adjusting washers exactly as they were before you started dismantling!

7.2 Replacing the motor

**ATTENTION: Danger of crushing to the hands and feet by the weight of the wheelchair!**

- Pay attention to the hand and feet.
- Use proper lifting techniques.

**ATTENTION: Injury hazard caused by uncontrolled movement of the mobility device!**

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before raising the vehicle, secure the wheels by blocking them with wedges.
- Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case! If the wooden block is too short or too high, the mobility device can still tip!

**WARNING!****Fire and burns hazard if battery terminal is bypassed!**

- Please take great care to ensure that the battery terminals are never short-circuited with tools or mechanical mobility device parts!
- Ensure that the battery terminal caps have been replaced if you are not working on the battery terminals.

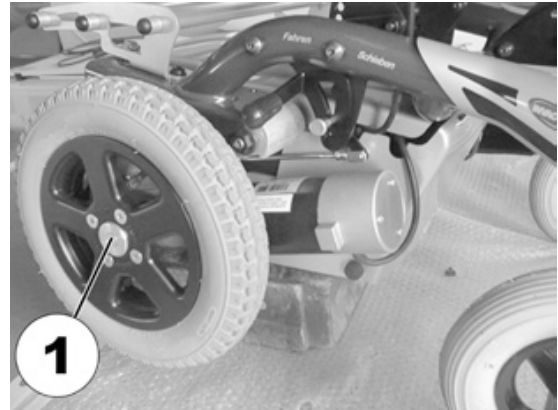
**Pre-requisites:**

- Small, flat screwdriver
- 5 mm Allen key
- 8 mm Allen key
- 11 mm open-ended spanner
- 19 mm open-ended spanner
- Aglet, diameter 2.5 mm (for knocking the splint out of the decoupling leverage)
- Small hammer
- Edge cutter
- Cable binder
- Wooden chock (approx. 12 x 12 x 30 cm) for jacking up the vehicle

**Note**

Please take care of the small parts and observe the sequence in which the component parts are installed. Please set them out in an orderly fashion so that they can be installed again easily in the correct sequence.

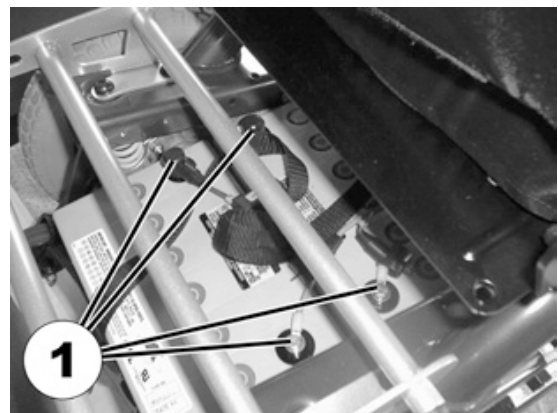
- Jack up the vehicle using the wooden chock.
- Loosen the socket head screw (1) using a 5 mm Allen key.
- Remove the screw and the hub cap.
- Pull the complete wheel from the wheel hub.



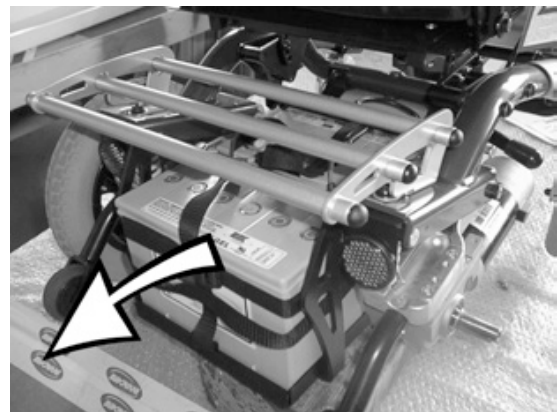
- Remove the battery cover.



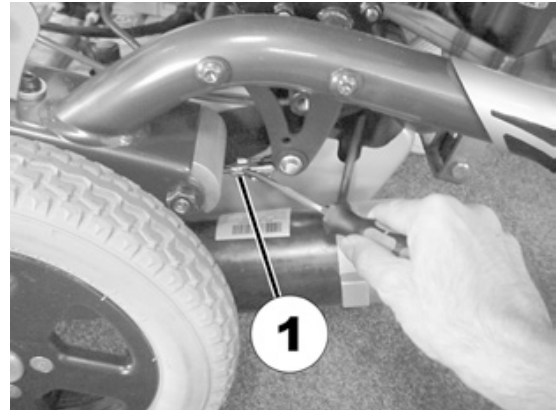
- Pull off the battery pole caps and push back to gain access to the battery poles.
- Loosen the battery pole clips with the 11 mm open-ended spanner.



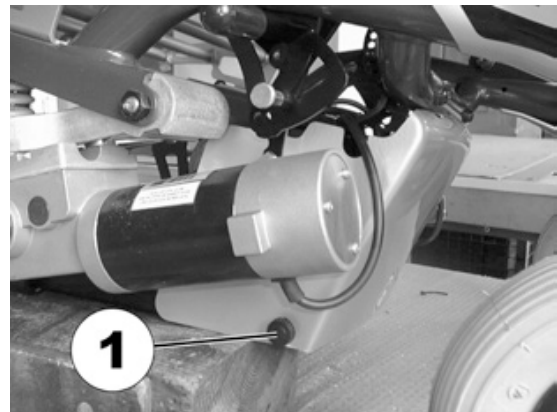
- Remove the batteries.



- In order to remove the motor, the front decoupling rod connection (1) must be disconnected. Release the retaining ring (1) using the small, flat screwdriver and pull out.



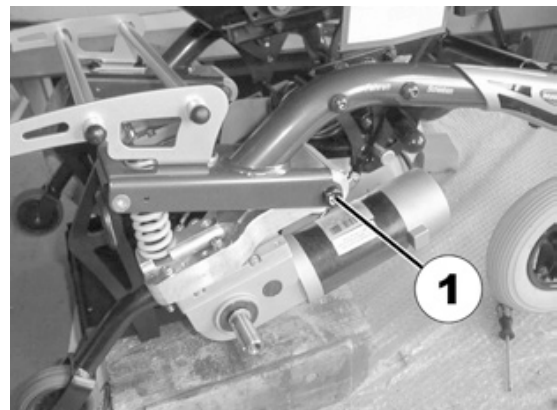
- Unscrew handwheels (screws) (1) on both sides of the panelling for the electronics.
- Remove the panelling for the electronics.



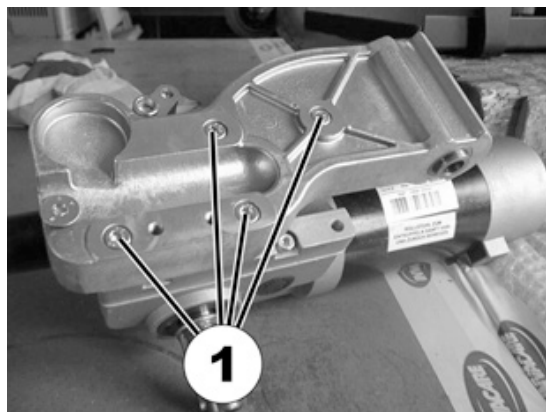
- Pull the motor plug on the motor to be replaced out of the electronics.
- The motor cable is secured to the frame with a cable binder. Use the edge cutter to cut through the cable binder.



