

# Invacare® Leo



en Scooter  
Service Manual



DEALER: Keep this manual.  
The procedures in this manual MUST be performed by a qualified technician.



**Yes, you can.®**

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Invacare® reserves the right to alter product specifications without further notice.

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# 1 General

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## 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 device should be taken from service manual.
  - You can find information about ordering spare parts in the spare parts catalogue.
  - Spare parts must match original Invacare parts. Only use spare parts which have been approved by Invacare.
  - We reserve the right to make any alterations on the grounds of technical improvements.
  - For more information about the product, for example product safety notices and product recalls, contact your local Invacare representative. For address and website see back page of this manual.
- The mobility device may only be maintained and overhauled by qualified personnel.
  - The minimum requirement for service technicians is suitable training, such as in the cycle or orthopedic 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 device 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 contact your provider.

## 2 Safety

### 2.1 Safety and fitting instructions

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

#### Before any inspection or repair work

- Read and observe this repair manual and the associated user manual.
- Observe the minimum requirements for carrying out the work (see 1.1 *General information, page 4*).

#### 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 standardized 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.

#### General safety information and information about fitting / removal



#### **DANGER!**

##### **Risk of Death, Serious Injury, or Damage**

Lighted cigarettes dropped onto an upholstered seating system can cause a fire resulting in death, serious injury, or damage. Mobility device occupants are at particular risk of death or serious injury from these fires and resulting fumes because they may not have the ability to move away from the mobility device.

- DO NOT smoke while using this mobility device.



#### **WARNING!**

##### **Risk of Serious Injury or Damage**

Storing or using the mobility device near open flame or combustible products can result in serious injury or damage.

- Avoid storing or using the mobility device near open flame or combustible products.



#### **CAUTION!**

##### **Risk of crushing**

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

- Note the high weight of some components. This applies especially to the removal of drive units, batteries and the seat.



#### **CAUTION!**

##### **Injury hazard if the mobility device starts moving unintentionally during repair work**

- Switch the power supply off (ON/OFF key).
- Engage the drive.
- Before lifting up, secure the mobility device by using chocks to block the wheels.



#### **CAUTION!**

##### **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!**

##### **Risk of burns from hot surfaces on the motor**

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



#### **CAUTION!**

##### **Injury hazard and risk of damage to mobility device 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 mobility device with the approved tire pressures (see technical data).
- Check all electrical components for correct function. Note that incorrect polarity can result in damage to the electronics.
- Always carry out a trial run at the end of your work.



#### **CAUTION!**

##### **Risk of injury and damage to property, if the maximum speed reduction on a wheelchair with a lifter does not function correctly**

The wheelchair's control unit must reduce the maximum possible speed as soon as the lifter is raised.

- Test the maximum speed reduction for correct function after any maintenance work or modifications to the wheelchair.



**CAUTION!**

**Any changes to the drive program can affect the driving characteristics and the tipping stability of the mobility device**

- Changes to the drive program may only be carried out by trained Invacare providers.
- Invacare supplies all mobility devices with a standard drive program ex-works. Invacare can only give a warranty for safe mobility device driving behavior - especially tipping stability - for this standard drive program.



Mark all current settings for the mobility device (seat, armrests, backrest etc.), and the associated cable connecting plugs, before dismantling. This makes reassembly easier. All plugs are fitted with Mechanical locks 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.

## 3 Hygiene

### 3.1 Handling of returned used products

When reconditioning or repairing returned mobility devices:

- Take precautions for yourself and the product.
- Use protection equipment as specified locally.

#### Before transport (according to Biological Agents Ordinance)

Treat product according to following process steps:

Process step	Component	Application	Conditioning technique	Work station
Manual cleaning	Surface of used device	Before repair or reconditioning	Use saturated towel to apply cleaning detergent and remove residues after impact.	Cleaning and disinfection
Disinfection	Surface of used device	Before repair or reconditioning	Use saturated disinfectant wipes and clean* the device surface.	Cleaning and disinfection

\*Invacare uses detergent "Nücosept special" 1.5% in water ml/ml

#### Disinfection tools

- Disposable wipes (fleece)
- Brushes to clean areas difficult to access

#### Further information



For more information contact your Invacare service department.

## 4 Service

### 4.1 General safety information on installation work



**Risk of damage to mobility device**

Collisions can be caused if shim rings are removed from the drive wheels during installation work. Shim rings are frequently placed between drive shaft and wheel hub to compensate tolerances. Collisions can be caused if these shim rings are removed and not re-installed.

- Install all shim rings in exactly the same positions they were in before dismantling.

### 4.2 Tightening torques



**CAUTION!**

**Risk of damage to 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 fingertight.

The tightening torques stated in the following list are based on the thread diameter for the nuts and bolts for

#### 4.3.2 Drive Fault Diagnosis

Problem	Other symptoms	Possible cause	Solution	Documentation
<b>Scooter will not start</b>	Status display on operating console does not illuminate	Batteries defective	Replace batteries	See user manual
		Completely discharged battery	Pre-charge batteries	
		Power supply to operating console interrupted	Check main fuse	See user manual for main fuse position
		Operating console defective	Check cable between modules for loose connections or damage	See <i>Replacing power module</i>
	Replace operating console		See <i>Replacing Operating Console</i>	
	Status display on operating console flashing	Various causes	Assess error code	See controls user manual
<b>Scooter judders in drive mode</b>	None	Drive motor(s) defective	Replace motor(s)	See
		Drive lever potentiometer defective	Replace potentiometer	See <i>Replacing Potentiometer</i>
<b>Batteries not being charged</b>	None	Batteries defective	Replace batteries	See user manual
	LEDs flashing on charger	Charger defective	Replace charger	See charger user manual

which no specific values have been determined. All values assume dry and de-greased threads.

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

### 4.3 Troubleshooting

#### 4.3.1 Operational faults

Proceed as follows if you have any problems:

1. First assess the possible cause of the problem using the following table.
2. Check operating console status display. Evaluate flash code.
3. Carry out necessary checks and repairs as recommended in the following table.



Problem	Other symptoms	Possible cause	Solution	Documentation
Scooter runs too slowly	None	Operating console defective	Replace operating console	See <i>Replacing Operating Console</i>
		Batteries defective	Replace batteries	See user manual

### 4.3.3 Error codes and diagnostic codes

Flash code	Fault	Consequence for the scooter	Comments
1	Batteries must be charged	Continues to drive	<ul style="list-style-type: none"> <li>The batteries are discharged. Charge the batteries as soon as possible.</li> </ul>
2	Battery voltage too low	Stops driving	<ul style="list-style-type: none"> <li>The batteries are depleted. Charge batteries.</li> <li>If you switch the scooter off for a few minutes, the batteries can often recuperate to such a stage that a short journey is still possible. You should only do this in an emergency, however, because this causes the batteries to become excessively discharged.</li> </ul>
3	Battery voltage too high	Stops driving	<ul style="list-style-type: none"> <li>The battery voltage is too high. If the battery charger is connected, disconnect it from the scooter.</li> <li>The electronic system charges the batteries when running downhill and when braking. This fault is caused when the battery voltage becomes too high during this process. Switch the scooter off and on again.</li> </ul>
4	Power time exceeded	Stops driving	<ul style="list-style-type: none"> <li>The maximum current was exceeded over too long a period, probably because the motor was overloaded or has been working against an immovable resistance. Switch the scooter off, wait a few minutes and then switch on again.</li> <li>The electronic system has determined a motor short-circuit. Check the wiring harness for short-circuit and check the motor.</li> <li>Contact your Invacare provider.</li> </ul>
5	Brake failure	Stops driving	<ul style="list-style-type: none"> <li>Ensure that the disengaging lever is in the engaged position.</li> <li>There is a defect in the braking coil or in the cabling. Check the magnetic brake and cabling for open or short-circuited circuitry. Contact your Invacare provider.</li> </ul>
6	No neutral position when switching scooter on.	Stops driving	<ul style="list-style-type: none"> <li>Drive lever is not in neutral when the keyswitch was turned. Put the drive lever in neutral, turn the power off and then turn on again.</li> <li>It may be necessary to replace the drive lever. Contact your Invacare provider.</li> </ul>
7	Fault in speed potentiometer	Stops driving	<ul style="list-style-type: none"> <li>The drive lever controls could be faulty or incorrectly connected. Check the cabling for open or short-circuited circuitry.</li> <li>Potentiometer is not correctly adjusted and must be replaced. Contact your Invacare provider.</li> </ul>
8	Motor voltage error	Stops driving	<ul style="list-style-type: none"> <li>The motor or its cabling is defective. Check the cabling for open or short-circuited circuitry.</li> </ul>
9	Miscellaneous internal fault	Stops driving	<ul style="list-style-type: none"> <li>Contact your Invacare provider.</li> </ul>
10	Push/freewheel mode error	Stops moving	<ul style="list-style-type: none"> <li>The scooter has exceeded the permissible maximum speed during pushing or freewheeling. Switch the electronics system off and on again.</li> </ul>

