SUNRISE MEDICAL

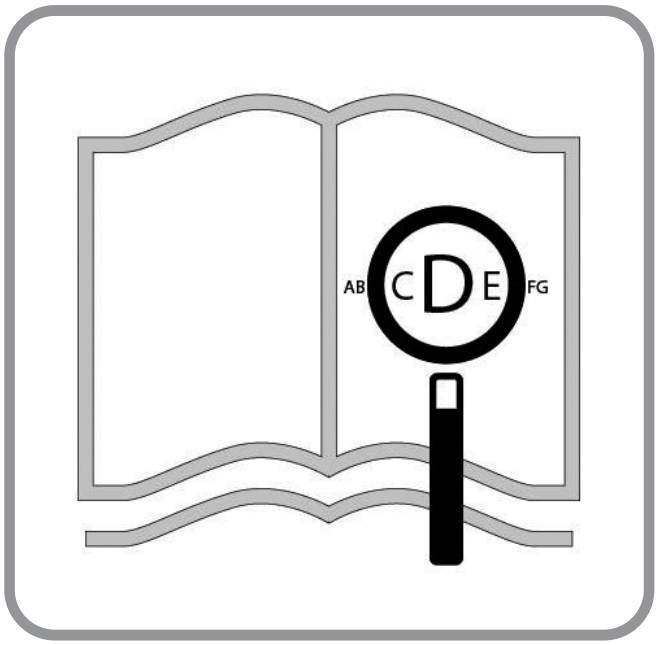
Empulse®

WHEEL ADD-ON POWER ASSIST

259802-GB Rev. A

Empulse® M90

Instructions for use



If you are visually impaired, this document can be viewed in PDF format at **www.SunriseMedical.co.uk**

Wheel Add-on Power Assist Components

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We at SUNRISE MEDICAL have been awarded the ISO-13485 certificate, which affirms the quality of our products at every stage, from R & D to production. This product complies with the standards set forth in EU and UK regulations. Options or accessories shown are available at extra cost.

Contents

(continued on next page)

Definitions of words used in this manual

Word	Definition
⚠ **DANGER!**	Advice to the user of Potential Risk of serious injury or death if the advice is not followed
⚠ **WARNING!**	Advice to the user of a risk of injury if the advice is not followed
⚠ **CAUTION!**	Advice to user that potential damage to equipment may occur if the advice is not followed
NOTE:	General advice or best practice
	Consult instructions for use

NOTE:
- Please keep a note of your local service agent's address and telephone number in the space provided.
- In the event of a breakdown, contact them and try to give all relevant details so they can help you quickly.
- The power assist devices shown and described in this user guide may not correspond in every detail exactly to your own model. However, all instructions are completely relevant, regardless of possible detail differences.
- The manufacturer reserves the right to alter without notice any weights, measurements or other technical data shown in this manual. All figures, measurements and capacities shown in this manual are approximate and do not constitute specifications.

ACRONYMS

LED: Light-Emitting Diode

OTA: Over the air

Dealer signature and stamp

Foreword

Dear Customer,

We are very happy that you have decided in favour of a high-quality product from SUNRISE MEDICAL.

This owner's manual will provide numerous tips and ideas so that your new power assist device can become a trustworthy and reliable partner in your life.

For Sunrise Medical, it is very important that we have a good relationship with our customers. We like to keep you up-to-date about new and current developments at our company. Keeping close to our customers means: fast service, as little red tape as possible, working closely with customers. Whenever you need replacement parts or accessories, or if you just have a question about your power assist device – we are there for you.

We want you to be satisfied with our products and service. At Sunrise Medical we are constantly working to develop our products further. For this reason, changes can occur in our range of products with regard to form, technology, and equipment. Consequently, no claims can be construed from the data or pictures contained in this user's manual.

CE **As the manufacturer, CONCOURSE ASSISTIVE TECHNOLOGY, declares that the product conforms to the Medical Device Regulation (2017/745).**

NOTE:
General user advice.
Not following these instructions may result in physical injury, damage to the product or damage to the environment!

Notice to the user and/or patient: Any serious incident that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the Member State in which the user and/or patient is established.

B4Me special adaptations
Sunrise Medical strongly recommends that in order to ensure that your B4Me product operates, and performs as intended by the manufacturer; all the user information supplied with your B4Me product is read and understood, before the product is first used.

Sunrise Medical also recommends that the user information is not discarded after reading it, but it is kept safely stored for future reference.

Medical Device Combinations
This medical device is always to be used in combination with one other Medical Device or other product. Information on which combinations are possible can be found at www.SunriseMedical.co.uk. All combinations listed have been validated to meet the General Safety and Performance Requirements, Annex I Nr. 14.1 of the Medical Device Regulation 2017/745.

Guidance on the combination, such as mounting, can be found within this manual.

Please contact your local, authorised SUNRISE MEDICAL dealer if you have any questions regarding the use, maintenance or safety of your power assist device.

In the case of there being no authorised dealer in your area and you have any questions regarding product safety or recalls, contact Sunrise Medical either in writing or by telephone.

Sunrise Medical Ltd.
Thorns Road
Brierley Hill
West Midlands
DY5 2LD
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Phone: 0845 605 66 88
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www.SunriseMedical.co.uk

Do not use your power assist device until this manual has been read and understood. Please follow the instructions contained within the Owner's Manual.

Use

The Empulse M90 is a power assist device, which is attached to a wheelchair, to support the mobility and integration of the wheelchair user in daily life. It is designed for personal use indoors or outdoors.

The maximum user weight (including both the user and any weight of accessories fitted to the power assist device) is marked on the serial number label. The serial number label is located on the device as well as in the owner's manual.

Warranty can only be taken on if the product is used under the specified conditions and for the intended purposes.

Service life
The expected life of the power assist device is 5 years, provided that:
- It is used in strict accordance with the intended use.
- All service and maintenance requirements are fulfilled.

⚠ DANGER!

- Do not fit any unauthorized electronic equipment.

Area of Application

The power assist device provides the user with the potential to safely cover long distances in an ergonomically and ecologically efficient manner, using their own wheelchair. It expands the activity radius significantly. The attached wheelchair must be equipped in accordance with road traffic regulations when used on public roads, pavements and spaces.

Indications
The adjustability, as well as the modular design, mean that it can be used by those who cannot walk or have limited mobility because of:
- Paralysis
- Loss of extremity (leg amputation)
- Extremity defect deformity
- Joint contractures/joint injuries
- Illnesses such as heart and circulation deficiencies, disturbance of equilibrium or cachexia as well as for elderly people who still have strength in the upper body.

Contraindications
The power assist devices shall not be used in case of:
- Perception disorder
- Imbalance
- Loss of both arms
- Joint contracture or joint damage on both arms
- Seating disability
- Physically and mentally not capable of safely operating the power assist device in all operating situations.
- Not meeting the legal requirements for use on public roads.

Operating Conditions
The power assist device should be able to cope with tarmac surfaces and firm paths with different topography. Avoid driving on unpaved or loose surfaces (e.g. on loose gravel, in sand, mud, snow, ice or through deep puddles of water), as this may expose the user to unforeseen risks.

In the absence of approval, in accordance with the road traffic laws, the Empulse M90 may not be driven on public roads, bicycle-lanes and pavements. You need to inform yourself about the country specific legislation regarding usage and your legal obligation to insure the Empulse M90. When you´re travelling with your M90, always check the specific legislation in the respective country.

NOTE:
Please note that driving a wheelchair requires sufficient cognitive, physical and visual skills. The user must be able to assess the effects of actions during the operation of the wheelchair and, if necessary, to correct them. These capabilities and the safe use of the additionally attached components cannot be assessed by Sunrise Medical as a manufacturer. We cannot accept any liability for any damage resulting from this.

Please refer to the operating instructions of the wheelchair and the additionally mounted components. Instruct the user in the safe use of the wheelchair and the additionally mounted components. Inform users of specific warnings that need to be read, understood, and respected.

1.0 General safety notes and Driving limits

The technology and construction of this power assist device have been designed to provide maximum safety. International safety standards currently in force have either been fulfilled or exceeded in parts.
Nevertheless, users may put themselves at risk by improperly using their power assist device. For your own safety, the following rules must be strictly observed. Unprofessional or erroneous changes or adjustments increase the risk of accident. As a power assist device user, you are also part of the daily traffic on streets and pavements, just like anyone else. We would like to remind you that you are therefore also subject to any and all traffic laws.

Follow safety instructions carefully. Not paying careful attention to these instructions may result in injury to the user or environment. It may also result in damage to the device. Safety information is provided in this chapter and where relevant throughout the user manual.
Be careful during your first ride with this power assist device. Get to know your power assist device.

⚠ WARNING!

- Exceeding the maximum load can lead to damage to the power assist device, loss of control, or potential injury to the user and other people.
- Exercise caution when using the power assist device. For example, avoid negotiating obstacles such as, steps, curbs, path edges or dropping down gaps without slowing down first.
- This power assist device should be used exclusively to convey one person at a time. Any other use does not comply with the intended purpose.
- Use of the power assist device is only recommended for those who have the right physical and psychological constitution to be able to cope with public traffic.
- Please note that you are subject to any and all traffic laws when riding in public traffic.
- As a beginner, you should ride particularly carefully at first.
- Familiarise yourself with the stopping distances from various speeds.
- Familiarise yourself with the general traffic laws!
- In order to achieve a stable ride when travelling straight ahead, wherever possible, you should avoid hasty steering movements when travelling at speed or going round corners.
- The speed must be adjusted to suit the technical capabilities of the device, terrain and operator.
- Only ride on asphalt paths, or firm, smooth surfaces.
- Use caution when riding over curbs, steps, potholes, etc. as there is an increased risk of tipping over.
- Adjust your method of driving to your capabilities.
- Ride slowly and carefully, particularly when riding round corners.
- Do not touch the motor, because it can get very hot.
- Your power assist device should be serviced by your dealer at regular intervals (minimum every year).
- As with all moving parts, there is a risk that fingers could become trapped. Please always handle carefully.
- If the power assist device is subject to direct sunlight / external heat sources or low temperatures for long periods, parts of your power assist device could become very hot (>41°C) or very cold (<0°).
- The power assist device should not be used in stormy conditions, heavy rain/snow or on slippery or damaged surfaces.
- You should only use product combinations which have been approved by Sunrise Medical.
- **Do not** operate the device when observing abnormal behavior.
- The maximum user weight is 100kg (220 lbs). Exceeding Max user weight will reduce performance, void warranty, and may damage the product.
- Maximum speed is 6 km/h (3.7 mph).
  Note: When travelling on inclines, maximum speed may vary depending on user weight and slope angle.
- During motor vehicle transportation, where the M90 is to be combined with a wheelchair used as a passenger seat in a motor vehicle, the M90 may only be combined with a wheelchair that has the required safety approval to be used as a seat in a motor vehicle.
- The standard version of your power assist device has been tested on the applicable requirements with respect to electromagnetic radiation (EMC requirements) In spite of these tests:
- It cannot be excluded that electromagnetic radiation may have an influence on the power assist device. For example:
  - mobile telephony
  - large-scale medical apparatus
  - other sources of electromagnetic radiation
- It cannot be excluded that the power assist device may interfere with electromagnetic fields. For example:
  - shop doors
  - burglar alarm systems in shops
  - garage door openers

  In the unlikely event that such problems do occur, we request that you notify your dealer immediately.

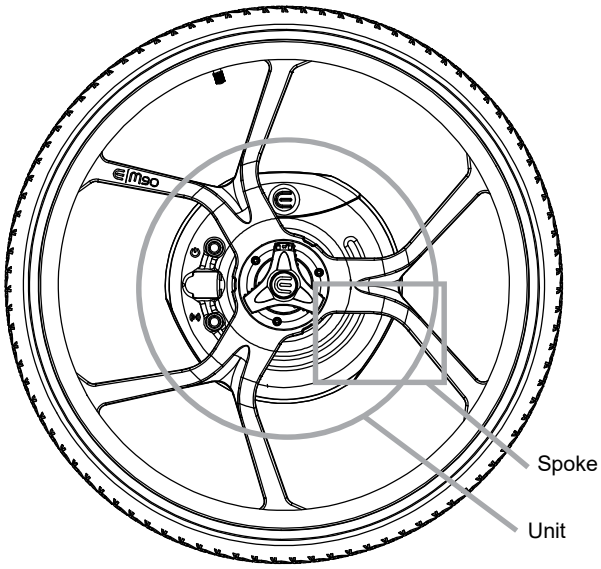
⚠ DANGER!

CHOKING HAZARD – This mobility aid uses small parts which under certain circumstances may present a choking hazard to young children.

NOTE: The power assist devices shown and described in this user guide may not correspond in every detail exactly to your own model. However, all instructions are completely relevant, regardless of possible detail differences. The manufacturer reserves the right to alter without notice any weights, measurements or other technical data shown in this manual. All figures, measurements and capacities shown in this manual are approximate and do not constitute specifications.

The device has moving and rotating parts. Contact with moving parts may result in serious physical injury or damage to the device. Contact with the moving parts of the device should be avoided.

- Spoke: beware of entrapment between spoke and plastic cover
- Unit: beware of entrapment between back-side of unit and wheelchair



Safety instructions – prior to each ride

⚠ CAUTION!

- Check the conditions of your wheels, (including the wheels of your wheelchair) visually, (spokes and rims, damages of tyres) as well as the pressure of the tyres. The correct air pressure is indicated on the tyre.
- Tyre pressure which is too low or too high will have a negative effect on wear and tear, and the driving performance.
- Always check that the tread depth of your tyres is okay.
- Check that all components, especially the bolts, are tight.
- Check the frame and the components of your wheelchair for any damage, (e.g. cracks).
- When attaching the device to the wheelchair, ensure the device is locked in place.
- Ensure that your feet cannot slip off the foot plate of your wheelchair. Use a special fixing tool if necessary.
- Check all cables and electrical connections.
- Check that the battery is installed correctly and fully charged.
- Switch the battery on and check the light.
- Verify there is no unusual vibration in the device. Inspect for any problems. Your Sunrise Medical authorized dealer can help you find and correct the problem(s).