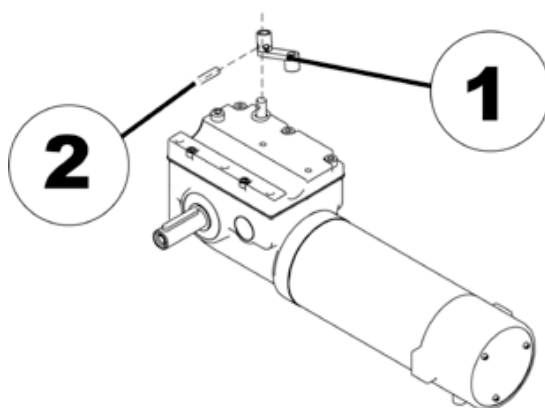
- Loosen the motor suspension (1) using the 8 mm Allen key and the 19 mm open-ended spanner and remove.
- Remove the motor from the suspension in a downward direction.



- Loosen the four screws (1) on the motor suspension and remove.



- Use the aglet and the hammer to carefully knock the splint (2) out of the decoupling leverage (1).
- Remove the decoupling leverage (1) together with the decoupling rod (cannot be seen in the picture on the right) from the old motor.

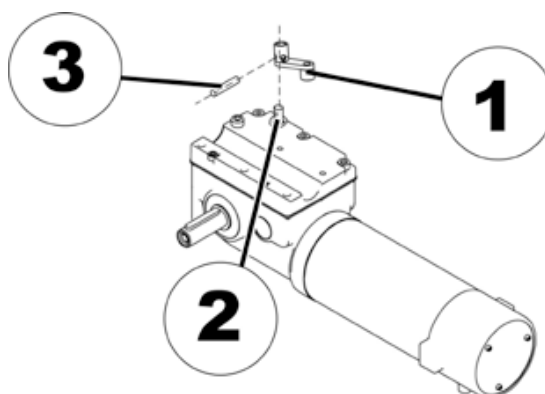
**CAUTION!****Damage to the motor is possible!**

- Only apply moderate pressure to the decoupling lever when fitting to the metal rod on the new motor.*
- Do not use a hammer!*

**Note**

The simplest way to install the decoupling lever is to do this before the motor and other parts are assembled together.

- Carefully press the decoupling leverage (1) onto the rod (2) protruding from the new motor.
- Press the splint (3) in.



- The motor is installed in the reverse order.
- Secure the motor cable by means of a new cable binder.

7.3 Replacing the Shark Electronics



Pre-requisites:

- Phillips screwdriver
- To modify a drive program you will need: Programming software or a Handheld Programmer and the Installation Manual of the Shark Electronics (Part Number 1436160), available from Invacare®.



Note

All electronic modules are supplied with a standard drive program. If the driving program has been customised, then you will have to perform this customisation again, after installing the new electronic module.

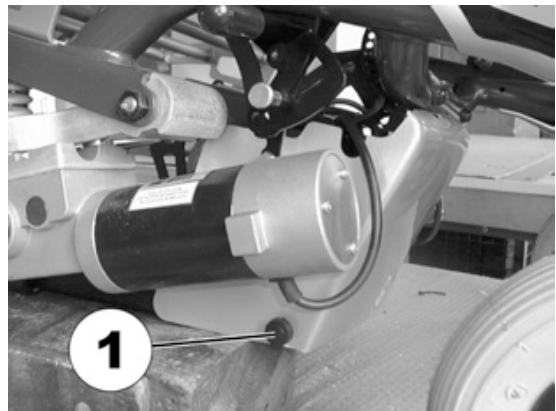


WARNING!

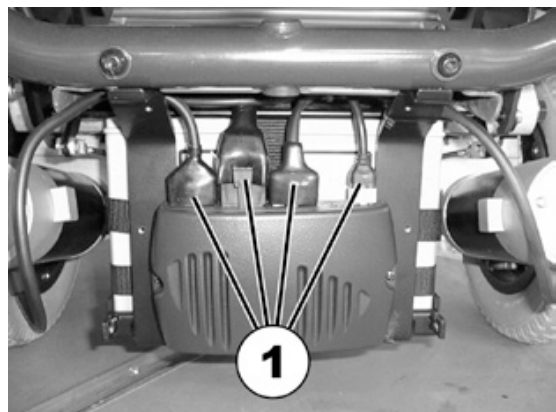
Every alteration to the drive program can influence vehicle handling and the tipping stability of the wheelchair!

- *Alterations to the drive program must only be carried out by trained Invacare®-dealers!*
- *Invacare® can only assume a warranty for the safe vehicle handling of the wheelchair – in particular tipping stability - for unaltered standard drive programs!*

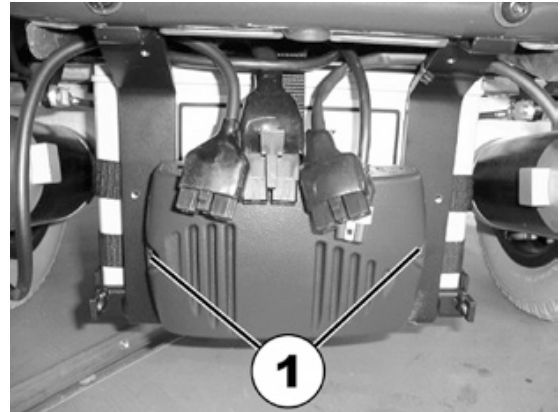
- Unscrew the handwheels (screws) (1) on both sides of the panelling for the electronics.
- Remove the electronic panelling.



- Disengage all the plugs (1) on the electronic module.



- Remove the screws (1) on both sides of the power module.
- Pull out the module.



- Installation of the electronics is carried out in the reverse order.
- Update the software, in case a newer version is available.
- Customise the driving program with the programming software, if required.
- Check all vehicle functions.

7.4 Updating the driving program

The driving programs for electric wheelchairs are continually updated and improved by Invacare®. For this reason, you should check whether the version number is still up to date each time a wheelchair comes in for repairs, and also during regular inspections.

If a newer version is available, the driving program must be updated. The procedure for updating the driving program is described in the user manual of the Wizard software.



Note

The electronic system is supplied with a standard drive program. If the driving program has been customised, you have to perform this customisation again, after installing the new driving program.



WARNING!

Every alteration to the drive program can influence vehicle handling and the tipping stability of the wheelchair!