## 4.3.4 Service Plan

Component	Check	Remedy	Notes	✓
<b>Seat</b>	Check welded seams, fixings and upholstery	Tighten screws, replace parts if damaged		
	Check seat suspension	Grease the spring generously, replace parts if damaged	See <i>Replacing seat suspension/spring</i>	
<b>Frames (chassis) / battery mounting</b>	Check fixings, welded seams and battery mounting	Tighten screws, replace parts if damaged		
	Check battery fixing straps			
<b>Wheel suspension and wheels</b>	Check drive wheels for tight fit	Tighten hub nuts, replace if necessary		
	Check front wheels for tight fit, float and side play	Adjust / replace		
	Check pneumatic tire	Repair or replace if damaged	See user manual	
	Check tracking and steering link	Tighten screws		
Check tracking and steering		Installing and removing wheels (4-wheel version and rear wheels on 3 wheel version)		
<b>Drive units, coupling mechanism</b>	Check functions in drive and push modes	Replace motor if necessary	See user manual	
	Check clutch mechanism	Tighten screws / nuts, adjust or replace		
<b>Batteries</b>	Check batteries for damage	Replace batteries	See user manual	
	Check battery voltage	Charge batteries	See user manual	
	Check contacts and terminals	Clean contacts and terminals		
<b>Drive controls</b>	Check status display (flashing)	Evaluate flash code		
	Check fixing	Tighten or replace fixing		
	Check cable, connecting plug	Replace cable, connecting plug		
	Check drive lever function	Replace drive lever		
	Check power supply	Replace cable, connecting plug or console		

Component	Check	Remedy	Notes	✓
Drive program	Check drive program version. New version available?	Update software		
Screws	Check screws for tight fit	Tighten screws if necessary		

## 4.4 Controls

### 4.4.1 Replacing power module



**WARNING!**  
**Risk of accident**

When parking mobility device on its support wheels it is no longer slowed by the motor brake. The mobility device can roll away out of control.

- Place mobility device’s rear frame on a supporting wooden block before you remove wheels.



The controls system is supplied with a standard drive program. If you have carried out customer-specific modifications to the drive program, you will have to make these changes again after installing the new power module.



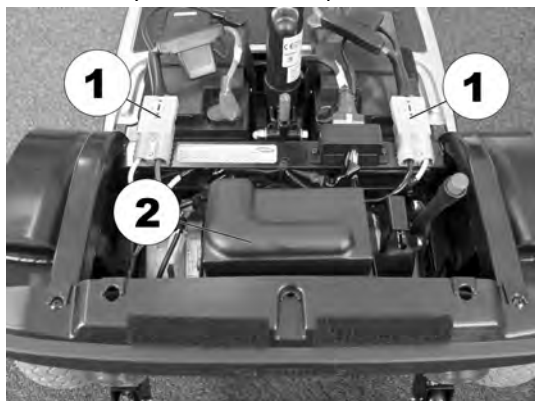
When removing, note position of small parts such as screws and washers. Put small parts down so that they can be installed in correct sequence.



- Phillips screwdriver
- Supporting wooden block
- To adapt drive program: programming software or hand programming device and controls system installation manual, available from Invacare®.

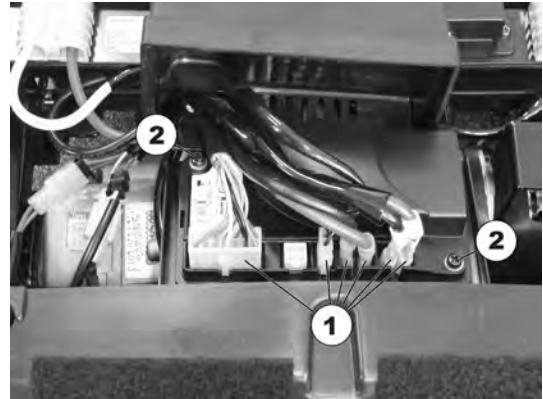
#### Removing power module

1. Remove seat.
2. Remove battery and motor compartment shroud.
- 3.



Remove battery plug (1).

4. Remove cover (2) from controls system.
- 5.



Remove all plugs (1) from power module.

6. Remove screws (2) on both sides of power module.
7. Replace power module.
8. Install parts in reverse order.
9. Modify drive program.
10. Complete installation of mobility device.
11. Test all functions.

### 4.4.2 Replacing operating console

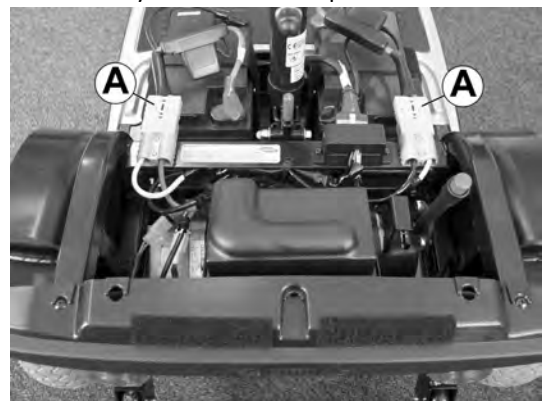


When removing, note the position of small parts such as screws and washers. Put small parts down so that they can be installed in the right sequence.



- Phillips screwdriver

1. Remove seat.
2. Remove battery and motor compartment shroud.
- 3.



Disconnect battery cable (A).

4.



Remove plugs from rear mirror fixing **B** or rear mirror depending on fittings.

5.



Remove screws **C** below operating console.

6.



Pull operating console upwards out of front fixing **D**.

7.



Remove all plugs **E** from operating console.

**!** **Risk of damaging circuit board by electrostatic discharge**  
 – Handle circuit boards only in (EPA) Electrostatic Protected Areas.

8. Replace operating console.
9. Install parts in reverse order.
10. Test all functions.

#### 4.4.3 Replacing controls



**WARNING!**  
**Risk of accident**

When parking the scooter on the scooter support wheels is no longer slowed by the engine brake. The scooter can roll away out of control.  
 – Place the scooter rear frame on a supporting wooden block before you remove the wheels.



The controls system is supplied with a standard drive program. If you have carried out customer-specific modifications to the drive program, you will have to make these changes again after installing new power module.



When removing, note position of small parts such as screws and washers. Put small parts down so that they can be reassembled in correct sequence.



Plugs on power module can not be wrongly connected because all plugs have a different size and only fit in one socket.



- Phillips screwdriver
- Supporting wooden block
- To adapt drive program: programming software or hand programming device and controls system installation manual, available from Invacare.

1. Remove steps.
2. Remove battery and motor compartment shroud.
3. Remove battery plug (1).
4. Remove controls system shroud (2).
5. Remove all plugs (1) from controls system.
6. Remove screws (2) on both sides of controls system.
7. Install parts in reverse order.
8. Test all functions.

#### 4.4.4 Replacing potentiometer



**WARNING!**  
**Burn and scald hazard if power cable is shorted**

– Turn off the power completely before removing any power supply components of mobility device. Therefore take out batteries.  
 – Avoid a bridging of contacts during measurements on live electrical components.



- Phillips screwdriver
- 2 mm Allen key – open-ended wrench
- Digital multimeter

1. Remove seat.
2. Remove battery and motor compartment shroud.
3. Remove battery cable (1).



Remove plugs from rear mirror fixing (1) or rear mirror, depending on fittings.



Remove screws (1) below operating console.



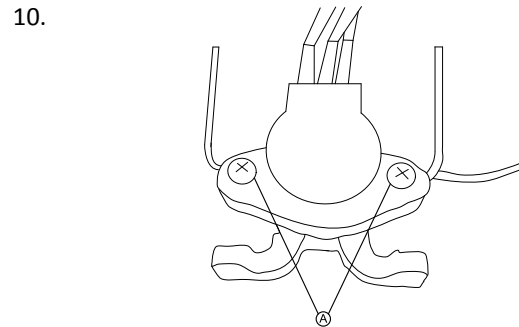
Pull operating console upwards out of front fixing (1).



Remove drive lever (1).

8. Remove screws © on drive lever (1) and remove drive lever.

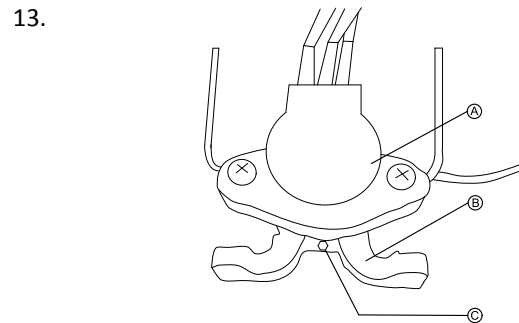
9. Disconnect potentiometer plug (3) from operating console.



