Invacare® TDX® SP2 Series

en Power Wheelchair
Service Manual

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

Yes, you can.

Contents

1 General

1.1 About this manual

- This manual refers to configurations with Modulite seat system. Older specifications have been described in revision 11 of this service manual.
- For seat systems, refer to the corresponding manual.
- For Shark, DX, DX2, refer to revision 11 of this service manual.
- For LiNX controls, refer to LiNX Service Manual.

1.2 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.

1.3 Notes on shipping

- If the mobility device 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.

1.4 Symbols in this manual

In this manual, hazard statements are indicated by symbols. The symbols are accompanied by a signal word that indicates the severity of the risk.

WARNING
Indicates a hazardous situation that could result in serious injury or death if it is not avoided.

CAUTION
Indicates a hazardous situation that could result in minor or slight injury if it is not avoided.

IMPORTANT
Indicates a hazardous situation that could result in damage to property if it is not avoided.

Gives useful tips, recommendations and information for efficient, trouble-free use.

This product complies with Directive 93/42/EEC concerning medical devices. The launch date of this product is stated in the CE declaration of conformity.

This symbol identifies a list of various tools, components and items which you will need in order to carry out certain work.

1.5 Images in this manual

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

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 *1.2 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 Setup

4.1 Adjusting seating position

Adjusting the seating position in order to adapt the mobility device optimally to the requirements of the user, we recommend that you ask your authorised Invacare® dealer to adjust seat depth individually. Adapting the seat to the user's seating position depends on the seat that has been fitted, and should be carried out in the following sequence.

1. Adjusting the lower leg length and seat depth. See chapter *4.1.1 Adjusting lower leg length, page 8* .
2. Adjusting the center of gravity of the seat frame. See chapter*4.1.3 Adjusting center of gravity of seat, page 8* .
3. Checking that the swivel castors can move freely.
4. Repetition of steps 2 to 4, if necessary.

WARNING!
Risk of injury after tilting of mobility caused by blocked steering wheels
– Always check the seat depth settings for both forward and reverse movement. Make sure that steering wheels can rotate freely and have not contact to any fixed mobility device component.

CAUTION!
Risk of tipping over
Any change in the seating position can negatively influence the stability of the mobility device.
– Always make sure that the mobility device is stable and will not tip over, after adjusting seating position.

WARNING!
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 vehicle driving behavior - especially the tipping stability - for this standard drive program.

WARNING!
Risk of crushing
The seat is very heavy. Risk of injury to hands and feet.
– Pay attention to the hand and feet.
– Use proper lifting techniques.

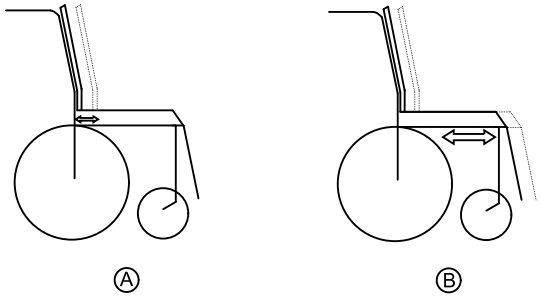
4.1.1 Adjusting lower leg length

Invacare offers a range of legrests which can be adjusted individually. See user manual.

4.1.2 Adjusting seat depth

A: Seat depth

B: Center of gravity of the seat/ seat position



Seat depth Ⓐ can be adjusted by moving backrest in relation to seat surface.

Modulite seat

The seat depth is adjusted by shifting the position of the backrest. See User Manual.

Seat systems

For details on

- Standard seat
- Flex seat
- Contour seat
- Max seat

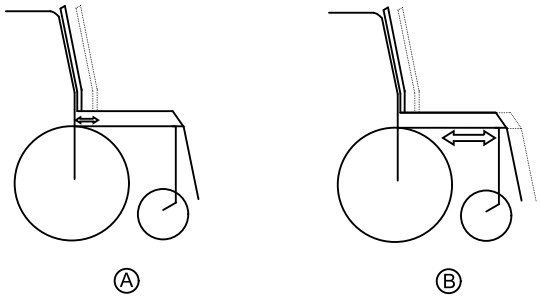
refer to revision 11 of this service manual.

For details on Modulite seat see below.

4.1.3 Adjusting center of gravity of seat

The center of gravity of seat (CoG) can be adjusted by mounting seat frame farther towards front or the rear of seat.

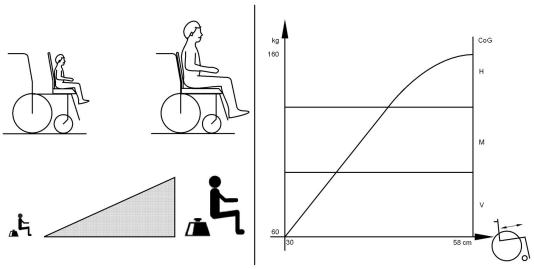
CAUTION!
The seating system of the mobility device is delivered ex works with a standard adjustment of center of gravity (CoG), which meets 80–90% of user requirements. CoG can be adjusted individually. However, any change in this adjustment setting can negatively influence the stability of the power wheelchair.
– You must perform an individual risk analysis every time you change the center of gravity of the seating position, in order to ensure the safety and stability of the power wheelchair.



A: Seat depth

B: Center of gravity of the seat/ seat position

The user weight and seat depth have strong influences on the choice of the center of gravity (CoG). If the user is heavy and the seat depth is greater, the focus should be the farther back. For best possible driving characteristics of rear-wheel drive wheelchairs, the weight should be distributed: 30 – 40 % front and 60 - 70 % rear. For center wheel drives the weight should be distributed 25% front, 50% center and 25% rear.



CAUTION!
Risk of damage due to collisions of the legrests with other parts of the mobility device
– Set the legrests to the smallest angle before adjusting the seat center of gravity.
– Pay attention with adjusting seat center of gravity that legrests do not touch any other parts of wheelchair. This ensures that the legrests can not collide with other parts of wheelchair.

Seat systems

For details on

- Standard seat
- Flex seat
- Contour seat
- Max seat

refer to revision 11 of this service manual.

For details on Modulite seat see below.

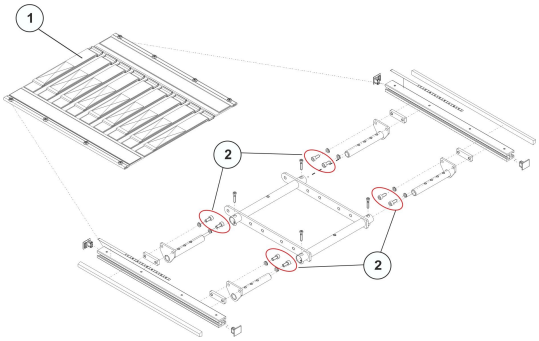
4.1.4 Modulite seat

The Modulite seat is available in two versions:

- Telescopic seat frame (plate and strap): Adjustment of center of gravity via the lateral profiles, as described below in “Telescopic seat frame”.
- One piece seat plate: Adjustment of center of gravity via the oblong holes of the seat adapter as described below in chapter “One piece seat plate”.

Telescopic seat frame

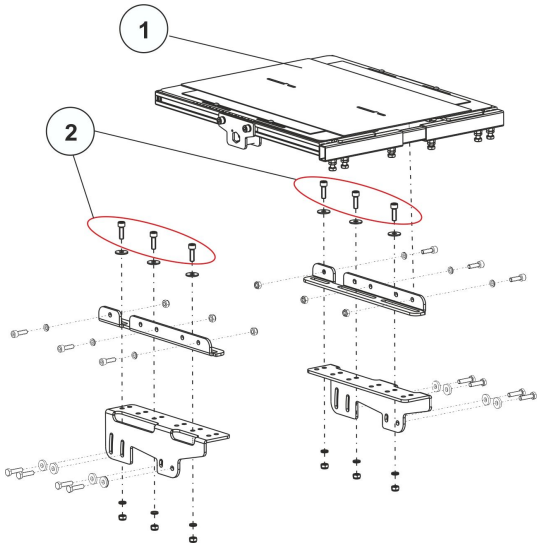
- 6 mm Allen key



1. Remove seat plate or sling seat (1), see chapter “Adjusting seat width” in Modulite service manual.
2. Loosen Allen screws (2) in front and rear, left and right – DO NOT remove.
3. Shift position of seat.
4. Tighten screws.
5. Install seat plate or sling seat.

One piece seat plate (TDX SP2/ TDX SP2 NB)

- 6 mm Allen key



1. Remove seat plate (1) or sling seat. See chapter “Adjusting seat width” in Modulite service manual.
2. Loosen Allen screws (2) and (3) in front and rear, left and right – DO NOT remove.
3. Shift position of seat frame.
4. Tighten screws.
5. Install seat plate.

Imperial to metric conversion chart

You can use this chart as an orientation to find the right tool size.

IMPERIAL	METRIC
inch	**mm**
5/64	1.9844
3/32	2.3813
7/64	2.7781
1/8	3.1750
9/64	3.5719
5/32	3.9688
11/64	4.3656
3/16	4.7625
13/64	5.1594
7/32	5.5563
15/64	5.9531
1/4	6.3500
17/64	6.7469

IMPERIAL	METRIC
inch	mm
9/32	7.1438
19/64	7.5406
5/16	7.9375
21/64	8.3344
11/32	8.7313
23/64	9.1281
3/8	9.5250
25/64	9.9219
13/32	10.3188
27/64	10.7156
7/16	11.1125
29/64	11.5094
15/32	11.9063
31/64	12.3031
1/2	12.7000
33/64	13.0969
17/32	13.4938
35/64	13.8906
9/16	14.2875
37/64	14.6844

IMPERIAL	METRIC
inch	mm
19/32	15.0813
39/64	15.4781
5/8	15.8750
41/64	16.2719
21/32	16.6688
43/64	17.0656
11/16	17.4625
45/64	17.8594
23/32	18.2563
47/64	18.6531
3/4	19.0500
49/64	19.4469
25/32	19.8438
51/64	20.2406
13/16	20.6375
53/64	21.0344
27/32	21.4313
55/64	21.8281
7/8	22.2250

5 Testing

5.1 Testing Motor

- Phillips screwdriver, size 2
- Digital multimeter with resistance measurement

1. Remove rear shroud. See *6.6 Shrouds, page 31*.
2. Disconnect motor plug (3) from power module.
3. Connect digital multimeter to motor plug contacts (3) and measure resistance between contacts.

   A resistance of between 0.5 ohms and 5 ohms indicates a motor ready for operation. A resistance of between 15 ohms and infinity indicates a defective motor. High resistances are normally caused by bad connections or worn carbon brushes.

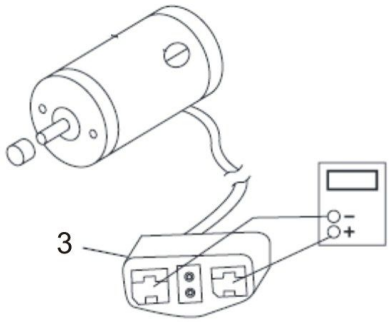


Fig. 5-1

5.2 Testing Motor Brake

This test should only be carried out on mobility device with conventional motor/gearbox units.

CAUTION!
Risk of damage to power module due to shorts in motor brake
– NEVER connect a shorted motor brake to an intact power module.
– Always replace shorted brakes immediately.

A defective motor can damage the power module, but a defective power module cannot damage the motor.

- Phillips screwdriver, size 2
- Digital multimeter with resistance measurement

1. Remove rear shroud. See *6.6 Shrouds, page 31*.
2. Disconnect motor plug (3) from power module.
3. Connect digital multimeter to adjacent central motor plug contacts and measure resistance between contacts.

   A resistance of between 40 ohms and 80 ohms indicates an intact brake. A resistance of 0 ohms or a very high resistance (mega-ohms or infinity) indicates a short-circuit, a bad connection or a defective brake.

4. If there is a defect, replace motor and send it to Invacare Service for inspection or repair.

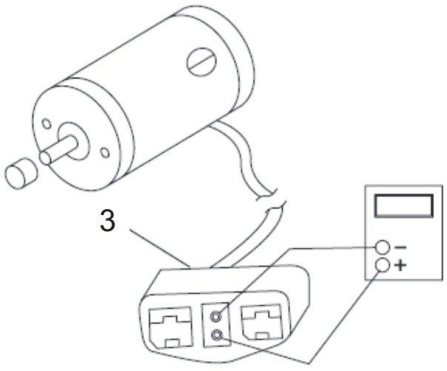


Fig. 5-2

5.3 Rain test

- Check to ensure that the black battery terminal caps are secured in place, gaiter is not torn or cracked where water can enter and that all electrical connections are secure at all times.
- Do not use the mobility device if the gaiter is torn or cracked. If the gaiter becomes torn or cracked, replace immediately.

5.4 Field Load Test

Old batteries loose their ability to store and release power due to increased internal resistance. In this procedure, batteries are tested under load using a digital voltmeter to check battery charge level at the charger connector. The charger connector is located on the remote. When voltage at the output drops 1.0 volts under load (2.0 volts for a pair), replace the batteries.

Read these instructions carefully and the manufacturer's instructions on the digital voltmeter before proceeding.

- Voltmeter

WARNING!
– When performing the following steps, ensure your feet are clear from casters and wall, otherwise injury may result.

1. Switch electronics OFF on remote.
2. Make sure battery is fully charged. An extremely discharged battery will exhibit the same symptoms as a bad battery.
3. Remove footboard/legrests from mobility device.
4. Connect voltmeter leads to charger connector Ⓐ on mobility device. Most digital voltmeters Ⓑ are not affected by polarity. However, analog meters (meters with swinging needles) can be and should be used carefully.

   A good meter reading should be 25.5 VDC to 26.0 VDC with the chair in neutral.

5. Switch electronics ON on remote.
6. Ensue that your feet are clear from casters and wall.
7. Run mobility device in neutral for at least 2 minutes.
8. Sit in mobility device and place your feet against a door jam, workbench or other stationary object.
9. Carefully give forward command, trying to drive the mobility device through the stationary object. The load should draw between 30 amps to 40 amps from the batteries for 0.3 seconds.

   Performing this step puts a heavy load on the batteries as they try to push through the stationary object. If the wheels spin, have two individuals (one on each arm) apply as much downward pressure as possible on the arms of the mobility device.

10. Read meter while motors are straining to determine voltage under load.

    If the voltage drops more than 2.0 volts from a pair of fully charged batteries during the 0.3 seconds, they should be replaced regardless of the unloaded voltages.

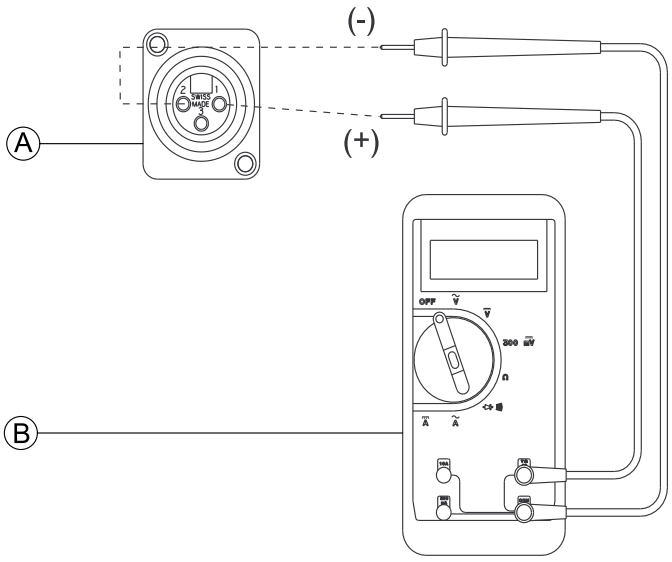


Fig. 5-3

5.5 Checking Battery Charge Level

The following "Dos" and "Don'ts" are provided for your convenience and safety.

DON'T	DO
Don't perform any installation or maintenance without first reading this manual.	Read and understand this manual and any service information that accompanies a battery and charger before operating the personal transporter.
Don't perform installation or maintenance of batteries in an area that could be damaged by battery spills.	Move the personal transporter to a work area before cleaning terminals, or opening battery box.
Don't make it a habit to discharge batteries to the lowest level.	Recharge as frequently as possible to maintain a high charge level and extend battery life.
Don't use chargers or batteries that are not appropriate for the chair.	Follow recommendations in this manual when selecting a battery or charger.
Don't put new batteries into service before charging.	Fully charge a new battery before using.

DON'T	DO
Don't tip or tilt batteries.	Use a carrying strap to remove, move or install a battery.
Don't tap on clamps and terminals with tools.	Push battery clamps on the terminals. Spread clamps wider if necessary.

6 Service

6.1 Tightening torques

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 fingertight.

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.

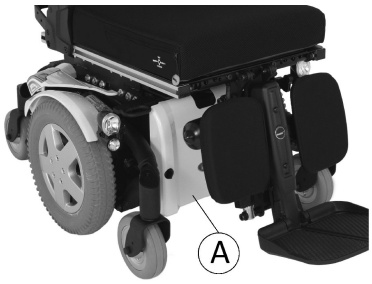
Thread	Tightening torque in Nm ±10%
M4	3 Nm
M5	6 Nm
M6	10 Nm
M8	25 Nm
M10	49 Nm
M12	80 Nm
M14	120 Nm
M16	180 Nm

UNC Thread	Tightening torque in Nm ±10%
1/4”-20	11–7 Nm
5/16”-20	22–14 Nm
3/8”-16	41–25 Nm
7/16”-14	67–40 Nm
1/2”-13	100–60 Nm
9/16”-12	150–90 Nm
5/8”-11	210–130 Nm
3/4”-1	370–230 Nm
7/6”-9	600–370 Nm
1”-8	900–550 Nm

6.2 Overview mobility device

This overview applies for TDX SP2 mobility devices with Modulite Seat.

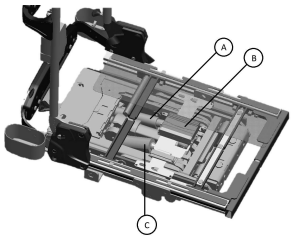
Underneath seat



Batteries behind front shroud Ⓐ
Fig. 6-1

Power module behind rear shroud Ⓐ
Fig. 6-2

Actuator modules



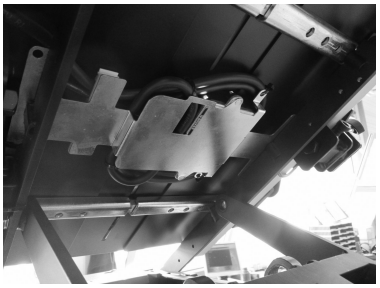
Tilt actuator (optional) Ⓐ

Actuator module (optional) Ⓑ

Lifter actuator (optional) Ⓒ
Fig. 6-3

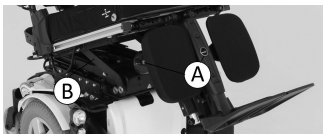
Lifter

ACT with Lifter



located under the seat.