- *Alterations to the drive program must only be carried out by trained Invacare®-dealers!*
 - *Invacare® can only assume a warranty for the safe vehicle handling of the wheelchair – in particular tipping stability - for unaltered standard drive programs!*
-



Pre-requisites:

- Dynamic® Wizard software
 - User manual for the Wizard software
 - For further information on other requirements - such as the minimum system configuration of the PC to be used for programming, necessary programming cables - see the user manual of the Wizard software. You find the latest version of the user manual in the download area on <http://www.dynamiccontrols.com/>.
-

7.5 Changing the batteries



ATTENTION:**Injury hazard and possible material damages if batteries are handled improperly!**

- The installation of new batteries may only be carried out by authorised specialists.
 - Observe the warning information on the batteries.
 - Only use battery versions stated in the specifications.
-



ATTENTION:**Fire and burns hazard if battery terminal is bypassed!**

- Please take great care to ensure that the battery terminals are never short-circuited with tools or mechanical mobility device parts!
 - Ensure that the battery terminal caps have been replaced if you are not working on the battery terminals.
-



ATTENTION: Danger of crushing!**The batteries are extremely heavy. This results in injury hazards to your hands.**

- Bear in mind that the batteries are sometimes very heavy!
 - Please handle the batteries with care.
-



WARNING: BURN HAZARD!**Injury hazard due to discharged acid.**

- Always wear acid-proof protective gloves when handling batteries.
- Always wear protective goggles when handling batteries.

**What to do if acid is discharged:**

- Always take clothing which has been soiled by or dipped in acid off immediately!
- Rinse any areas of your skin which has come into contact with battery acid off immediately with plenty of water!

If contact with eyes is made:

- Rinse the affected eye under running water for several minutes! You should also consult an eye specialist immediately afterwards!
-

7.5.1 Removing the batteries

**ATTENTION:****Fire and burns hazard if battery terminal is bypassed!**

- Please take great care to ensure that the battery terminals are never short-circuited with tools or mechanical mobility device parts!
- Ensure that the battery terminal caps have been replaced if you are not working on the battery terminals.

**ATTENTION: Danger of crushing!****The batteries are extremely heavy. This results in injury hazards to your hands.**

- Bear in mind that the batteries are sometimes very heavy!
- Please handle the batteries with care.

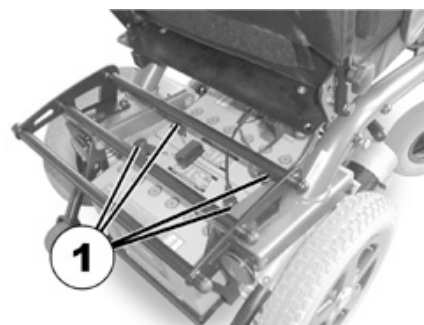
**Requirements:**

- Open-end spanner 11 mm

- Remove the battery cover.



- Pull the battery pole caps (1) upward and push back in order to reach the battery poles.
- Use the open-ended spanner to loosen the battery pole clamps.
- Remove the batteries to the rear.



7.5.2 How to handle damaged batteries correctly



WARNING: BURN HAZARD!**Injury hazard due to discharged acid.**

- Always wear acid-proof protective gloves when handling batteries.
- Always wear protective goggles when handling batteries.

**What to do if acid is discharged:**

- Always take clothing which has been soiled by or dipped in acid off immediately!
- Rinse any areas of your skin which has come into contact with battery acid off immediately with plenty of water!

If contact with eyes is made:

- Rinse the affected eye under running water for several minutes! You should also consult an eye specialist immediately afterwards!
-



Requirements:

- Safety goggles
 - Acid-resistant gloves
 - Acid-resistant receptacle for transportation
-

- Always wear appropriate safety clothing when handling damaged batteries.
 - Place damaged batteries in an acid-resistant receptacle immediately after removing them.
 - Only ever transport damaged batteries in an appropriate acid-resistant receptacle.
 - Wash all objects that have come into contact with acid with lots of water.
-



Always dispose used or damaged batteries correctly

Used and damaged batteries will be taken back by your medical equipment supplier or Invacare®.

7.6 Checking and replacing the main fuse



CAUTION: Fire hazard!

A short circuit can cause extremely high currents which can result in spark formation and fire!

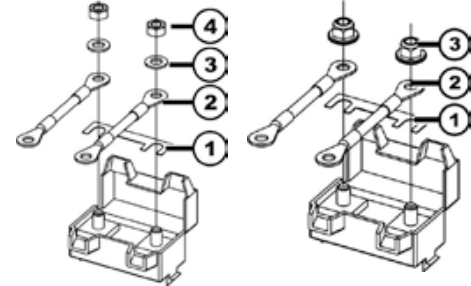
- Always use an original strip fuse with the approved amperage.
- If the main fuse has blown, first rectify the cause before fitting a new one.



CAUTION: Fire hazard!

Fitting the incorrect strip fuse causes a fire hazard!

- Only ever assemble the fuse in the order shown in the illustration at right!
- Always tighten nuts to between 3.3 and 3.5 Nm!



Until 03.2004

1. Fuse
2. Fuse compartment
3. Washer
4. Nut M5

After 03.2004

1. Fuse
2. Fuse compartment
3. Nut DIN 6923



Pre-requisites:

- 8mm open-ended spanner
- 40A strip fuse



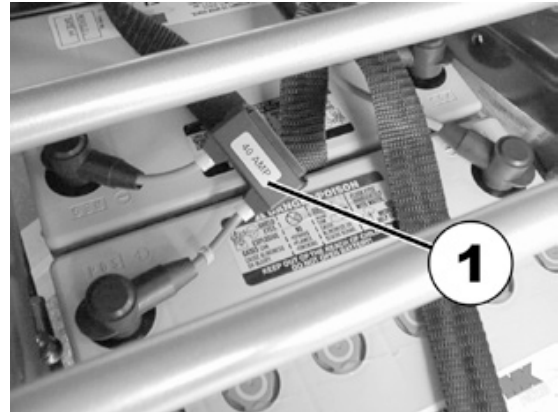
Information

If the fuse holder is damaged this can be replaced completely together with the battery cables.

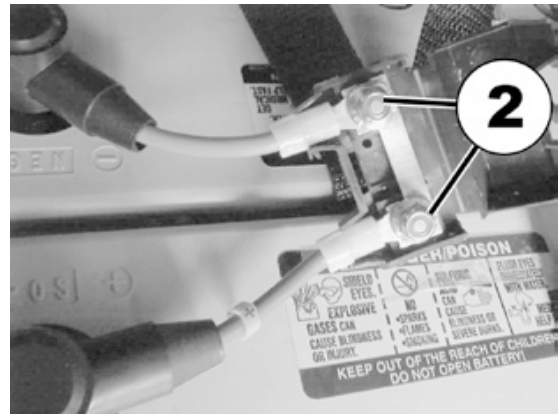
- Remove the battery cover.



- The fuse holder of the Shark electronic system is located on top of the batteries (1).
- Open the fuse holder cover.
- If the strip fuse has blown, determine the cause of the fault and remedy if necessary. The main fuse should only be replaced when the fault has been remedied.



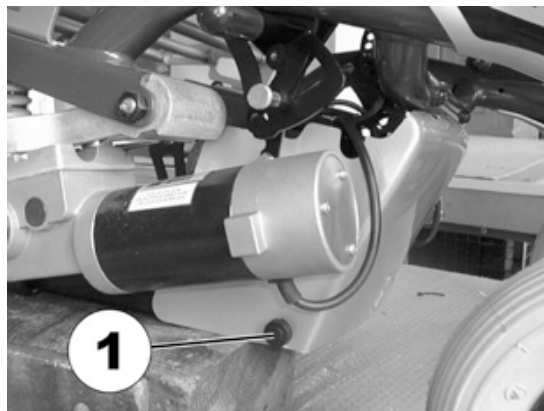
- Use the 8mm open-ended spanner to unscrew the nuts (2) on the strip fuse.
- Replace the strip fuse.