Remove screws A on potentiometer.

11. Replace potentiometer.

12. Reconnect potentiometer plug (3) with operating console.



Connect potentiometer A and drive lever mounting B:

- Tighten screw C.

14. Install parts in reverse order.

15. Test all functions.

#### 4.4.5 Checking cables

1. Switch controls OFF on the operating control.
2. Check all cables for visible damage, crushing points or abrasion points.
3. Replace damaged cables.
4. Pull on each plug carefully. The plug must not come out of its socket when pulled on lightly.
5. If a plug is loose, apply slight pressure to push the plug into the socket. The plug must snap in place securely.
6. Check that the plug is firmly attached to its socket.
7. Remove batteries, as described in chapter 6.3.
8. Check battery cables for visible damage, crushing points or abrasion points.
9. Replace damaged cables.
10. Assemble all parts again in reverse order.
11. Test all functions of the mobility device.

#### 4.4.6 Updating 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.



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.



- 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/>.

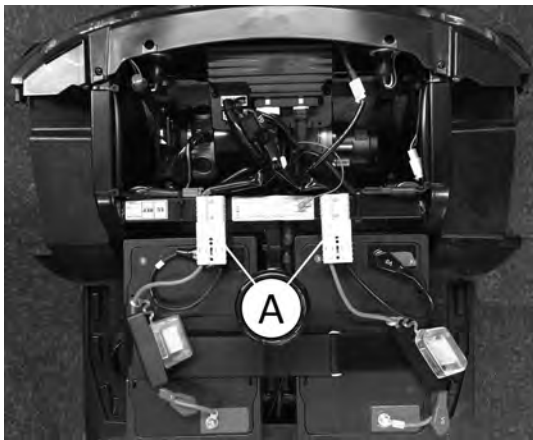
## 4.5 Lighting unit

### 4.5.1 Replacing headlight



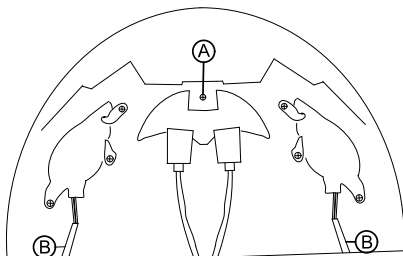
- Phillips screwdriver

1. Remove seat.
2. Remove shroud.
- 3.



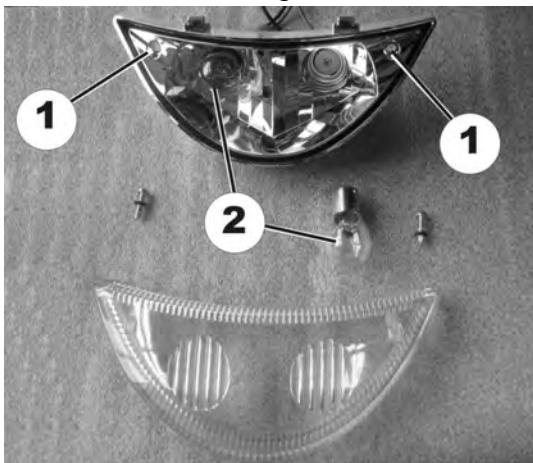
Disconnect battery cable (A).

4.



Remove screw (1) or (A) on headlight under front shroud.

5. Remove headlight.
6. Disconnect cable from wiring harness.
- 7.



Remove screws (1) on headlight glass.

8. Remove headlight glass.

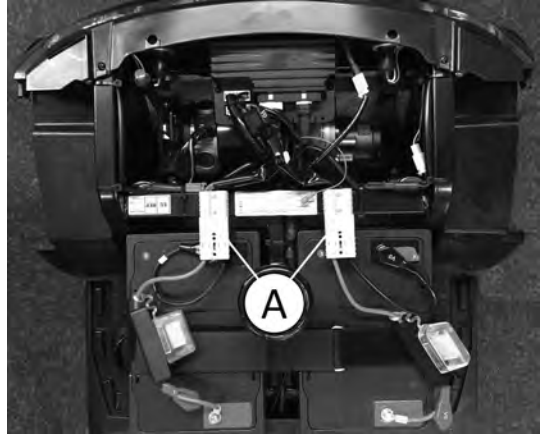
9. Replace bulb(s) in headlight.
10. Test function.

### 4.5.2 Replacing front direction indicators



- Phillips screwdriver

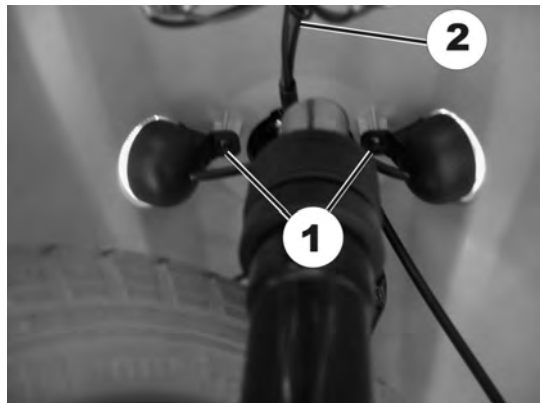
1. Remove seat.
2. Remove shroud.
- 3.



Disconnect battery cable (A).

#### 3-wheel version

1.

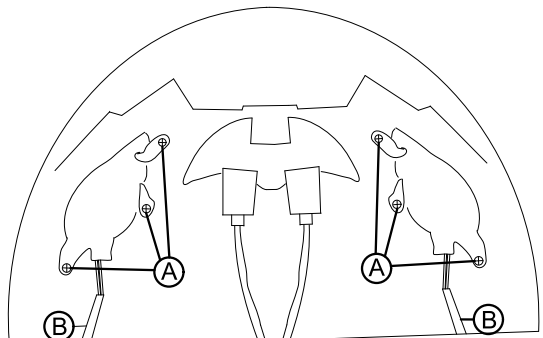


Remove direction indicator screw (1).

2. Disconnect direction indicator cable (2) from wiring harness.
3. Replace direction indicator.
4. Install direction indicators in reverse order.
5. Test function.

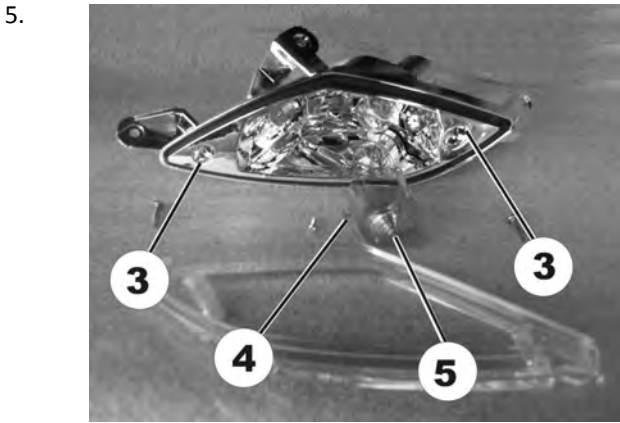
#### 4-wheel version

1. Remove steering column shroud and steering column. See *Replacing steering column*.
2. Remove chassis bolts and fold chassis upwards.
- 3.



Remove direction indicator screw (A) on chassis.

4. Disconnect direction indicator cable (B) from wiring harness.



5. Remove screws (3) on glass.
6. Remove glass.
7. Loosen screws (4) on orange-colored cap (5) and remove cap.
8. Replace lightbulb.
9. Install parts in reverse order.
10. Test function.

### 4.5.3 Replacing center brake light



**CAUTION!**

- Risk of burning if power cable is shorted**
- Turn off the power completely before removing any power supply components of the mobility device. Therefore take out the batteries.
  - Avoid bridging of contacts during measurements on live electrical components.

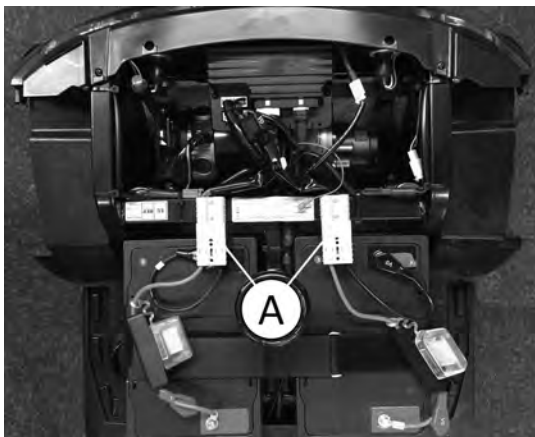


When disassembling, note the position of small parts such as screws and washers. Put small parts down so that they can be reassembled in the right sequence.