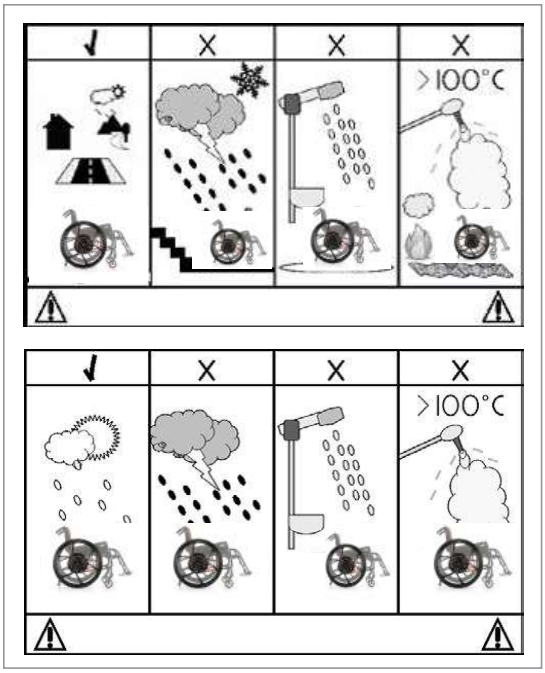
Safety instructions – while driving

⚠ WARNING!

- Make yourself familiar with the device in flat terrain before driving up or down slopes.
- Always adapt your speed to your driving capability and to the traffic - / terrain conditions
- Use particular caution when approaching stairs, edges, drops, or other hazard areas.
- Reduce your speed to walking pace and lean your body inwards, when driving round a bend.
- When driving on pedestrian areas, observe the maximum permitted speed (walking speed).
- Always follow the road traffic regulations when driving on public roads and footpaths.
- Avoid driving on unpaved or loose surfaces (e.g. on loose gravel, in sand, mud, snow, ice, or through deep puddles of water).
- Avoid abrupt steering actions.
- Avoid driving in parallel to slopes.
- Avoid turning on slopes.
- The driving style and speed should be always adjusted so that the device can be safely stopped at all times.
- Towing or using a trailer is not permitted.
- Driving on stairs is not permitted.
- It must be avoided that any wheelchair components or parts of your body get trapped when driving over or passing obstacles. This could result in falls and serious injuries as well as damage to the device.
- When driving on wet surfaces, there is an increase slip hazard because the traction of the tyres is reduced. Adapt your driving style accordingly.

⚠ CAUTION!

- Prevent the device from coming into contact with both sea water and road salt during operation, transportation, or storage: sea water and road salt are caustic and may damage the device.
- Prevent the device from coming into contact with sand: sand can permeate into the moving parts of the device, causing extensive wear on these parts.
- Do not use the device if temperatures are outside the range listed in Section 16.0 Technical Data.
- Do not push and/or tow any objects with the device.
- Do not drive through puddles of water.
- Never take your device into a shower, tub, pool, or sauna.
- Dry the device as soon as you can if it gets wet, or if you use water to clean it.



Safety instructions - after your ride

- Switch off the device immediately when it is not in use to avoid accidental operation / movements.
- Switching off helps to preserve the battery charge.

2.0 Warranty

YOUR LEGAL RIGHTS ARE NOT LIMITED BY THIS GUARANTEE.
Sunrise Medical* provides a guarantee, as set out in the warranty conditions, for wheelchairs to its customers covering the following.

Warranty conditions:

1. If a part or parts of the power assist device require repair or exchange as a consequence of a manufacturing defect within 24 months after delivery to the purchaser, then the affected part or parts will be repaired or replaced for free. The warranty will only cover manufacturing defects.

2. To enforce the warranty, please contact the supplier of your device – e.g. the Sunrise Medical Approved dealership or Healthcare provider with the exact details of the nature of the difficulty. Should you be using the device outside the area covered by the Sunrise Medical customer service agent, repairs or replacement will be carried out by another agency as designated by the manufacturer. The device must be repaired by a customer service centre/ dealer designated by Sunrise Medical.

3. For parts, which have been repaired or exchanged within the scope of this warranty, we provide a warranty in accordance with these warranty conditions for the remaining warranty period for the device in accordance with point 1).

4. For original spare parts which have been fitted at the customer's expense, these will have a 12 months guarantee, (following the fitting), in accordance with these warranty conditions.

5. Claims from this warranty shall not arise, if a repair or replacement of a product or a part is required for the following reasons:

   a. Normal wear and tear, which include batteries, armrest pads, upholstery, tyres, brakes shoes, etc.

   b. Any overloading of the product, please check the EC label for maximum user weight.

   c. The product or part has not been maintained or serviced in accordance with the manufacturer's recommendations as shown in the user instructions and/or the service instructions.

   d. Accessories have been used which are not specified as original accessories.

   e. The product or part having been damaged by neglect, accident or improper use.

   f. Changes/modifications have been made to the product or parts, which deviate from the manufacturer's specifications.

   g. Repairs have been carried out, before our Customer Service has been informed of the circumstances.

6. This guarantee is subject to the law of the country in which the Sunrise Medical product was purchased.

* Means the Sunrise Medical facility from which the product was purchased.

Liability:
If the power assist device:

- Is handled improperly
- Is not maintained in accordance with the maintenance schedule
- Is commissioned and used contrary to the instructions in this manual
- Has had repairs or other works carried out by non-authorised persons, or third-party parts installed or connected without prior agreement with Sunrise Medical,

then Sunrise Medical is not responsible for the safety of the power assist device.

3.0 Handling

Delivery:
Your new power assist device is delivered fully assembled in a cardboard box. In order to avoid any damage during transportation, loose parts or parts to be fitted, are packed separately in the cardboard box.

Unpacking:
- Check the shipping cardboard box for external damage which may have been caused during transportation.
- Remove all packaging material.
- Take the power assist device carefully out of the box and check that it is complete.
- Check all parts for surface damage, scratches, cracks, dents, distortions and other defects.

NOTE: Should you find any damage, or if any parts are missing please let us know immediately.

⚠ **CAUTION!**

- The power assist device must be handed over ready to use from Sunrise Medical or an authorised Sunrise Medical dealer.
- Before using for the first time, the battery should be fully charged.

NOTE:
- Wherever torque settings are specified, it is strongly recommended that a torque meter (not included), is used to verify correct torque specification is achieved.

⚠ **CAUTION:**
- Some of the screws that are used in manufacture have a thread lock (blue dot on the threads) and can be used up to three times, then they must be replaced by new screws with thread lock. Alternatively, you can put Loctite™ 243. Apply threadlock to the screws and re-fit them.

Storage:
The power assist device should always be stored in an environment with low humidity, on an easy to clean surface.

Transport:
It is allowed to transport the user in the wheelchair with the M90 docked in a car. The device is tested and approved according to ISO 7176-19. It is therefore allowed to transport the user in the wheelchair with the M90 docked in a car. The M90 device must be paired with a wheelchair device that has been tested to according to ISO 7176-19:2022.

⚠ **WARNING!**

- The product and all its components must be secured during transport so that they are not damaged (e.g. by falling over) and do not become any risk to other people.

4.0 Intended use of the device

4.1 Indications for Use

The Empulse M90 is intended to be used to provide power assistance to manual wheelchair users who are limited in their field of activities because of their physical conditions. It is designed to augment or replace the manual propulsion provided by the user, reducing the effort required by the user to propel the wheelchair.

4.1.1 Intended Use

Choosing the best device for your unique mobility needs will depend on such things as:

1. Your disability, grasping strength, balance, and coordination.
2. The types of hazards you must overcome in daily use (where you live and work, and other places you are likely to use your device).

The M90 is a wheel add-on power assist device intended to provide electronic power to manual wheelchairs through retrofitted wheels. The M90 is intended for slopes up to 6 degrees. The device is designed for active wheelchair users who have adequate cognitive and physical ability to safely operate the wheelchair with the M90 attached. This extends to being competent in all possible conditions, while also having the ability to manually stop and slow the wheelchair down in the event of the M90 electronic brakes failing.

4.1.2 Dimensions

The Empulse M90 is retrofittable to existing wheelchairs. Retrofitting your wheelchair with the M90 in most cases will not change the dimensions of your wheelchair. In rare cases, it may increase the total width of your chair by up to 50mm.

The M90 will add a total of 10.6kg to the weight of your wheelchair. *Measurement excluding battery and charging component weight.

The turning circle of the M90 is dependent on the specific wheelchair the M90 has been retrofitted to.

Wheelchair 24 System (Wheel assembly x2)
- Size: 610 x 99.35mm
- Weight: 5.3 kg
- Material: Aluminum PC Black/ABS

Wheelchair Axle 0.5 Inch Assembly (QR Axle x2)
- Size (overall): 143.50 x 28 mm
- Weight: 0.11 kg
- Material: Aluminum PC Black/Stainless steel

Battery Assembly (Battery x2)
- Size (overall): 164 x 68 x 66 mm
- Weight: 0.6 kg (individual)
- Material: ABS

Joystick Assembly (Control unit x1)
- Size (overall w/ standard handle): 135 x 79 x 60 mm
- Size (overall w/ Toggle): 135 x 52 x 60 mm
- Weight: 0.17 kg
- Material: ABS/ TPE

Dock Leg Assembly (Leg strap dock x1)
- Size (overall excluding strap): 24 x 67 x 111 mm
- Weight: 0.04 kg
- Material: ABS

Dock Arm Rest Assembly (Fix-to-arm dock x1)
- Size (overall): 24 x 67 x 111 mm
- Weight: 0.04 kg
- Material: ABS

Charging Dock Assembly (Charging dock x1)
- Size (overall): 43 x 176 x 181 mm
- Weight: 0.45 kg
- Material: ABS

Power Supply Assembly (Wheel battery charger x1)
- Size: 180 mm x 65 diameter (diameter)
- Weight: .75 kg
- Material: PC/ PVC

Joystick Charger (Control unit charging cable x1)
- Size: 80 mm x 25 diameter (diameter)
- Weight: 0.025 kg
- Material: PVC

4.1.3 Curb Height

The Empulse M90 will not affect the curb height that the retrofitted wheelchair could previously climb.

4.1.4 Tuning Parameters

The Empulse M90 has several parameters that can be tuned. The tuning parameters are to be set in conjunction with a Sunrise Medical authorized dealer.

Note: A user must be instructed in handling and operating the device before use. A training session should be arranged through a Sunrise Medical authorized dealer.

Note: If the operator is likely to deteriorate further due to their condition, this needs to be handled very carefully. Further mitigation requires the operator to gain access to a caregiver, such that they are no longer an operator and are instead an occupant. Thus, it is critical for the operator to have professional recommendation regarding their ability to operate the M90, inclusive of how to manage potential future risks that their condition may introduce over time.

The maximum user weight shall not exceed:

Max User weight is 100kg.

⚠ WARNING!

Exceeding Max user weight will reduce performance, damage the product, and void warranty. Use of any unauthorised features will void warranty.

Note: Exceeding the weight limit will void warranty.

4.1.5 Maintenance

The M90 is to be taken to a Sunrise Medical authorized dealer for maintenance and service once per year. This guideline interval may vary with the product's degree of utilization and the behavior of a user. Ultimately, the degree of use and user behavior is the responsibility of the operator, and therefore the need for maintenance should be assessed accordingly.

4.2 Area of Application: Attendants

Before you assist a user, ensure you read all warnings contained in this manual, and follow all instructions that apply. Be aware that after consulting a health care provider, you will need to learn safe and proven body mechanics to use and create assistive methods best suited to your abilities. An attendant may only assist a user when the M90 is in Free-roll mode.

Note: Do not attempt to push a user while the electronic braking is on.

4.3 Area of Application: User

Before using the device ensure you read all warnings contained in this manual and follow the instructions that apply. Be aware that after consulting a health care provider, you will need to learn safe and proven body mechanics to use and create assistive methods best suited to your abilities. Drive within one's own ability when in Free-roll mode. Take caution as there is added weight compared to the user's traditional system.

There will always be circumstances that will result in the M90 experiencing failure. Excessive drops, rough outdoor terrain, sand etc. are not to be attempted via the M90. The M90 is designed to accommodate foreseeable misuse within the scope of a class A wheelchair. Wheelchairs are intended for driving on flat horizontal surfaces and gentle slopes.

The drive pin is not to be disengaged in usual operation. However, in the event of an emergency, or need to revert to manual wheelchair control, the drive pin can be disengaged via the engagement cam. Use the emergency stop facility to stop/prevent erratic or unexpected behavior. (Fig. 4.1)

There are general wear components such as tyres, operating elements (e.g., handles), or batteries (e.g., bearings and belts) used in the M90. Safe operation requires prescribed 1-year interval servicing by a Sunrise Medical authorized dealer to maintain general wear components.

4.3.1 Safety: Wheels

⚠ WARNING!

Only tyres provided by a Sunrise Medical authorized dealer are to be used on the device. Other types of tyres are prohibited. If you have a punctured tyre, please contact a Sunrise Medical authorized dealer.

Statistics in this owner's manual refer to testing conducted using pneumatic tyres. Statistics stated will differ when using alternative tyres. This must be taken into consideration.

4.3.2 Safety: Anti-tip Wheels

⚠ WARNING!

1. It is recommended to not use M90 without anti-tippers. The anti-tip device is important for your safety and prevents you from tipping backwards in case of high acceleration on a steep slope.
2. If the anti-tip blocks other parts of your own wheelchair, please contact your Sunrise Medical authorized dealer. Consult your clinician for an assessment of individual capability to use device without anti-tippers.

4.3.3 Safety: Stopping Distance

⚠ WARNING!

Stopping distance on slopes can be significantly greater than on level ground. Reduce speed and take caution when travelling down hill.

4.3.4 Safety: Sudden Stop

⚠ WARNING!

1. The device may stop suddenly when exceeding load capacity.
2. The wheelchair may stop suddenly when exceeding maximum slope rating, exceeding weight limit, on rough terrain, or prevailing drive conditions.

4.3.5 Safety: Caster Wheels

⚠ WARNING!

Using the M90 on wet grass, without an adequately prescribed caster wheel, may affect performance and create risk of tip-over.

4.3.6 Safety: Quick Release Axle

⚠ WARNING!

Before each use of your device, ensure the M90 is locked in by the quick release axles. Do this by attempting to remove the M90 without pressing the axle button.

Note: Only use an original equipment QR axle or a QR axle prescribed by a Sunrise Medical authorized dealer. Failure to do so may result in damage to person, environment, or device.

4.3.7 Safety: Pairing

⚠ WARNING!

Each M90 is paired to a single control unit. Do not attempt to pair your control unit with another user's set of wheels. If your control unit is damaged or lost, please contact a Sunrise Medical authorized dealer

4.3.8 Safety: Tampering

⚠ WARNING!

DO NOT attempt to open the M90. The removal of tamper proof and/or compliance labels will result in voided warranty. Tampering with your device may result in damage to person, environment, or device.

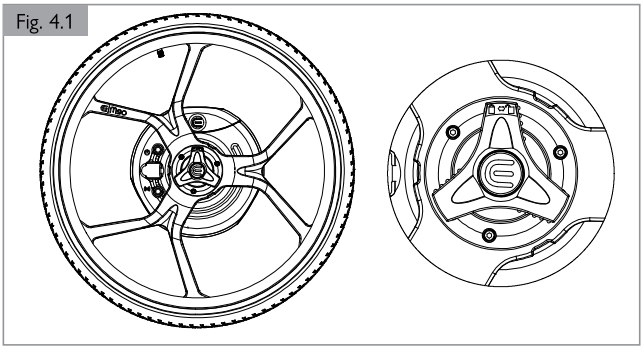
4.3.9 Safety: Engagement Switch

⚠ WARNING!