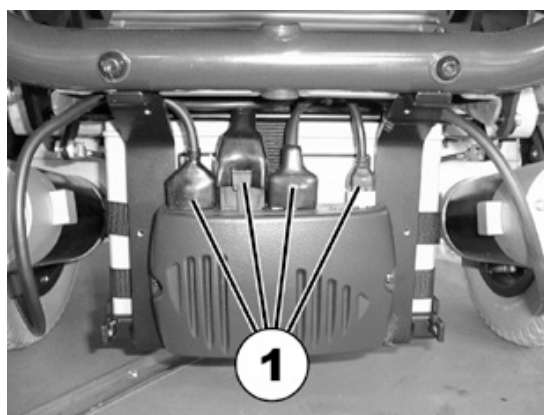
- Installation is carried out in the reverse order.
- Check all vehicle functions.

7.7 Checking the cables

- Unscrew the handwheels (screws) (1) on both sides of the panelling for the electronics.
- Remove the panelling for the electronics.



- Check all cables for visible damage and crushing. Replace damaged cables.
- Pull on each plug (1) carefully. It must not come out of the socket.
- If a plug is loose, apply slight pressure to push the plug into the socket. It must lock in place.
- Check whether the plug is now fitted firmly inside the socket. If not, please repeat the preceding work step.



- Remove the battery cover.



- Check the battery cables (1) for visible damage and crushing. Replace damaged cables.



- Re-install the panelling for the electronics and the battery cover.
- Check all vehicle functions.

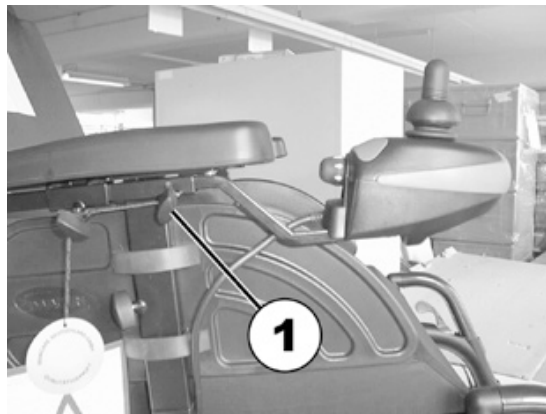
7.8 Replacing the Shark Remote



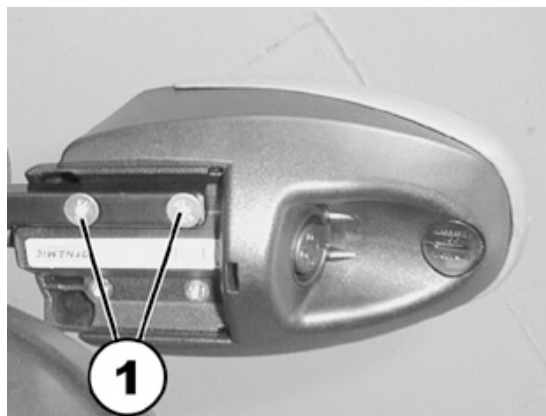
Pre-requisites:

- 3 mm Allen key

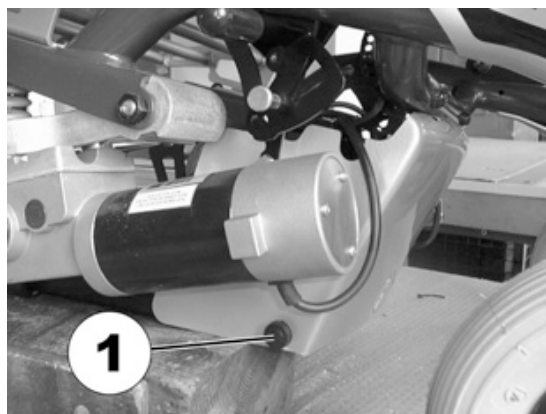
- Switch off the remote.
- Loosen the wing screw (1).
- Pull the remote out of the guide together with the remote holder.



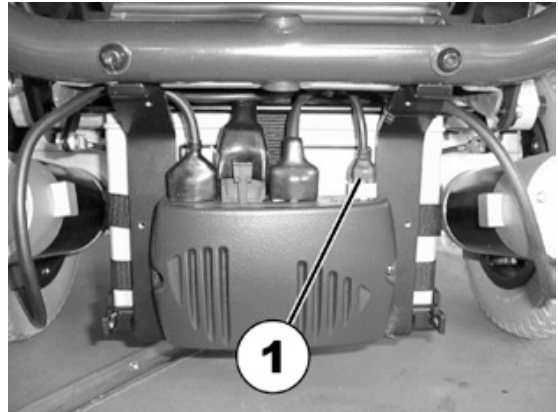
- Use the Allen key to unscrew both screws (1) on the remote holder.



- Unscrew the handwheels (screws) (1) on both sides of the panelling for the electronics.
- Remove the panelling for the electronics.



- Disengage the remote plug.



- The installation of the remote and the panelling for the electronics is carried out in the reverse order.
- Check all vehicle functions.

7.9 Operating hours counter

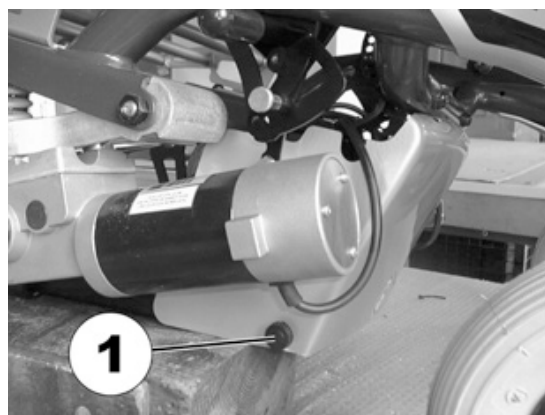
7.9.1 Replacing the operating hours counter



Requirements:

- Philipps screwdriver, size 2
- 10 mm open-end wrench

- Switch off the electronics.
- Remove the legrests.
- Loosen and remove the thumb screws (1) on both sides of the electronics cover.
- Remove the electronics cover.

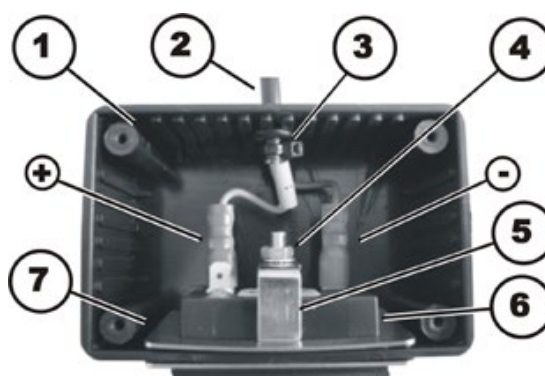


The operating hours counter is attached to the frame with a Velcro strip.

- Disconnect the cable of the operating hours counter from the drive motor.
- Pull the operating hours counter off of the frame.
- Turn the operating hours counter over.
- Loosen and remove the four Philipps head screws of the casing.