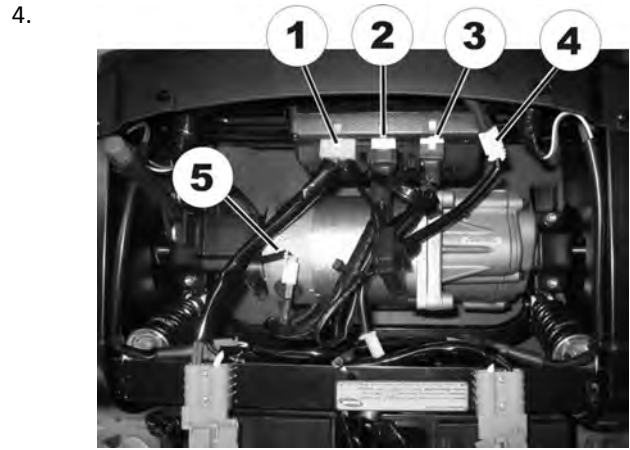


- Phillips screwdriver

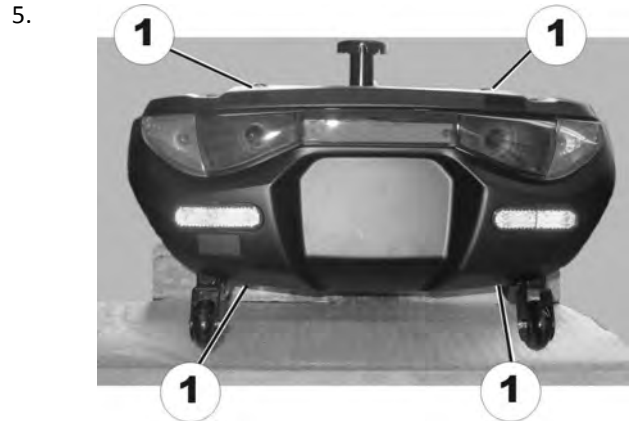
1. Remove seat.
2. Remove shroud.
- 3.



Disconnect battery cable Ⓐ.



Disconnect plug (4).



Remove bolts (1) on rear shroud.

6. Lift the rear shroud upwards.
- 7.



Remove screws (1) on brake light.

8. Replace brake light.
9. Install parts in reverse order.
10. Test functions (trial run).

### 4.5.4 Replacing rear lights/direction indicators



**CAUTION!**

- Risk of burning if power cable is shorted**
- Turn off power completely before removing any power supply components of mobility device. Therefore take out batteries.
  - Avoid bridging of contacts during measurements on live electrical components.

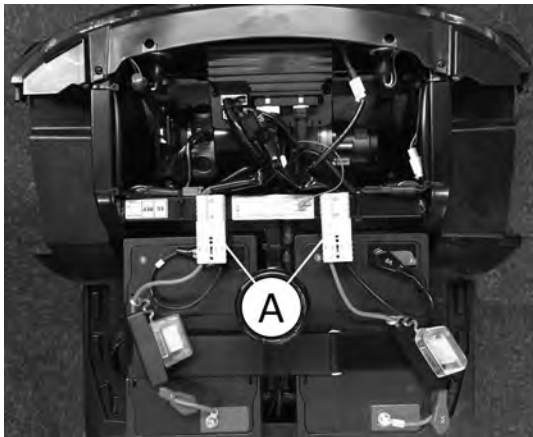


When disassembling, note the position of small parts such as screws and washers. Put small parts down so that they can be reassembled in the right sequence.

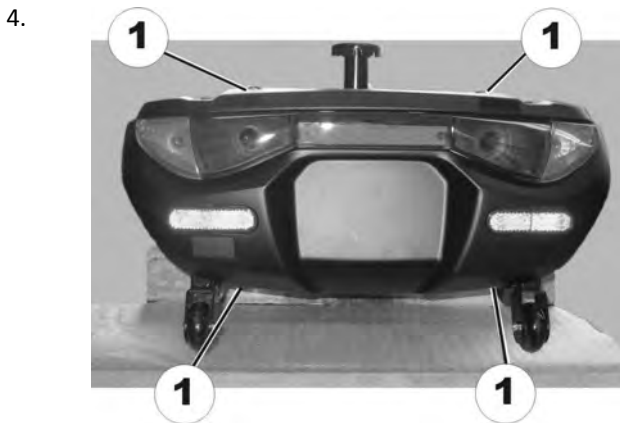


- Phillips screwdriver

1. Remove seat.
2. Remove shroud.
- 3.



Disconnect battery cable (A).



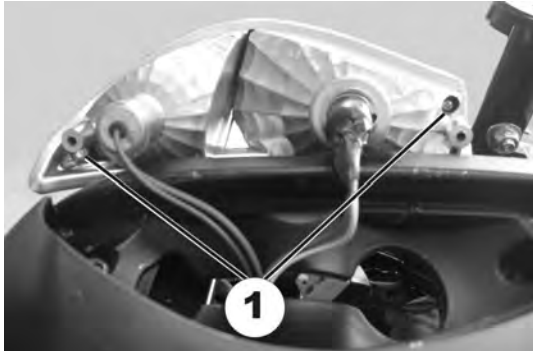
Remove bolts (1) on rear shroud.

5. Lift rear shroud upwards.
- 6.

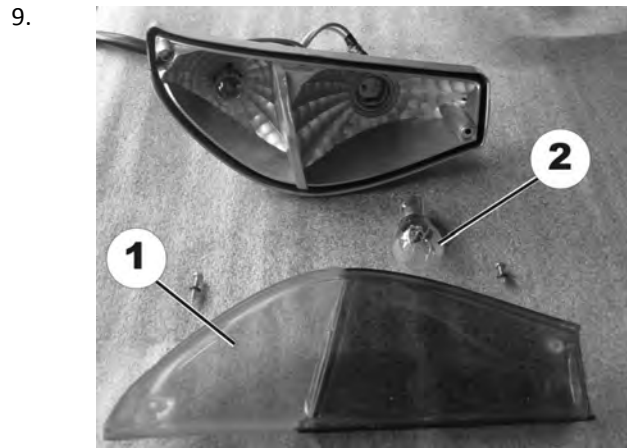


Remove screws (1) on rear light.

7. Remove rear light.
- 8.



Remove screws (1) on glass.



Remove glass (1).

10. Replace lightbulbs (2).
11. Install parts in reverse order.
12. Test function.

## 4.6 Shrouds

### 4.6.1 Removing shroud



**CAUTION!**

**Risk of damage to shroud**

- Do not pull shroud straight up to remove.
- Follow instructions below.



Place one hand at the front, the other at the rear of the shroud (A).

2. Lift shroud up from front.
- 3.



Place hands on left and right side of shroud.

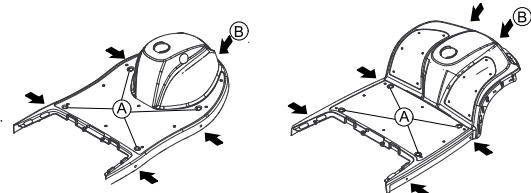
4. Twist and lift to remove shroud completely.

### 4.6.2 Replacing front shroud



- 10 mm socket wrench
- Phillips screwdriver

1. Remove shroud. See 4.6.1 *Removing shroud*, page 16.
- 2.



Remove four caps (A).

3. Loosen and remove screws (B).



4. Take off front shroud.
5. Install parts in reverse order.

## 4.7 Wheels

### 4.7.1 Replacing wheel suspension



**WARNING!**

**Risk of accidents**

Accidents may result from standing the chassis upright on its end.

- Secure chassis against falling over.

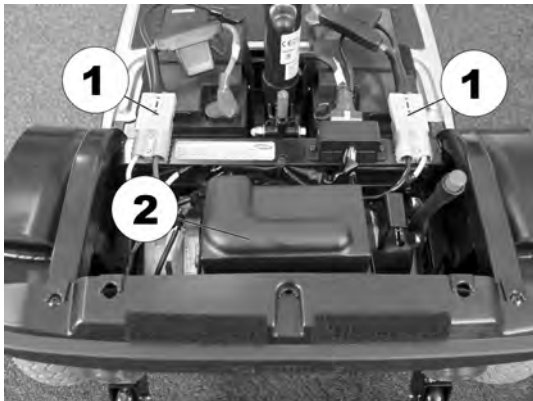


Pay attention to the positions of small parts such as screws and washers during installation. Put small parts aside in such a way that they can be installed in correct order.



- 12 mm wrench
- 13 mm wrench
- 32 mm wrench
- Phillips screwdriver

1. Remove seat.
2. Remove motor shroud.
- 3.



Disconnect battery cable (1).

- 4.