Center mount powered legrests and tilt module



G-Trac® Sensor

The optional G-Trac-sensor is located behind the rear shroud.

6.3 Chassis

6.3.1 Overview of Components

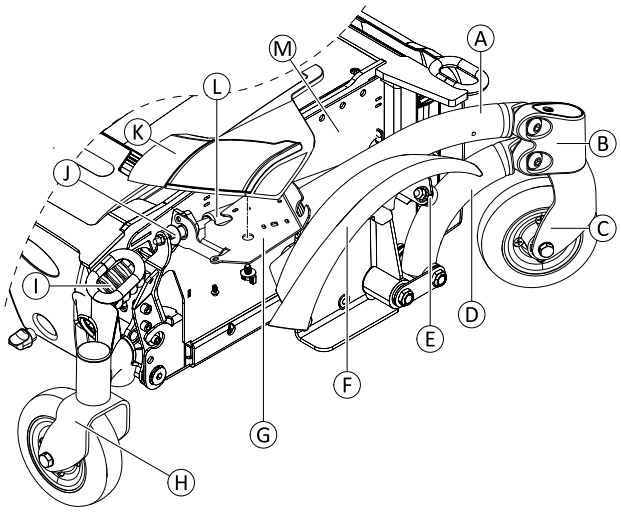


Fig. 6-4 Overview of the following described components and their location on the mobility device. For better view the propulsion unit and seat are not shown.

Ⓐ	Top Walking Beam
Ⓑ	Steering Head Front
Ⓒ	Front Castor
Ⓓ	Bottom Walking Beam
Ⓔ	Rubber Stopper
Ⓕ	Fender
Ⓖ	Rear Light Bracket
Ⓗ	Rear Castor
Ⓘ	Rear Spring
Ⓙ	Setting Screw
Ⓚ	Rear Light
Ⓛ	Gas Locking Cylinder
Ⓜ	Battery Box

6.3.2 Stability lock

Replacing Gas Locking Cylinder

CAUTION!
Risk of strain from lifting heavy parts!
– Use proper lifting techniques.

CAUTION!
Risk of injury by uncontrolled movement of mobility device
– Switch power supply off (ON/OFF key).
– Engage drive.
– Before raising mobility device, secure wheels by blocking them with wedges.

- 3/16 in Allen key
- 5/16 in wrench with extension
- 3/4 in wrench
- 5/32 in Allen key
- 7/16 in socket wrench
- Phillips screwdriver, size 2
- Torque wrench 5 - 25 Nm (or similar)
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Medium-strength thread locking adhesive (Loctite 242 or similar)

For better view the following illustrations does not show the seat system.

Removing Cylinder

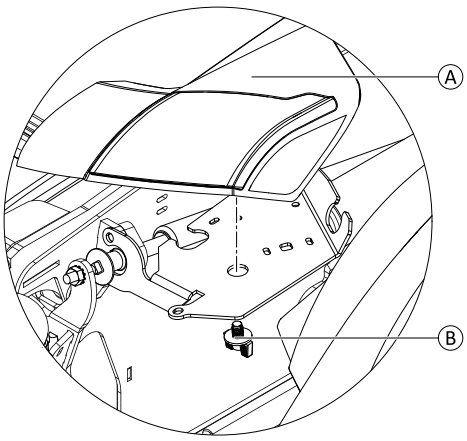
1. Lift mobility device up on one side and place a 14 cm high wooden block under battery box so that wheels are off the ground and can rotate freely. Use proper lifting techniques.
2. Repeat same procedure on other side of mobility device.
3. 

Fig. 6-5 Detail view of right rear light

Loosen and remove hand screw Ⓑ of rear light Ⓐ.

4. When installing, make sure to replace cable ties.

If LED light is installed, unplug all plugs on rear side and remove rear light and cable ties.

5.

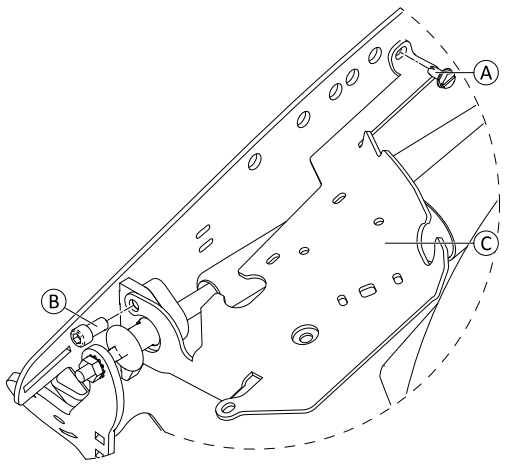


Fig. 6-6

Loosen and remove screws Ⓐ and Ⓑ.

6. Remove rear light bracket Ⓒ.
7. Remove drive wheel. See *6.5.7 Replacing Drive Wheel, page 27*.
8. Remove fender. See *6.6.5 Replacing fender , page 32*.
9. Remove batteries. See *6.8 Batteries, page 35*.
10.

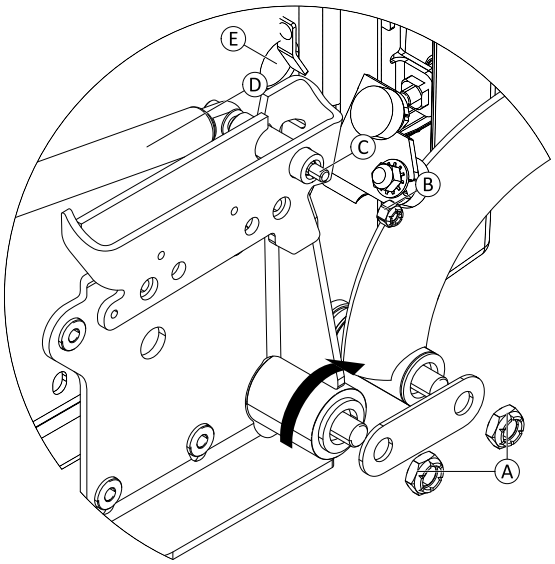


Fig. 6-7 Detail view of right walking beam assembly. For better view top walking beam, fender and motor/gearbox unit are not shown.

Loosen nuts Ⓐ that fix lower walking beam to chassis.

11. Rotate top walking beam so that bolt Ⓒ and drillhole Ⓔ are in line.
12. Loosen and remove nut Ⓑ on upper walking beam. Hold bolt Ⓒ in place.
13. Push bolt Ⓒ towards battery box so that gas cylinder Ⓓ is separated from walking beam.
14. Push gas cylinder against battery box.
15. Raise rear axle so that gas cylinder is activated and then retract cylinder.
16. Push gas cylinder to the rear and pull it off battery box.

Installing Cylinder

When installing nuts to lower and upper walking beam, use thread locking adhesive.

1. Install parts in reverse order.
2. Test all functions.

Replacing Setting Screw

- 1/4 in torque wrench 5 Nm -25 Nm (or similar)
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Feeler gauge with 2.0 mm

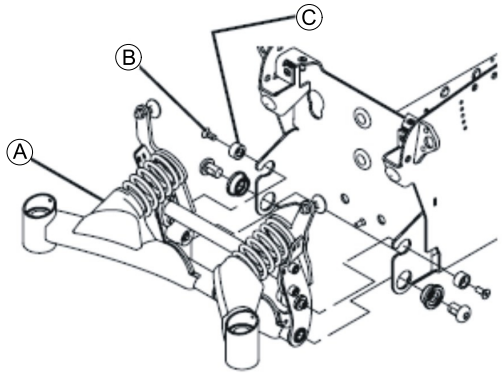


Fig. 6-8

Invacare recommends always replacing both setting screws simultaneously to ensure that the mobility device works perfectly.

Removing Setting Screw

1. Lift the mobility device up on one side and place a 14 cm high wooden block under the battery case so that the wheels are off the ground and can rotate freely. Use proper lifting techniques.
2. Repeat same procedure on other side of mobility device.
3. Remove both anti-tip system protective caps. The protective caps on anti-tip system will either be held using a screw or a cable tie depending on the mobility device's date of manufacture.
4.

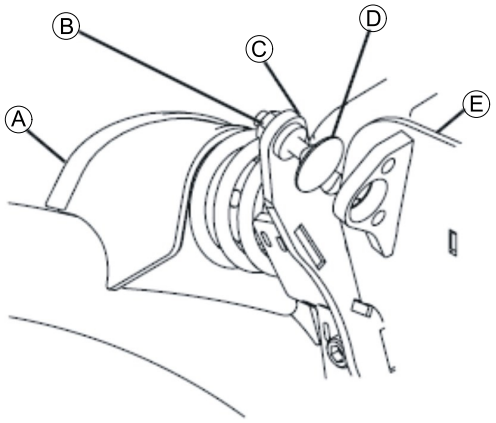


Fig. 6-9

Loosen two screws Ⓑ and remove together with washers Ⓒ.

5. Loosen and remove lock nut Ⓑ of setting screw Ⓓ.
6. Rotate setting screw Ⓓ towards battery case until you can remove it from its holder Ⓒ.

Installing Setting Screw

- 1/4 in torque wrench 5 Nm - 25 Nm (or similar)
- Feeler gauge with 2.0 mm

1. Screw new setting screw Ⓓ into holder Ⓒ.
2.

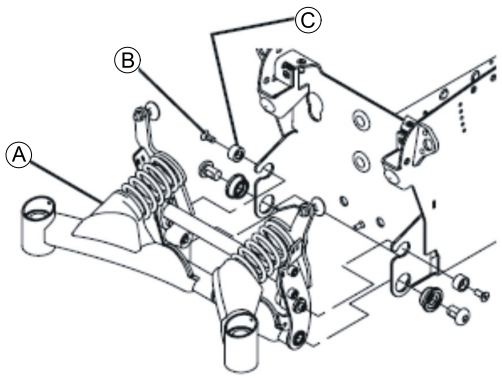


Fig. 6-10

   Insert two screws Ⓑ together with washers Ⓒ.
3. Tighten screws.
4. Remove wooden block from under mobility device, so that all casters are in contact with floor.
5.

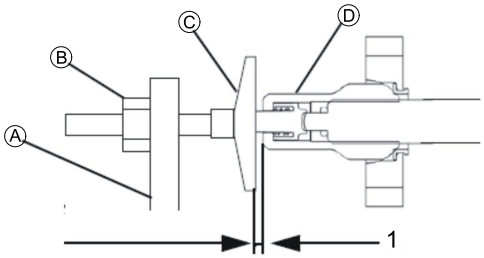
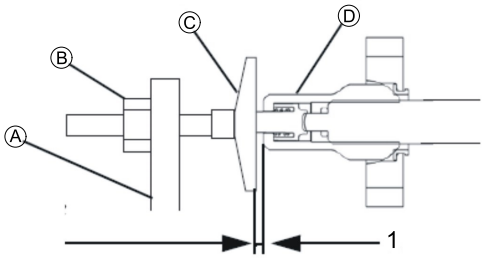


Fig. 6-11

   Rotate setting screw Ⓒ until there is a space of 2.0 mm (1) between it and gas cylinder Ⓓ.
6. Install lock nut Ⓑ. Tighten to 8 Nm.
7. Install two protective caps.

Adjusting Setting Screw

- 1/4 in torque wrench 5 Nm - 25 Nm (or similar)
- Feeler gauge with 2.0 mm



1. Remove both protective caps of stability lock system. They are held using a screw or a cable tie depending on the mobility device's date of manufacture.
2. Ensure that mobility device is contacting floor with all its wheels and casters.
3. Loosen and remove lock nut Ⓑ.
4. Rotate setting screw Ⓒ until there is a space of 2.0 mm (1) between it and gas cylinder Ⓓ.
5. Install lock nut Ⓑ. Tighten to 8 Nm.
6. Repeat for other setting screw.
7. Install two protective caps.

6.3.3 Top Walking Beam

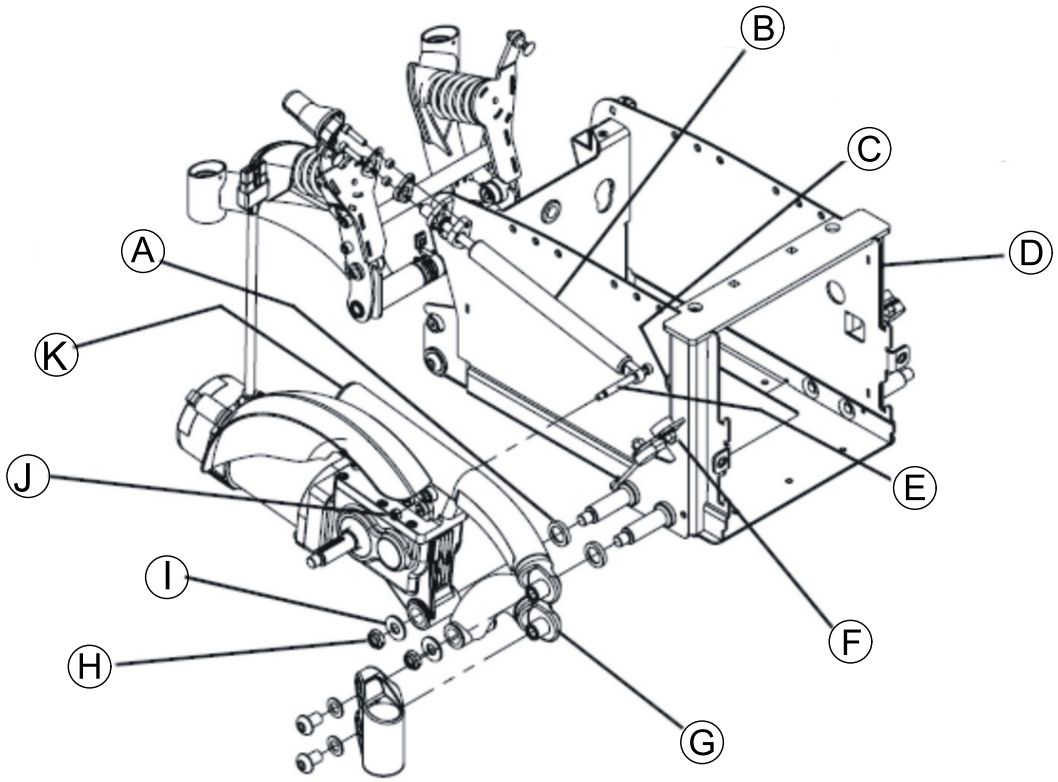


Fig. 6-12

- 5/16 in Allen key
- 5/8 in Allen key
- 7/8 in Allen key
- 1/4 in wrench
- 1/2 in wrench
- Phillips screwdriver, size 2
- Torque wrench 5 - 25 Nm (or similar)
- Two long wooden blocks, min. 14 x 14 x 30 cm

Removing Top Walking Beam

1. Remove batteries as described in *6.8.3 Making Batteries Accessible, page 36* and *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*/*6.8.6 Replacing Batteries / Battery Cables, page 38*
2. Ensure you note the cable routing carefully. If necessary, take photos with a digital camera.
3. Remove drive wheel as described in *6.5.7 Replacing Drive Wheel, page 27*.
4. Remove front steering head as described in *6.3.5 Steering head front, page 19*.
5. Remove rubber stopper as described in *6.3.10 Replacing rubber stopper, page 21*.
6. Pull motor plug off power module.
7. Note carefully how motor cable is routed.
8. If necessary, remove any existing cable ties which are fixing motor cable.
9. Rotate top walking beam Ⓚ until Allen screw Ⓔ is in line with opening Ⓒ in battery case Ⓓ.
10. Remove nut Ⓙ, which secures screw Ⓔ.
11. Push screw Ⓔ towards battery case until gas cylinder is free of top walking beam.
12. Fix gas cylinder in place with a cable tie or suitable adhesive tape.
13. Remove nut Ⓗ and washer Ⓘ.
14. Remove top walking beam including motor/gearbox unit from axle.
15. Remove washer Ⓐ from axle.

Installing Top Walking Beam

1. Place washer Ⓐ on battery case Ⓓ rear axle.
2. Push top walking beam Ⓚ including motor/gearbox unit onto axle.
3. Install washer Ⓘ and nut Ⓗ.
4. Tighten nut Ⓗ to 18 Nm.
5. Rotate nut Ⓗ back by 1/4 turn.
6. Raise rear wheel suspension to free gas cylinder Ⓑ.
7. Position gas cylinder so that screw Ⓔ is in line with opening Ⓒ in battery case Ⓓ.
8. Rotate top walking beam Ⓚ until drillhole for screw Ⓔ is in line with opening Ⓒ in battery case Ⓓ.
9. Push screw Ⓔ through gas cylinder and top walking beam.
10. Install nut Ⓙ on screw Ⓔ and tighten to 8.5 Nm.
11. Install rubber stopper as described in *6.3.10 Replacing rubber stopper, page 21*.
12. Install front steering head as described in *6.3.5 Steering head front, page 19*.
13. Install batteries as described in *6.8.3 Making Batteries Accessible, page 36* and *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*/*6.8.6 Replacing Batteries / Battery Cables, page 38* .
14. Install rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
15. Install front shroud as described in *6.6.1 Removing front shroud, page 31*.
16. Install drive wheel as described *6.5.7 Replacing Drive Wheel, page 27*.

6.3.4 Bottom walking beam

- 5/8 in Allen key
- 5/16 in Allen key
- Phillips screwdriver size 2
- 1/2 in wrench
- Torque wrench 5 - 25 Nm (or similar)
- Two long wooden blocks, min. 14 x 14 x 30 cm

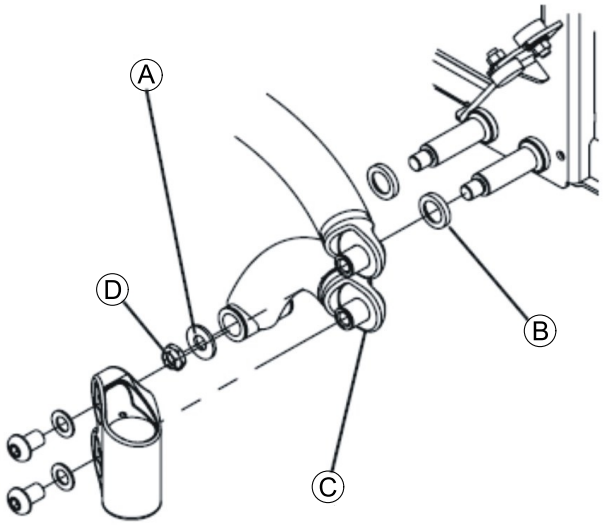


Fig. 6-13

Removing bottom walking beam

1. Remove drive wheel as described in *6.5.7 Replacing Drive Wheel, page 27*
2. Remove front steering head as described in *6.3.5 Steering head front, page 19*.
3. Remove nut Ⓓ.