Note: The M90 can be placed in Free-roll mode at any time by rotating both engagement switches. Use engagement switches to switch into Free-roll mode if the M90 is unresponsive. (Fig. 4.1)

The engagement switch should be re-engaged before the occupant is left unattended or attempts to operate the wheelchair.

Fig. 4.1



4.3.10 Safety: Pinch Points

⚠ WARNING!

Beware of pinch points. The device has several moving parts. Beware of pinch points between the spokes and device hub. Also be aware of pinch points between spokes and the wheelchair.
NOTE: Ensure the device is switched off when removing batteries to avoid potential pinch points.

4.3.11 Safety and Security: Contraindications

⚠ WARNING!

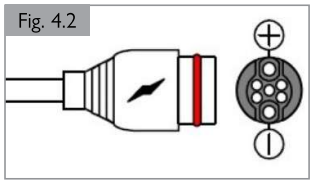
1. If you are under the influence of medicines that can have an effect on your ability to operate the device, you are not permitted to use the device.
2. Adequate vision is required in order to safely operate the device in the user situation concerned.
3. Not more than one person at a time can use the device.
4. Do not allow children to use the device unsupervised.
5. The Control Unit dock, Left hand side M90 Wheelchair Bracket, power supply plug and charging sockets in wheels and charging dock contain permanent magnets. These elements of the device must not come within 152mm of other magnetically susceptible medical devices.
6. Ensure device is kept out of reach of unauthorized individuals. Ensure only the devices contained in M90 System View are connected to the device.
7. Do not allow unauthorized updates of medical device firmware to be installed on the M90. Only use the OTA updating mode when in an isolated space away from other devices.

4.3.12 Safety: Charging Connector Pin Assignment

⚠ WARNING!

Connector pin assignment is directed by magnets in the charging socket and power supply. (Fig. 4.2)

Fig. 4.2



4.4 Area of Application: Environment

⚠ WARNING!

This device has been designed to accommodate indoors and outdoors; care facilities and private residences. When operating the device outdoors, drive only on paved roads, pavements, footpaths, and bicycle paths. Do not operate on loose, rocky, grass, rough, or wet surfaces, or near cliffs or sudden terrain or ground elevation changes, including adjacent to open water. This could cause a loss of traction or stability resulting in damage to the device, loss of control, and put the user at risk of a fall or tip-over. The speed must be adapted to suit the environment.

Reduce speed when cornering and/or cornering on a slope. Reduce speed when a clear path is not visible to avoid unforeseen obstacles. Maintain perspective of upcoming surface terrain. Avoid parking close to a hazard. Therefore, inadvertently bumping the control unit will not put the user at risk.

NOTE: Avoid using the Outdoor profile in confined or inappropriate areas.

4.4.1 Safety: Temperature Range

4.4.1.1 Wheel

- Optimal Temperature: 0 to 30°C
- Minimum Temperature: –10°C
- Maximum Temperature: 40°C

⚠ WARNING!

Note: Operating at greater than 30°C may have adverse effects on motor performance including overheating. Less than 0°C may have adverse effects on battery performance, with more frequent charging required.

4.4.1.2 Battery

- Operating Temperature Range: 0 to 55° C

⚠ WARNING!

Do not use the battery outside of the operating range. This will have adverse effects on performance and may cause damage.

4.4.2 Safety: Ground Type

⚠ WARNING!

Avoid using the M90 on soft ground such as loose chips, gravel, mud, ice, wet grass, sand, snow, or deep puddles. Such conditions may affect performance and may result in wheelchair toppling over. Do not attempt to traverse debris. Maintain awareness of gaps in terrain. Maintain consistent terrain under all wheels. Avoid terrain near cliffs or other significant ground elevation changes, including adjacency to open water, all of which reduce the user's ability to take mitigating actions in case of unforeseen events or malfunction.

4.4.3 Safety: Maximum Slope

⚠ WARNING!

Tested to 6° slopes. Reduce speed when commencing or traversing a downward slope.

NOTE: Performance tested at minimum speed setting of 1.5Km/h.

NOTE: When travelling downhill the maximum speed will be electronically limited for safety depending on the gradient of the hill. If user wishes to travel faster, device can be switched into manual mode.

4.4.4 Safety: Weather Conditions

⚠ WARNING!

1. Adapt wheelchair speed for wet ground conditions – wet wheels may affect grip and result in slipping. Adapt driving behavior accordingly and never drive with worn tyres. Reduce speed in wet conditions.
2. Use caution when operating push rims in wet weather. Account for loss of grip by using adherent gloves or using the control unit instead.

4.4.5 Safety: Escalators or Moving Walkways

⚠ WARNING!

Do not use the M90 on escalators or moving walkways.

4.4.6 Safety: Railroads and Tram Tracks

⚠ WARNING!

Please take caution when traveling around and/or over railroads or tram tracks.

4.4.7 Safety: Water Ingress

⚠ WARNING!

1. Do not submerge wheels under water. The M90 is Ingress Protection rated 64, dust tight and water splashes from any angle. It is not designed for any further liquid ingress including sea water, temporary submersion, or permanent submersion.
2. The M90 may deteriorate quicker when not stored appropriately in a dark, dry, and protected location.

4.4.8 Safety: Sunlight

⚠ WARNING!

When not in use, do not expose M90 to strong sunlight for long periods of time. This could cause the motor to heat up and not be able to operate at full power. The push rim or chassis will become too hot to use and potentially burn the user. The materials of the device may also discolor and deteriorate quicker when not stored appropriately in a dark, dry, and protected location.

4.4.9 Safety: Tyre Pressure

⚠ WARNING!

1. Ensure that tyres maintain recommended pressure, which is between 586-1000 Kpa.
2. Operating the device on rough or abrasive surfaces may lead to a loss of tyre pressure, potentially causing unintended movement. Additionally, overinflating the tyres beyond the recommended pressure can negatively impact control of the device.

NOTE: Users should follow the tyre specifications printed on the tyres. Some riders may choose to use their own tyres.

4.4.10 Safety: Obstacles

⚠ WARNING!

Do not attempt to overcome obstacles you are not experienced in or have trouble when traversing with a manual wheelchair. Always be aware of upcoming terrain.

NOTE: You can switch to free-roll mode to overcome obstacles in the same fashion as a manual wheelchair.

4.4.11 Safety: Public Transport

⚠ WARNING!

When using public transport, please follow procedures outlined by the public transportation staff and markings on how to safely commute.

NOTE: Failure to follow instructions may result in damage to person, environment, or device.

4.4.12 Safety: Unattended Chair

⚠ WARNING!

Do not leave your chair unattended around children or public places. Your chair may be designed for an adult user. A child is not trained in operating the chair and may cause damage to person, environment, or device.

4.4.13 Safety: Choking Hazard

⚠ WARNING!

This mobility aid uses small parts which under certain circumstances may present a choking hazard to young children.

4.4.14 Safety: Lifting the device

⚠ WARNING!

Lift the device only when disassembled. Lifting the device when assembled may damage the device or cause injury to the user.

4.4.15 Safety: Electromagnetic radiation

⚠ WARNING!

Heed all warnings to reduce the risk of unintended movement:

1. Beware of the danger from hand-held transceivers. Never turn on or use a hand-held transceiver while power to your device is on. Use extra care if you believe that such a device may be in use near your device.
2. Be aware of nearby radio or TV stations, and avoid coming close to them.
3. If unintended movement occurs, turn your device off as soon as it is safe to do so.

4.4.15.1 Safety: What is EMI?

⚠ WARNING!

1. EMI means: electromagnetic (EM) interference (I). EMI comes from radio wave sources such as radio transmitters and transceivers. (A “transceiver” is a device that both sends and receives radio wave signals).
2. There are a number of sources of intense EMI in your daily environment. Some of these are obvious and easy to avoid. Others are not, and you may not be able to avoid them.
3. Your device may be susceptible to Electromagnetic interference (EMI) emitted from sources such as radio stations, TV stations, amateur radio (HAM) transmitters, two-way radios, and cellular phones.
4. EMI can also be produced by conducted sources or electrostatic discharge (ESD).

4.4.15.2 Safety: What effect can EMI have?

⚠ WARNING!

EMI can cause your device, without warning, to move by itself. If this occurs, it could result in severe injury to you or others. EMI can damage your device. This could create a safety hazard, and lead to costly repairs.

4.4.15.3 Safety: Sources of EMI

⚠ WARNING!

The sources of EMI fall into three broad types:

1. Hand-Held Transceivers:
   The antenna is usually mounted directly on the unit.
   These include:
   a. Citizens band (CB) radios
   b. “Walkie-talkies”
   c. Security, fire, and police radios
   d. Mobile phones
   e. Lap-top computers with phone or fax
   f. Other personal communication devices
   g. Electronic article surveillance systems

NOTE: These devices can transmit signals while they are on, even if not in use.

2. Medium-Range Mobile Transceivers: These include two-way radios used in police cars, fire trucks, ambulances, and taxi cabs. The antenna is usually mounted on the outside of the vehicle.
3. Long-Range Transceivers: These include commercial radio and TV broadcast antenna towers and amateur (HAM) radios.

NOTE - The following are not likely to cause EMI problems: Lap-top computers (without phone or fax), cordless phones, TV sets or AM/FM radios, CD, or tape players.

4.4.15.4 Safety: MR unsafe

⚠ WARNING! 

Device poses unacceptable risks to the patient, medical staff, or other persons within a MR environment.

4.4.15.5 Distance from the source

⚠ WARNING!

Electro-magnetic energy rapidly becomes more intense as you get closer to the source. For this reason, EMI from hand-held devices is of special concern. A person using one of these devices can bring high levels of EM energy very close to your device without you knowing it.

4.4.15.6 Immunity level

⚠ WARNING!

1. The level of EM is measured in volts per meter (V/m). Every power assist device can resist EMI up to a certain level. This is called its “immunity level”.
2. The higher the immunity level, the less the risk of EMI. It is believed that a 20 V/m immunity level will protect the device user from the more common sources of radio waves.
3. The common configuration tested and found to be immune to at least 20 V/m is: M90 mounted to a Manual Wheelchair using lithium ion batteries.

⚠ WARNING!

If there is any doubt that the device is not immune to 20V/m, extra care should be taken around known sources of EMI.

⚠ WARNING!

There is no way to know the effect on EMI if you add accessories or modify the chair your device is mounted to. Any change to your chair may increase the risk of EMI. Parts not specifically tested or parts from other suppliers have unknown EMI properties.

4.4.15.7 Report all suspected EMI incidents

⚠ WARNING!

You should promptly report any unintended movement. Be sure to indicate whether there was a radio wave source near your device at the time. Contact: Sunrise Medical, Customer Service Department.

4.4.15.8 EMI from device

⚠ WARNING!

The device itself can disturb the performance of electromagnetic fields such as emitted by alarm systems of shops.

4.4.16 Radio Communication Regulations

The device is compliant to radio communication regulations dictated by the European Union and Australian regulatory bodies, and as such, the device has been formally proven to be safe with respect to radio communications testing and electromagnetic compatibility.

The device is exempt from FCC authorization for use in North America.

4.4.17 Wireless remote control

⚠ WARNING!

1. Your device utilizes wireless remote control to communicate between the Control Unit and the Wheels. It is intended for use in environments that do not have unsatisfactory levels of EMI, as noted above. Use of the device may be impacted during use in abnormally cramped and/or metallic or ferro-concrete spaces due to signal degradation.
2. Your device wireless connection is range-limited to less than 10 meters (typical, depending on environmental factors) in order to localize control. Do not attempt control of your device when not in close proximity to it, otherwise unpredictable results may arise.
3. You should promptly report any poor wireless remote control performance. Be sure to indicate whether there was a radio wave source near your device at the time, and describe the surrounding environment's composition. Contact: Sunrise Medical, Customer Service Department.

4.4.17.1 Wireless operating modes

⚠ WARNING!

The M90 can only be operated when the wireless controller is connected. While the controller is charging, the unit cannot be driven.

4.4.17.2 Wireless connection and security

⚠ WARNING!

1. Connection of your device to other wireless systems is not supported. Industry-standard security measures are applied to prevent other system types and users of other similar devices access to your device.
2. Your device does not store any personal/patient data. Any data stored is purely device performance related and is anonymous in nature.

4.4.17.3 Wireless risks and performance

⚠ WARNING!

1. Your device includes an industry-standard radio system configured with a robust data exchange algorithm to enhance reliability and responsiveness of the remote control when driving. If degradation of this remote control occurs, protective mechanisms are in place to help ensure that the device maintains personal safety. Such mechanisms include signal strength monitoring, data corruption detection, and command timeouts.
2. You should promptly report any poor wireless control unit performance. Be sure to indicate whether there was a radio wave source near your device at the time, and describe the surrounding environment's composition. Contact: Sunrise Medical, Customer Service Department.

4.4.17.4 Software update process

1. Download Sunrise Medical Application on the applicable app store.
2. Turn on your device. Ensure the wheels have batteries inserted. Press the horn to ensure your device is turned on. Ensure batteries are fully charged.
3. Place device in OTA (Over The Air) mode by holding the profile button and clicking and holding down the toggle for five seconds. OTA mode is indicated by a flashing cyan Control Unit Status LED.
4. Use the application to find your wheels. Pair and begin the update process.
5. Once update is confirmed by the application, remove and re-insert batteries to hard reset the device.
6. Ensure Control Unit is powered off and on after this process is complete.

Note: Please contact your Sunrise Medical authorized dealer for any assistance with this process.

4.4.18 Safety: Power Supply

⚠ WARNING!

Use power supply in dry locations only.

4.4.19 Safety: Charging

⚠ WARNING!

1. Explosive gases can be generated while charging. Remove all components away from sources of ignition such as flames and sparks.
2. Charging is carried out with the wheelchair in a space at least twice its volume with sufficient ventilation so that there is no hazard due to build-up of flammable gas.
3. Do not carry the power supply on wheelchairs.