Remove plastic plugs (1) or rear view mirrors, if fitted, from threaded holes.

- 5.

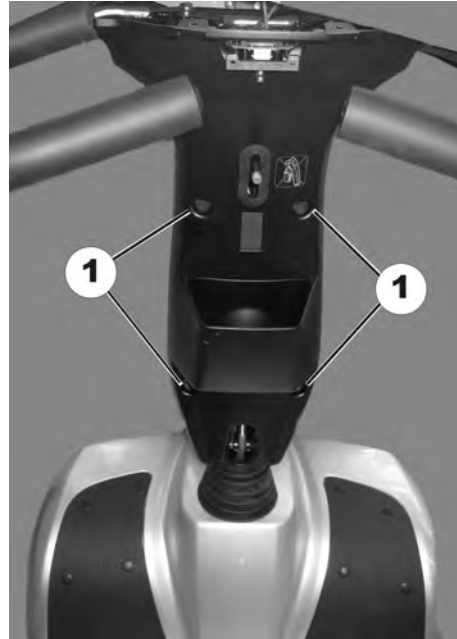


Remove screws (1) beneath control console.

6. Remove screws (2).
7. Remove control lever.
- 8.



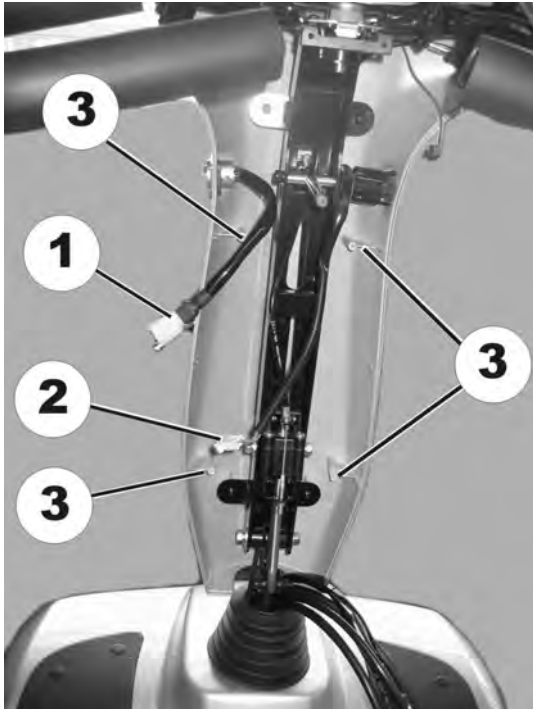
Pull control console up out of front fixation (1).



9. Loosen and remove screws (1) of rear steering column shroud.

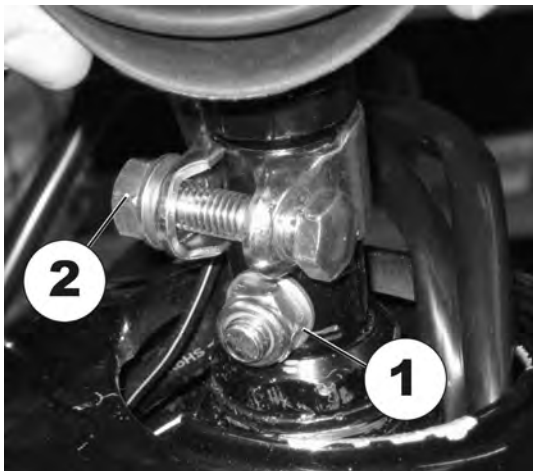
10. Remove steering column cover.
11. Remove fixation screws of front basket holder.
12. Remove basket holder.
13. Remove distance bushings.

14.



Disconnect cables (1, 2) from cable loom.

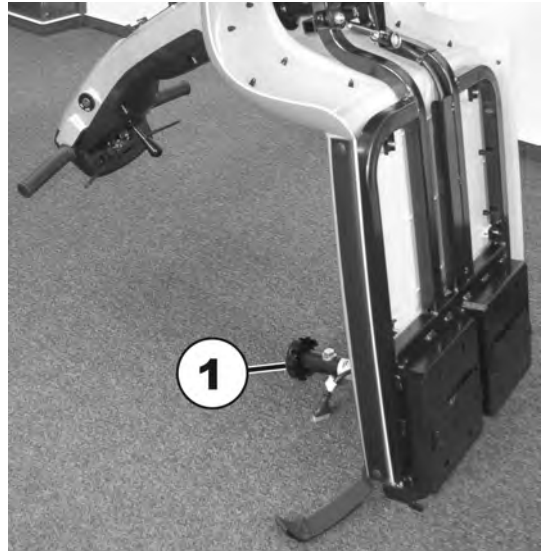
15.



Loosen and remove screws (3) of front steering column shroud.

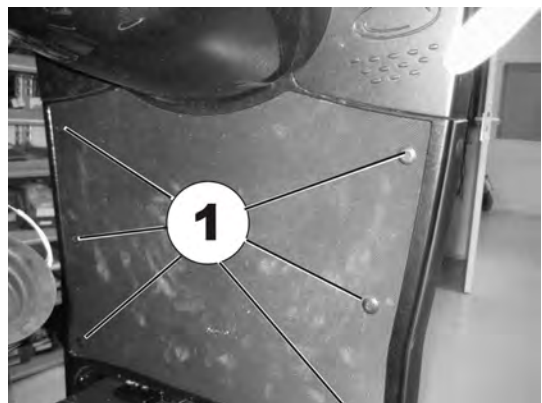
- 16. Remove front steering column shroud.
- 17. Slide rubber sleeve upwards.
- 18. Loosen and remove fixation screw of steering column (1).
- 19. Loosen screw (2).

20.



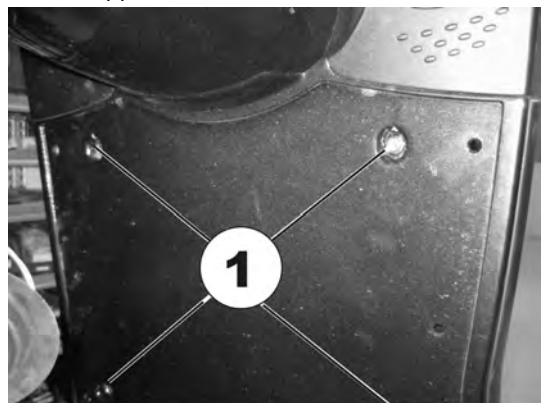
Place chassis upright on its seat adapter (1).

21.



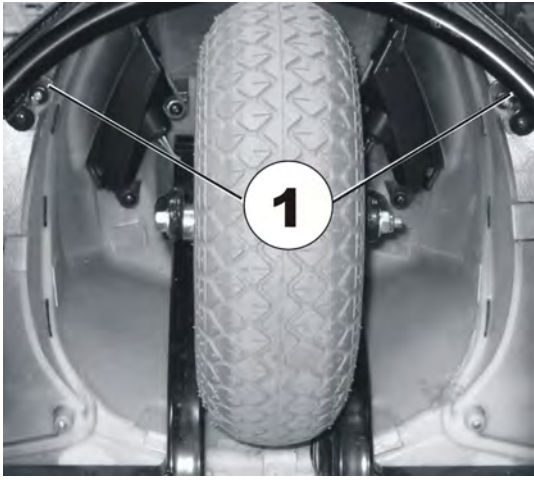
Secure chassis against falling over.

- 22. Press 6 fixation clips in (in the middle of the clips).
- 23. Remove fixation clips.
- 24. Remove foot mat.
- 25. Remove 4 upper screws of chassis.
- 26.



Remove 2 lower screws of chassis.

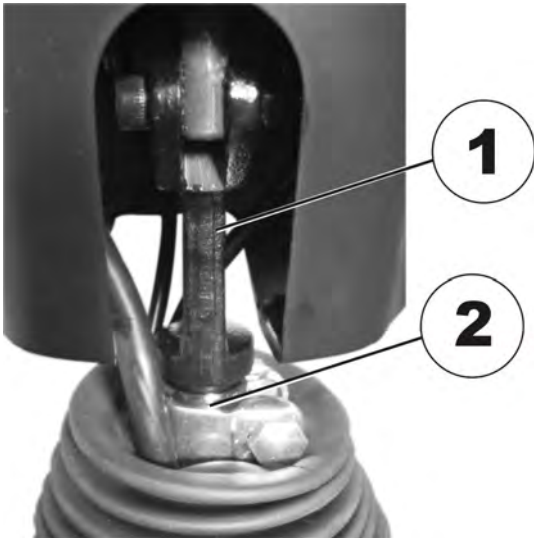
27.



Remove chassis by pulling it upwards.