4. Remove washer Ⓐ.
5. Remove bottom walking beam Ⓒ from axle.
6. Remove spacer Ⓑ from axle.

Installing bottom walking beam

1. Install parts in reverse order.
2. Tighten nuts Ⓓ to 18 Nm.

6.3.5 Steering head front

- 5/16 in Allen key
- Torque wrench 5 - 25 Nm (or similar)

Removing steering head front

1.

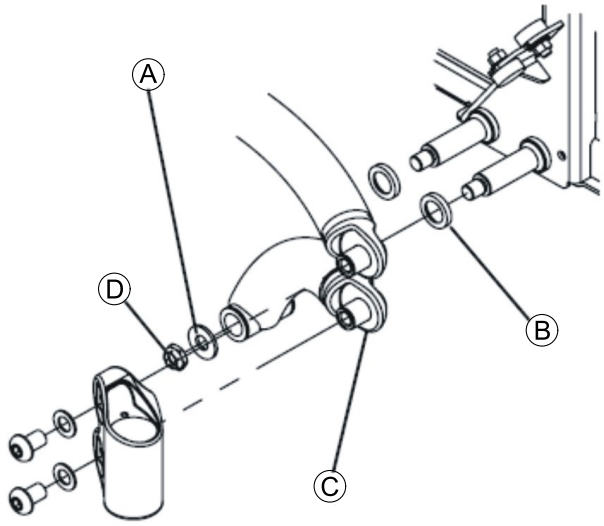


Fig. 6-14

Remove two Allen screws Ⓐ.
2. Remove two washers Ⓑ.
3. Remove steering head Ⓔ from top walking beam Ⓒ and bottom walking beam Ⓓ.

Installing steering head front

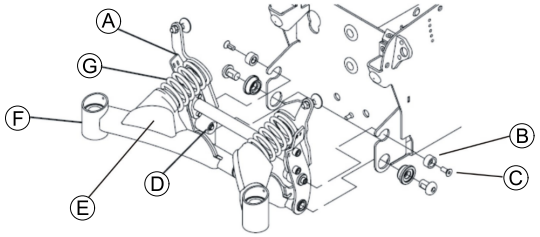
1. Install parts in reverse order.
2. Tighten screws according to following sequence:
   - Tighten all screws to 18 Nm.
   - Turn screws back by 1/8 turn.

6.3.6 Removing rear springs

Invacare recommends always replacing both springs simultaneously to ensure that the mobility device works perfectly.

- 5/6“ Allen key
- 5/32“ Allen key
- Phillips screwdriver size 2
- Flat screwdriver
- 1/4“ wrench
- 5/16“ wrench
- Torque wrench 0 - 20 Nm (or similar)
- Oblique pliers
- Cable ties
- M8 washer
- Two long wooden blocks, min. 14 x 14 x 30 cm

1. Lift mobility device up on one side and place a 14 cm high wooden block under battery case so that wheels are off the ground and can rotate freely. Use proper lifting techniques.
2. Repeat same procedure on other side of mobility device.
3. Remove rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
4. Make sure you note cable routing carefully. If necessary, take photos with a digital camera.
5. Remove all cables and cable ties which are fixed to wheel suspension or which could get in the way during work.
6. Remove both protective caps of stability lock system. They are either held using a screw or a cable tie depending on the mobility device date of manufacture.
7.



Make sure rear springs Ⓖ are compressed:

- Block method
  - Raise suspension arms Ⓕ and place wooden blocks underneath to remove stopper Ⓓ.
- Clamp method
  - Loosen both screws Ⓒ and remove including spacer Ⓑ.
  - Make sure suspension arms Ⓕ are lowered as much as possible.
  - Remove rubber caps Ⓔ.
  - Compress springs with joiner's clamp to remove stopperⒹ.

8. Loosen both nuts on stopper with wrench and remove nuts, washers and stopper. If necessary, use a flat screwdriver to loosen stopper.
9. Remove wooden blocks or joiner's clamps to release springs.
10. Remove springs.

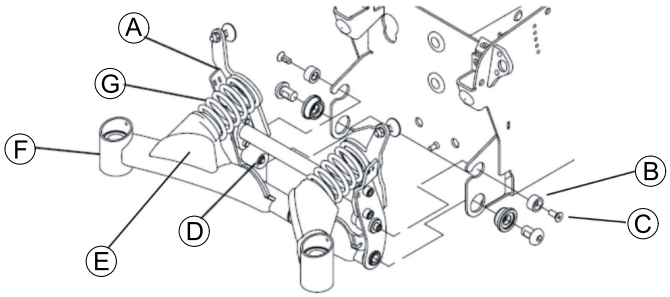
6.3.7 Installing rear springs

Invacare recommends always replacing both springs simultaneously to make sure that the mobility device works perfectly.

CAUTION!
Risk of crushing
Mobility device is very heavy. Risk of injury to hands and feet.
– Use proper lifting techniques.

Risk of injury caused by uncontrolled movement of the mobility device
– Turn off power (ON/OFF key).
– Engage drive. Before propping up mobility device, secure wheels by blocking them with wedges.

- 5/6“ Allen key
- 5/32“ Allen key
- Phillips screwdriver size 2
- Flat screwdriver
- 1/4“ wrench
- 5/16“ wrench
- Torque wrench 0 - 20 Nm (or similar)
- Oblique pliers
- Cable ties
- M8 washer
- Two long wooden blocks, min. 14 x 14 x 30 cm



1. Put springs Ⓖ into position between suspension arm Ⓕ and stop Ⓐ.
2. Make sure rear springs are compressed:
   - Block method
     – Raise suspension arms and replace wooden blocks underneath them until springs are compressed.
   - Clamp method
     – Press springs together with joiner's clamp or similar suitable clamp until nylon spacer Ⓑ can be fitted into recesses provided in suspension Ⓕ.
     – Fit two screws Ⓒ including spacer Ⓑ.
     – Tighten screws to 8.5 Nm.
3. Install two stoppers Ⓓ.
4. Fit washer and nuts to secure stoppers.
5. Tighten nuts to 8.5 Nm.
6. Remove wooden blocks or joiner's clamps carefully so that springs are released.
7. Reinsert all necessary plugs and fix cables with cable ties as previously. See also *6.7.8 Cable routing, page 35*.
8. Install rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
9. Lift mobility device off wooden blocks.
10. Check all mobility device functions.
11. If necessary, carry out adjustments to setting screw on stability lock system as described in *Adjusting Setting Screw, page 17*.
12. Fit both protective caps of the stability lock system. They are held using a screw or a cable tie depending on mobility device’s date of manufacture.

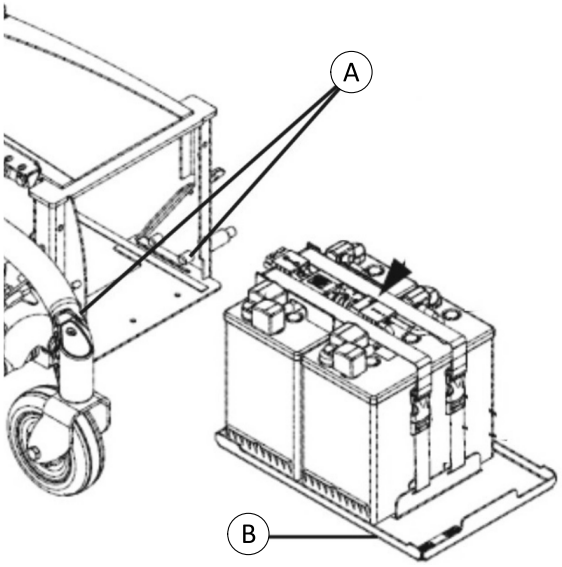
6.3.8 Replacing battery tray

- Phillips screwdriver size 2
- 5/8“ Allen key
- 5/32“ Allen key

TDX SP2 Low-Rider does not have a battery tray. Remove batteries manually.

Removing battery tray

1. Make batteries accessible as described in *6.8.3 Making Batteries Accessible, page 36*.
2. Remove batteries as described in chapter *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37/ 6.8.6 Replacing Batteries / Battery Cables, page 38/6.7.2 Replacing Tilt Actuator (“Fixed Pivot” Tilt), page 33*.



3. Remove two stop bolts Ⓐ.
4. Pull battery tray Ⓑ out of battery box.

Installing battery tray

1. Install parts in reverse order.

6.3.9 Replacing battery box

- 5/6“ Allen key
- 5/32“ Allen key
- Phillips screwdriver size 2
- Flat screwdriver
- 1/4“ wrench
- 5/16“ wrench
- Torque wrench 0 - 20 Nm (or similar)
- Torque wrench 5 - 25 Nm (or similar)
- Torque wrench 20 - 80 Nm (or similar)
- Oblique pliers
- Cable ties
- M8 washer
- Two long wooden blocks, min. 14 x 14 x 30 cm

Removing battery box

1. Remove seat including seat support as described in “Seating” and in Modulite service manual.
2. Remove shrouds as described in *6.6 Shrouds, page 31*.
3. Remove batteries as described in *6.8.3 Making Batteries Accessible, page 36* and *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37* / *6.8.6 Replacing Batteries / Battery Cables, page 38*.
4. Remove battery support as described *6.3.8 Replacing battery tray, page 20*.
5. Remove headlights and rear lights depending on version (including holder) as described in *6.9 Lighting unit, page 39*.
6. Remove power module as described in *6.7.1 Replacing Power Module, page 32*. See corresponding service manual:
   - For LinX, see LiNX service manual.
   - For DX2, see revision 11 of TDX SP2 service manual.

7. Remove bottom walking beams as described in *6.3.4 Bottom walking beam, page 18*.
8. Remove top walking beams as described in *Removing Top Walking Beam, page 18*.
9. Remove gas cylinder as described in *Replacing Gas Locking Cylinder, page 15*.
10. Remove rear wheel suspension as described in *6.5 Wheels, page 25*.
11. Remove front and rear bulb holders depending on version as described in *6.9 Lighting unit, page 39*.
12. Remove rubber stopper as described in *6.3.10 Replacing rubber stopper, page 21*.
13. Remove battery box.

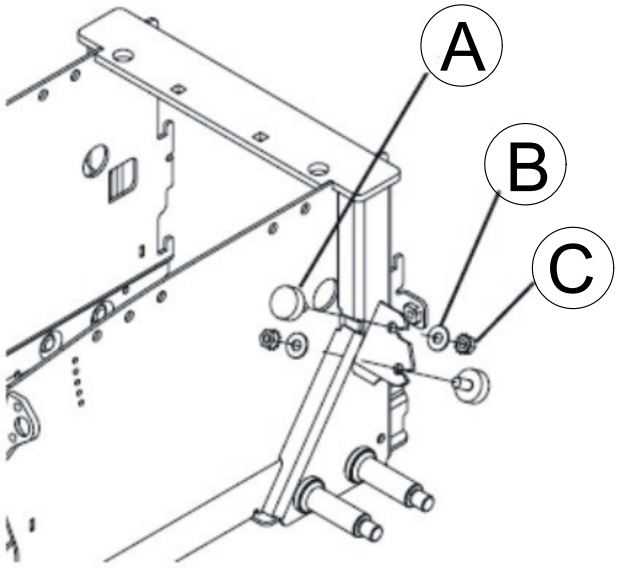
Installing battery box

1. Install rubber stopper as described in *6.3.10 Replacing rubber stopper, page 21*.
2. Install front and rear lampholder depending on version as described in *6.9 Lighting unit, page 39*.
3. Install rear wheel suspension as described in *6.5 Wheels, page 25*.
4. Install gas cylinder as described in *Replacing Gas Locking Cylinder, page 15*.
5. Install top walking beams as described in *Installing Top Walking Beam, page 18*.
6. Install bottom walking beams as described in *6.3.4 Bottom walking beam, page 18*.
7. Install power module as described in *6.7.1 Replacing Power Module, page 32*.
8. Install battery support as described in *6.3.8 Replacing battery tray, page 20*.
9. Install batteries in their correct location as described in *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*/*6.8.6 Replacing Batteries / Battery Cables, page 38* and *6.8.3 Making Batteries Accessible, page 36*.
10. Install shrouds as described in *6.6 Shrouds, page 31*.
11. Install seat including seat support as described in *6.10 Seating, page 42* and Modulite service manual.
12. Adjust setting screw on anti-tip system as described in *Adjusting Setting Screw, page 17*.
13. To conclude, carry out an extensive driving and function test with mobility device.

6.3.10 Replacing rubber stopper

Invacare recommends that you replace all rubber stoppers as soon as one needs replacing.

- 5/16“ wrench
- 7/8“ Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Torque wrench 5 - 25 Nm (or similar)



Removing rubber stopper

1. Remove drive wheel as described in *6.5.7 Replacing Drive Wheel, page 27*.
2. Loosen and remove nut Ⓒ.
3. Remove washer Ⓑ.
4. Remove rubber stopper Ⓐ.

Installing rubber stopper

1. Install parts in reverse order.

6.3.11 Replacing Tie-Down Adapter (Low-Rider)

The Low-Rider kit may not be used for retrofitting.

CAUTION!
Risk of strain from lifting heavy parts!
– Use proper lifting techniques.

CAUTION!
Risk of fire and burns if battery terminal is shorted
– Take great care to make sure that battery terminals are never shorted with tools or mechanical mobility device parts.
– Ensure that tilt module is equipped with a battery protection plate on its bottom side.

- TX30 Torx key
- 6 mm Allen key
- 13 mm wrench
- Medium-strength thread locking adhesive (Loctite 243 or similar)

Removing Adapter

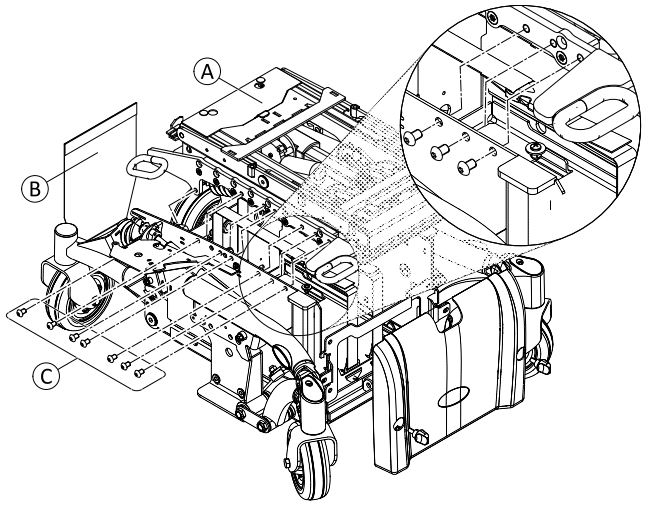


Fig. 6-15

1. Turn OFF electronics.
2. Remove rear and front shroud. See *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31* and *6.6.1 Removing front shroud, page 31*.
3. Loosen and remove water protection flap Ⓑ.
4. Unplug battery plug. See *6.8.3 Making Batteries Accessible, page 36*.
5. Remove seat. See relevant topics in service manuals of corresponding seating system.
6. Loosen and remove screws Ⓒ on both sides.
7. Lift off tie-down adapter assembly Ⓐ from chassis.

Replacing Tie-Down Bracket / Tilt-Module

The seat can be set to two different seat heights. Adjust seat height at tie-down adapter according to following table:

403 mm	lower holes
420 mm	upper holes

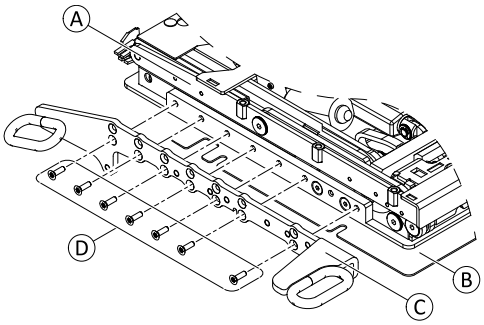


Fig. 6-16

1. Loosen and remove screws Ⓓ.
2. Remove tie-down brackets Ⓒ from Ⓐ.
3. Replace defective parts.
4. Install parts in reverse order. Ensure that new tilt module is equipped with battery protection plate Ⓑ.

Installing Adapter

1. Install parts in reverse order.
2. Plug in battery plug.
3. Test all functions.

6.4 Drive components

6.4.1 Overview Motor/Gearbox Unit

Not all motor-gearbox combinations are available for all models. Contact your provider or check the spare parts catalogue.

The following mounting instructions are valid for all combinations.

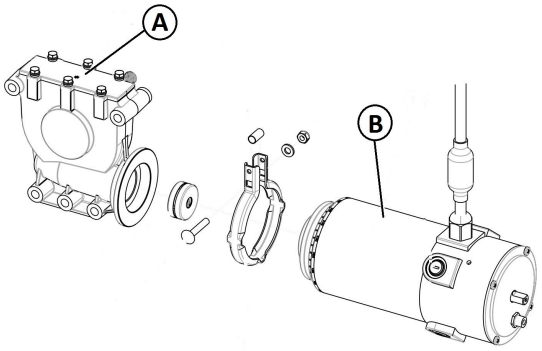


Fig. 6-17 Example of a motor/gearbox unit with SSD motor

For description of old motors and components, see earlier revision of service manual.

6.4.2 Replacing motor/gearbox unit

CAUTION!
Risk of crushing
The wheelchair is very heavy. Risk of injury to hands and feet.
– Use proper lifting techniques.

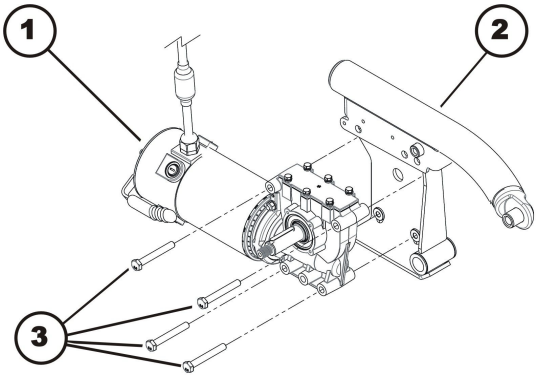
Risk of injury due to uncontrolled movement of the mobility device
– Turn off power (ON-/OFF key).
– Engage drive motors.
– Secure mobility device against rolling away by placing wedges under wheels.

CAUTION!
Risk of crushing
Motor gearbox unit is extremely heavy. Risk of injury to hands.
– Pay attention to heavy weight.

DuraWatt motors are maintenance-free, due to lifetime brushes.