- Disconnect the plugs (+) & (-).
- Remove the nut (4) including the locking washer.
- Pull the operating hours counter (6) forwards out of the casing (1). Pay attention to the mounting bracket (5) and the retaining frame (7).
- Replace the operating hours counter.



**CAUTION!**

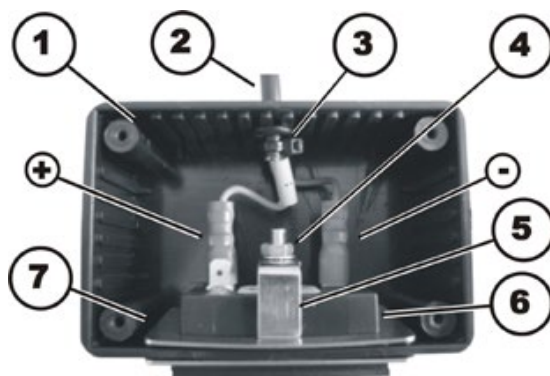
Property damage can result if the counter is incorrectly connected. If the plus and minus wires are connected the wrong way, it will damage the electronic components of the operating hours counter.

- *Make sure the cable is connected correctly.*

- The operating hours counter is installed in reverse order.
- Connect the plug on the blue wire (-) to the pin on the operating hours counter which is marked with a "minus" symbol.
- Connect the plug on the brown wire (+) to the pin on the operating hours counter which is marked with a "plus" symbol.

The brown wire is additionally marked with a yellow sleeve with a "plus" symbol on it.

- Close the casing and reattach it to the wheelchair with the Velcro fastening.
- Reinstall all remaining components in reverse order.



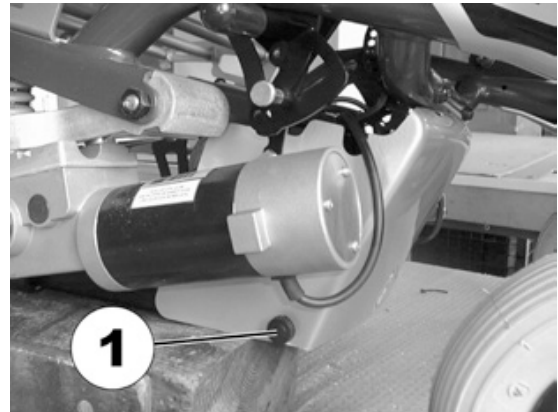
7.9.2 Replacing the connecting cable of the operating hours counter



Requirements:

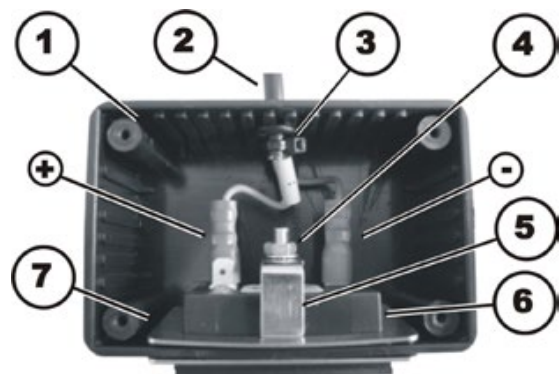
- Philipps screwdriver, size 2
- Side cutters
- Cable ties

- Switch the electronics OFF.
- Remove the legrests.
- Loosen and remove the thumb screws (1) on both sides of the electronics cover.
- Remove the electronics cover.



The operating hours counter is attached to the frame with a Velcro strip.

- Disconnect the cable of the operating hours counter from the drive motor.
- Pull the operating hours counter off of the frame.
- Turn the operating hours counter over.
- Loosen and remove the four Philipps head screws of the casing.
- Disconnect the plugs (+) & (-).
- Remove the cable binder.
- Carefully pull the cable (2) of the operating hours counter out of the casing (1).
- Replace the operating hours counter cable.



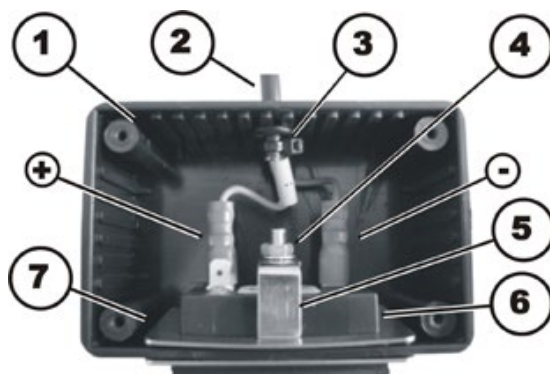
**CAUTION!**

Property damage can result if the counter is incorrectly connected. If the plus and minus wires are connected the wrong way, it will damage the electronic components of the operating hours counter.

- *Make sure the cable is connected correctly.*

- The cable of the operating hours counter is installed in reverse order.
- Connect the plug on the blue wire (-) to the pin on the operating hours counter which is marked with a "minus" symbol.
- Connect the plug on the brown wire (+) to the pin on the operating hours counter which is marked with a "plus" symbol.

The brown wire is additionally marked with a yellow sleeve with a "plus" symbol on it.



- Secure the cable with a cable tie (3), thereby protecting it from being pulled off unintentionally.
- Close the casing and reattach it to the wheelchair with the Velcro fastening.
- Reinstall all remaining components in reverse order.

7.10 Replacing the steering head bearings on the steering wheels



ATTENTION: Danger of crushing to the hands and feet by the weight of the wheelchair!

- Pay attention to the hand and feet.
- Use proper lifting techniques.



CAUTION: Injury hazard caused by uncontrolled movement of the mobility device!

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before raising the vehicle, secure the wheels by blocking them with wedges.



CAUTION!

Incorrect reassembly can damage the bearings and cause the steering wheels to fall out!

The single-row angular ball bearing rings are not identical on both sides! There is only one correct way to insert them!

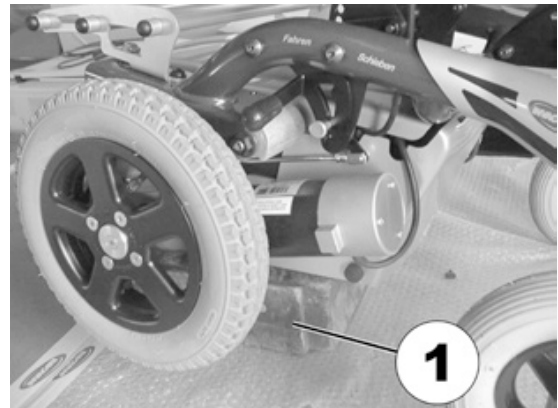
- Follow the assembly instructions precisely!