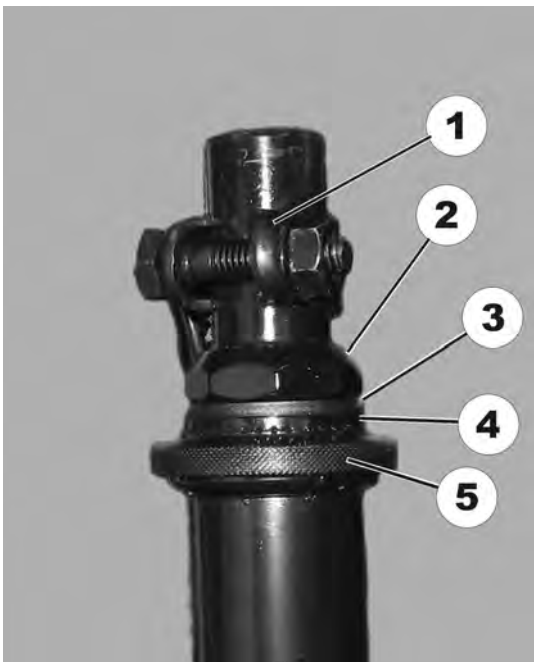
28. Remove front wheel (see chapter 6.2).

29.



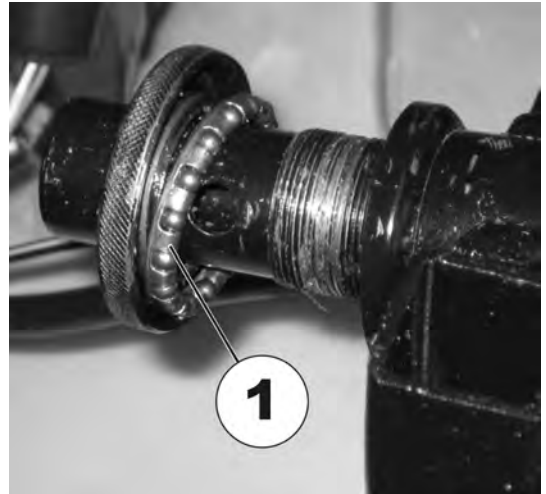
Pull fork out. This can require a lot of strength, as fork (2) can be difficult to detach from the steering head holder (1).

30.



Remove clamp (1).

31. Loosen fork bolt (2).
32. Remove retaining ring.
33. Remove serrated washer.
34. Remove knurled screw (3).
35. Pull steering column up and out.
- 36.



Remove ball bearing (1).

37. Install parts in reverse order.
38. Test all functions.

#### 4.7.2 Removing and installing wheels (4-wheel version and rear wheels on 3-wheel version)



**WARNING!**  
**Risk of accident**

When parking the mobility device on its support wheels it is no longer slowed by the engine brake. The mobility device can roll away out of control.

- Place the mobility device rear frame on a supporting wooden block before you remove wheels.



When removing, note position of small parts such as screws and washers. Put small parts down so that they can be installed in right sequence.

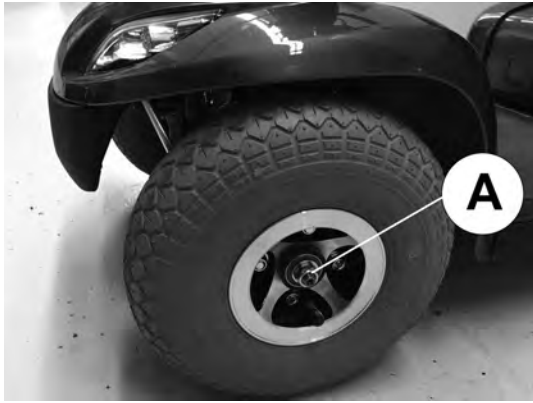


- 17 mm wrench
- Rubber hammer
- Flat screwdriver
- 17 mm self-locking nut
- Block of wood

1. Secure mobility device against rolling away.
2. Position block of wood under the frame in the vicinity of the battery box.

### Removing wheel

1.



Loosen nut (A).

2. Remove wheel.
3. If necessary, loosen wheel by tapping it lightly with a rubber hammer.

### Installing wheel

1. Install parts in reverse order.
2. Use a new self-locking nut.
3. Test all functions.

### 4.7.3 Replacing front axle (4-wheel version)



**WARNING!**

**Risk of accidents**

Accidents may result from standing the chassis upright on its end.  
– Secure chassis against falling over.

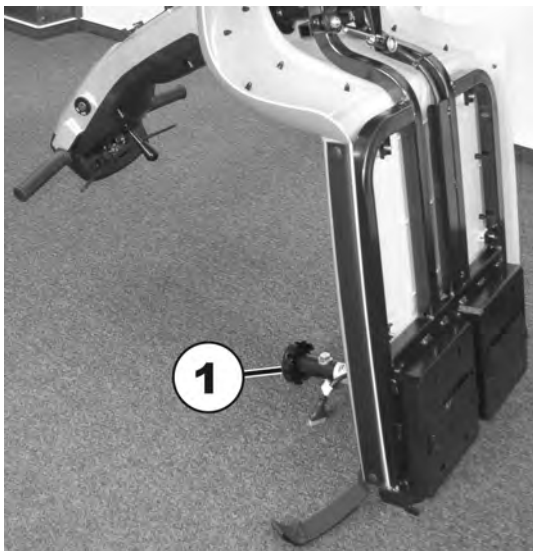


Pay attention to the positions of small parts such as screws and washers during disassembly. Put small parts aside in such a way that they can be re-fitted in the correct order.



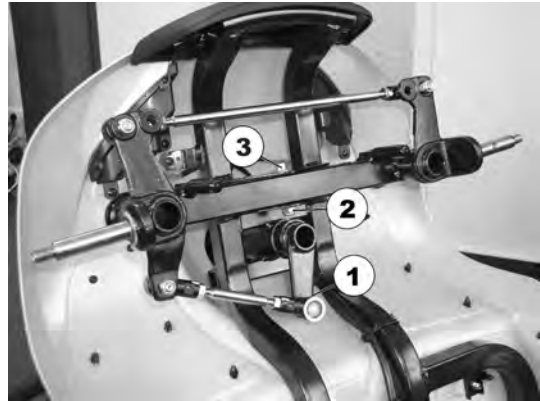
- 17 mm wrench
- 19 mm wrench

1. Remove seat.
2. Remove batteries.
3. Remove drive unit.
- 4.



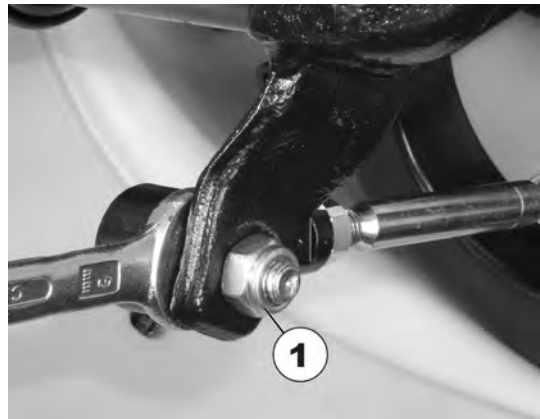
Place chassis upright on its seat adapter (1).

5. Secure chassis against falling over.
6. Remove wheel (1). (see chapter 6.3)
7. Loosen and remove nut on the track rod (1) (see note below).
8. Remove track rod from the steering knuckle.
- 9.



Loosen and remove nut of the axle suspension (2). Counter axle suspension bolt (3) so it cannot rotate while performing this task.

10. Pull bolt (3) out and remove axle assembly.
- 11.



Counter tie rod end while removing nut (1) so it cannot rotate.

12. Install parts in reverse order.
13. Test all functions.

### 4.7.4 Replacing the crash protection bar



**WARNING!**

**Risk of accidents**

Accidents may result from standing the chassis upright on its end.  
– Secure chassis against falling over.



Pay attention to the positions of small parts such as screws and washers during disassembly. Put small parts aside in such a way that they can be re-fitted in the correct order.



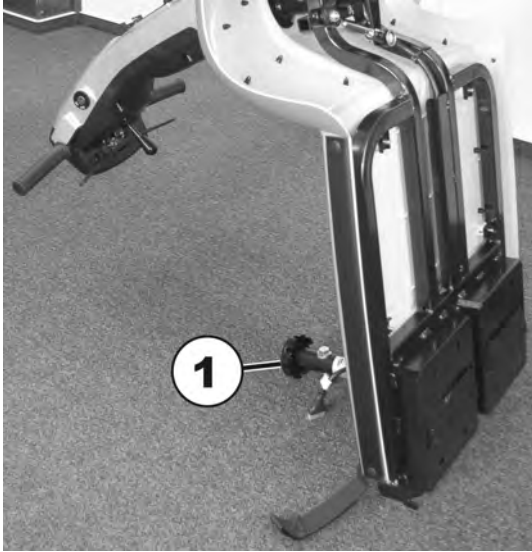
- Phillips screwdriver

1.