- 6 mm Allen key
- 5/8“ Allen key
- 7/8“ Allen key
- 5/16“ Allen key
- Phillips screwdriver size 2
- 13 mm socket wrench
- 1/2“ socket wrench
- 1/4“ socket wrench
- 5/16“ socket wrench
- Torque wrench 5 - 25 Nm (or similar)
- Torque wrench 10 - 80 Nm (or similar)
- Two long wooden blocks, min. 14 x 14 x 30 cm

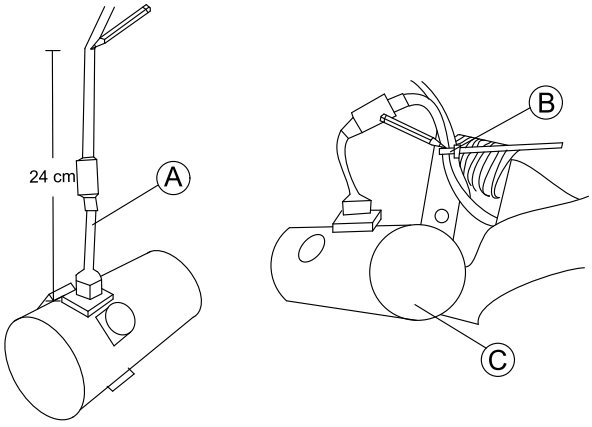
Removing motor/gear box unit

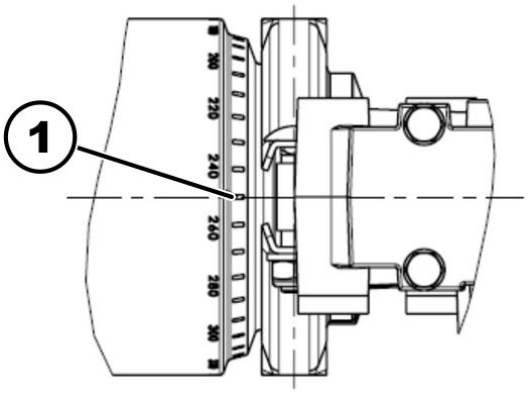
1. Remove rear battery box shroud, as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
2. Disconnect motor plug from power module.
3. Open cable ties so you can freely access motor cable.
4. Remove drive wheel, as described in *6.5.7 Replacing Drive Wheel, page 27*.
5. Remove wheel hub, as described in *6.4.6 Replacing drive wheel hub, page 25*.
6. 

   Loosen four screws (3).
7. Remove screws.
8. Remove motor/gear box unit (1) from walking beam (2).

Installing motor/gearbox unit

1. Replace defective components.
2. Before installing a new motor/gearbox unit, make sure sealing ring is correctly mounted. The sealing ring securely attaches motor and gearbox. The ring must be installed such that self-locking nut is located on outside.
3. If the sealing ring is incorrectly installed, rotate it around as described in *6.4.3 Replacing or rotating motor/gearbox unit sealing ring, page 23*.
4. Install motor/gearbox unit in reverse order.
5. Install all cable ties. Make sure to tie motor cable Ⓐ to frame at 24 cm Ⓑ.



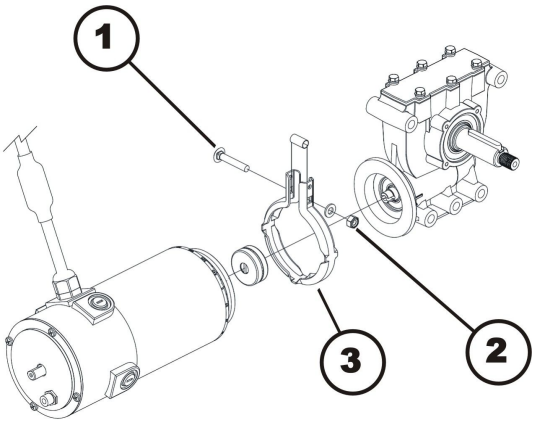
6. 

   Use scale to align motor to center axis (1), 2-pole motors and 4-pole motors:
   - Left: 0°
   - Right: 0°
7. Make sure that motor cable cannot be pinched or bent, and that it is not exposed to chafing in any place.
8. If LiNX system is used, perform calibration process. See *Suggested programming procedure* in LiNX service manual.
9. Test all functions (trial run).

6.4.3 Replacing or rotating motor/gearbox unit sealing ring

CAUTION!
Risk of crushing
The motor / gearbox unit is very heavy. Risk of injury to hands.
– Pay attention to heavy weight.

- 6 mm Allen key
- 5/8“ Allen key
- 7/8“ Allen key
- 5/16“ Allen key
- Phillips screwdriver size 2
- 10 mm socket wrench
- 1/2“ socket wrench
- 1/4“ socket wrench
- 5/16“ socket wrench
- Torque wrench 0 - 25 Nm (or similar)
- Torque wrench 10 - 80 Nm (or similar)
- Two long wooden blocks, min. 14 x 14 x 30 cm



Removing sealing ring

1. Remove motor/gearbox unit, as described in chapter 8.14.2.
2. Use wrench to loosen and remove nut (2) including washer.
3. Remove screw (2), which secures sealing ring (3).
4. Carefully bend sealing ring apart and remove it.

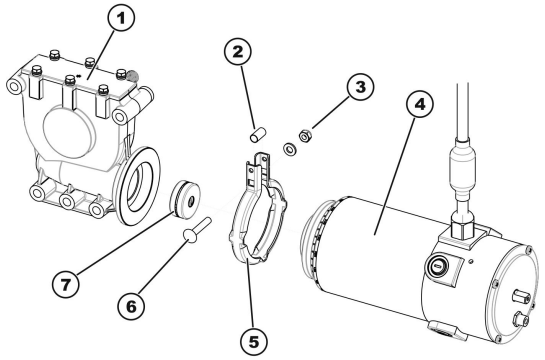
Installing sealing ring

1. Install sealing ring so square hole for carriage screw is on inside of mobility device.
2. Insert carriage screw through sealing ring.
3. Install washer and self-locking nut.
4. Do not tighten nut completely, as motor orientation must be adjusted during installation.

6.4.4 Replacing motor/gearbox clutch

CAUTION!
Risk of crushing
Motor / gearbox unit is very heavy. Risk of injury to hands.
– Pay attention to heavy weight.

- 5/8“ Allen key
- 7/8“ Allen key
- 5/16“ Allen key
- 6 mm Allen key
- Phillips screwdriver size 2
- 10 mm wrench
- 1/2“ wrench
- 1/4“ wrench
- 5/16“ wrench
- Torque wrench 0 - 20 Nm (or similar)
- Torque wrench 5 - 25 Nm (or similar)
- Torque wrench 10 - 80 Nm (or similar)
- Two long wooden blocks, min. 14 x 14 x 30 cm



Removing motor/gearbox clutch

1. Removing motor/gearbox unit, as described in *6.4.2 Replacing motor/gearbox unit, page 22*.
2. Loosen and remove self-securing nut (3).
3. Remove carriage screw (6), which secures sealing ring (5).
4. Carefully bend sealing ring apart and remove it.
5. Pull motor (4) and gearbox unit (1) carefully apart.
6. Remove clutch individual parts (7).
7. Replace clutch, if necessary.

Installing motor/gearbox clutch

1. Install new clutch (7) on motor axle. Pay attention to position of groove.
2. Position locking ring (5) on motor (4) or gearbox (1).
3. Carefully insert motor into gearbox. Pay attention to position of groove in axle of gearbox. If necessary, rotate motor and gearbox to correct position.
4. Insert carriage bolt through locking ring. Do not forget spacer sleeve (2).
5. Install washer and self-locking nut.
6. Do not tighten self-locking nut completely, as motor orientation must be adjusted during installation.
7. Install motor/gearbox unit, as described in *6.4.2 Replacing motor/gearbox unit, page 22*.

6.4.5 Replacing carbon brushes

Always replace all carbon brushes on both motors.

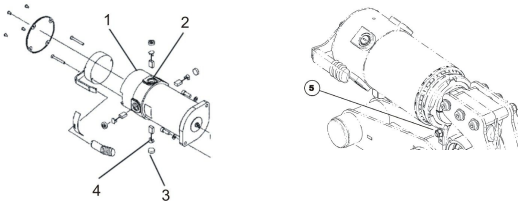
DuraWatt motors are maintenance-free, due to lifetime brushes.

CAUTION!
Risk of crushing
Mobility device is very heavy. Risk of Injury to hands and feet.
– Use proper lifting techniques.

- 5 mm Allen key
- 6 mm Allen key
- 10 mm socket wrench
- 19 mm socket wrench
- Screwdriver
- Two long wooden blocks, min. 14 x 14 x 30 cm

Removing carbon brushes

1. Turn off mobility device.
2. Remove drive wheels as described in *6.5.7 Replacing Drive Wheel, page 27*.



3. Disengage motor (1) by setting engaging lever to "Push".

   In case of SSD motor, loosen nut (5), then turn motor around so that you can access rear carbon brushes easier.

4. Remove all four plastic caps (3) with flat screwdriver.
5. Pull carbon brushes (4) a little out of brush holder. Note fixing position and location of carbon brushes.

   If carbon brushes were checked but not replaced, you must know their exact fitting position. Used carbon brushes need to be refitted exactly in the same position from which they were taken to guarantee optimum contact to collector.

6. Make a marking on motor and carbon brushes to guarantee correct installation.
7. Remove carbon brushes completely from mounting (2).
8. Test carbon brushes and springs for level of wear, broken components or discoloration.

Installing carbon brushes

1. Depending on condition of brushes and spring:
   - either re-insert brushes in exactly same position from which they were taken or
   - fit new brushes.
2. Replace plastic caps and tighten them.
3. Install top walking beams as described in *Installing Top Walking Beam, page 18*.
4. Install bottom walking beams as described in *6.3.4 Bottom walking beam, page 18*.
5. Install drive wheels as described in *6.5.7 Replacing Drive Wheel, page 27*.

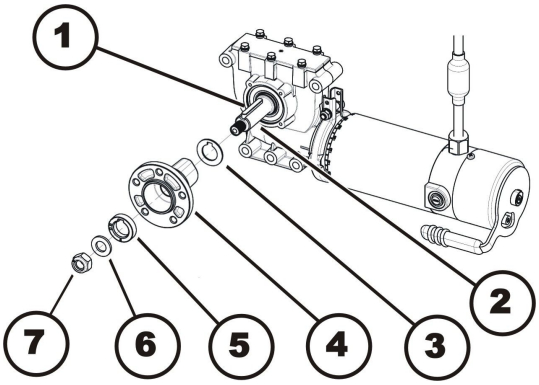
To guarantee maximum performance after replacement treat carbon brushes according to following procedure.

CAUTION!
Risk of accidents
Risk of injury to workers, surroundings and mobility device.
– Do not leave mobility device unattended during following procedure.
– Make sure both drive wheels are off ground before calibrating.
– Secure area.

6. Lift mobility device up on one side and place a 14 cm high wooden block underneath it so that drive wheel is suspended freely. Use proper lifting techniques.
7. Repeat same procedure on other side of mobility device.
8. Allow motors to run in forward direction for an hour.
9. Allow motors to cool down for 30 minutes.
10. Allow motors to run in reverse direction for an hour.
11. Lift mobility device off wooden blocks.

6.4.6 Replacing drive wheel hub

- 19 mm wrench



Removing drive wheel hub

1. Loosen and remove nut (7).
2. Remove washer (6).
3. Remove distance ring (5).
4. Remove wheel hub (4) from axle (2).
5. Remove shim rings (3).
6. Remove feather key (1) from axle.

Installing drive wheel hub

1. Install drive wheel hub parts in reverse order.
2. Use thin film of lubricant to easier install wheel hub on axle.
3. Tighten nuts (4) to 60 Nm.

6.5 Wheels

6.5.1 Tyre Pressure

CAUTION!
Risk of damage to rim and tire when tyre pressure is exceeded
– Observe recommended tyre pressure.

For recommended tire pressure see inscription on tyre, rim, or contact Invacare. Compare table below for conversion.

psi	bar
22	1.5
23	1.6
25	1.7
26	1.8
28	1.9
29	2.0
30	2.1
32	2.2
33	2.3
35	2.4
36	2.5
38	2.6
39	2.7
41	2.8
42	2.9
44	3.0

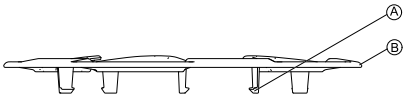
6.5.2 Replacing rim inserts in drive wheels

- Slotted screwdriver

Removing rim insert

1. Insert tip of screwdriver between rim and rim insert.
2. Remove rim insert.

Installing rim insert

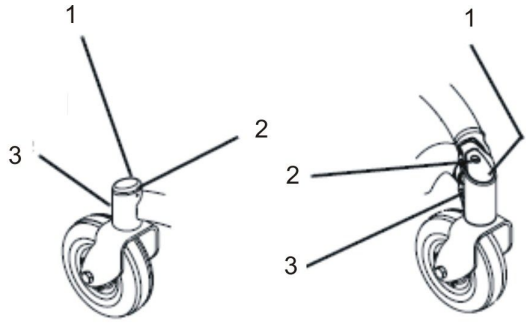
1. Hold insert over rim.
2. 

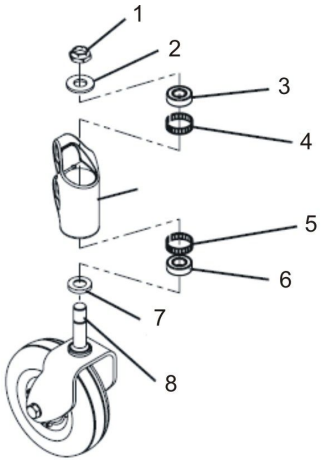
Carefully push to fasten rim insert, until foot of rim insert Ⓐ snaps and rim insert Ⓑ clings to rim.

6.5.3 Replacing caster fork

- Size 2 Phillips screwdriver
- 5/8“ socket wrench

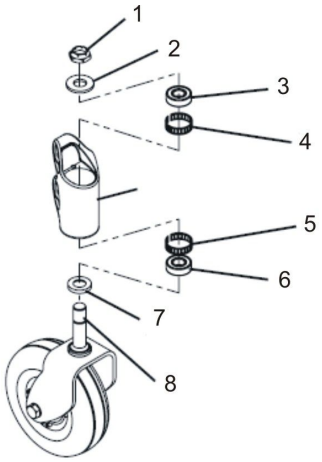
Removing caster fork

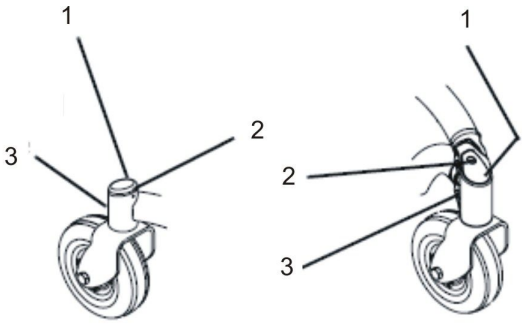


1. Loosen and remove Philips screw (2).
2. Take cap (1) off steering head (3).
3. 

   Loosen nut (1) with a 5/8" wrench.
4. Remove washer (2).
5. Remove caster fork (8) and spacer (7) downwards.
6. If necessary, remove ball-bearings (3) and (6) tolerance rings (4) and (5).

Installing caster fork



1. If you removed them, replace tolerance rings (4) and (5) and ball-bearings (3) and (6).
2. Place spacer (7) on caster fork (8).
3. Insert caster fork from underneath.
4. Fit washer (2) from above.
5. Fit nut (1) and tighten it loosely so that caster forks can just turn.
6. Adjust caster as described in *6.5.4 Adjusting caster fork, page 26*.
7. 

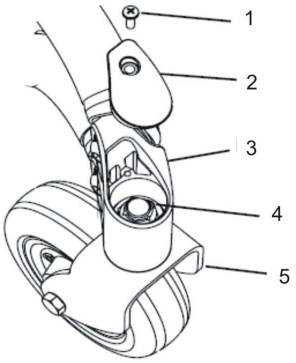
   Place cover cap (1) on castor housing (3).
8. Tighten screw (2) finger-tight.

6.5.4 Adjusting caster fork

WARNING!
Risk of crushing
The mobility device is very heavy. Risk of injury to hands and feet.
– Use proper lifting techniques.

- Phillips screwdriver size 2
- 5/8“ wrench

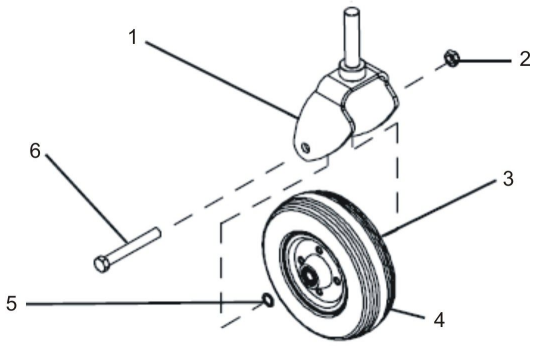
Front and rear casters are adjusted the same way. The following illustrations only show the front caster.

1. 

   If necessary, remove screw (1) and cap (2).
2. Tilt mobility device to rear. Use proper lifting techniques.
3. Rotate caster forks (5) upwards.
4. Let go of caster forks so that they can swing downwards again.
5. Adjust nut (4) so that caster forks are not too loose but can still rotate freely. The caster forks should oscillate to the opposite side a maximum of once and then come to rest facing downwards.
6. Place mobility device on all four casters again.
7. Test mobility device's manoeuvrability.
8. Repeat adjustment steps if necessary until casters are correctly adjusted.
9. Replace cap (2) and tighten screw (1) finger-tight.

6.5.5 Replacing casters on double-sided caster forks

- 2x 7/16“ wrench
- Torque wrench 5 - 25 Nm (or similar)



Removing caster

1. Loosen nut (2).
2. Remove screw (6).
3. Remove two washers (3) and (5).
4. Remove wheel (4).
5. Replace any defective parts.

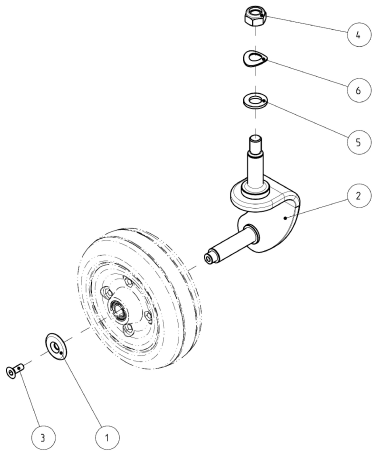
Installing caster

1. Install parts in reverse order.
2. Tighten screw (6) and nut (2) to 18 Nm.

6.5.6 Replacing Castors on Single-Sided Castor Forks

- TX30 Torx key
- Torque wrench 5 - 25 Nm (or similar)

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



Removing Castor

1. Loosen and remove screw 3 including washer 2.
2. Remove castor.
3. Replace castor.

Installing Castor

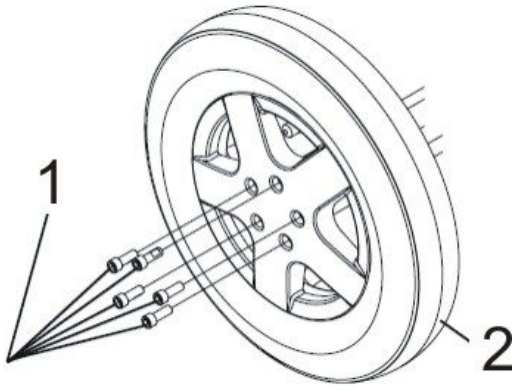
1. Install parts in reverse order.
2. Tighten screw (3).