5.0. Description of the device

M90 Components

- 2x Wheels
- 2x Wheel Batteries
- 1x Control Unit
- 1x Power Supply and Charging Cables for Wheel Batteries
- 1x Control Unit Charging Cable
- 2x Control Unit Mounts
- 2x Quick Release Axles
- 1x Retrofitting Kit
- 1x Owner's Manual
- 1x Battery Docking Charger

Fig. 5.1

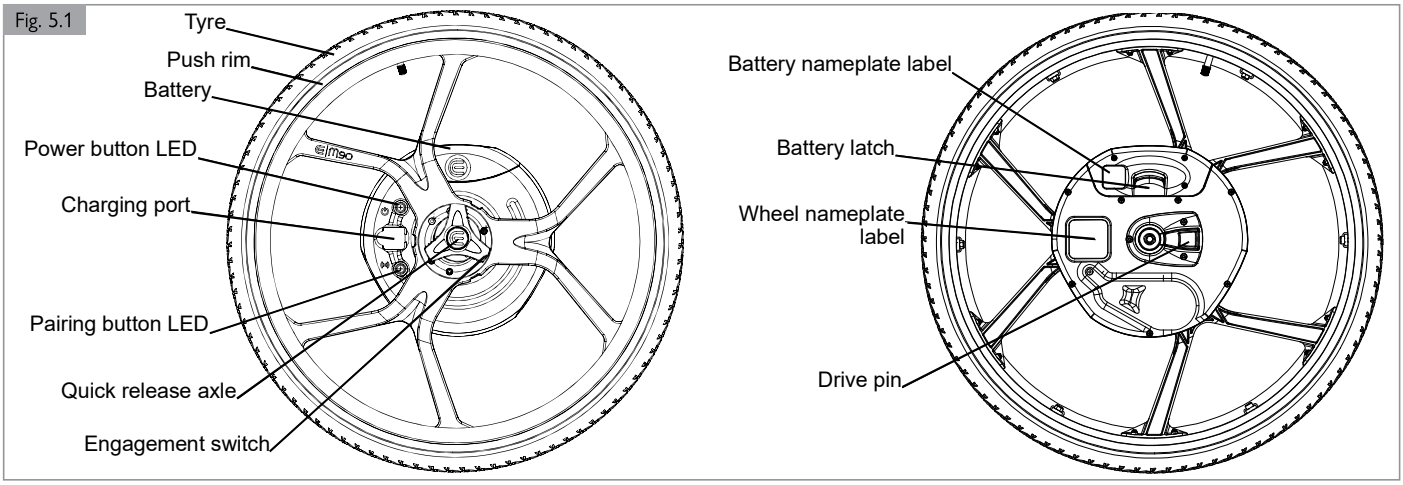


Fig. 5.2

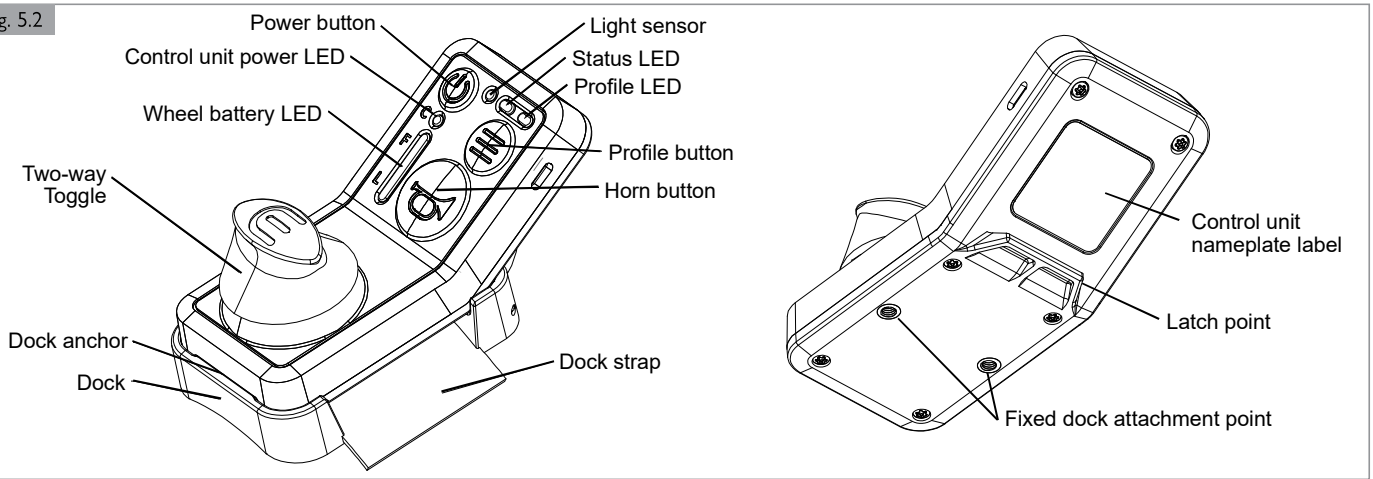


Fig. 5.3

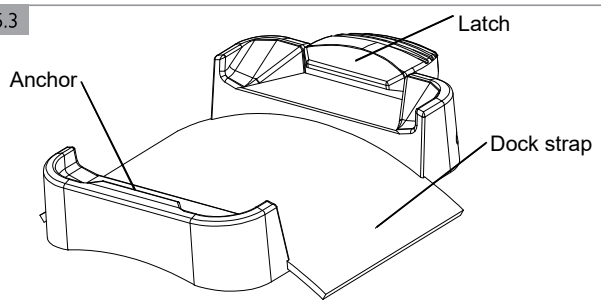
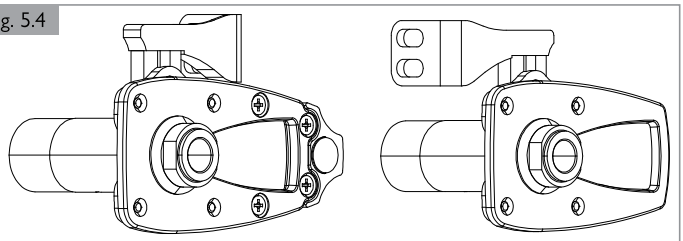
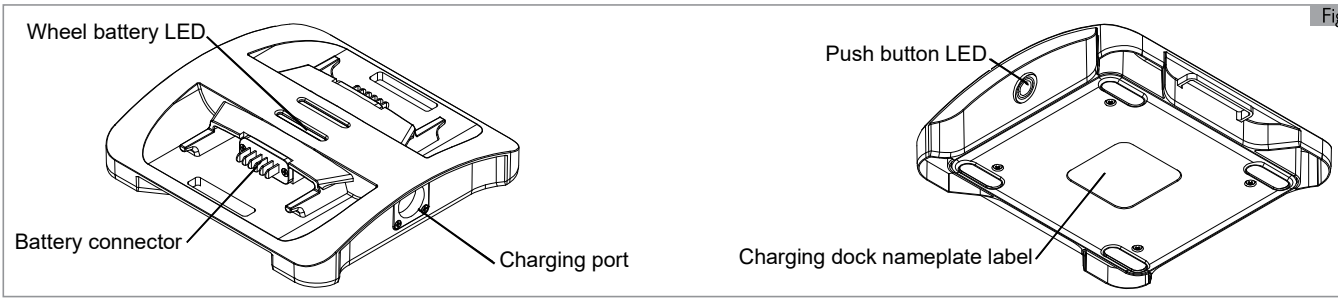


Fig. 5.4



Note: Depending on chair model the M90 brackets may look different than the one pictured.

Fig. 5.5



* Included but not pictured M90 control unit charging cables, M90 battery power supply, and power supply cable.

6.0. Inspection of the device

Prior to operating the Empulse M90, please conduct a thorough inspection of the device for safety:

6.1 Check Clothing Entrapment

When operating the device, please ensure that your clothing does not hamper the device (i.e. too long). Before use, always ensure your clothing or accessories do not come into contact with the wheels or other moving and/or rotating parts in which they could become entangled.

⚠ WARNING!

Potential clothing entrapment.

6.2 Check Wheelchair Brackets

Check wheelchair brackets are firmly in place on the wheelchair. See Chapter 7 for reference on how the bracket is secured to the chair.

Ensure the magnet on the left-hand-side bracket is free of debris.

6.3 Check Wheelchair Brakes

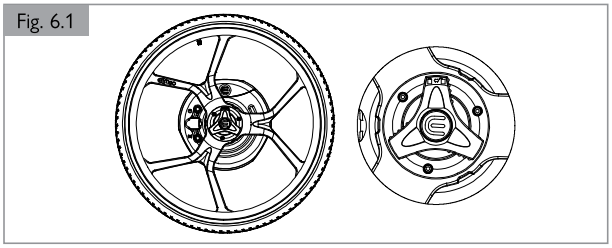
Check manual wheelchair brakes are free of debris and are functioning correctly.

6.4 Check for Foreign Objects

⚠ WARNING!

Check for foreign objects in/around the M90. Ensure the battery, quick wheel release/engagement cam and spokes are free of debris. (Fig. 6.1)

Fig. 6.1



6.5 Check Tyres

⚠ WARNING!

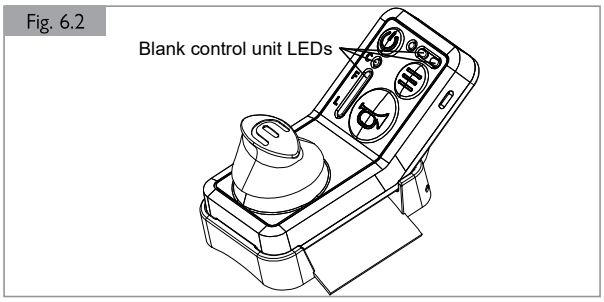
1. Check the air pressure in the tyre is inflated to between 586-1000 Kpa.
2. Schwalbe RightRun Plus Tyres: Puncture resistance is maximized when the wheel is vertical and diminishes with the amount of camber.
3. It is recommended to use an automatic pump for tyres to avoid injury.
4. Check tyre wear. If tyre is overly worn and/or there is a loss of traction, then replacement of the device tyre is recommended.
5. Follow the specification on the tyre if you have replaced or are using non-stock tyres.

6.6 Check Control Status

⚠ WARNING!

1. Check the device is switched off and the wheelchair brakes are engaged before entering or exiting the wheelchair.
2. Ensure the control unit LEDs are blank. (Fig. 6.2)

Fig. 6.2



6.7 Inspection: Batteries

⚠ WARNING!

1. Check that the batteries are sufficiently charged for operation. Before using your device for the first time, charge your batteries for a period of 24 hours. Full charge on the wheel batteries is indicated by two solid purple LEDs. Full charge on the control unit is indicated by the control unit power LED displaying a solid purple light.
2. Sunrise Medical can provide additional or replacement batteries if required. Contact your Sunrise Medical authorised dealer if another battery is required.
3. Refer to chapters 11 and 13 for the proper care, use, and maintenance of the battery and charger.
4. See Chapter 4, section 4.4 for battery warnings.

6.8 Inspection: Function

Check there are no cracks or functional faults on device.

6.9 Inspection: Control Unit

⚠ WARNING!

Check control unit can freely move and is free of debris. If control unit is jammed or unable to adjust, the device may move unpredictability resulting in damage to person, environment, or device.

7.0. M90 Mounting setup

All setup of the M90 is to be carried out by a Sunrise Medical authorized dealer.
NOTE: When setting up the bracket, the installer must consider the added weight to the chair and if the wheel position requires adjustment.

Users should refer to the packaging their M90 brackets came in for instructions or use the link below:
Link: www.SunriseMedical.com

7.1 M90 Bracket

⚠ WARNING!

A M90 bracket must be attached to your chair by a Sunrise Medical authorized dealer. It is the interface between the M90 and your wheelchair. It allows you to use both the M90 and your traditional wheels.

NOTE: Your personal wheelchair must be matched to a specific corresponding M90 bracket. If a M90 bracket is not available through your dealer, inquire about ordering a custom M90 bracket (fees may apply).

Section 7.1 provides an example of a M90 bracket being installed on a Quickie Nitrum.

7.1.1 Quickie Nitrum with Anti-tip Mounting Instruction

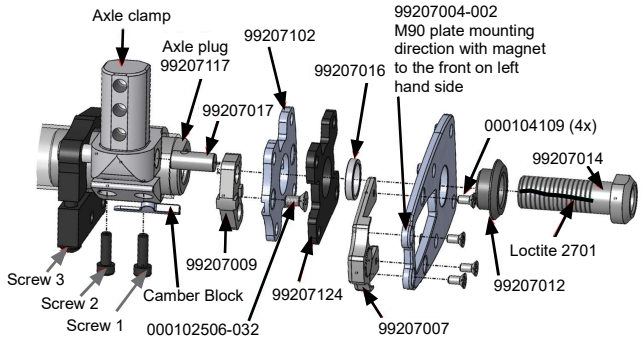
NOTE: The M90 bracket with magnet must be on the left side when assembled.

NOTE: Components seen in Figure 7.1 are specific to the Quickie Nitrum wheelchair. Although similar parts are used across different brackets, it is important to always use the correct parts for each specific chair.

NOTE: Not all M90 brackets require the axle sleeve to be disassembled.

1. To remove, loosen screw easily 1+2 from Axle Clamp and screw 3 from Anti Tip Holder, remove existing Axle Plug, to replace by part 99207117. (Fig 7.1)
2. Replace existing inside mounted short round nut and replace with longer one P/N 99207017. (Fig 7.1)
3. Tighten with Screw 1 and Screw 2 on Axle Clamp. Torque screws to 5 Nm. (Fig 7.1)

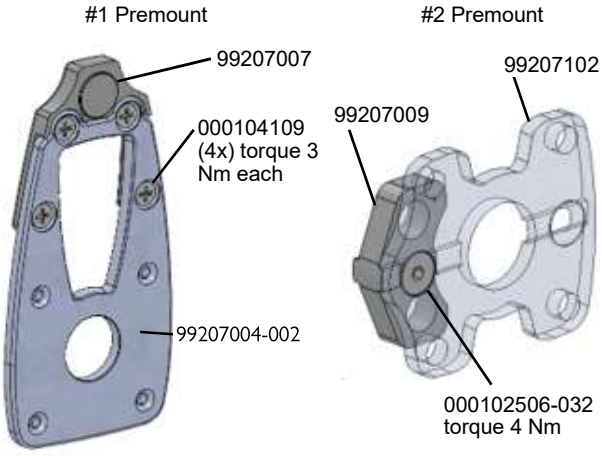
Fig. 7.1



#3 mount with magnet, on chair Left Hand side

4. Assemble premounts #1 and #2. (Fig 7.2)

Fig. 7.2

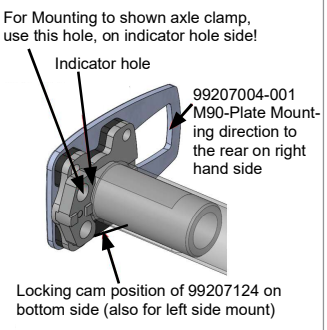


5. Follow mount #3 for the left side of chair, attention to M90-Plate, magnet direction points to the front for part 99207004-002 (Fig 7.1). For mounting support plate, see Fig 7.5.
6. To mount axle sleeve 99207014 with axle plug 99207117, use screw lock (Loctite 2701) along thread and fasten to a torque of 25 Nm.
7. For mount #4 (Fig 7.4), follow mount #3 in the same way, but pay attention to mount M90 Bracket Plate, direction to the rear for part 99207004-001 and on right hand side. For mounting support plate, see Fig 7.5.
8. To mount axle sleeve 99207014 with axle plug 99207117, use screw lock (Loctite 2701) along thread and fasten to a torque of 25 Nm.