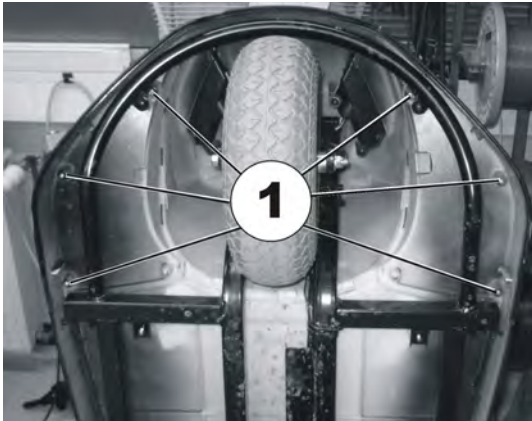
The crash protection bar (1) serves to protect scooter from damage.

2. Remove seat.
3. Remove batteries.
4. Remove drive unit.
- 5.



Place chassis upright on its seat adapter (1).


6. Secure chassis against falling over.
- 7.



Loosen and remove the 6 fixation screws of the crash protection bar.

8. Pull crash protection bar up and out.
9. Install parts in reverse order.
10. Test all functions.

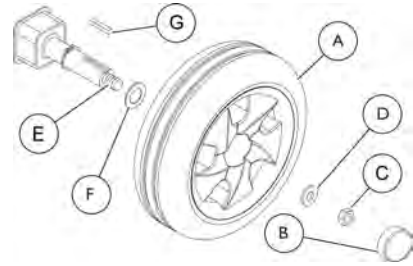
#### 4.7.5 Removing/Installing the Drive Wheels

 This procedure applies to the rear wheels of the four wheel and three wheel models.

Take note of position and orientation of wheel and mounting hardware before removing.


 Tools:

- 17 mm spanner
- Rubber mallet
- Screwdriver
- 17 mm safety nut



#### Removing the Drive Wheels


1. Turn power off and remove the key from the ignition.
2. Remove the seat. Refer to *Removing/Installing the seat*.
3. Place the rear frame assembly (not shown) up on blocks so that the drive wheels (A) are off the ground.
4. Remove the cap (B), locknut (C) and small washer (D) from the threaded end of the drive shaft (E).
5. Remove the existing drive wheel assembly from the drive shaft.

 Use a wheel puller if necessary to remove the wheel from the drive shaft.

6. Remove the large washer (F) from the drive shaft.
7. Remove keystick (G) from drive shaft. Set aside.
8. If necessary, repeat STEPS 3 - 6 to remove other drive wheel.


#### Installing the Drive Wheels

1. Place keystick (G) in cutout on drive shaft (E) as shown in the illustration above.


 The keystick in the drive shaft MUST lineup with the cutout in the wheel hub.  
If necessary, use a rubber hammer to gently tap drive wheel completely into position on the drive shaft.

2. Install the large washer (F) onto the drive shaft.
3. Install the drive wheel (A) onto the drive shaft.
4. Secure wheel to drive shaft by installing the small washer (D) and locknut (C) onto the threaded end of the drive shaft. Securely tighten.
5. Install the cap (B).
6. Repeat STEPS 1-5 to install the other drive wheel.
7. Install the seat. Refer to *Removing/Installing the seat*.

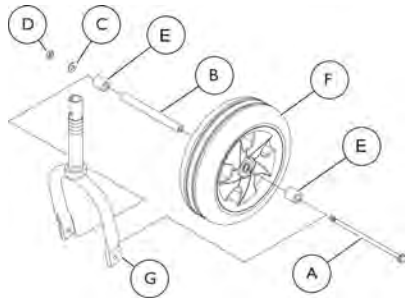
#### 4.7.6 Removing/Installing the Front Wheel - Three Wheel Models

 Take note of position and orientation of wheel and mounting hardware before removing.

Reverse this procedure to install the front wheel.


 Tools:

- 12 mm spanner
- 13 mm spanner
- 13 mm safety nut



1. Turn power off and remove the key from the ignition.
2. Place the front of the scooter up on blocks so that the front wheel is off the ground.
3. Remove the bolt (A), axle (B), washer (C), nut (D) and two spacers (E) that secure the wheel (F) to the fork (G).
4. Remove the wheel from the fork.

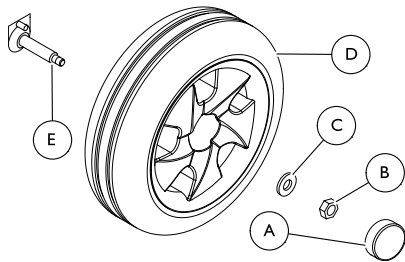
#### 4.7.7 Removing/Installing the Front Wheels - Four Wheel Models

 Take note of position and orientation of wheel and mounting hardware before removing.



Tools:

- 17 mm spanner
- Rubber mallet
- Screwdriver
- 17 mm safety nut



#### Removing the Front Wheels

1. Turn power off and remove the key from the ignition.
2. Place the front of the scooter up on blocks so that the front wheels are off the ground.
3. Remove the cap (A), locknut (B) and washer (C) that secure the front wheel (D) to the front axle (E).
4. Remove the front wheel from the front axle.
5. If necessary, repeat STEPS 3 – 4 to remove the remaining front wheel.

#### Installing the Front Wheels

1. Align the front wheel (D) with the front axle (E).
2. Use the washer (C) and locknut (B) to secure the front wheel to the front axle.
3. Securely tighten the front wheel mounting hardware.
4. Install the cap (A).
5. If necessary, repeat STEPS 1 – 4 to install the remaining front wheel.

#### 4.7.8 Repairing tire punctures (pneumatic tires of type 10")



Tools:

- Inner tube repair set **or** a new inner tube
- Talcum powder
- 13 mm socket spanner
- 13 mm open-ended spanner



1. Remove valve cap.
2. De-inflate the tire by pressing in the center valve pin.
3. Loosen the four bolts (1) with the socket spanner and remove them.
4. Remove both wheel rim halves out of the tire and remove the inner tube.
5. Repair the inner tube and refit in the wheel, or replace it with a new inner tube.



If the old inner tube has been repaired and is to be used again, and became wet during repair, it is easier to replace it if it is lightly dusted with talcum powder beforehand.

6. Refit the wheel rim parts from outside into the tire.
7. Pump up the tire lightly.
8. Reinsert the nuts and bolts which hold the wheel rim together and tighten fully.
9. Make sure that the tire is properly located on the wheel rim.
10. Inflate the tire up to the recommended tire pressure.
11. Check to make sure that the tire is still located properly on the wheel rim.
12. Screw the valve cap back on.
13. Locate the wheel on the drive shaft again.
14. Reassemble the wheel.

## 4.8 Brakes

### 4.8.1 Replacing hand brakes



#### CAUTION! Risk of accident

Accidental rolling can lead to accidents.  
– Secure the scooter against rolling away.



When disassembling, note the position of small parts such as screws and washers. Put small parts down so that they can be reassembled in the right sequence.



The front axle can only be replaced on the 3-wheel version. The 4-wheel version does not have a replaceable axle.



- 10 mm wrench
- 17 mm wrench
- 19 mm wrench
- Supporting wooden block

1. Remove seat.
2. Remove shroud.

3. Disconnect battery cable.
4. Place a supporting wooden block under the front part of the frame so that the front wheel is no longer touching the floor.

1. Slacken brake cables.
2. Disconnect brake cable at affected wheel.
- 3.



Loosen and remove wheel bolt (A).

4. Pull wheel and brake off shaft.
5. Pull brake out of brake drum.
6. Replace brake lining or complete brake.
7. Refit wheel and brake.
8. Push wheel and brake onto shaft.
9. Apply brake and tighten axle bolts at same time.
10. Install parts in reverse order.
11. Adjust braking force on wheel using brake lever setting screw.
12. Test braking function while pushing.

#### 4.8.2 Replacing brake cable



##### CAUTION! Risk of accident

Accidental rolling can lead to accidents.  
– Secure mobility device against rolling away.



When disassembling, note position of small parts such as screws and washers. Put small parts down so that they can be reassembled in right sequence.

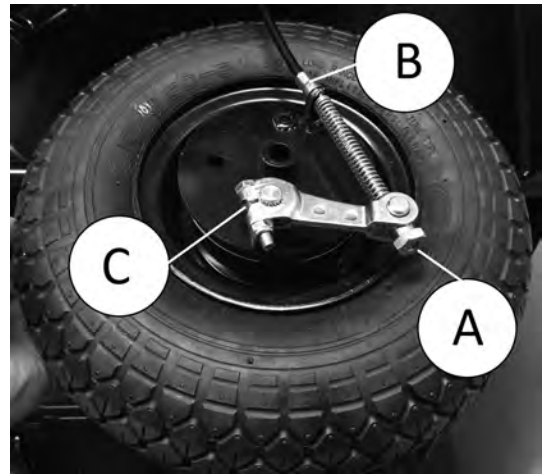


You do not need to remove wheel to replace brake cable.