6.5.7 Replacing Drive Wheel

CAUTION!
Risk of strain from lifting heavy parts!
– Use proper lifting techniques.

CAUTION!
Risk of injury caused by uncontrolled movement of mobility device
– Switch power supply off (ON/OFF key).
– Engage drive.
– Before raising mobility device, secure wheels by blocking them with wedges.

- 6 mm Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Torque wrench 5 - 25 Nm (or similar)
- Medium-strength thread locking adhesive (Loctite 243 or similar)



Removing Drive Wheel

1. Lift mobility device up on one side and place a 14 cm high wooden block underneath it so that drive wheel is off ground and can rotate freely. Use proper lifting techniques.
2. If necessary, repeat this procedure for other side of mobility device.
3. Remove five screws (1).
4. Take wheel (2) off wheel hub.

Installing Drive Wheel

CAUTION!
Risk of injury from wheels coming loose
If wheels are insufficiently secured during mounting, they can come loose when driving.
– When mounting wheels, tighten bolts with prescribed torque.
– Secure all bolts using a suitable blocker (e.g. Loctite 243).
– Never use normal nuts instead of self-locking nuts.
– Always use new nuts and bolts with an undamaged coating.

1. Install wheel in reverse order.
2. Tighten screws to 18 Nm.

6.5.8 Replacing tire or inner tube

There are three different types of tires or inner tubes, and specific points must be observed for the replacement of each type. The individual types of tires can be easily distinguished:

- Pneumatic tires have black valve caps.
- Puncture-protected tires have red valve caps.
- Puncture-proof tires have no valves.

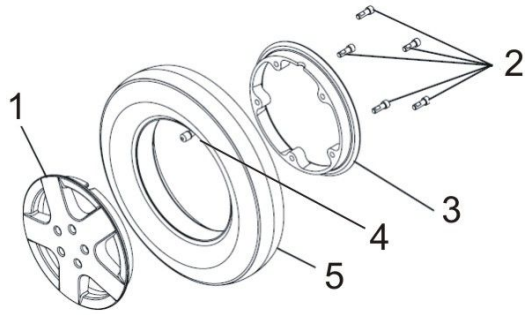
Proceed in accordance with the appropriate chapter:

- Replacing pneumatic tires – see “Replacing pneumatic tires”
- Replacing puncture-protected tires – see “Replacing puncture-protected tires”
- Replacing puncture-proof tires – see “Replacing puncture-proof tires”

Replacing pneumatic tires

Pneumatic tires have black valve caps.
Puncture-protected tires have red valve caps.

- 6 mm Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Torque wrench 5–25 Nm (or similar)
- Repair kit for inner tube tires or a new inner tube.
- Tire pump or compressor
- Talcum powder



Removing tires

1. Remove wheel as described in *6.5.7 Replacing Drive Wheel, page 27*.

CAUTION!
Risk of explosion
There is considerable pressure in the tire. Risk of injury. Parts can be thrown out and injure you if you do not release all the air from tire.
– Press release pin in valve inwards and evacuate all the air from tire.

2. Remove valve cap (4).
3. Press release pin in valve inwards and release all air from tire.
4. Loosen five screws (2) on inside of wheel.
5. Remove inside (3) and outside ring (1) of wheel rim from tires (5).
6. Replace any defective or worn parts.

Refitting tires

1. Refit tires onto wheel rim in reverse order.

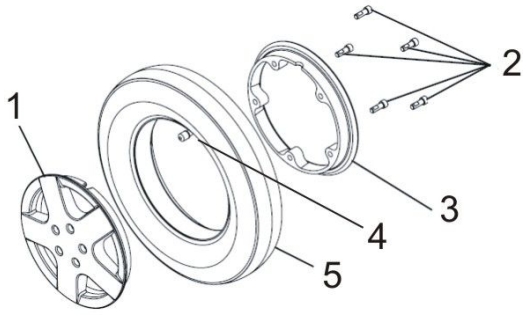
If old inner tube is to be repaired and re-used and has become wet during repair, you can make refitting easier by applying some talcum powder to inner tube.

2. When putting rim rings back together, make sure that drillholes and threads for screws are exactly on top of each other.
3. Tighten screws (2) to 18 Nm.
4. Inflate inner tube to specified air pressure.

Replacing puncture-protected tires

Pneumatic tires have black valve caps.
Puncture-protected tires have red valve caps.

- 6 mm Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Torque wrench 5–25 Nm (or similar)
- Repair kit for tire repair or a new inner tube
- Tire pump or compressor
- Talcum powder



Removing tires

1. Remove wheel as described in *6.5.7 Replacing Drive Wheel, page 27*.
2.

CAUTION!
Risk of explosion
There is considerable pressure in tire. Risk of injury. Parts can be thrown out and injure you if you do not release all air from tire.
– Press release pin in valve and release all air form tire.

CAUTION!
Risk of damage
Valve can become blocked by the puncture protection gel and get unusable.
– During following work you should always hold valve up so that puncture protection gel can not enter valve.

Remove valve cap (4).
3. Press release pin and evacuate all air from tire.
4. Loosen five screws (2) on inside of wheel.
5. Remove inner (3) and outer (1) ring of the rim from tire (5).
6. Replace any defective or worn parts.

Refitting tires

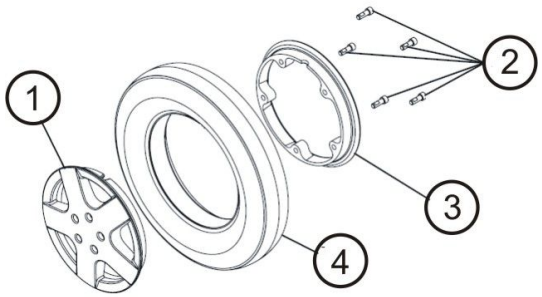
1. Refit tires to rim in reverse sequence.

   If 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.

2. When fitting rim rings together, make sure that drillholes and threads for bolts are placed exactly on top of each other.
3. Tighten screws (2) to 18 Nm.
4. Inflate inner tube to specified air pressure.

Replacing puncture-proof tires

- 6 mm Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Three joiner's clamps with plastic caps
- Torque wrench 5 - 25 Nm (or similar)
- Talcum powder



Removing tires

1. Remove wheel as described in *6.5.7 Replacing Drive Wheel, page 27*.

   CAUTION!
   Risk of explosion
   There is considerable pressure in tire. Risk of injury. Parts can be thrown out and injure you if you do not secure rim rings.
   – Secure rim rings with joiner's clamps.

2. Secure rim rings against unexpected discharge with three joiner's clamps. Make sure not to scratch rims.
3. Loosen five screws (2) on inside of wheel.
4. Loosen joiner's clamps carefully and alternately until rim rings can be removed without danger.
5. Remove inner (3) and outer (1) ring of rim from tire (4).
6. Replace any defective or worn parts.

Refitting tires

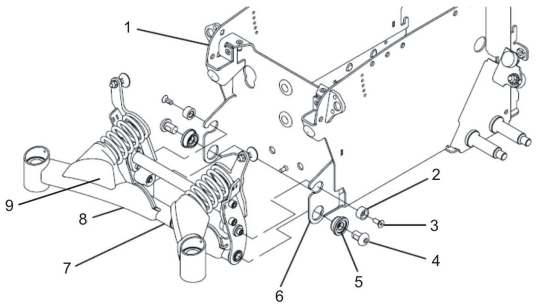
1. Refit tires to rim in reverse order.
2. Refit rim rings together. Make that drillholes and threads for bolts are placed exactly on top of each other.
3. Place joiner's clamps in position.
4. Tighten joiner's clamps alternately in small stages until rim rings are precisely aligned.
5. Tighten Allen screws (2) to 18 Nm.

6.5.9 Removing rear suspension

CAUTION!
Risk of crushing
The mobility device is very heavy. Risk of injury hazard to hands and feet.
– Use proper lifting techniques.

Risk of injury caused by uncontrolled movement of the mobility device
– Turn off power (ON/OFF key).
– Engage drive.
– Before raising mobility device, secure wheels by blocking them with wedges.

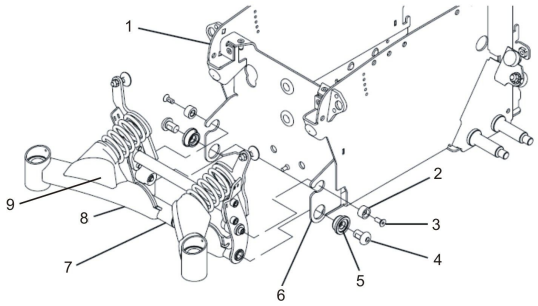
- 5/16“ Allen key
- 5/32“ Allen key
- Phillips screwdriver size 2
- Torque wrench 0 - 20 Nm (or similar)
- Torque wrench 20 - 80 Nm (or similar)
- Oblique pliers
- Cable ties
- Two long wooden blocks, min. 14 x 14 x 30 cm

1. Lift mobility device up on one side and place a 14 cm high wooden block under battery case so that wheels are off the ground and can rotate freely. Use proper lifting techniques.
2. Repeat same procedure on the other side of mobility device.
3. Remove rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
4. Make sure you note cable routing carefully. If necessary, take photos with a digital camera.
5. 

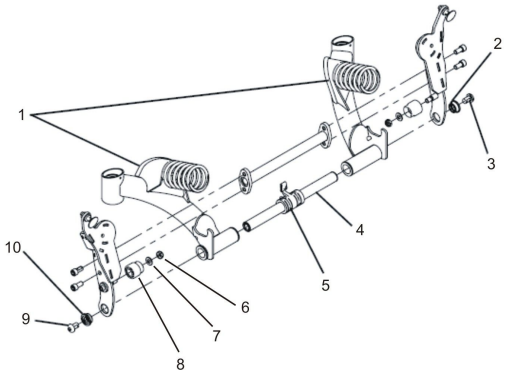
   Remove all cables and cable ties which are fixed to wheel suspension or which could get in the way during work.
6. Loosen two screws (3) with a 5/32" Allen key and remove screws including nylon washer (2).
7. Loosen and remove two screws (4) with a 5/16" Allen key and remove screws including bushings (5). If only one of two screws can be removed, proceed as described in *6.5.10 Removing rear suspension – alternative method, page 29* as an alternative.
8. Take complete rear wheel suspension off.
9. Replace individual parts such as suspension arms (1) or pivot bar (4).
10. See *6.5.5 Replacing casters on double-sided caster forks , page 26* to install wheel suspension at a later time.

6.5.10 Removing rear suspension – alternative method

- More wooden blocks **or** joiner's clamps

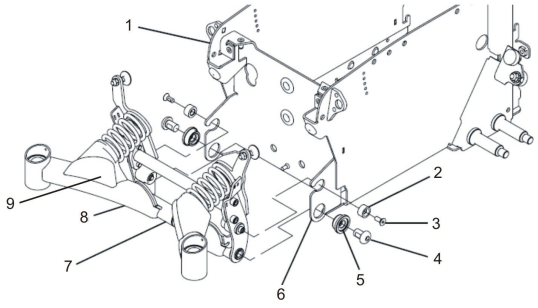


1. Carry out following steps if only one of the two screws (4) can be undone.
2. Make sure that rear springs are compressed:
   - Block method
     – Raise suspension arms and replace wooden blocks underneath them until springs are compressed.
   - Clamp method
     – Lower suspension arms downwards as far as possible.



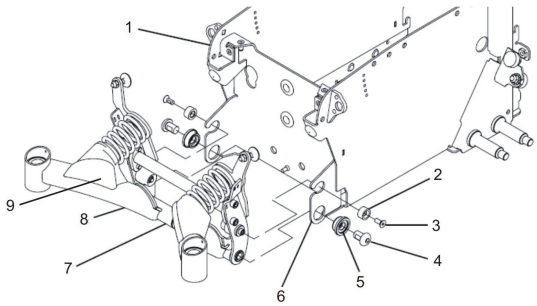
3. Remove rubber caps (9).
4. Press springs together with a joiner's clamp or similar clamp.
5. Remove pivot bar (4) by putting it sideways out of guides together with remaining bolt and socket.
6. See *6.5.12 Refitting rear suspension – alternative method, page 30* to replace wheel suspension at a later time.

6.5.11 Refitting rear suspension

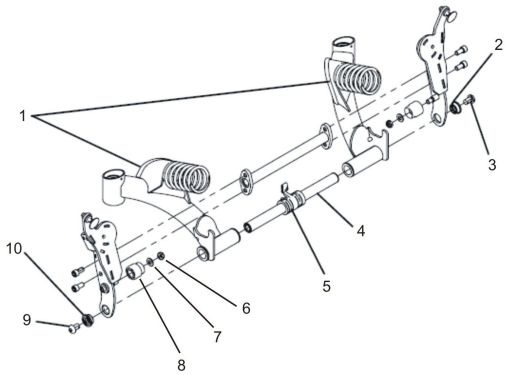


1. Position complete rear wheel suspension between two mounting points (6).
2. Fit two bushings (5) and two screws (4).
3. Tighten screws to 60 Nm.
4. Make sure that rear springs are compressed:
   - Block method
     – Lift suspension arm and place wooden blocks or similar underneath it until springs are pressed together and nylon spacer (2) can be fitted into recesses provided in suspension (6).
   - Clamp method
     – Remove rubber caps (9).
     – Press springs together with a joiner's clamp or similar suitable clamp until nylon spacer (2) can be fitted into recesses provided in suspension (6).
5. Fit two screws (3) including spacer (2).
6. Tighten screws to 8.5 Nm.
7. Replace two rubber caps (9) if necessary.
8. Install all necessary plugs and fix cables with cable ties as previously. See also *6.7.8 Cable routing, page 35*.
9. Install rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
10. Lift mobility device off wooden blocks.
11. Check all mobility device functions.
12. If necessary, carry out adjustments to setting screw on stability lock system as described in *Adjusting Setting Screw, page 17*.

6.5.12 Refitting rear suspension – alternative method

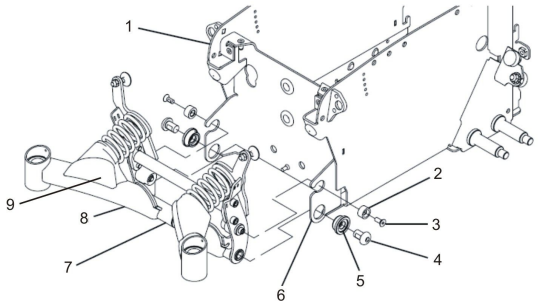


1. Position complete rear wheel suspension between two mounting points (6).



2. Position mounting (5) centrally between two suspension arms (1).
3. Push pivot bar (4) including remaining bolts and socket from side through guides, suspension arm bushes and mounting.
4. Install sockets and bolts you have removed.
5. Tighten bolts to 60 Nm.

6.



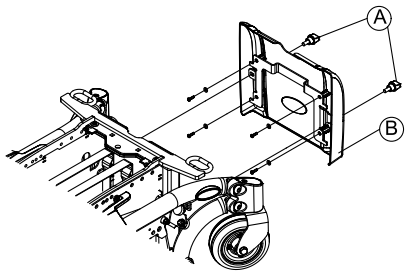
Make sure that rear springs are compressed:

- Block method
  – Lift suspension arm and place wooden blocks or similar underneath it until springs are pressed together and nylon spacer (2) can be fitted into recesses provided in suspension (6).
- Clamp method
  – Remove rubber caps (9).
  – Press springs together with a joiner's clamp or similar suitable clamp until nylon spacer (2) can be fitted into recesses provided in suspension (6).

7. Fit two bolts (3) including nylon spacer (2).
8. Tighten bolts to 8.5 Nm.
9. Replace two rubber caps (9) if necessary.
10. Install all plugs and fix cables with cable ties as previously. See also *6.7.8 Cable routing, page 35*.
11. Install rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
12. Lift mobility device off wooden blocks.
13. Test all mobility device functions.
14. If necessary, carry out adjustments to setting screw on the stability lock system as described in *Adjusting Setting Screw, page 17*.

6.6 Shrouds

6.6.1 Removing front shroud



Removing front shroud

1. Remove legrests.
2. Remove screws Ⓐ on front shroud Ⓑ.
3. Pull front shroud upwards and remove it.

Installing front shroud

1. Install parts in reverse order.
2. Tighten all screws finger-tight.

6.6.2 Replacing Rear Shroud (Without Operating Hour Counter)

TDX SP2 Low-Rider is equipped with a water protection flap under the rear shroud. The illustration below does not show it.

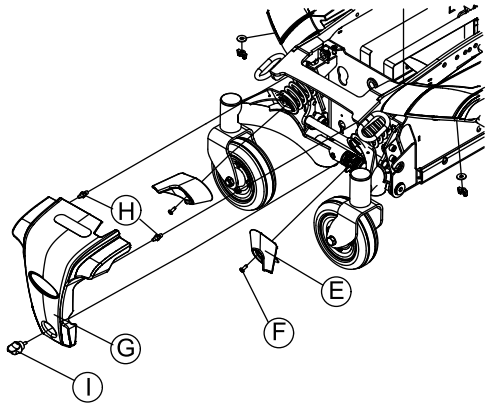


Fig. 6-18

Removing Rear Shroud

1. Loosen and remove hand screw Ⓘ on rear shroud Ⓖ.
2. Remove rear shroud.
3. If installed, remove water protection flap.

Installing Rear Shroud

1. Install parts in reverse order.
2. Tighten all screws finger-tight.

6.6.3 Replacing Rear Shroud (With Operating Hour Counter)

- Phillips screwdriver, size 2

TDX SP2 Low-Rider is equipped with a water protection flap under the rear shroud. The illustrations below does not show it.