NOTE: See the individual work instruction for your chair's M90 bracket hardware torque specifications.

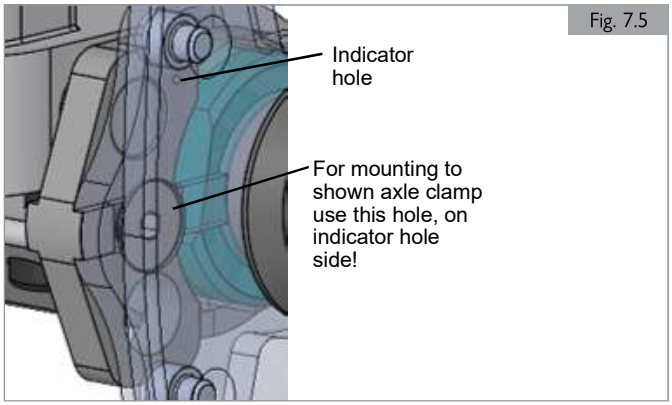
Fig. 7.3

Fig. 7.4



#4 Mount without Magnet, on Chair Right Hand Side

Fig. 7.5

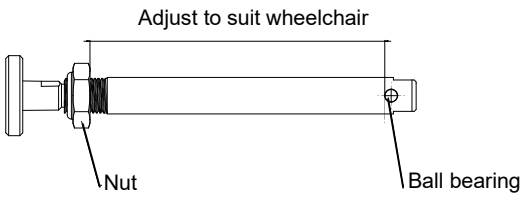


7.1.2 Quick Release Axle Length

Use a size19mm and 11mm spanner to adjust length of QR axle to 10cm. This is measured as the distance from nut to ball bearing. (Fig. 7.6)

NOTE: See the individual work instruction for your chair's QR axle length. Various axle sleeves are used in bracket assemblies.

Fig. 7.6



7.1.3 Wheel Lock Adjustment

Check if wheel locks need adjusting. Wheel locks will need adjusting if adding the M90 adds to wheel width position or there is a change in wheel diameter.

A medically compliant wheel lock must be used and fitted by a Sunrise Medical authorized dealer.

7.2 Device Tuning Parameters

The drive parameters and performance can be adjusted using the TechTool. It is recommended that you consult with your occupational therapist or health care provider to determine the correct settings. Adjustments should be completed by a Sunrise Medical authorized dealer.

⚠ WARNING!

Changing device parameters will affect performance of device.

Features that can be tuned include:

- Maximum speed forward and reverse
- Deceleration Speed (Harder/Softer)
- Acceleration Speed (Harder/Softer)
- Steering (Faster/Slower) in movement and stationary

⚠ WARNING!

Calibration of the Empulse M90 wheels is required after fitting to a new chair, and after any chair configuration changes (including changes to Center of Gravity and Seat Height adjustment).

Contact a Sunrise Medical authorized dealer for Calibration.

8.0 Device set up

8.1 Instructions for use

Follow the steps below to begin using your M90.

NOTE: Before setting up your device, ensure yourself and the chair are in a safe position, on flat ground and using the wheelchair's manual parking brake.

8.1.1 Insert Battery

Insert a battery into each wheel, ensuring it is placed on the interior side of the wheel (Fig. 8.1), and ensuring 'click' of latch is heard (Fig. 8.2).

⚠ WARNING!

1. If the batteries are not 'clicked in' correctly, they may fall out. Double check batteries are inserted correctly.
2. Wheels will be in a sleep state until the control unit is turned on.

Fig. 8.1

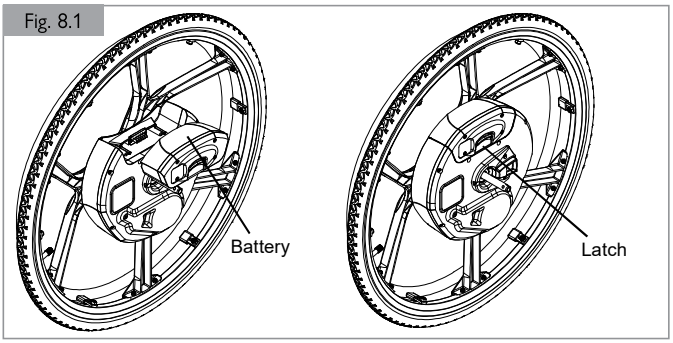
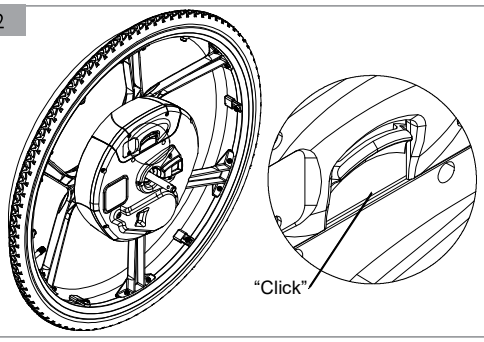


Fig. 8.2



8.1.2 Attach Wheels to Chair

Attach wheels to your chair by sliding the axle into the M90 bracket attached to the chair while pressing down on the M90 axle button.

Ensure quick release axles are correctly engaged by attempting to remove the wheel without pressing the axle button.

The wheels are not Left and Right specific. They will detect a magnet in the LHS M90 bracket and determine left and right once inserted into the chair, and the battery is attached.

If using a controller dock strap continue reading, otherwise skip to step 8.1.4.

If using a fixed wheelchair arm dock, the dock is permanently in place.

8.1.3 Controller Dock

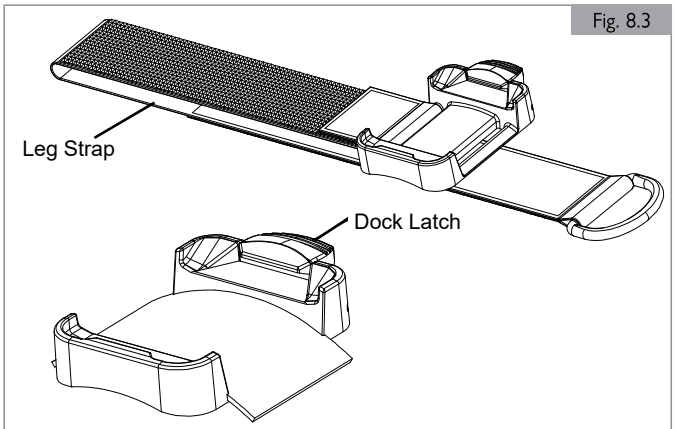
There are two types of docks provided. The Strap Dock, a dock that utilizes a strap to attach to your body and the mounted dock, a dock which utilizes two bolts to attach to a controller mount. See Fig 8.3 for reference.

8.1.3.1 Leg Strap Dock

Strap controller dock to your preferred leg by wrapping the strap around your limb and fastening with the hook and loop fasteners. (Fig. 8.3)

Ensure the strap is NOT wrapped over bare skin. Wrap the strap over clothing.

Fig. 8.3



8.1.3.2 Frame Mounted Dock

This dock is designed to attach the controller to the wheelchair's frame.

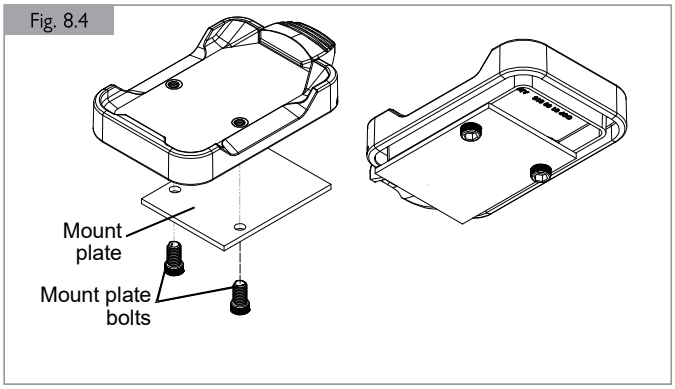
1. Attach the mounting dock to the frame attachment by using the mount plate bolts. Torque to 6.3 Nm. (Fig 8.4)
2. Attach the frame mounting hardware to the wheelchair frame with a 5mm allen wrench.
3. To adjust the angle to the desired location, loosen the two small screws with a 2.5 mm allen wrench. Once aligned to the preferred angle tighten the two screws.
4. Insert the frame attachment into the frame mounting hardware until you feel a click. The mount should be secure but still removable by pulling straight up on controller.
5. Ensure the controller can be easily accessed by the wheelchair user. Adjust the position on the frame as needed.

⚠ WARNING!

Only use the mounted dock on a controller mounting approved by a Sunrise Medical authorized dealer.

Attach the mounted dock by using the mount plate bolts. Torque to 6.3 Nm. (Fig. 8.4)

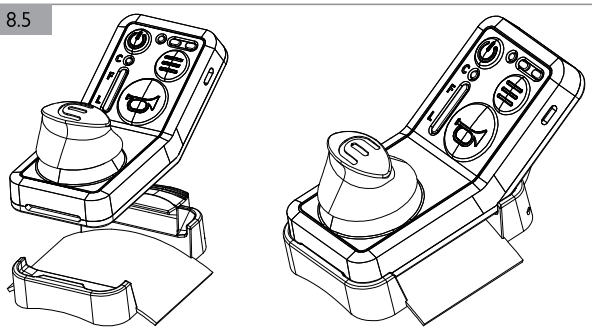
Fig. 8.4



8.1.4 Control Unit

Attach the control unit to the dock by sliding the bottom side of device in first and then lock in place by pushing down on the dock latch to secure the top side of the control unit in place. (Fig. 8.5)

Fig. 8.5

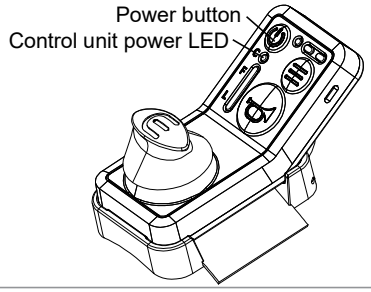


8.1.5 Turn on Control Unit

Turn on control unit: press power button once and a beep will be heard once the controller connects to the wheels. A lit Control Unit power LED will also be displayed. (Fig. 8.6)

- Control Unit Power LED will flash white while connecting. This may take up to 5 seconds.
- Control Unit Power LED will display a solid green light when connected.

Fig. 8.6

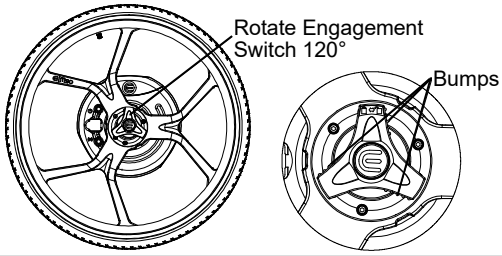


8.1.6 Rotate Engagement Switch

Reach down to each wheel and turn the device into powered mode using the engagement switch. (Fig. 8.7)

- To do this, push against the bumps on the surface of the switch until it stops rotating. The direction of rotation will be opposite for Left hand side and Right hand side wheel.
- The engagement switch should be re-engaged before the occupant is left unattended or attempts to operate the wheelchair.

Fig. 8.7

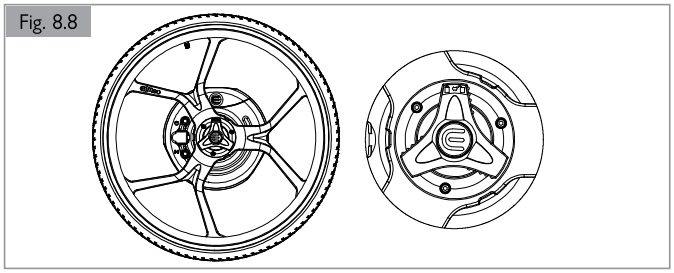


8.1.7 Engage

Push and hold the toggle on the control unit forward and wait until wheelchair registers drive-pin engagement. The control unit status light will turn from white to green when the wheels are locked and engaged. In order to trigger engagement Control LED must be green. Engage remote by pushing power button. (Fig. 8.8)

- If drive pins are engaged, device will go into Indoor profile, if either drive pin is not engaged, device will assume Free-roll mode.
- If not successful in engaging the drive pin, attempt to re-engage by repeating steps 8.1.1- 8.1.7. Both wheels must be engaged for control unit control to be enabled.

Fig. 8.8



8.1.8 Drive and Profile Switching (Fig. 8.9)

Wheels are ready for use in power mode, indicated by a solid green LED displayed on the control unit power and status LEDs.

Drive

When entering Power Mode, the M90 will go into Indoor profile (solid profile LED) by default. To switch to Outdoor profile, press the profile button once (Flashing profile LED).

NOTE: Do not allow the pushing of a chair once the electric brake has been switched on. Pushing the chair while the electric brakes are on may cause damage to the M90.

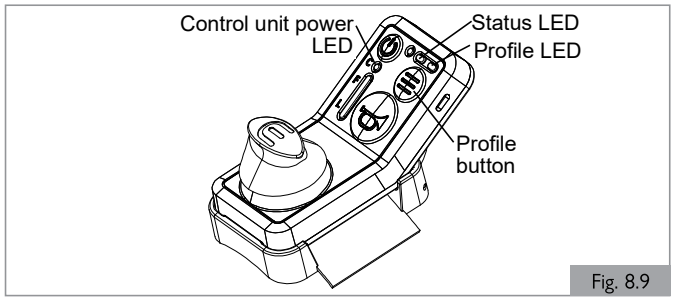


Fig. 8.9

Profile Switching

The M90 has two profiles pre-saved: Indoor and Outdoor. To switch between them, press the profile button. The profile button has three lines and is shown in Figure 8.9.

If the wheels are driven into over-load while in Outdoor profile, the current profile may auto-switch “down” to Indoor profile.

8.1.9 Emergency Brake

In the instance of an emergency, use the emergency brake on the control unit. To apply the emergency brake, press the power button once. This will also disable the control unit. A disabled control unit is shown by a solid white control unit power LED. To remove the emergency brake, press the power button. (Fig. 8.10)

Turning the Control Unit off completely also results in emergency braking.