- 10 mm wrench
- Phillips screwdriver

1.



Slacken brake cable using setting screw (A).

2. Disconnect brake cable at wheel (B).
3. Disconnect brake cable at brake lever on steering column.
4. Route brake cable through shroud.
5. Loosen brake lever screw (C) at wheel.
6. Replace brake cable.
7. Install parts in reverse order.
8. Test braking function while pushing.

## 4.9 Drive components

### 4.9.1 Replacing drive motor



##### WARNING! Risk of accident

When parking the scooter on the scooters support wheels it is no longer slowed by the engine brake. The scooter can roll away out of control.  
– Place the scooter rear frame on a supporting wooden block before you remove the wheels.



When disassembling, note the position of small parts such as screws and washers. Put small parts down so that they can be reassembled in the right sequence.



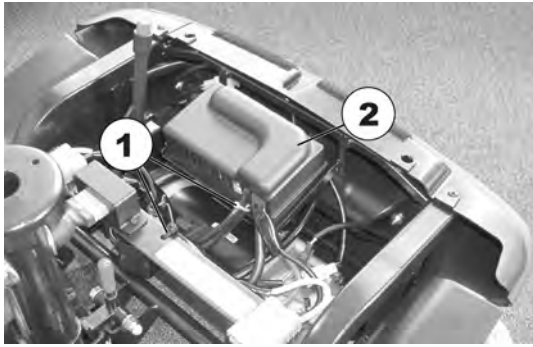
The plugs on the electronic module cannot be wrongly connected because all plugs have a different size and only fit in one socket.



- 10 mm open spanner
- 17 mm open spanner
- Oblique pliers
- Rubber hammer
- Phillips screwdriver
- Supporting wooden block
- 17 mm self-locking nut

1. Secure scooter against rolling away.
2. Place supporting wooden block under the frames at battery holder height.
3. Remove seat.
4. Remove batteries.
5. Remove drive unit.

6.



Cut through cable ties (1) and remove.

7. Fold up controls shroud (2).

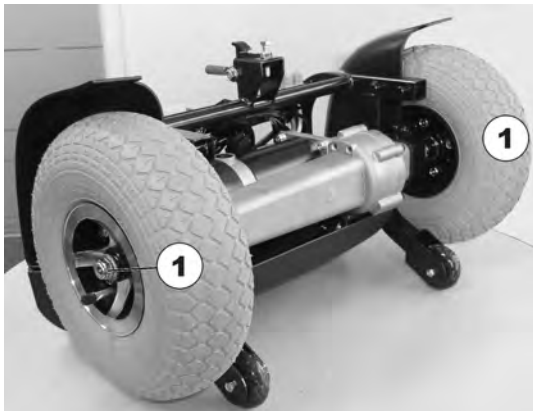
8.



Remove motor cable plug (1) from controls system.

9. Remove motor cable.

10.



Fold drive to the rear onto enclosure and antitipper.

11. Remove wheels (1). (see chapter 6.3)

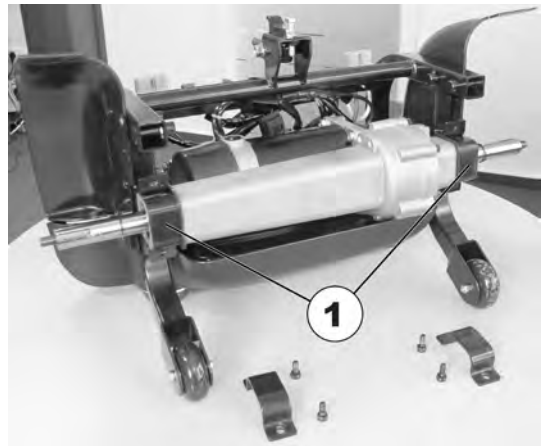
12.



Loosen motor fixing bolts (1) on both sides and remove.

13. Remove motor downwards out of the mobility device frame.

14.



Check rubber bearing (1) on motor suspension. Replace damaged rubber bearings.

15. Install motor in reverse order.

16. Secure motor cable with cable tie.

17. Complete installation of mobility device.

18. Test all functions.

## 4.10 Seat system

### 4.10.1 Replacing seat suspension/spring



**WARNING!**  
**Risk of accident**

Accidental rolling can lead to accidents.  
– Secure mobility device against rolling away.



When removing, note position of small parts such as screws and washers. Put small parts down so that they can be installed in right sequence.



The following seat support tubes are available for seat suspension:

User weight	Length of seat support tube
0–136 kg	508,5 mm
	533,5 mm
	558,5 mm
136 – 160 kg	508,5 mm
	533,5 mm
	558,5 mm



- 17 mm open wrenches

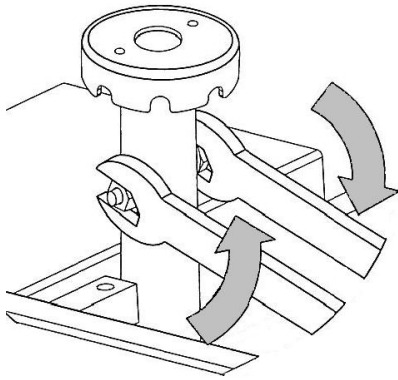
1. Secure mobility device against rolling away.

2. Remove seat.

3. Loosen securing bolt of seat support tube.

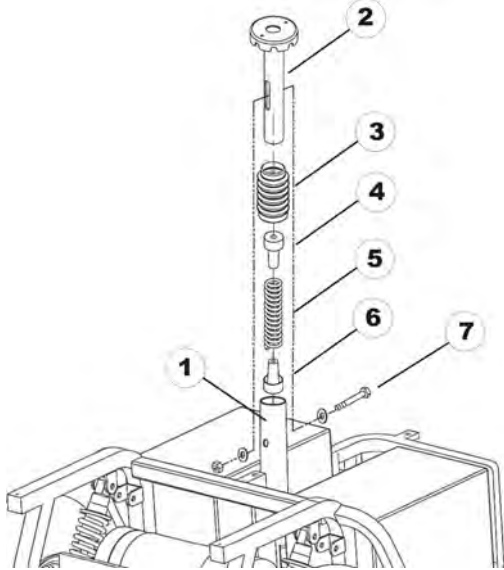


4.



Remove bolt (7), nut and washers.

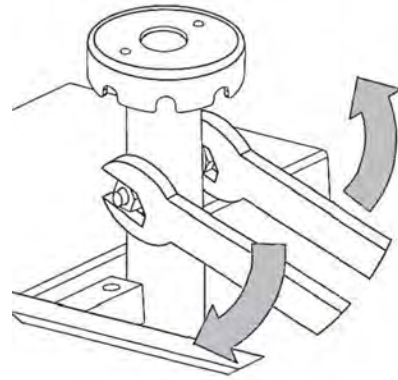
5.



Remove seat support tube (2) from receptacle tube (1).

6. Remove concertina type shroud (3) including spring (5) and plastic end pieces (4 and 6).
7. Fit plastic end pieces (4 and 6) to new spring.
8. Grease spring generously. The spring should be covered completely.
9. Install concertina type shroud (3).
10. Install concertina type shroud (3) including spring (5) and plastic end pieces (4 and 6).
11. Insert seat support tube (2) into receptacle tube (1) and press down gently.
12. Reposition bolt (7), nut and washers.

13.



Firmly tighten seat support bolt.

14. Reposition seat.

## 4.11 Accessories

### 4.11.1 Accessories list

- Mirror (right or left)
- Connection tube (to mount oxygen tube, shopping basket)
- Safety vest
- Warning triangle
- OrionMETRO: solid tires (without rim), 11 inch, black
- OrionPRO: solid tires (without rim), 12 inch, black
- Seat lifter kit, electrical, 12 cm
- Seat suspensions
- Front bumper
- Rear bumper
- Personal key
- Crutch/cane holder (right or left)
- Lockable storage box, front
- Lockable storage box, rear, incl. clutch holder bracket
- Rear basket
- Backrest bag
- Hour counter
- Seat belt
- Seat bag
- Walking frame holder
- Rollator holder incl. crutch holder
- Windscreen
- Oxygen bottle holder
- Can holder
- Off-board charger kit
- Covers: Storage cover (Full scooter cover), Seat Cover (Rain & Dirt protection)



The installation instructions for additional accessories are available at your Invacare® provider or directly from Invacare®.





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