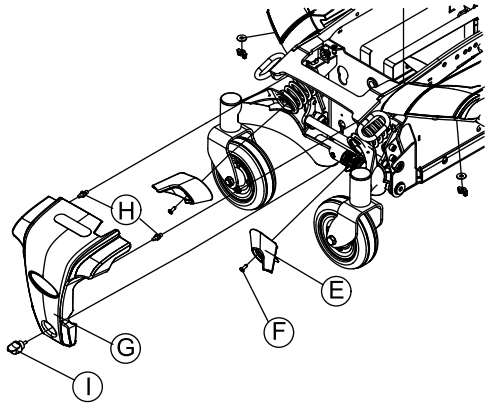


Fig. 6-19

Removing Rear Shroud

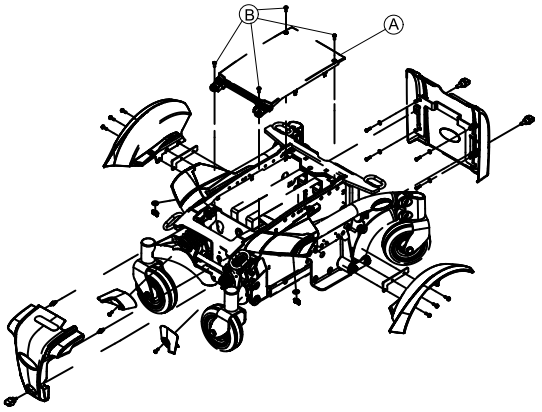
1. Loosen and remove hand screw Ⓘ on rear shroud Ⓖ.
2. Carefully loosen rear shroud. Pay attention to cable of operating hour counter.
3. Take note of positions of cables and sockets. Mark plugs and sockets or take a photo with digital camera.
4. Remove cable of operating hour counter from drive motor.
5. Remove rear shroud.
6. If installed, remove water protection flap.

Installing Rear Shroud

1. Install parts in reverse order.
2. Tighten all screws finger-tight.

6.6.4 Removing top shroud

- Size 2 Phillips screwdriver



Removing top shroud

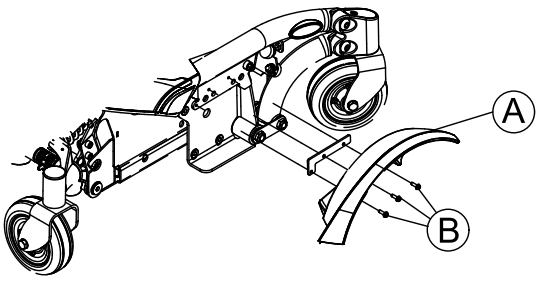
1. Remove seat.
2. Undo the four Phillips screws Ⓑ on the top shroud Ⓐ.
3. Remove top shroud.

Installing top shroud

1. Install parts in reverse order.
2. Tighten all screws finger-tight.

6.6.5 Replacing fender

- 6 mm Allen key
- Two long wooden blocks, min. 14 x 14 x 30 cm
- Torque wrench 0 - 20 Nm (or similar)
- Torque wrench 5 - 25 Nm (or similar)
- Flat screwdriver



Removing fender

1. Remove drive wheel as described in *6.5.7 Replacing Drive Wheel, page 27*.
2. Loosen and remove three slotted screws Ⓑ.
3. Remove fender Ⓐ from walking beam.

Installing fender

1. Install parts in reverse order.
2. Tighten screws to 4.5 Nm.

6.7 Controls

6.7.1 Replacing Power Module

Various power modules can be installed to the mobility device with a range of different remotes.

CAUTION!
Any changes to drive program can affect driving characteristics and tipping stability of mobility device
– Changes to drive program may only be carried out by trained providers.
– Invacare can only give a warranty for safe mobility device driving behavior - especially tipping stability - for unaltered standard drive programs.

All power modules are delivered with a standard drive program. If you have carried out customer-specific modifications to the drive program, you will have to repeat these changes after installing the new power module.

For replacement of remote in combination with power module and the subsequent selection of LiNX drive programs, see below.

For DX, ACS or ACS 2 electronic module, see earlier revision of this Service manual.

- To adapt drive program: Programming software or hand programming device and system installation manual, available from Invacare.

Removing Power Module

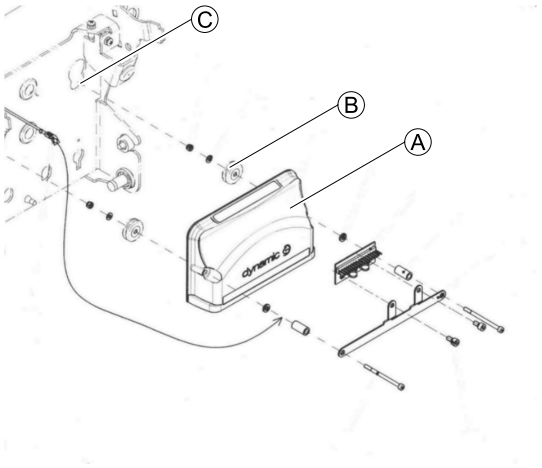
1. Remove rear shroud. See *6.6 Shrouds, page 31*.
2. Carefully note location of cable and connection locations of various plugs. Either mark each plug and socket, or take a photo with digital camera.
3. Unplug all plugs from power module.
4. 

Fig. 6-20

Remove module Ⓐ carefully by lifting rubber stoppers Ⓑ from opening Ⓒ.
5. Replace defective module.

Installing Power Module

1. Install parts in reverse order.
2. If LiNX system is used, perform calibration process. See *Suggested programming procedure* in LiNX service manual.
3. Test all functions.

For instruction on “Drive program selection after component replacement”, see LiNX Service Manual.

6.7.2 Replacing Tilt Actuator (“Fixed Pivot” Tilt)

- Flat screwdriver
- Wooden block (approx. 30 x 40 x 29 cm)

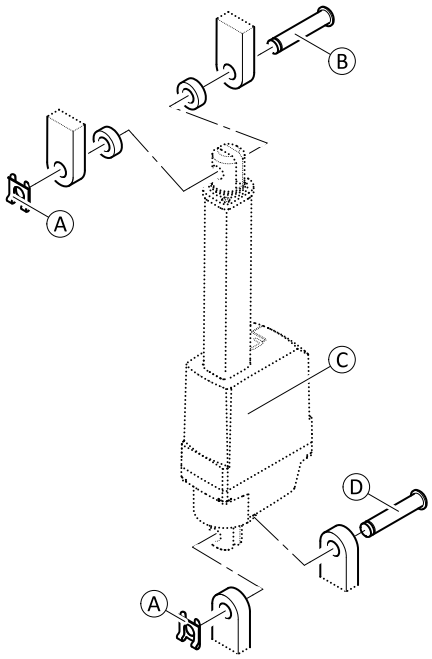


Fig. 6-21 For better view only the actuator, pins, spacers and SL retainer clips are shown.

Removing Actuator

When removing, take care of small parts such as spaces. Put all small parts down so that they can be installed in the correct sequence.

1. Remove front shroud. See *6.6.1 Removing front shroud, page 31*.
2. Unplug actuator cable directly on actuator.
3. Remove SL retainer clips Ⓐ on actuator at top and bottom.

CAUTION!
Risk of crushing
Seat comes down when actuator is removed.
– Hold the seat in position while removing the actuator.
– Move the seat into service position and place a wooden block under the backrest, or lower it carefully to the chassis.

4. Remove upper pin Ⓑ. Hold seat in position.
5. Move seat into service position. Alternatively, lower it carefully to chassis.
6. Remove lower pin Ⓓ and actuator Ⓒ.

Installing Actuator

1. Install parts in reverse order.
2. Test all functions.

6.7.3 Replacing G-Trac Sensor

- 10 mm socket wrench

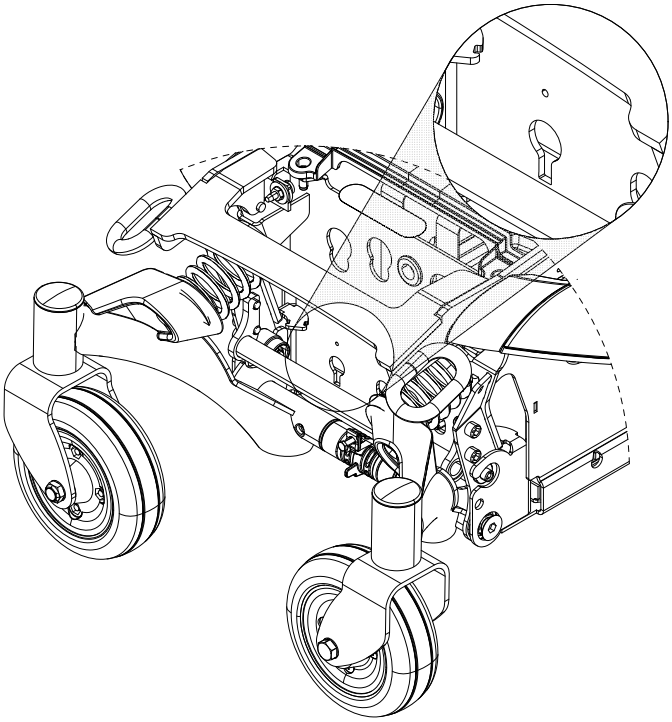


Fig. 6-22

Removing Sensor

1. Turn OFF electronics.
2. Remove rear shroud. See *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
3. Take note of positions of all cables and the sockets that they are connected to. Mark the connectors and sockets or take a photograph with a digital camera.
4. Unplug sensor cable from power module.
5.

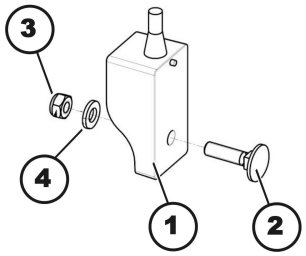


Fig. 6-23

Loosen and remove self-locking nut (3), including washer (4).

6. Remove sensor (1).
7. Replace sensor.

Installing Sensor

CAUTION!
Risk of injury and damage due to uncontrolled movement of mobility device
An incorrect installed sensor sends wrong data to the power module.
– Ensure that sensor is installed with cable pointing upwards.
– Ensure that notch on backside of sensor is engaged in its installation hole.

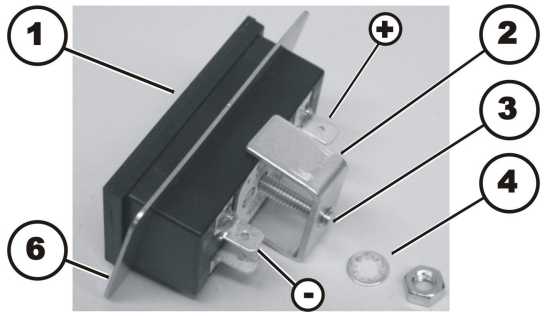
1. Install parts in reverse order.
2. Check that sensor is installed with cable pointing upwards and correctly engaged notch on backside.
3. Plug in sensor cable to power module.
4. Test all functions.

6.7.4 Replacing operating hour counter/connecting cable

- 10 mm socket wrench

The operating hour counter is located on rear shroud (2).

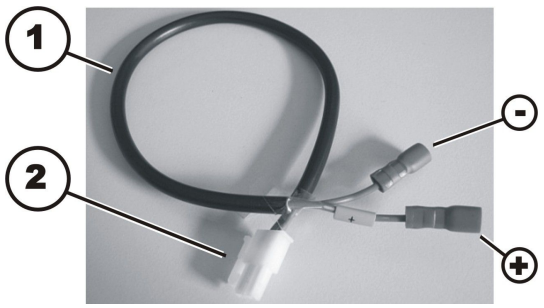
Removing operating hours counter

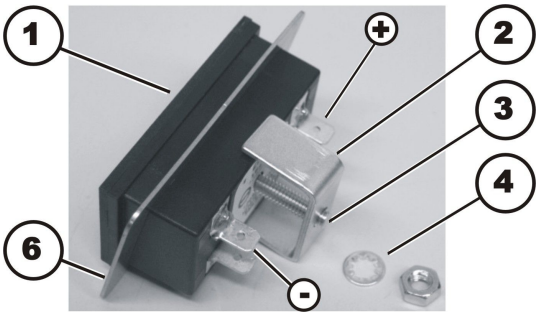
1. Switch controls system of wheelchair off.
2. Remove rear shroud as described in chapter “Shrouds”.
3. 

Loosen and remove nut (5) including locking washer (4) using 10 mm socket wrench.
4. Pull mounting bracket (2) off of threaded rod (3).
5. Remove retaining frame (6).
6. Pull operating hours counter forwards out of rear shroud.
7. Disconnect two plugs of cable (not shown in the illustration) from pins (-) & (+).
8. Replace operating hour counter and cable respectively.

Installing operating hour counter

Risk of damage
If counter is wrongly connected. If plus and minus wires are connected wrong way, it will damage electronic components of operating hour counter.
– Make sure cable is connected correctly.



1. Connect plug on blue wire (-) to pin on operating hour counter which is marked with a “minus” symbol. The brown wire is additionally marked with yellow sleeve with “plus” symbol on it.
2. Insert cable from outside through cut-out for operating hour counter located in rear.
3. Position operating hour counter in cut-out.
4. 

5. Reposition retaining frame (6).
6. Place mounting bracket (2) on threaded rod (3) so that mounting bracket presses retaining frame on shroud.
7. Place locking washer (4) and nut (5) on threaded rod.
8. Tighten nut hand-tight.
9. Install rear shroud again. See chapter *6.6 Shrouds, page 31*.

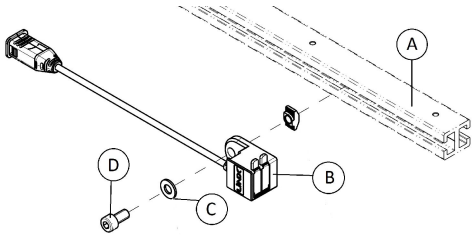
6.7.5 Updating driving program

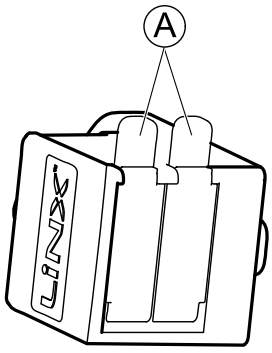
CAUTION!
Every alteration to the drive program can influence handling and tipping stability of mobility device.
– Alterations to drive program must only be carried out by trained Invacare® providers.
– Invacare® can only assume a warranty for safe handling of mobility device – in particular tipping stability - for unaltered standard drive programs.

6.7.6 Replacing USB charger

- 4 mm Allen wrench

When charger overheats, it stops working. Rail under the seat serves to dissipate heat.
- Always mount USB charger in first third of the rail of telescopic seat frame.





Removing USB charger

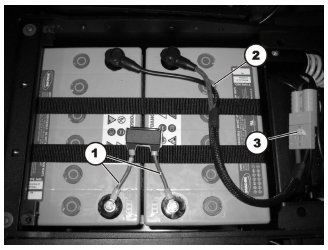
1. Loosen and remove screw Ⓓ including washer Ⓒ.
2. Take off USB charger Ⓑ from rail of telescopic seat frame Ⓐ.
3. Replace USB charger.

Installing USB charger

1. Install parts in reverse order.

6.7.7 Checking cable

- 5/8“ Allen key
- Size 2 Phillips screwdriver
- Oblique pliers
- Cable ties

1. 

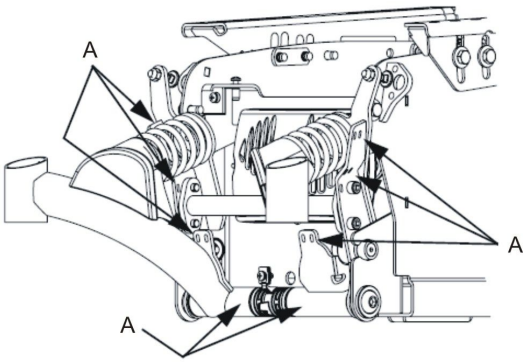
   Remove shrouds, disconnect battery plugs and pull batteries out of battery compartment as described in *6.8.3 Making Batteries Accessible, page 36*.
2. Check fuse cable (1), battery cable (2) and battery plug (3) for visible damage and crushing locations.
3. Replace any damaged cables.
4.

   The position of the plugs is different for other electronic modules. The procedure for checking is otherwise identical. The position of the plugs is described in revision 11 of this manual or in LiNX Service Manual”.

   Check all cables for visible damage and crushing locations. Replace any damaged cables.
5. Pull each plug carefully. Plug should not come out of socket.
6. If one of plugs is loose, press it back into socket with light pressure. Plug must engage.
7. Checked to make sure that plug is now firmly in its socket. If not, repeat previous step.
8. Install parts in reverse order.
9. Test all functions.

6.7.8 Cable routing

- Size 2 Phillips screwdriver
- Oblique pliers
- Cable ties

1. Remove rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
2. When routing cables in rear section, make sure that rear wheel stabilizers are movable.
3. 

   Fix cable with cable ties at locations marked Ⓐ.
4. Make sure cable has enough play so that all movable parts can move freely without stretching, clamping or chafing cable.
5. Route cable in the same manner underneath seat and control shroud.

6.8 Batteries

CAUTION!
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.

CAUTION!
Fire and burns hazard if battery terminal is bypassed
– 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.

CAUTION!
Risk of crushing
Batteries can be extremely heavy. This results in injury hazards to your hands.
– Handle the batteries with care.
– Ensure that batteries do not fall to the ground when removed from chassis.
– Pay attention to hands.
– Use proper lifting techniques.

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
– You should also consult an eye specialist immediately afterwards!

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

6.8.1 General instructions on handling the batteries

- Never mix and match different battery manufactures or technologies, or use batteries that do not have similar date codes.
- Never mix gel with AGM batteries.
- The batteries reach their end of life when the drive range is significantly smaller than usual. Contact your provider or service technician for details.
- Always have your batteries installed by a properly trained mobility device technician or a person with adequate knowledge. They have the necessary training and tools to do the job safely and correctly.

6.8.2 How to handle damaged batteries correctly

CAUTION!
Corrosion and burns from acid leakage if batteries are damaged
– Remove clothes that have been soiled by acid immediately.

After contact with skin:
– Immediately wash affected area with lots of water.

After contact with eyes:
– Immediately rinse eyes under running water for several minutes; consult a physician.

- Always wear safety goggles and 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.

Disposing of dead or damaged batteries correctly

Dead or damaged batteries can be given back to your provider or directly to Invacare.

6.8.3 Making Batteries Accessible

- Phillips screwdriver, size 2
- 5/32 in Allen key
- 13 mm wrench
- Two wooden blocks (approx. 30 x 40 x 29 cm)

1.

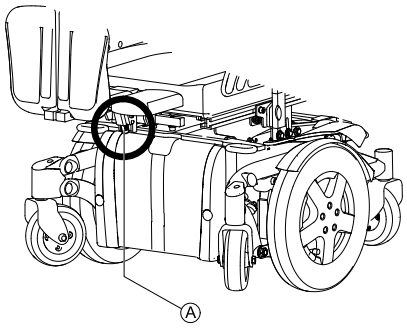


Fig. 6-24

Remove side-mounted legrests if fitted. A centre-mounted, manually adjustable legrest should be either put in its top position by turning the spindle Ⓐ or removed. Elevate powered legrests to top position.

2.