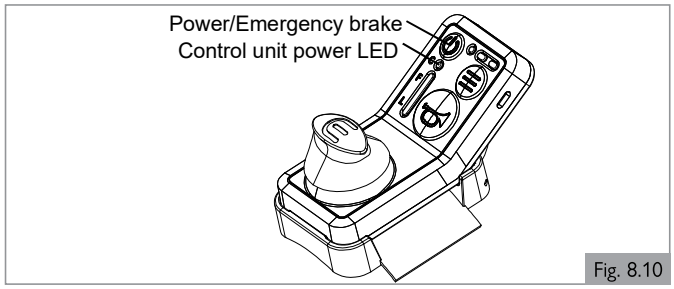


Fig. 8.10

8.2 LED Indications Control Unit and Wheel (Fig. 8.11)

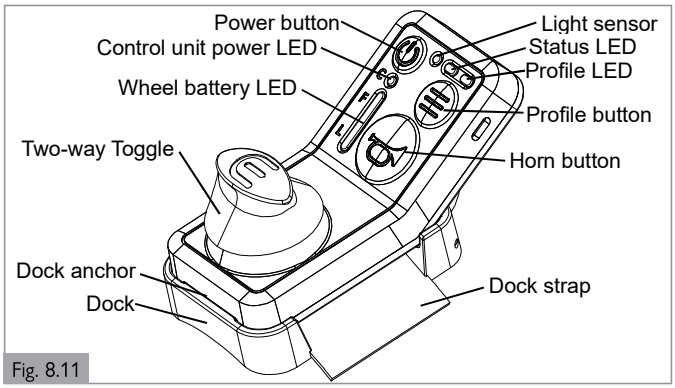


Fig. 8.11

8.2.1 Connected Mode Unlocked: Control Unit

The unlocked control unit status and control unit power LEDs display green. The M90 system is in a 'ready-to-go' state. (Fig. 8.12)

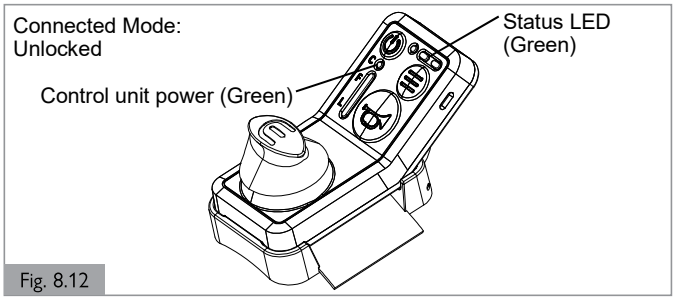


Fig. 8.12

8.2.2 Connected Mode Locked: Control Unit

The locked control unit Status LED displays green. The locked control unit Power LED displays white LED. (Fig. 8.13)

To enter or exit locked mode, press the power button. While in locked mode, only the horn button will be responsive.

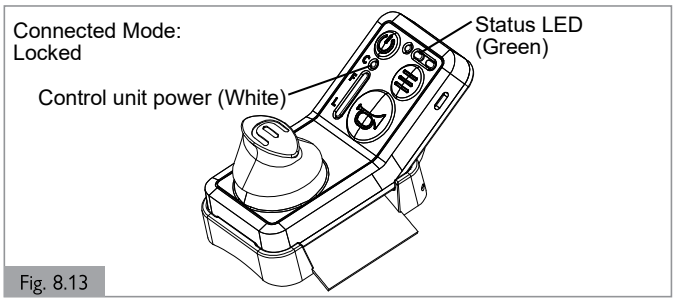


Fig. 8.13

8.2.3 Unconnected Mode: Control Unit

To connect your device, press the power button on the control unit. While the control unit is connecting to the wheels, the control unit power LED will flash white. (Fig. 8.14)

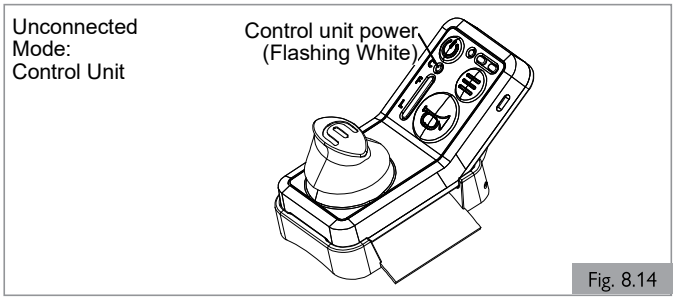


Fig. 8.14

8.2.4 Connected Mode: Wheel

In connected mode the two wheel LEDs on each wheel will display white. (Fig. 8.15)

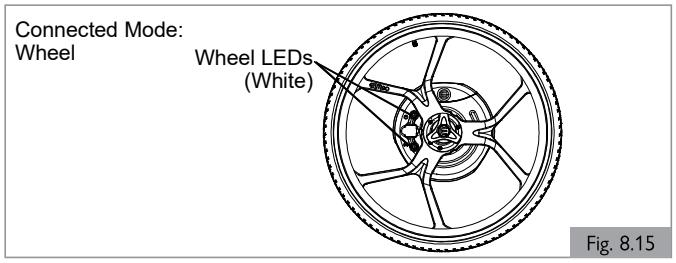


Fig. 8.15

8.2.5 Unconnected Mode: Wheel

In unconnected mode the two wheel LEDs on each wheel will display no light.

However, when the batteries are placed, the two wheel LEDs will flash white. (Fig. 8.16)

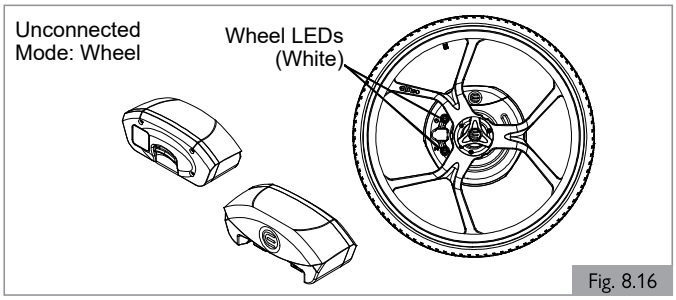


Fig. 8.16

8.2.6 Wheel Battery Charge (Fig 8.17)
Wheel battery LED will display:

- 3x Green: 90% < SoC ≤ 100%
- 3x White: 60% < SoC ≤ 90%
- 2x White: 30% < SoC ≤ 60%
- 1 White: 15% < SoC ≤ 30%
- 1x yellow: 05% < SoC ≤ 15%
- 1x red: SoC ≤ 5%

Note: When charging wheel batteries, full charge is indicated by solid purple wheel LEDs.
Solid purple wheel LEDs override control unit wheel battery LEDs indication.

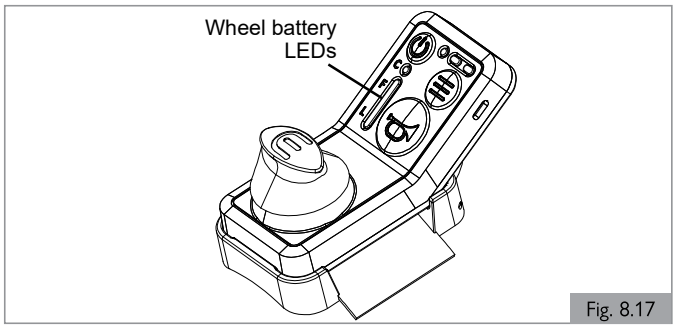


Fig. 8.17

8.2.7 Control Unit Charge <15%
The control unit power LED will display yellow when the control unit possesses less than 15% charge. (Fig. 8.18)

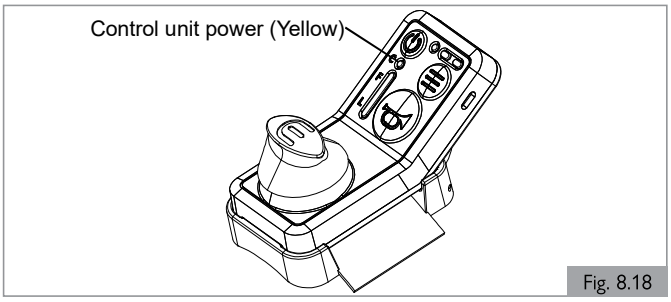


Fig. 8.18

8.2.8 Control Unit Charge <5%
The control unit power LED will display flashing yellow when the control unit possesses less than 5% charge. (Fig. 8.19)

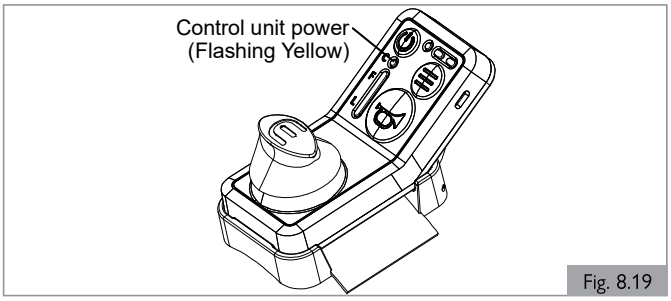


Fig. 8.19

8.2.9 Charging: Control Unit Charging
When plugged in, the control unit power LED will display a flashing purple light. (Fig. 8.20)
NOTE: Drive system will be disabled during charging.

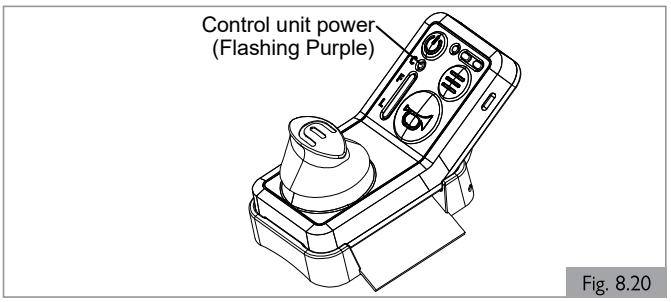


Fig. 8.20

8.2.10 Charging: Control Unit
When plugged in and charged, the control unit power LED will display a solid purple light. (Fig. 8.21)
NOTE: The M90 will be disabled and unable to be driven while the controller is charging.

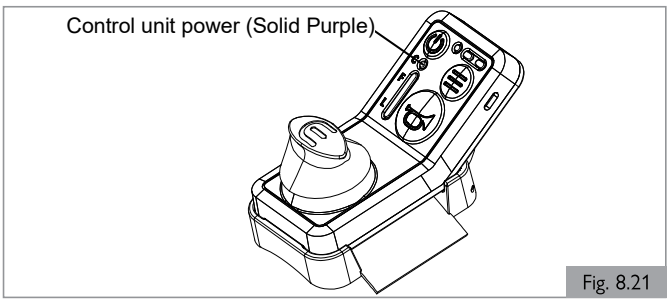


Fig. 8.21

8.2.11 Charging: Wheel Batteries Charging
Wheel LEDs will display 2 purple flashing lights when charging. (Fig. 8.22)
NOTE: Drive system will be disabled during charging.

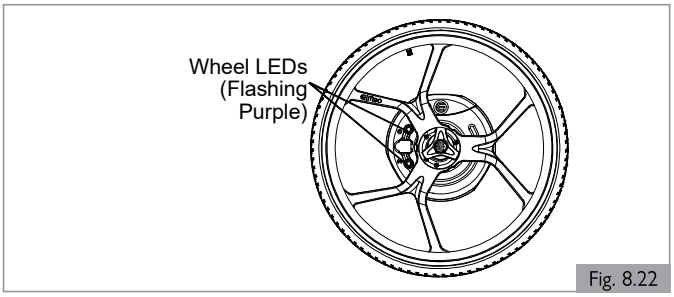


Fig. 8.22

8.2.12 Charging: Wheel Batteries Charged

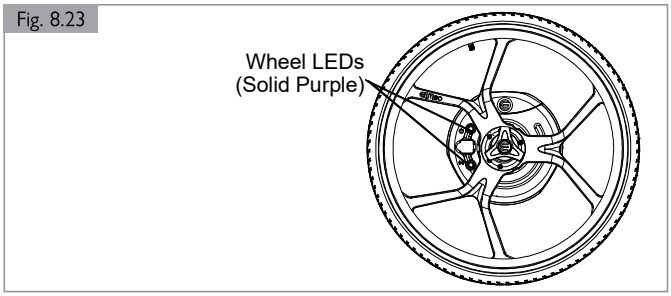
Wheel LEDs will display 2 purple solid lights when charged. (Fig. 8.23)

NOTE: If wheel LEDs are not illuminated, check connectors are inserted correctly as outlined (Fig 11.2).

You can also check wheel battery charge by turning on the control unit and observing the control unit wheel battery LEDs.

NOTE: Drive system will be disabled while charging source plugged in.

Fig. 8.23



8.2.13 Error Message (Fig 8.24)

Error message implies critical failure. Error message will override any status LED indication.

Control Unit: Control unit power LED will flash red.

Wheel: Wheel LEDs will display 2 red flashing lights.

Sound: Loud irregular beeps will come from both the control unit and wheel.

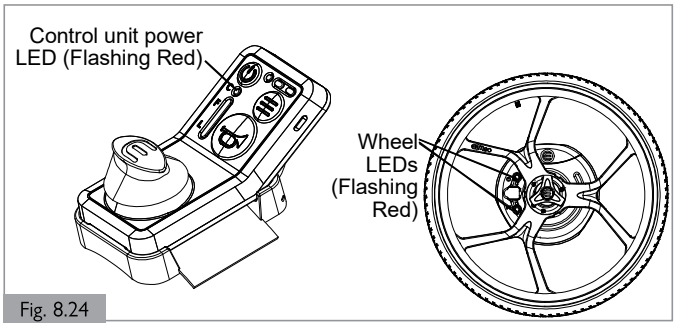


Fig. 8.24

8.2.14 Control Unit: Profiles (Fig. 8.25)

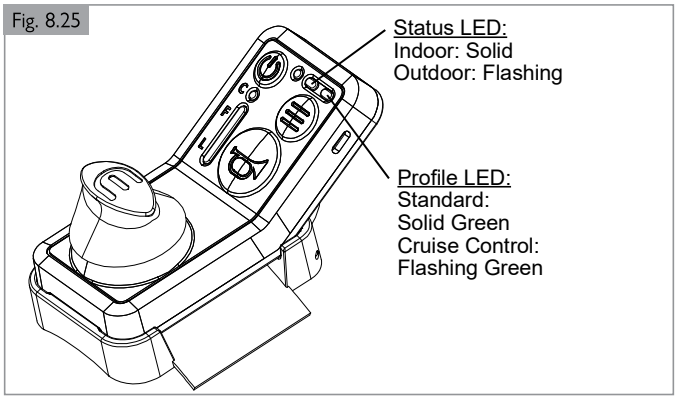
Indoor: Control unit profile LED will display a solid white light. The M90 will initiate in this profile when turned on.