Required parts/tools:

- 19 mm socket wrench
- Torque spanner
- Large screwdriver, flat
- Wooden chock (approx. 12 x 12 x 30 cm) for jacking up the vehicle

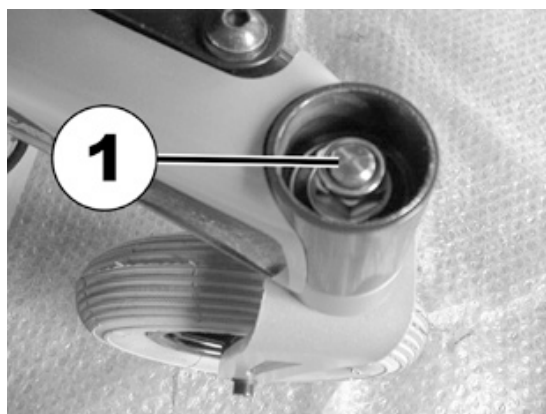
- Use the wooden chock (1) to jack up the wheelchair on the side on which the ball bearings are to be replaced.



- Carefully remove the plastic cap (1) using the large screwdriver.



- Use the socket wrench to loosen and remove the 19 mm nut. Hold the wheel in such a way that it is not able to rotate when the nut is removed.
- Pull the steering head shaft downward and out of the steering head tube.
- Remove the shim and the ball race from the head of the tube. The other ball race should be on the shaft.

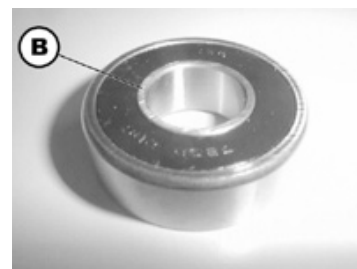
**IMPORTANT ASSEMBLY INFORMATION!**

The illustrations show the wide edge on the outside of the ball race (A) and the narrow edge on the inside (B).

The bearings must always be installed in such a way that the narrow edges are facing each other (inside). The steering head bolt and the nut must always press against the wide outside edges. The bearings would otherwise be pressed apart by the bolt pressure.

The steering wheels should be able to rotate freely after assembly, but there must not be any clearance on the bearings.

- Tighten the nut primarily to 20 Nm +/- 2 Nm.
- Slacken the nut slightly.
- Re-tighten to 15 Nm +/- 1.5 Nm.



7.11 Repairing a flat tyre



WARNUNG: Injury hazard if the vehicle starts moving unintentionally during repair work.

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before raising the vehicle, secure the wheels by blocking them with wedges.



ATTENTION: Danger of crushing to the hands and feet by the weight of the wheelchair!

- Pay attention to the hand and feet.
- Use proper lifting techniques.

7.11.1 Repairing the rear tyre (wheel size 12½ x 2¼")



Pre-requisites:

- Torque wrench with
 - Allen key Bit 5 mm
 - Torx Bit R40
- Mounting kit
- Wooden block (approx. 12 x 12 x 30 cm for propping up vehicle)
- Repair kit for tyre repair **or** a new inner tube.
- Talcum powder

Dismantling the wheel:

- Lift the vehicle up and place a wooden block underneath it to keep it in a raised position.
- Remove the four countersunk head screws TX40 (1) using the Torx bit.
- Pull the wheel from the hub.



Repairing the tyre

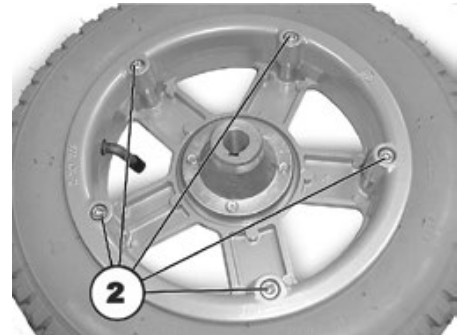


ATTENTION: Explosion hazard!

The wheel will explode if you do not let the air out of the tyre before removing the wheel rim!

- Always allow the air to escape completely from the wheel before you remove the rim.

- Remove the valve cap.
- Exhaust the air from the tyre by pressing the spring pin in the valve.
- Remove the 5 cylinder head bolts (reverse side of the wheel, 2) using the Allen key.
- Remove the rim halves from the tyre.
- Remove the inner tube from the tyre.
- Repair inner tube and replace, or insert new.



Note

If the old inner tube is to be repaired and re-used, and has become wet during repair, you can make replacement easier by sprinkling the inner tube with a little talcum powder.



Note

Refit the wheel in reverse order. Please ensure that the wheel is re-fitted on the same side and in the same running direction as removed.

- Re-insert the rim halves into the tyre.
- Pump a little air into the tyre.
- Insert the socket head screws into the rim and tighten the screws to 10 Nm. Make sure the inner tube is not crushed between the two rim halves.
- Make sure that the tyre is situated directly on the rim.
- Inflate the tyre to the recommended pressure.
- Check that the tyre is still situated directly and correctly on the rim.
- Screw the valve cap back on.

Installing the wheel:



ATTENTION! Danger of injury if the wheels come off.

If the drive wheels are insufficiently attached during assembly, they can come off during driving.

- Tighten the TX40 countersunk screws to 30 Nm when mounting the drive wheels.
- Always use new screws with undamaged coating.

- Re-install the wheel.

7.11.2 Repairing a flat tyre (wheel size 220/120 x 50)

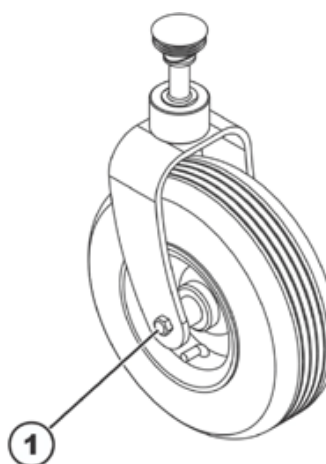
**Pre-requisites:**

- 13 mm socket wrench
- 12 mm socket wrench
- Repair kit for inner tube tires or a new inner tube
- Talcum powder

Removing the wheel**ATTENTION! Danger of crushing to the hands and feet by the weight of the wheelchair!**

- *Pay attention to the hand and feet.*
- *Use proper lifting techniques.*

- Jack up the vehicle (place a wooden wedge under the frame).
- Loosen and remove the screw (1) using the 12 mm socket wrench on the outside and the 13 mm socket wrench on the inside (to counter).
- Pull the wheel from the fork

**NOTE**

Installation is carried out in reverse order. Please ensure that the wheel is re-fitted on the same side and in the same running direction as removed.

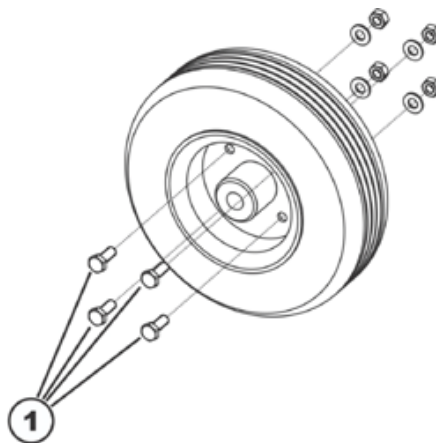
Repairing a flat tyre

**ATTENTION: Explosion hazard!**

There is considerable pressure in the tyre. Danger of injury! Parts can be thrown out and injure you if you do not evacuate all the air from the tyre.

- *Press the release pin in the valve inwards and evacuate all the air from the tyre.*

- Unscrew the valve cap.
- Exhaust the air from the tyre by pressing the spring pin in the valve.
- Loosen and remove the four screws (1) using the 12 mm socket wrench on the outside and the 13 mm socket wrench on the inside (to counter).
- Remove the tire with the inner tube from the rim halves.
- Repair the tube and re-fit or fit new tube

**Note**

If the old inner-tube is to be repaired and re-fitted and has become wet during repair work, powdering the hose with some talcum powder can simplify the fitting procedure.