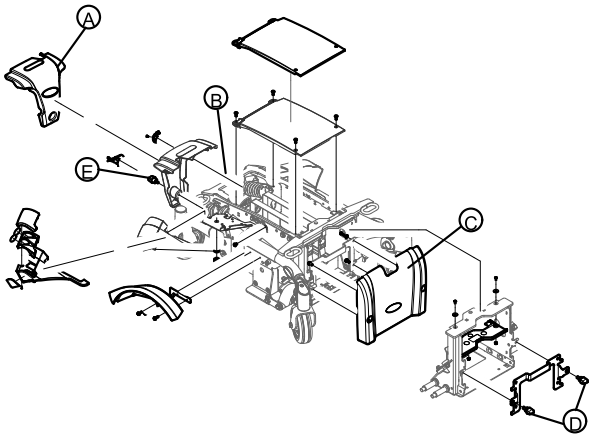


Fig. 6-25

Remove hand screw Ⓔ on rear shroud Ⓐ.
3. Remove rear shroud.
4. Unplug battery plugs Ⓑ.
5. Remove hand screws Ⓓ on front shroud Ⓒ.
6. Pull front shroud upwards and remove it.
7. Remove tilt actuator if fitted. See *6.7.2 Replacing Tilt Actuator ("Fixed Pivot" Tilt), page 33*.
8.

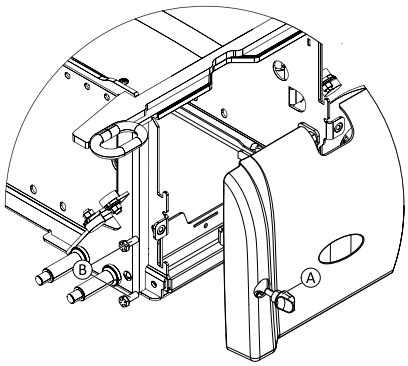


Fig. 6-26

Loosen screws Ⓑ on both sides. Do not remove them.

6.8.4 Replacing Batteries (60 Ah / 73 Ah)

- Phillips screwdriver, size 2
- 5/32 in Allen key
- 11 mm wrench
- Wooden block (approx. 30 x 40 x 29 cm)

TDX SP2 Low-Rider does not have terminal caps. Take special care NOT to shorten battery terminals.

Removing Batteries

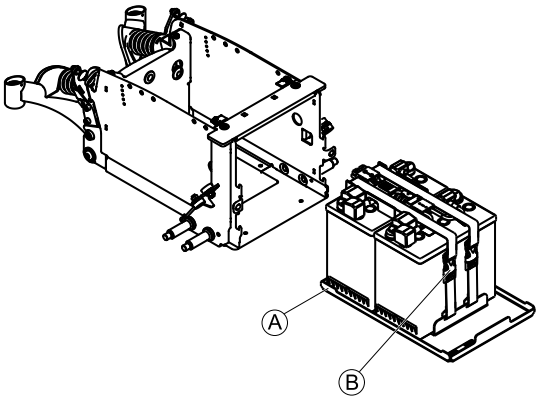
1. Make batteries accessible. See *6.8.3 Making Batteries Accessible, page 36*.
2. 

Fig. 6-27

Pull out battery tray Ⓐ.

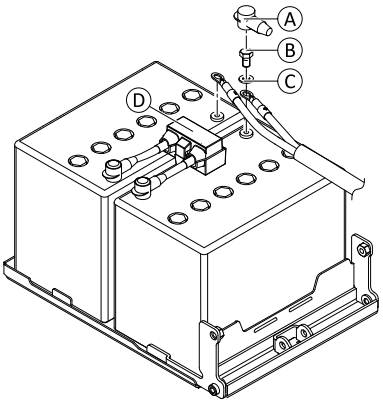
3. 

Fig. 6-28

TDX SP2 Low-Rider does not have terminal caps.

Remove terminal caps Ⓐ.

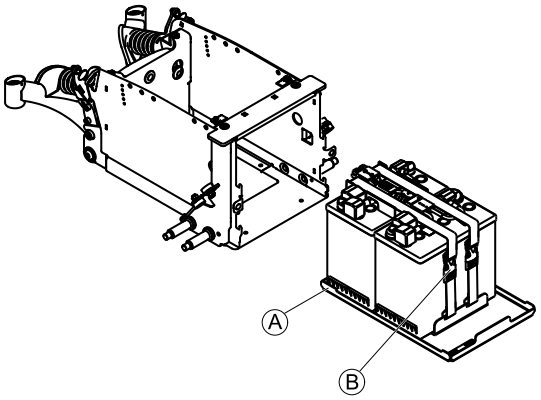
4. Loosen and remove terminal screws Ⓑ including washers Ⓒ. First remove negative terminal screw. After this, remove positive terminal screw.
5. Remove connection cable with main fuse Ⓓ.
6. 

Fig. 6-29

Open battery straps Ⓑ.

7. Remove batteries.

Installing Batteries

1. Install batteries in reverse order.
2. Make sure that battery box sockets/plugs have been correctly refitted. A polarity diagram is located in battery box shroud.

6.8.5 Replacing Batteries (50 Ah)

- 3/8 in wrench
- 19 mm wrench
- Torque wrench 5 - 25 Nm (or similar)
- Oblique pliers
- Wooden block (approx. 30 x 40 x 29 cm)

Removing Batteries

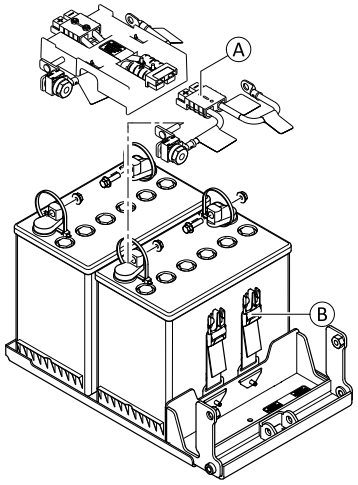
1. Make batteries accessible. See *6.8.3 Making Batteries Accessible, page 36*.
2. Pull out battery tray.
3. 

Fig. 6-30

Disconnect plug Ⓐ.

4. Open battery straps Ⓑ.
5. Remove batteries from mobility device.

6.

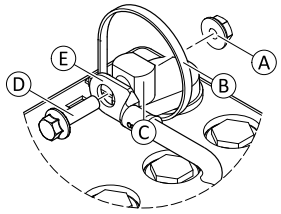


Fig. 6-31 Detail view of negative terminal

Remove cable ties Ⓑ on all terminals.

7. Remove terminal caps.
8. Remove terminal screw of negative terminal.
   a. Loosen and remove nut Ⓐ.
   b. Remove terminal screw Ⓓ together with cable lug Ⓔ from battery terminal Ⓒ.
9. Repeat previous step to remove terminal screw of positive terminal.
10. Remove cable harness.

Installing Batteries

Connect negative terminal first, then positive terminal.

1. Install parts in reverse order. Tighten screws to 7 Nm.
2. Make sure that battery box sockets and plugs are correctly installed. A polarity diagram is located in battery box shroud.
3.

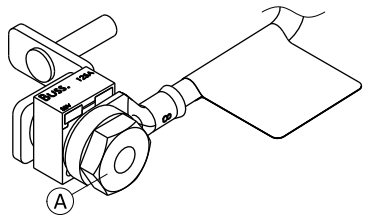


Fig. 6-32

Check nut Ⓐ on positive terminal for tight fit. If required, tighten to 7 Nm.

4. Carefully reposition battery terminal caps and secure them with a cable tie to prevent them from possibly slipping out of place.

6.8.6 Replacing Batteries / Battery Cables

To replace fuse, battery cable with fuse attached to it must be replaced.

Removing batteries/battery cables

1. Remove batteries. See *6.8.3 Making Batteries Accessible, page 36*.

Positive Terminal (+)

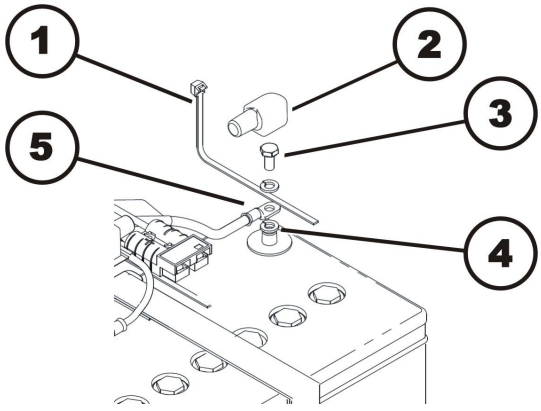


Fig. 6-33

1. Remove cable ties (1) with side cutting pliers.
2. Lift battery terminal cap (2) off and move it up cable and out of way.
3. Loosen battery terminal screw (3).
4. Remove battery terminal screw together with both washers and cable lug (5) from battery terminal (4).

Negative Terminal (-)

1. Repeat steps of procedure on negative terminal of battery.
2. Replace batteries and/or battery cables.

Installing Batteries / Battery Cables

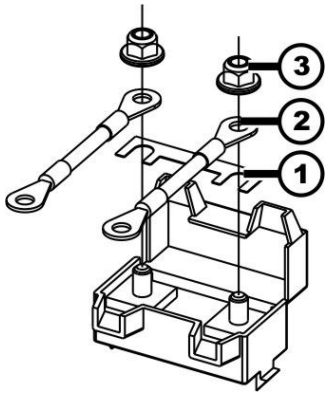
1. Install parts in reverse order. Connect negative terminal first, then positive terminal.
2. Make sure battery box sockets and plugs are correctly installed. A polarity diagram is located in the battery box shroud.
3. Carefully reposition battery terminal caps and secure them a with cable tie to prevent them from possibly slipping out of place.

6.8.7 Checking and replacing main fuse

CAUTION!
Risk of fire
An electric short can cause extremely high currents which can result in spark formation and fire
– Always use an original strip fuse with the approved amperage.
– If main fuse has blown, first rectify the cause before fitting a new one.

Risk of fire
Fitting the incorrect strip fuse causes a risk of fire
– Only fix strip fuses in the sequence shown in the image on the right.
– Tighten nuts with 3.3 or 3.5 Nm.

Fitting original strip fuse in correct sequence

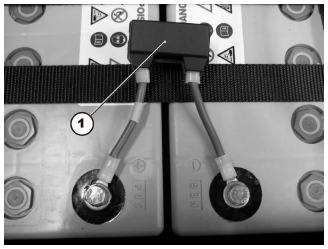


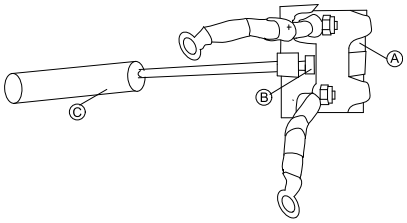
1. Strip fuse (1)
2. Cable lug (2)
3. DIN 6923 nut (3)

- 5/8“ (16 mm) Allen key
- 4 mm flat screwdriver
- 8 mm wrench
- Torque wrench 0-20 Nm (or similar)

If fuseholder is damaged, you can replace it completely with battery cables.

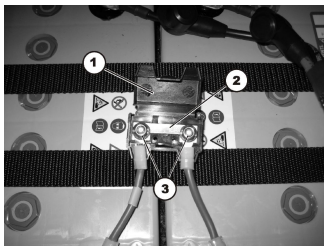
Removing main fuse

1. Remove battery compartment shroud, disconnect battery plugs and pull batteries out of battery compartment as described in *6.8.3 Making Batteries Accessible, page 36*.
2. 

The fuseholder (1) is located on top of batteries.
3. 

Pry open snap hook Ⓑ with flat screwdriver Ⓒ. Fuseholder shroud Ⓐ is open.

Older fuseholder versions may be locked with a cable tie. If so, cut open cable tie to access fuse strip.

4. 

You can see strip fuses (2) once fuse holder (1) is open.
5. If strip fuse has blown, you must first ascertain and rectify the cause of fault.
6. The main fuse may only be replaced once fault has been rectified.
7. Remove nuts (3).
8. Replace strip fuse.

Installing main fuse

1. Install parts in reverse order.
2. Test all functions.

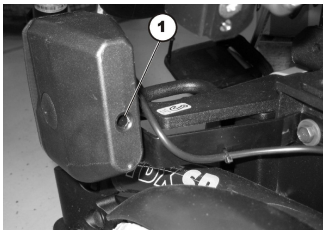
Make sure to press two parts of fuse holder shroud together until it snaps.

If older fuseholder version is used, lock fuseholder with UL94V0 cable tie.

6.9 Lighting unit

6.9.1 Replacing front bulb (conventional lighting system)

- Size 2 Phillips screwdriver

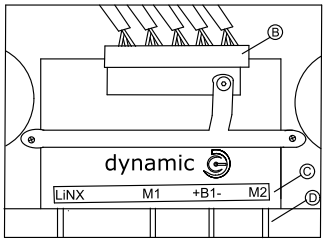


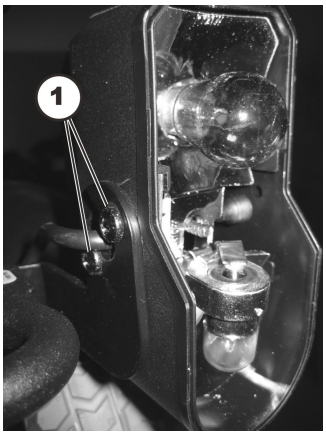
1. Loosen and remove screw (1) on rear of headlight/indicator combination.
2. Remove glass.
3. Replace defective bulb.
4. Close glass and tighten Phillips screw finger-tight.

6.9.2 Replacing headlight complete (conventional lighting system)

- Phillips screwdriver size 2
- Oblique pliers
- Cable ties

Removing headlight

1. Remove rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
2. Carefully note location of cable and connection locations of the various plugs. Either mark each plug and socket, or take a photograph with a digital camera.
3. 

On the illustration you can see lighting PCB Ⓑ for power module Ⓒ, optional cross connector Ⓓ.
4. Loosen cable leading to lighting PCB from front headlight affected.
5. Remove all cable ties and pull cable out of mobility device.
6. 

Loosen and remove two screws which hold front headlight.
7. Replace headlight unit.

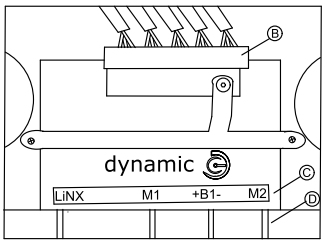
Installing front headlight

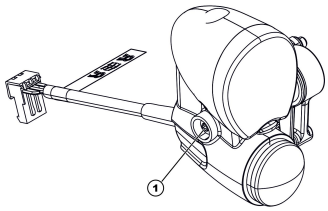
1. Install parts in reverse order. Route cables carefully and fix them with cable ties.
2. Test all functions.

6.9.3 Replacing headlight complete (LED lighting system)

- Allen key 4 mm
- Oblique pliers
- Cable ties

Removing headlight

1. Remove rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
2. Carefully note location of cable and the connection locations of the various plugs. Either mark each plug and socket, or take a photograph with a digital camera.
3. 

   In the illustration you can see lighting PCB Ⓑ, power module Ⓒ and optional cross connector Ⓓ.
4. 

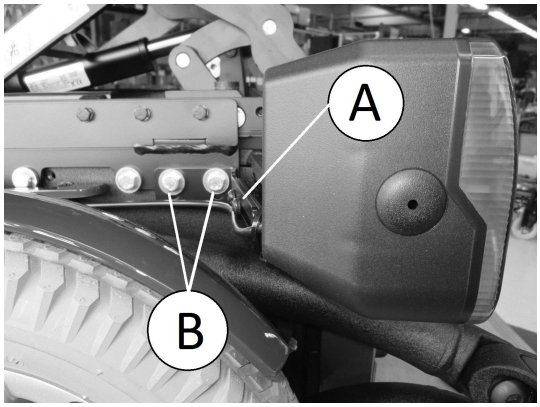
   Loosen cable leading to lighting PCB from headlight affected.
5. Remove all cable ties and pull cable out of wheelchair.
6. Loosen screw (1) and remove front bulb from mounting.
7. Replace headlight.

Installing headlight

1. Install parts in reverse order.
2. Route cables carefully and fix them with cable ties. Pay attention to *6.7.8 Cable routing, page 35*.
3. Test all functions.
4. Tighten all screws finger-tight.
5. Test all functions.
6. Adjust headlight roughly using grid. User can carry out final adjustment according to user manual.

6.9.4 Replacing front lamp holder (conventional lighting system)

- Size 2 Phillips screwdriver
- 13 mm socket wrench



Removing front lamp holder

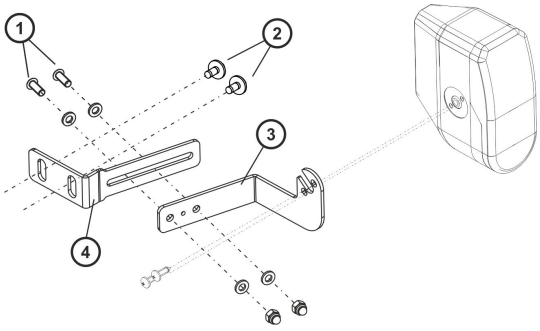
1. Remove complete headlight as described in *6.9.2 Replacing headlight complete (conventional lighting system), page 39*.
2. Loosen and remove screw Ⓑ and washer.
3. Remove front lamp holder Ⓐ.

Installing front lamp holder

1. Install parts in reverse order.
2. Test all functions.

6.9.5 Replacing front lamp holder - (conventional lighting system)

- Phillips screwdriver
- 4 mm Allen key
- 6 mm Allen key
- 13 mm socket wrench
- 10 mm socket wrench



Removing bulbholder

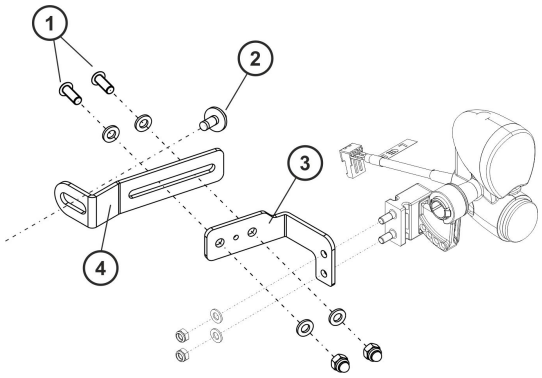
1. Remove headlight completely as described in *6.9.2 Replacing headlight complete (conventional lighting system), page 39*.
2. Loosen and remove screws (2) with washers.
3. Remove lamp holder (4).
4. Moving bulbholder (3):
   - Loosen two screws (1).
   - Move lamp holder (3) to correct position.
   - Install two screws (1) including washers and nuts.

Refitting bulbholder

1. Install parts in reverse order.
2. Check all functions.

6.9.6 Replacing front lamp holder - (LED lighting system)

- Phillips screwdriver
- 4 mm Allen key
- 6 mm Allen key
- 13 mm socket wrench
- 10 mm socket wrench



Removing lamp holder

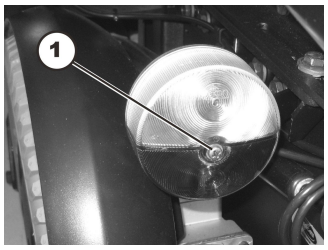
1. Remove complete headlight as described in *6.9.3 Replacing headlight complete (LED lighting system), page 40*.
2. Loosen and remove two retaining screws (2) with washers.
3. Remove lamp holder (4).
4. Moving lamp holder (3).
   - Loosen two screws (1).
   - Move lamp holder (3) into position.
   - Install two screws (1) including washers and nuts.