Outdoor: Control unit profile LED will display a flashing white light. Press the profile button to switch between Indoor and Outdoor profiles.

Cruise Control: Control unit status LED will display a flashing green light. Press the Joystick down while pushing the Joystick forwards to enter cruise control. Exit cruise control by utilizing any command other than pushing the Joystick forward.

The cruise control command works in both Indoor and Outdoor profiles.

Fig. 8.25



8.2.15 Error Message: General

⚠ WARNING!

Flashing Red LED: Take device to your nearest Sunrise Medical authorized dealer for analysis **– DO NOT ATTEMPT TO USE DEVICE.**

Yellow LED: Safety Warning; observe indication and take necessary steps to remediate issue by visiting the troubleshooting section of this user manual.

Wheel Errors: Displayed on control unit and wheel/s with error. Error will be specific to a wheel, indicated by matching error LED on the wheel. Technician may have access to more specific errors.

Both LEDs on a single wheel will always be the same color – this is a safety feature if one LED is covered by a spoke.

8.2.16 Temperature Warnings

⚠ WARNING!

Solid Cyan on Control Unit Status LED & Wheel Button LEDs: Outdoor profile locked out. Only indoor profile is available.

Indicated audibly a single wheel beep from the affected wheel. Audible indication if mode change is attempted again.

Flashing Yellow Control Unit Status LED & Wheel Button LEDs: Control Unit is locked and wheelchair cannot be driven. Electronic brake applied for 5 seconds. Apply manual brakes upon entering this state.

Indicated audibly by a continuous 5 second continuous beep from the affected wheel.

Flashing Red Control Unit Status LED and Wheel Button LEDs: Control Unit is locked and wheelchair cannot be driven. Passive brake applied. Apply manual brakes upon entering this state.

Indicated audibly by 3-2-3-2 beep pattern from the affected wheel.

9.0 Using the handrim control unit

9.1 Handrim Step by Step Instructions

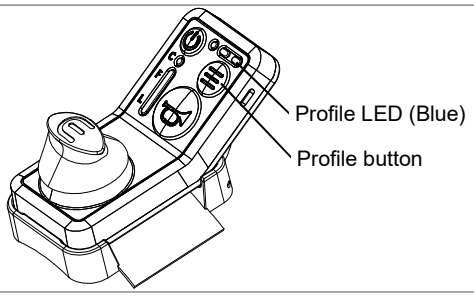
NOTE: Using the M90 device in handrim mode carries risks. Thoroughly consider handrim suitability.

1. Mount the controller with the two-way toggle using either the frame mount or leg dock strap.
2. Ensure the control unit is firmly secured in the controller dock. Check the control unit has been inserted into the anchor and attachment points correctly.

NOTE: If the control unit is removed from dock, the M90 will be locked.

3. Transition wheels into drive mode by pushing against the dimples on the rotating switch for each wheel. The rotation will be opposite for the Left and Right wheels.
4. Press Power button once.
5. The device will assume free-roll mode by default.
6. To use device, push and hold the two-way toggle forwards until a single beep is heard from each wheel. Release the toggle. The green status LED and single system beep indicate the drive pin is engaged. The profile LED will indicate what drive mode the unit is in. A blue profile LED indicates the unit is in Handrim Drive mode. The default mode can be configured in the TechTool.
7. To move between drive modes press and hold the profile button for 2 seconds. The profile LED will show blue when in Handrim Drive mode. (Fig. 9.1)

Fig. 9.1



NOTE: Switch between handrim and joystick mode by holding the mode button for two seconds. In handrim mode the profile LED will show as blue, in joystick mode the profile LED will show as white.

NOTE: Mechanics of two-way toggle are not compatible with joystick mode. Do not use mechanical two-way toggle knob and joystick firmware simultaneously.

NOTE: In handrim operation, joystick operation is disabled.

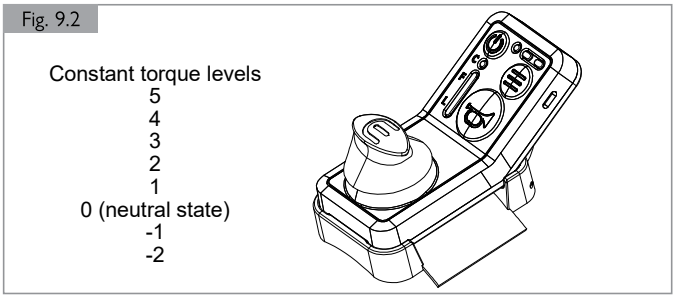
8. To initiate power, the two-way toggle can be pushed forward and backward.

   Two-way toggle input sets a constant power level. Control the wheelchair manually by providing resistance or assistance to handrims.

   When initially switching to handrim operation, the wheels are set to a neutral state. Constant torque is enabled by pushing the two-way toggle forward or in reverse. There are five forward and two reverse levels (Fig. 9.2). Push the two-way toggle forward or in reverse as needed to move between the levels.

NOTE: Drive performance can be adjusted in the techtool from Base, Standard, and Max.

Fig. 9.2



9. To reduce speed, move through two-way toggle levels to the desired speed. You can also reduce speed temporarily by providing resistance to the handrims. Once resistance is stopped, the device will maintain the commanded two-way toggle level.
10. To stop motion, move through two-way toggle levels back to neutral state. To stop quickly, press down on the two-way toggle a single time. The level will return to neutral state.
11. To lock device when stationary, press power button and engage manual parking brake. You can also use this as an emergency brake when not stationary.

The electronic brake uses power. You must engage the manual parking brake to lock device and remain stationary for a longer period. This will save battery.

⚠ WARNING!

Do not allow the pushing of a chair once the electric brake has been switched on. Pushing the chair while the electric brakes are on may cause damage to the M90.

⚠ WARNING!

When the device is not in use but remains on for convenience, disable the control unit by pressing the power button. Do this to avoid accidental command inputs. Press the power button a second time to enable the control unit.

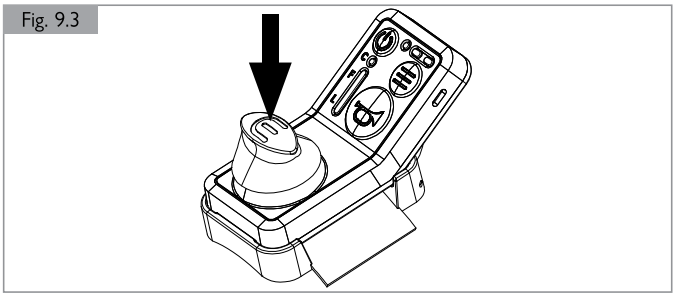
⚠ WARNING!

The control unit is activated by the dock. When the control unit is out of the dock, it will not be able to connect to the wheels.

9.2 Methods of Braking.

9.2.1 Smooth Braking
Move through two-way toggle levels back to neutral state or press down on the two-way toggle a single time (Fig. 9.3).

Fig. 9.3



NOTE: Device will continue to move when using smooth braking on a slope. Use emergency braking and manual parking brake to stop on a slope.

9.2.2 Emergency Braking
Option 1: Press power button once. This will stop acceleration and bring the user to a stop within 2 m. (Depends on user configurations). Indicated by a single beep from the control unit and the control unit power LED turning white.

Option 2: Grab and hold handrims until a single beep is heard from the control unit and the control unit power LED turns white.

NOTE: The control unit will remain locked until power button is pressed again if emergency brake is activated by pressing the control unit power button or stopping the device via handrims.

⚠ WARNING!

Wheelchair will stop suddenly when emergency brake is used.

9.2.3 Manual Braking
After coming to a stop, engage the manual wheelchair brake to avoid movement.

Control unit must be secured in dock for device to be functional. If controller becomes detached, the M90 will decelerate and come to a stop, entering locked mode. This is equivalent to using the emergency brake.

9.2.4 Fail-safe Braking
When the wheels are not powered but are engaged, or powered on but not ready for driving (engagement not confirmed), fail-safe brakes are applied.

⚠ WARNING!

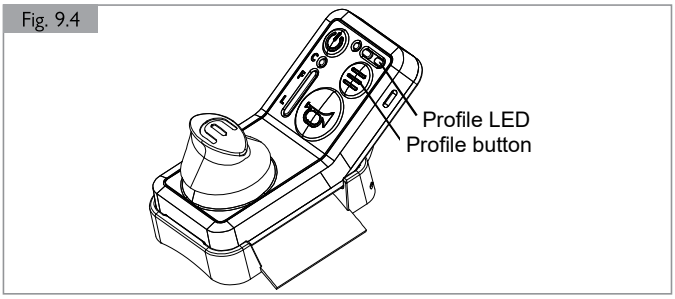
Do not allow the pushing of a chair once the fail-safe brake has been switched on. Pushing the chair while the failsafe brake is on may cause damage to the M90.

9.3 M90 Modes — Handrim
When a wheel battery level is below 10%, Outdoor profile is disabled if in use, and system will switch to Indoor profile.

9.3.1 Free-roll Mode
Regular manual wheelchair use – no M90 power features enabled.

9.3.2 Powered/Handrim Mode
In both drive modes, Indoor and Outdoor profiles can be selected by pressing the Profile button on the control unit. A solid Profile LED indicates Indoor mode, while a flashing Profile LED indicates Outdoor mode. (Fig. 9.4)

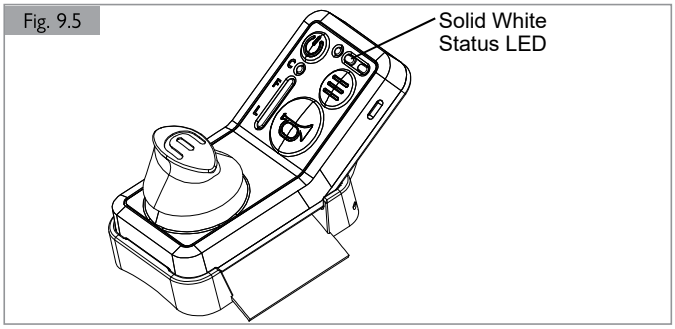
Fig. 9.4



9.3.2.1 Not Engaged or Not Ready
Fail-safe brakes active and drive disabled - Solid White Status LED. Can be invoked on transient/acute system overloading, or disengagement of drive pins during powered mode use. This is the initial state of the system when turned on and connected to wheels. (Fig. 9.5)

Perform engagement process for powered driving.

Fig. 9.5



9.3.2.2 Indoor Profile
Slower acceleration and speed - Solid Profile LED:
- Joystick: Solid Green
- Two-Way Toggle: Solid Blue

9.3.2.3 Outdoor Profile
Faster speed and acceleration – tuned by dealer technician - Flashing Profile LED:
- Joystick: Flashing Green
- Two-Way Toggle: Flashing Blue

9.3.2.4 Neutral State Control
Use handrims to make small adjustments to device position when two-way toggle is in neutral state.

9.3.2.5 Slope Control
Aim to gain speed prior to entering an upward slope. When traversing upward a slope use toggle to increase device power or assist device via handrims.

When traversing a downward slope, the device will limit speed to the set toggle level.

9.4 Horn Button

On press of the horn button, a buzzer will sound from the wheels until button is released.

Please use the horn to alert pedestrians of your approach or to signal for any reason.

⚠ WARNING!

Consideration to the possibility that horn buzzers are not heard by the party being warned should be taken into account. If the User is unable to vocalize a warning, or to gain attention via hand gesturing, it is recommended that additional clearance and caution be taken by the User to allow them to take mitigating action in the event of unforeseen circumstances or malfunction.

9.5 Power Off Device

Instructions to power off the device:

Make sure you are stationary and in a safe place.

1. Press the control unit power button for 3 seconds.
2. All LEDs will turn off on control unit controller.
3. Engage parking brake within 30 seconds of pressing down on power button.
4. If in Free-roll mode, turning off the device will have no effect.

Do NOT engage parking brake until you have commanded the wheels to shut down by pressing the power button for 3 seconds. If you try to drive forward without powering off, the motor will be trying to fight the parking brake.

9.6 Device Timeout

The device will automatically switch off when left unattended for 30 minutes.

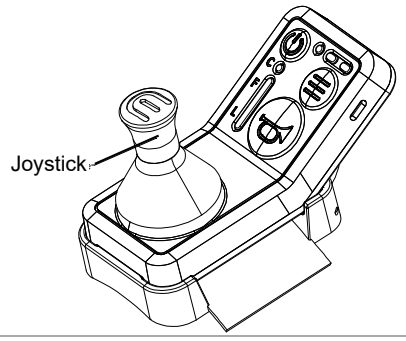
10.0 Using the joystick control unit

10.1 Joystick Step by Step Instructions

Note: The Handrim with Two-Way Toggle drive mode is not available in all regions.

1. Mount the controller with the joystick using either the frame mount or leg dock strap. (Fig. 10.1)

Fig. 10.1



2. Ensure that the control unit controller is firmly secured in the controller dock. Check the control unit has been inserted into the anchor and latch attachment points correctly.

NOTE: If the control unit is removed from dock, the M90 will be locked.

3. Transition wheels into drive mode by pushing against the bumps on the rotating switch for each wheel. The rotation will be opposite for the Left and Right wheels.
4. Press power button once.
5. The device will assume Free-roll mode by default.
6. To use device, push joystick on the control unit forward until single beep is heard and green LEDs on the power and the status indicate drive pin is engaged. Device is now ready to be operated.
7. To move wheelchair, push joystick in desired direction of travel.
   - The further down the joystick is pushed, the faster the speed (forward and reverse).
   - When stationary, pushing joystick left and right will turn wheelchair on the spot. Anything in between will steer toward that direction.
8. To reduce speed, bring joystick closer to the center vertical line.
9. To stop motion, let joystick return to center. To stop quickly, apply pressure to joystick in the opposite direction of travel (forward or reverse).
10. To lock device when stationary, press power button and engage manual parking brake. You can also use this as an emergency brake when not stationary.

The electronic brake uses power, you must engage the manual parking brake to lock device and remain stationary for a longer period. This will save battery.

⚠ WARNING!

NOTE: Do not allow the pushing of a chair once the electric brake has been switched on. Pushing the chair while the electric brakes are on may cause damage to the M90.

⚠ WARNING!

NOTE: When the device is not in use but remains on for convenience, disable the control unit by pressing the power button. Do this to avoid accidental command inputs. Press the power button a second time to enable the control unit.

⚠ WARNING!

NOTE: The control unit is activated by a magnet in the dock. When the control unit is out of the dock, it will not be able to connect to the wheels.

10.2 Methods Of Braking

10.2.1 Smooth Braking

Release joystick, allowing it to center.

10.2.2 Emergency Braking

Press power button once, center joystick, apply reverse when traveling forward or forward command when traveling backwards. This will stop acceleration and bring wheelchair to a stop within 2m. (depends on user configurations).