- Re-insert the rim halves into the tire from the outside.
- Pump a little air into the inner tube.
- Re-position the screws and screw rim together tightly. Make sure the inner tube does not get pinched between the rims halves!
- Check the exact fit of the shoe.
- Inflate the tyre to the prescribed air pressure.
- Re-check the exact fit of the shoe.
- Screw on the valve cap.
- Re-install the wheel.

7.12 Replacing a drive wheel



ATTENTION: Danger of crushing to the hands and feet by the weight of the wheelchair!

- Pay attention to the hand and feet.
- Use proper lifting techniques.



WARNING: Injury hazard caused by uncontrolled movement of the mobility device!

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before raising the vehicle, secure the wheels by blocking them with wedges.
- Prevent the mobility device tipping by propping it up on a wooden block which is long and wide enough under the battery case! If the wooden block is too short or too high, the mobility device can still tip!



Required parts/tools:

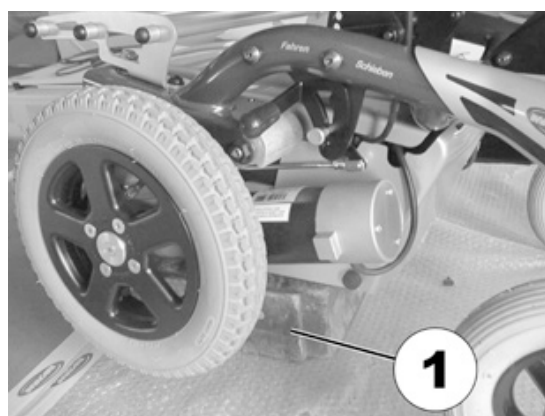
- Torx Bit TX40 spanner
- Mounting kit
- Wooden chock (approx. 12 x 12 x 30 cm) for jacking up the vehicle.



Note

Please take care of the small parts and observe the sequence in which the component parts are installed. Please set them out in an orderly fashion so that they can be installed again easily in the correct sequence.

- Jack up the vehicle using the wooden chock (1).



- Loosen the 4 screws fastening the wheel (1) using the Torx Bit TX40.
- Remove the wheel from the hub.





ATTENTION: Danger of injury if the wheels come off!

If the drive wheels are insufficiently attached during assembly, they can come off during driving.

- Tighten the TX40 countersunk screws to 30 Nm when mounting the drive wheels.
 - Always use new screws with undamaged coating.
-



Note

Please ensure that the wheel is re-fitted on the same side and in the same running direction as removed.

- Refit the wheel in reverse order.

7.13 Adjusting the seat angle/seat height

There are three perforated plates under the seat for adjusting the seat angle and the seat height. These perforated plates, in connection with the adjustable rear holding plates, result in a multitude of different adjustment possibilities.

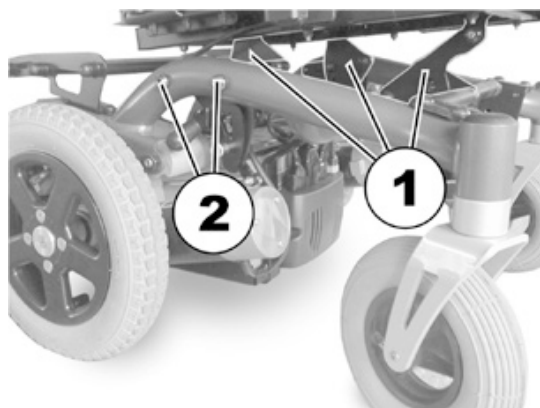
The adjustable range of the seat height (at 0° seat angle) is 42.5 cm to 50 cm. The adjustable range of the seat angle is -12° to 22°. Please observe: The higher the seat adjustment, the smaller the adjustable range of the seat angle!



Pre-requisites:

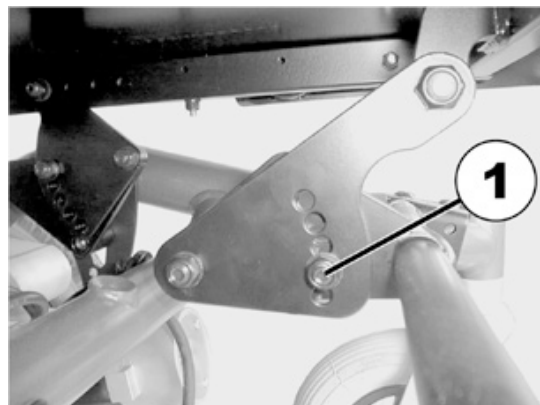
- 5 mm Allen key
- 6 mm Allen key
- 13 mm open-ended spanner
- Torque spanner
- Loctite (medium-hard)

- The picture on the right shows the position of the perforated plates (1) and the fastening screws on the holding plates (2) for adjusting the seat height and the seat angle.



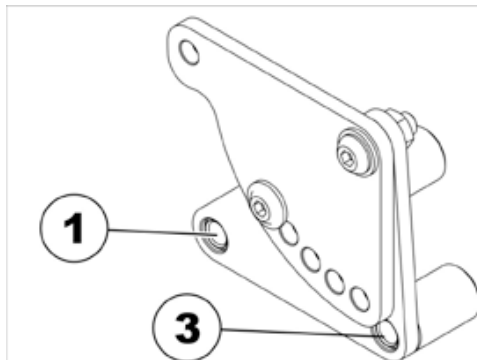
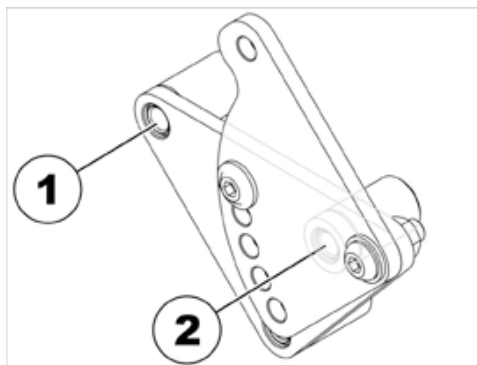
The picture on the right shows the front perforated plates. The approach is similar for the rear perforated plates. To adjust the front perforated plates a 13 mm open-ended spanner is required in addition to the 5 mm Allen key.

- To adjust the seat height/seat angle loosen the screw (1) with the spanners and pull out.
- Set the perforated plates to the desired height/angle.
- Apply the Loctite to the screw, re-insert the screw and tighten to 40 Nm using the spanners.



The seat height and seat angle can also be adjusted via the rear holding plates.