Installing lamp holder

1. Install parts in reverse order.
2. Test all functions.

6.9.7 Replacing rear bulb (conventional lighting system)

- Phillips screwdriver size 2

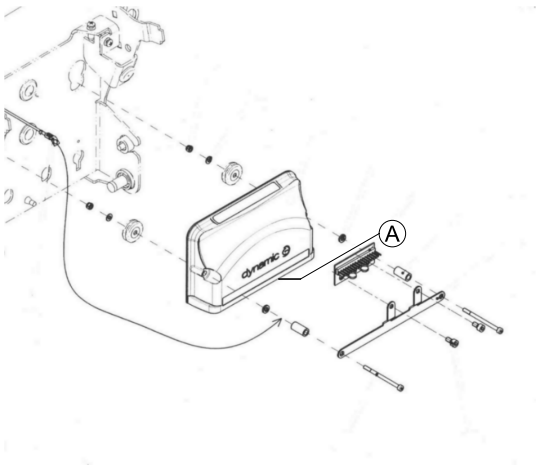


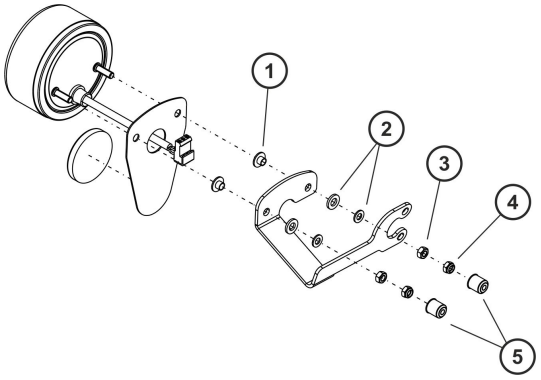
1. Loosen and remove screw in glass over rear light/indicator combination.
2. Remove glass.
3. Replace defective bulb.
4. Install glass and tighten screw finger-tight.

6.9.8 Replacing rear light complete - (conventional lighting system)

- Size 2 Phillips screwdriver
- 8 mm Socket wrench

Removing rear light

1. Remove rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
2. 

   Carefully note location of cable and connection locations of various plugs on power module Ⓐ. Either mark each plug and socket, or take a photograph with a digital camera.
3. Loosen cable leading to lighting PCB from rear light.
4. Remove all cable ties and pull cable out of mobility device.
5. 

   Remove two protection caps (5).
6. Loosen and remove two nuts (4) / (3) including washers (2) and protection caps (1).
7. Replace rear light.

Installing rear light

1. Install parts in reverse order.
2. Test all functions.

6.9.9 Replacing complete rear light - (LED lighting system)

- 4 mm Allen key
- 13 mm socket wrench

Removing rear light

1. Remove rear shroud as described in *6.6.2 Replacing Rear Shroud (Without Operating Hour Counter), page 31*.
2. Carefully note location of cable and connection locations of various plugs. Either mark each plug and socket, or take a photograph with a digital camera.

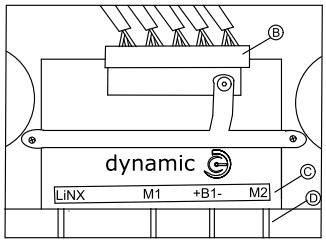
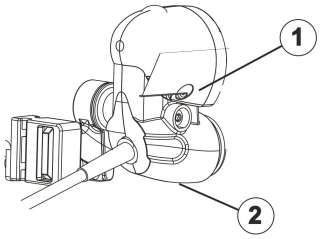
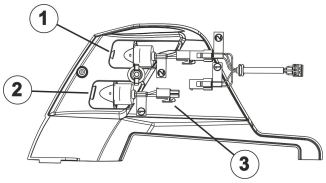
3. 

Illustration shows lighting PCB Ⓑ for power module Ⓒ, the optional cross connector Ⓓ.
4. Loosen cable leading to lighting PCB from rear light affected.
5. Remove all cable ties and pull cable out of wheelchair.
6. 

Loosen wing nut (2).
7. Remove glass (1).
8. 

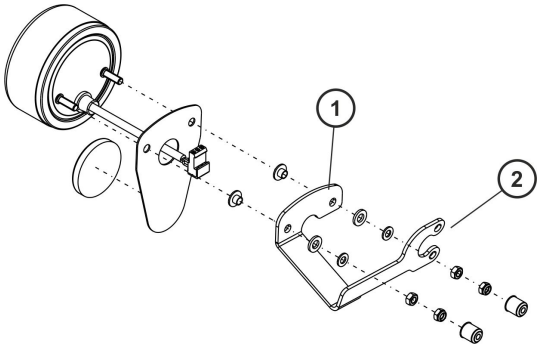
Open connector plug (3) for the rear light which needs to be replaced.
9. The rear lights are only clamped in by the plastic housing. If required, replace the red rear light (2) or the indicator (1). The cables are labelled appropriately.

Install rear light

1. Install parts in reverse order.
2. Tighten all screws finger-tight again.
3. Test all functions.

6.9.10 Replacing rear lamp holder - (conventional lighting system)

- Size 2 Phillips screwdriver
- 8 mm socket wrench
- 3/16" Allen key



Removing rear lamp holder

1. Remove complete rear light as described in *6.9.8 Replacing rear light complete - (conventional lighting system) , page 41*.
2. Loosen and remove two screws (2) on chassis including washers.
3. Replace lamp holder (1).

Installing rear lamp holder

1. Install parts in reverse order.
2. Test all functions.

6.10 Seating

- For seat systems —Modulite and ULM, refer to the corresponding manual.
- Older specifications have been described in revision 11 of this service manual.

7 Troubleshooting

7.1 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 the remote status display. Evaluate the flash error code.
3. Carry out the necessary checks and repairs as recommended in the following table.

The various power modules can be fitted in connection with diferent remotes in the mobility device. Rectification of operational faults depends on the power module fitted. The power modules used are described in the corresponding controls manual.

The tables for rectification of operational faults listed in the following chapters are only an excerpt from the original manufacturer's manuals. You can obtain the original manuals from Invacare®.

7.2 Drive fault diagnosis

Problem	Other symptoms	Possible cause	Solution	Documentation
Mobility device will not start	The remote status display illuminates normally and displays flash code 5/6	Drive motors disengaged	Engage drive motors	See user manual.
	Remote status display does not illuminate	Batteries defective	Replace batteries	See *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37* and *6.8.6 Replacing Batteries / Battery Cables, page 38*.
		Completely discharge battery	Pre-charge batteries	See user manual.
		Power supply to remote interrupted	Check main fuse	See *6.8.7 Checking and replacing main fuse, page 38* .
			Check cables between modules for loose connections or damage	See *6.7.7 Checking cable, page 35*.
		Remote defective	Replace remote	See *6.7.1 Replacing Power Module, page 32*.
	Remote status display flashing	Various causes	Assess error code	See remote manual.
Mobility device judders in drive mode	None	Batteries defective (unstable voltage)	Replace batteries	See *6.8.6 Replacing Batteries / Battery Cables, page 38* and *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*.
		Drive motor(s) defective	Replace motor(s)	See *6.4.2 Replacing motor/gearbox unit, page 22*.
			Replace carbon brushes	See *6.4.5 Replacing carbon brushes, page 24*.
Mobility device pulls to left or right	None	Drive motors running asymmetrically	Set motor parameter to synchronize motors	See programming manual.
	Tire visibly dented	Not enough tire pressure	Check tire pressure, replace inner tube and/or valve if necessary	

Problem	Other symptoms	Possible cause	Solution	Documentation
Error message does not disappear	None	Bad connections	Check all connecting cables	See *6.7.7 Checking cable, page 35*.
		Motor brake defective	Measure internal resistance of brakes, replace motor if defective	See *5.2 Testing Motor Brake, page 11* and *6.4.2 Replacing motor/gearbox unit, page 22*.
Motors stop and start again	None	Voltage decline	Stop driving and allow electronics to cool down	
Motor runs but loses power	None	High motor load allows power module to lower the voltage	Stop driving and allow electronics to cool down	
Motors stop and do not start again	None	High motor load allows power module to lower the voltage	Leave mobility device switched on and let power module operate. Charge batteries overnight with mobility device switched on	
	None	Fuse burnt out	Check cabling and replace fuse	See *6.7.7 Checking cable, page 35* and *6.8.7 Checking and replacing main fuse, page 38*.
	None	Motor defective	Check carbon brushes and replace if necessary	See *6.4.5 Replacing carbon brushes, page 24*.
			Measure internal resistance of motor, replace motor if defective	See *5.1 Testing Motor, page 11* and *6.4.2 Replacing motor/gearbox unit, page 22*.
	None	Power module defective	Replace power module	See *6.7.1 Replacing Power Module, page 32*.
Motors lose power while driving	None	Bad connections	Switch mobility device off, wait 10 seconds, switch mobility device on again. Check all cabling.	See *6.7.7 Checking cable, page 35*.
Motor judders or runs irregularly, or only one motor runs	None	Carbon brushes worn (only applies for motors without lifetime brushes)	Check carbon brushes and replace if necessary (only applies for motors without lifetime brushes)	See *6.4.5 Replacing carbon brushes, page 24*.
		Clutch(es) defective	Replace clutch	See *6.4.2 Replacing motor/gearbox unit, page 22*.
		Bearing defective	Replace motor	See *6.4.2 Replacing motor/gearbox unit, page 22*.
		Collector defective	Measure internal resistance of motor, replace motor if defective	See *5.1 Testing Motor, page 11* and*6.4.2 Replacing motor/gearbox unit, page 22*.

Problem	Other symptoms	Possible cause	Solution	Documentation
Motors do not run	None	Bad connections	Check all cabling	See *6.7.7 Checking cable, page 35*.
		Fuse burnt out	Check cabling and replace fuse	See *6.7.7 Checking cable, page 35* and *6.8.7 Checking and replacing main fuse, page 38*.
		Batteries defective	Replace batteries	See *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37* and*6.8.6 Replacing Batteries / Battery Cables, page 38*.
		Cabling to power module or remote defective	Check cabling	See *6.7.7 Checking cable, page 35*.
		Power module defective	Replace power module	See *6.7.1 Replacing Power Module, page 32*.
	Corroded contacts	Contacts defective	Check cabling, replace if necessary	See *6.7.7 Checking cable, page 35*.
Motor makes clicking noise	None	Clutch(es) defective	Replace clutch	See *6.4.2 Replacing motor/gearbox unit, page 22*.
		Bearing defective	Replace motor	See *6.4.2 Replacing motor/gearbox unit, page 22*.
		Collector defective	Measure internal resistance of motor, replace motor if defective	See *5.1 Testing Motor, page 11* and *6.4.2 Replacing motor/gearbox unit, page 22*
Scraping noise or motor blocked	None	Clutch(es) defective	Replace clutch	See *6.4.4 Replacing motor/gearbox clutch, page 24*.
		Bearing defective	Replace motor	See *6.4.2 Replacing motor/gearbox unit, page 22* and *6.4.4 Replacing motor/gearbox clutch, page 24*.
		Gearbox defective	Replace gearbox	See *6.4.2 Replacing motor/gearbox unit, page 22* and*6.4.4 Replacing motor/gearbox clutch, page 24*.
Gearbox makes clicking noise	None	Gearbox defective	Replace gearbox	See *6.4.2 Replacing motor/gearbox unit, page 22* and *6.4.4 Replacing motor/gearbox clutch, page 24*.
		Drive wheel loose	Tighten drive wheel, secure bolts with Loctite if necessary	See *6.4.2 Replacing motor/gearbox unit, page 22*.

Problem	Other symptoms	Possible cause	Solution	Documentation
Gearbox loses oil	None	Sealing ring on drive shaft defective	Replace gearbox if sealing ring defective	See *6.4.2 Replacing motor/gearbox unit, page 22* and *6.4.4 Replacing motor/gearbox clutch, page 24*.
			Check carbon brushes for oil wetting, replace motor if brushes wet	See*6.4.2 Replacing motor/gearbox unit, page 22* and *6.4.4 Replacing motor/gearbox clutch, page 24* and *6.4.5 Replacing carbon brushes, page 24*.
Irregular running	None	Drive shaft movable or bent	Check drive shaft, replace gearbox, if defective	See *6.4.2 Replacing motor/gearbox unit, page 22* and *6.4.4 Replacing motor/gearbox clutch, page 24*.
Batteries not being charged	None	Fuse burnt out, cable defective	Check cabling and replace fuse	See *6.7.7 Checking cable, page 35* and *6.8.7 Checking and replacing main fuse, page 38*.
		Batteries defective	Replace batteries	*6.8.6 Replacing Batteries / Battery Cables, page 38* and *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*.
	LEDs blinking on charger	Charger defective	Replace charger	See charger user manual.
Short charging period	None	One of the batteries could be defective	Replace batteries	See *6.8.6 Replacing Batteries / Battery Cables, page 38* and *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*.
Mobility device runs too slowly	None	Remote defective	Replace remote	See *6.7.1 Replacing Power Module, page 32*.
		Batteries defective	Replace batteries	See *6.8.6 Replacing Batteries / Battery Cables, page 38* and*6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*.

7.3 Charger fault diagnosis

Symptom	Possible cause	Solution
No LEDs illuminating on charger	Charger not connected to mains supply	Make sure that charger has been plugged in
	No mains supply	Check mains supply with voltmeter
	Defective mains supply cable	Check mains supply cable. Replace damaged cables or send charger to Invacare® Service for repair

Symptom	Possible cause	Solution
	LEDs are burnt out	Send charger to Invacare® Service for repair
	An internal fuse might be burnt out	Send charger to Invacare® Service for repair
Batteries do not charge	Fuse on mobility device has burnt out	Check mobility device fuses. See *6.8.7 Checking and replacing main fuse, page 38*.
	Charger not connected to mobility device	Make sure that charger has been connected to mobility device
	No mains supply	Check mains supply with voltmeter.
	Defective mains supply cable	Check mains supply cable. Replace damaged cables or send charger to Invacare® Service for repair
	Battery charger could be defective	Use battery charger which you know is working properly to charge batteries. Send defective battery charger to Invacare® Service for repair.
	Battery voltage is too low to operate mobility device.	Replace batteries. See *6.8.6 Replacing Batteries / Battery Cables, page 38*.

7.4 Service Plan (1x Annually)

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.

Component	Check	Remedy	Notes	✓
Posture belt	Damage to posture belt	Replace belt if damaged	See *Replacing Posture Belt* in service manual of seating system.	
	Belt lock function	Replace belt if damaged	See *Replacing Posture Belt* in service manual of seating system.	
Armrests	Damage to armrests	Replace covering if damaged		
	Armrest fixings	Tighten screws		
Fender	Damage to fender	Replace fender, if damaged		
	Side panel fixings	Tighten screws		
Powered tilt	Tight fit of SL retainer clip	Replace SL retainer clip, if necessary		
Powered recline (if fitted)	Damage to backrest Seams Fixing Check cable Check function	Replace parts if damaged Tighten screws Replace cable or motor if necessary		
Frames (chassis) / battery mounting	Check fixings, welded seams and battery mounting	Tighten screws Replace components if necessary		

Component	Check	Remedy	Notes	✓
Stability Lock	Check gas cylinder	Repair or replace if damaged Replace gas cylinder every 2 years!	See *6.3.2 Stability lock, page 15*.	
Wheel suspension and wheels	Check drive wheels for tight fit and side play	Adjust, replace wheel hubs	See *6.5.7 Replacing Drive Wheel, page 27* and *6.4.6 Replacing drive wheel hub, page 25*.	
	Check steering casters for tight fit, float and side play	Replace caster, caster fork or wheel bearings	See *6.5 Wheels, page 25*.	
	Tires	Repair or replace if damaged	See *6.5.8 Replacing tire or inner tube, page 28*.	
	Check suspension	Repair or replace if damaged	See *6.5 Wheels, page 25*.	
	Check straight running	Replace wheels, caster fork or wheel bearings	See *6.5 Wheels, page 25*.	
Drive units, clutch mechanism	Motors	Check motors	See *5.1 Testing Motor, page 11*.	
	Check functions in drive and push modes Check clutch mechanism	Check carbon brushes, replace if necessary (not with lifetime brushes) Replace motor if necessary Tighten screws/nuts, adjust or replace if necessary	See *6.4 Drive components, page 22*.	
Brakes	Inspect motor brake	Test motor brake	See *5.1 Testing Motor, page 11*.	
Legrests	Check welded seams, interlocking, screws, footplates	Tighten, replace if necessary		
Power legrests (if fitted)	Check cable Check contacts Check functions	Replace cable if necessary		
Lighting (if fitted)	Check cable Check function	Replace lamp or cable if necessary	See *6.9 Lighting unit, page 39*.	
Battery mounting	Check battery support and mounting belts for damage	Replace if necessary		
Batteries	Check batteries for damage	Replace batteries if necessary	*6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37*/*6.8.6 Replacing Batteries / Battery Cables, page 38* and *6.8.2 How to handle damaged batteries correctly, page 36*.	
	Check battery voltage	Charge batteries	See user manual.	
	Check contacts and terminals	Clean contacts and terminals	Refer to the safety information in *6.8.4 Replacing Batteries (60 Ah / 73 Ah), page 37* / *6.8.6 Replacing Batteries / Battery Cables, page 38* and *6.8.2 How to handle damaged batteries correctly, page 36*.	

Component	Check	Remedy	Notes	✓
Remote / power module	Remote, status LED flashing	Evaluate error/ flash code	See *7 Troubleshooting, page 43*.	
	Fixings	Tighten fixings, replace if necessary		
	Cables and connecting plugs	Replace damaged cables and tighten connecting plugs		
	Joystick function	Replace remote if necessary		
	Power supply	Replace damaged cables and tighten connecting plugs, if necessary		
Chair configuration	Check chair configuration version	Update software if newer version available	See *6.7.5 Updating driving program, page 34*.	
Screws (every 6 months)	Check screws for tight fit	Tighten screws if necessary		

8 Accessories

8.1 Accessories list

- Caneholder, right/-left side
- Swing-away tray
- DAHL docking station
- Hour counter
- Flip and fold away, 1/2 lap tray, right/-left side
- Ventilator tray:
  – Vent box, low profile recline (Universal, Trilogy or LTV-Easy Fit)
  – 02 Holder, low profile recline
- Sport Accessories:
  – Front bumper rubber coated (U-type)
  – Rear bumper

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

Notes

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