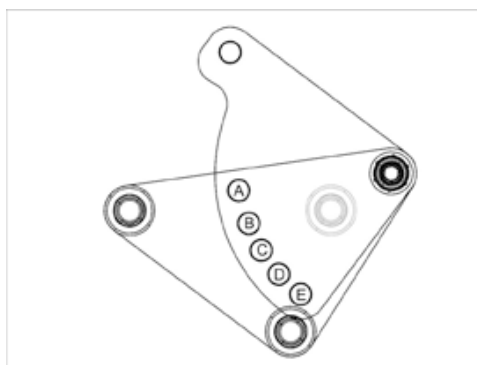
- Loosen the rear fastening screw on one side (in threaded bush 1) so that the holding plate can be swivelled upward or downward.
- Loosen the front fastening screw and remove (depending on the position the screw is either in threaded bush 2 or 3).
- Repeat the procedure on the other side.
- Low adjustment = Hole combination 1 and 2.
- High adjustment = Hole combination 1 and 3.
- Apply the Loctite to the screw, re-position the screws and tighten to 25 Nm +/- 3 Nm.



The rear swivelling perforated plates have five positions. In the illustration on the right these are marked by the letters A to E.

If the holding plates are in the low position (see above), all five positions can be used.

Only positions B, C, D and E are possible in the high position. In position A there would be a collision between the holding plate and the seat frame.



This results in the following seat heights:

Holding plate in the low position:

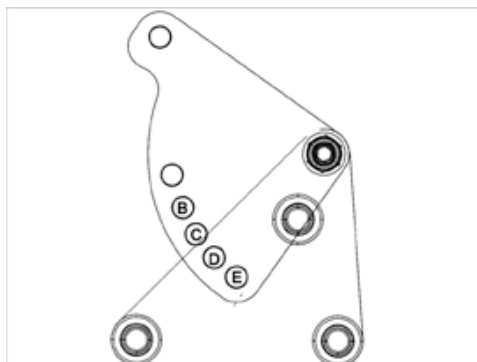
Position of the perforated plate / seat height:

- A / 42.5 cm
- B / 44 cm
- C / 44 cm
- D / 45 cm
- E / 45.5 cm

Holding plate in the high position:

Position of the perforated plate / seat height:

- B / 49 cm (at a seat angle of 6°)
- C / 47 cm
- D / 48 cm
- E / 50 cm



7.13.1 Adjustment tables

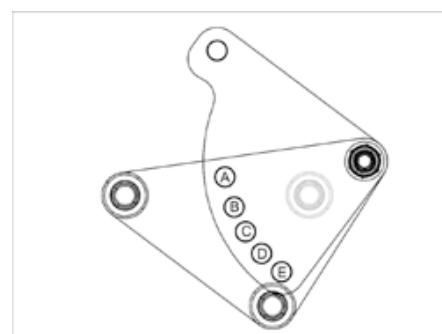
All combination possibilities of the perforated plates are shown in the following tables. These values refer to a seat frame that has been secured in the second drill hole from the front.

The measurements were carried out as follows:

- Adjust the rear swivelling perforated plates (hole A to E)
- Move the front perforated plate to the lowest possible position.
- Change the seat angle and the seat height via the front perforated plate.

7.13.1.1 Table 1

The first table refers to the rear holding plates in the low position (see illustration on the right).

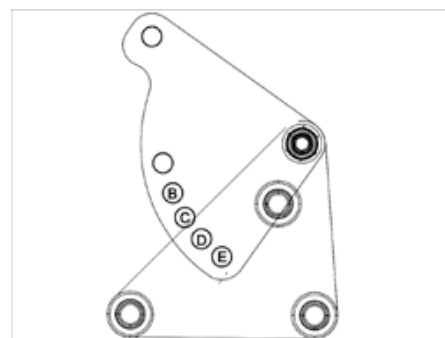


Position of the rear swivelling perforated plates	Seat angle in °	Seat height in cm
A	0	42.5
	2	43.5
	3	44.5
	5	45.5
	7	47
	8	47.5
	9	48
	10	49
	11	50
	13	51
B	-2	42.5
	0	43.5
	1	44.5
	3	45.5
	5	47
	6	47.5
	7	48
	8	48.5
	9	50
	11	51
	12	51.5
C	14	52.5
	15	53.5
	18	55
	-5	41.5
	-3	42.5
	-1	43.5
	0	44

Position of the rear swivelling perforated plates	Seat angle in °	Seat height in cm
	1	45.5
	3	46.5
	4	47
	5	47.5
	6	48.5
	7	49.5
	9	50.5
	10	51
	12	52
	13	53
	16	55
	17	56
	22	58
D	-8	39.5
	-6	41
	-4	42
	-3	43
	-2	44
	0	45
	1	46
	2	46.5
	3	47.5
	4	48
	6	49
	7	50
	8	50.5
	10	51.5
	12	53
	14	54.5
	16	55.5
	20	57.5
E	-11	38.5
	-10	39.5
	-7	41
	-5	42
	-4	43
	-3	43.5
	-1	44.5
	0	45.5
	1	46.5
	2	47
	3	47.5
	4	48.5
	6	49.5
	7	50
	9	51
	10	52
	13	54
	14	55
	18	57

7.13.1.2 Table 2

The second table refers to the rear holding plates in the high position (see illustration on the right).

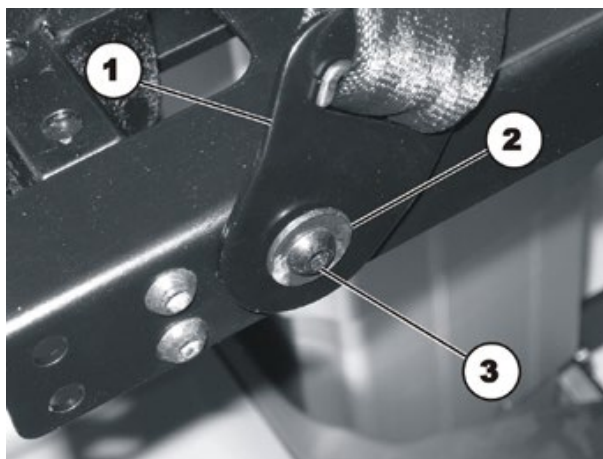


Position of the rear swivelling perforated plates	Seat angle in °	Seat height in cm
B	6	49
	8	50.5
	10	52
	14	54.5
C	-5	44
	-3	45
	0	46.5
	2	48
	5	50
	7	51.5
D	11	54
	-10	42
	-7	43.5
	-5	44.5
	-3	46
	0	48
	3	50
	5	51
E	9	54
	-12	42
	-8	44
	-7	45
	-5	46
	-3	48
	1	50
	2	51
	6	54

7.14 Replacing the safety belt

**Requirements:**

- 10 mm socket spanner
- 4 mm Allen key

**Dismantling the safety belt:**

- Remove the plastic cap (5).
- Loosen the bolt (3) and the associated nut (in the figure this is covered) with a 4 mm Allen key and a 10 mm socket spanner.
- Remove the nut incl. the washer.
- Remove the screw incl. the safety belt, the washer (2) and the washer arranged behind.

**Note**

Another nut is fixed between the two washers (2) and (4) as a spacer so that the belt mounting can rotate freely.

- Replace the safety belt (1).

Refitting the safety belt:

- Refit the parts in reverse order.

7.15 Testing an actuator motor

**Required parts/tools:**

- Multimeter

- The electric resistance of the adjustment motor is to be checked at the connection assembly. In case this is close to infinite, the motor is probably burnt out. If it is less than 1W, the motor has short-circuited. In either case the motor must be replaced.