NOTE: The control unit will remain locked until power button is pressed again if emergency brake is activated by pressing the control unit power button.

⚠ WARNING!

Wheelchair will stop suddenly when emergency brake is used.

10.2.3 Braking Logic

Low Load: Wheelchair will maintain active braking indefinitely.

High Load: The wheelchair will indicate one continuous beep, silence for three seconds, then a five second continuous beep. After the nine seconds the wheelchair will switch from active braking to passive braking.

Apply manual brakes within the nine seconds to remain stationary or use the joystick to steer the wheelchair.

Extreme Load: The wheelchair will indicate a five second continuous beep. After the five seconds the wheelchair will switch from active braking to passive braking.

Apply manual brakes within the nine seconds to remain stationary or use the joystick to steer the wheelchair.

10.2.4 Manual Braking

After coming to a stop, engage the manual wheelchair brake to avoid movement.

Control unit controller must be secured in dock for device to be functional. If controller becomes detached, the M90 will decelerate and come to a stop, entering locked mode. This is equivalent to letting go of the joystick and allowing it to center.

10.2.5 Fail-safe Braking

When the wheels are not powered but are engaged, or powered on but not ready for driving (engagement not confirmed), fail-safe brakes are applied.

⚠ WARNING!

NOTE: Do not allow the pushing of a chair once the fail-safe brake has been switched on. Pushing the chair while the fail-safe brake is on may cause damage to the M90.

10.3 M90 Modes
When a wheel battery level is below 10%, Outdoor profile is disabled if in use, and system will switch to Indoor profile.

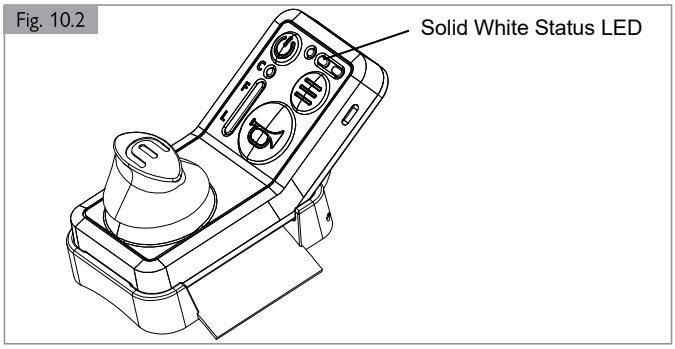
10.3.1 Free-roll Mode
Regular manual wheelchair use – no M90 power features enabled.

10.3.2 Powered Mode
Outdoor and Indoor profiles are selectable by pressing the profile button on the control unit controller.

10.3.2.1 Not Engaged or Not Ready
Fail-safe brakes active and drive disabled - Solid White Status LED. Can be invoked on transient/acute system overloading, or disengagement of drive pins during powered mode use. This is the initial state of the system when turned on and connected to wheels. (Fig. 10.2)

Perform engagement process for powered driving.

Fig. 10.2



10.3.2.2 Indoor Profile
Slower acceleration and speed - Solid White Profile LED.

10.3.2.3 Outdoor Profile
Faster speed and acceleration – tuned by dealer technician - Flashing White Profile LED.

10.3.2.4 Cruise Control
Constant speed - Flashing Green Status LED

To enter cruise control, follow the four steps outlined below:
1. Ensure that system is in powered on, in joystick drive mode, and you are traveling at the desired cruising speed you would like to set.
2. Push control unit joystick down when in the acceleration position you would like to cruise at and then let go. Upon entering cruise control, a click will be heard, along with 3 beeps. The Status LED will flash Green.
3. While in cruise control, you are still able to steer by moving the joystick in the left or right direction.
4. Cruise control is disengaged by pushing joystick forward, backward, or down.

10.4 Horn Button
On press of the horn button, a buzzer will sound from the wheels until button is released.

Please use the horn to alert pedestrians of your approach or to signal for any reason.

⚠ WARNING!

Consideration to the possibility that horn buzzers are not heard by the party being warned should be taken into account. If the User is unable to vocalize a warning, or to gain attention via hand gesturing, it is recommended that additional clearance and caution be taken by the User to allow them to take mitigating action in the event of unforeseen circumstances or malfunction.

10.5 Power Off Device
Instructions to power off the device:
Make sure you are stationary and in a safe place.
1. Press the control unit power button for 3 seconds.
2. All LEDs will turn off on control unit controller.
3. Engage parking brake within 30 seconds of pressing down on power button.
4. If in Free-roll mode, turning off the device will have no effect.

Do NOT engage parking brake until you have commanded the wheels to shut down by pressing the power button for 3 seconds. If you try to drive forward without powering off, the motor will be trying to fight the parking brake.

10.6 Device Timeout
The device will automatically switch off when left unattended for 30 minutes.

11.0 Charging instructions

11.1 Charging of Battery Using Wheel

Ensure the device is switched off and completely dry.

If charging socket is obstructed by spoke, rotate wheel until socket is freely exposed. This can be done by having the wheel drive pins engaged while still attached to the chair and using the handrims.

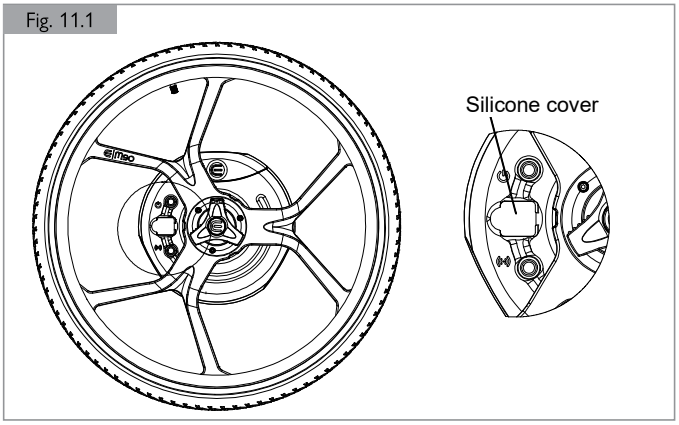
⚠ WARNING!

Do not attempt to charge while the M90 is turned on. Danger of finger or charging cable entrapment.

11.1.1 Remove Silicone Cover from Charging Port

To access the charging port, lift the silicone cover by pulling the tab, as shown in Fig. 11.1. After charging, unplug the charger and press the silicone cover back into place. The magnetic force will attract the cover out of the charging socket. You should then 'swipe' off the magnetic cover inside the magnetic charging plug cover until charging is complete. You may also manually remove cap with fingers. (Fig. 11.1)

Fig. 11.1



11.1.2 Attach Charging Cable

Plug power supply into charging port on each wheel. (Fig. 11.2)
Plug power supply into wall outlet.

⚠ WARNING!

Avoid creating a trip hazard when plugging in charging cables.

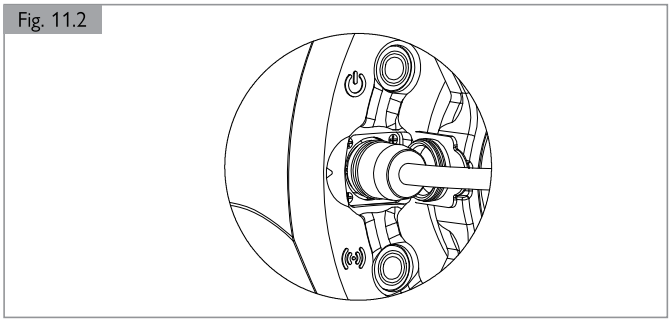
⚠ WARNING!

Ensure battery plug orientation is correct.

The "lightning" symbol must face towards the orange triangle indicator.

When plugging in the connector, use minimal force. The plug and socket are magnetic. The magnetic force will assist correct alignment.

Fig. 11.2



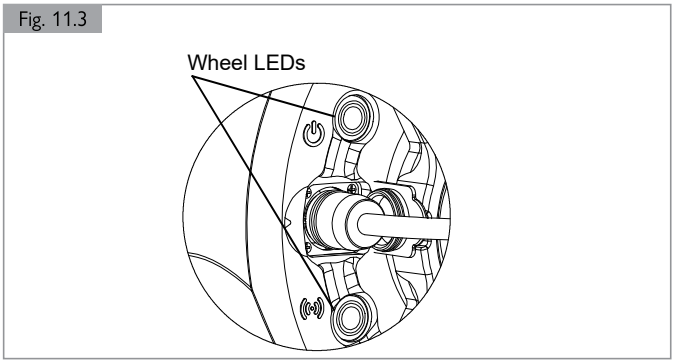
11.1.3 Charge Wheels

Switch on wall power and leave batteries to fully charge. Charging is indicated by 2 flashing purple LEDs on the wheel. Leave batteries to charge until both wheel batteries display 2 solid purple LEDs, indicating full charge. (Fig. 11.3)

⚠ WARNING!

Do not continuously charge batteries for more than 24 hours.

Fig. 11.3



11.1.4 Replace Magnetic Cover

Turn off the wall socket and remove the power supply from charging port on each wheel and the wall outlet.

Replace the charging port cover. To do this, press the cover into the charging port.

⚠ WARNING!

Ensure charging port cover is reinserted after use. Charging connections are not to be left exposed during use.

11.1.5 Store Accessories

Ensure the device is switched off and completely dry.

11.1.6 Charging Error

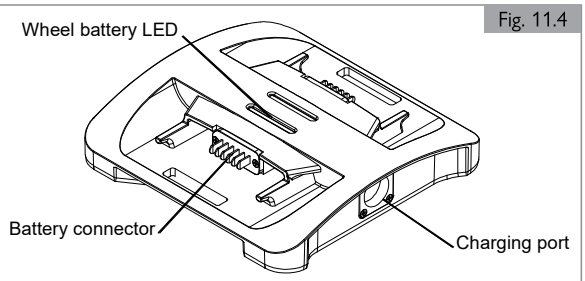
Battery charging errors are indicated by both the push button LEDs on the wheels displaying two solid yellow LEDs.

11.2 Charging of Battery Using Charging Dock

The M90 Charging Dock is intended to be used to charge the wheel batteries of the M90. Either one or two batteries are permitted to be charged at one time. (Fig. 11.4)

Please observe the electrical characteristics of the charging dock and never overload the power supply or use the Charging Dock if there are any electrical faults noted, such as exposed wiring, sparks, buzzing, or excessive heat.

Fig. 11.4



11.2.1 Electrical Characteristics

Input: 27-28V DC, 1.5A max (per Battery)
Output: 24V nominal, 1.5A max (per Battery)

11.2.2 Physical Characteristics

Indoor use only, IP44 rated.

11.2.3 Instructions for Use

There are three instructions for use of the M90 Charging Dock:

11.2.3.1 Plug in Charging Cable

Plug the Charging Dock cable into a wall outlet.

⚠ WARNING!

Avoid creating a trip hazard when plugging in charging cables.

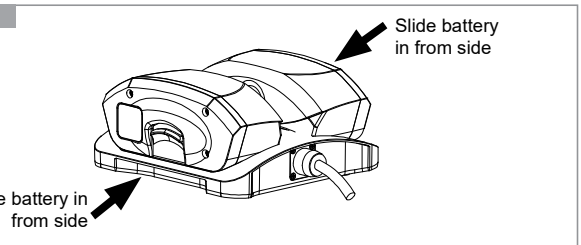
⚠ WARNING!

Only use one of the two connectors on a single charging dock at a time. The other connector must have its cap on. Do not allow the un-used connector to become a trip hazard. Therefore, only one power supply can be used to charge two batteries on one charging dock at a time.

11.2.3.2 Insert Batteries

Insert a battery into each side of the Charging Dock, inserting the battery into the battery connectors of the Charging Dock. One or two batteries may be charged at one time. (Fig. 11.5)

Fig. 11.5

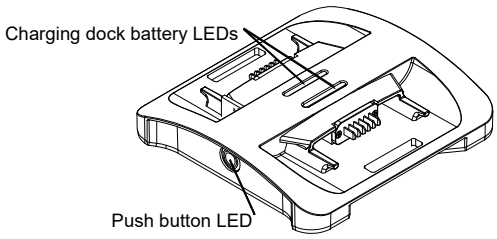


11.2.3.3 Turn Wall Outlet On

Once the charging cable is plugged into the charging socket and wall outlet and when batteries are inserted, turn on the wall outlet.

Observe the push button LED of the charging dock, as well as the LEDs being displayed on the Battery/Batteries, to indicate charging status. (Fig. 11.6)

Fig. 11.6



11.2.4 Remove Charging Cables

Once the wheel batteries are fully charged, switch off the wall outlet, remove the batteries then remove the power supply from the charging dock and wall socket. Store components in a secure location.

Do not continuously charge batteries for more than 24 hours.

11.2.5 Faulty Battery

Battery faults are displayed by charging dock battery LEDs displaying three solid red lights and a flashing push button LED. (Fig. 11.6)

11.2.6 Charging Dock LED Indications

The charging dock has one push button LED located at the front of the device and two sets of three LEDs on the upper surface of the device, one set for each battery.

11.2.6.1 Push Button LED: Power

The charging dock will display a solid yellow light when the power is on and no batteries are inserted.

11.2.6.2 Push Button LED: Charging

The charging dock will display a flashing purple light when the batteries are charging.

11.2.6.3 Push Button LED: Charged

The charging dock will display a solid purple light when the batteries are fully charged.

11.2.6.4 Charge LED Display

The Charge LED will display:

- 3x Green: 99% OR charge indicating complete
- 3x Magenta: 60% < SoC ≤ 99%
- 2x Magenta: 30% < SoC ≤ 60%
- 1x Magenta: SoC ≤ 30%

11.2.6.5 Troubleshooting

- If no LEDs are displayed, the charging dock has no input power supply. Please check that the power is switched on at the wall, the batteries are inserted fully, and the charging dock is free of electrical faults, such as exposed wiring or visible damage.
- On power-up, the Charging Dock LEDs will be at full brightness, suitable for indoor viewing in ambient lighting of 400 to 1000 lux. On pressing of the Power Button Switch, the LEDs shall dim to 20% of their maximum value, and thereafter toggle between their maximum value and 20% brightness.
- If issue persists, remove batteries from charging dock and place into wheels. Insert power supply into wheel charging sockets to charge the batteries.

⚠ CAUTION!

Do not use a single power supply to charge more than two batteries at a time.

11.3 Charging Of Control Unit Controller

11.3.1 Plug into Controller

Plug USB-C charging plug into the control unit controller. Plug the other end into your charging device.

11.3.2 Turn on Power

Switch on wall power and leave the battery to fully charge, indicated by a flashing purple Control Unit Power LED, until Control Unit Power LED turns solid purple.

Occasional use of the wheelchair prior to complete charging indication is acceptable if the need is urgent.

⚠ WARNING!

Do not continuously charge batteries for more than 24 hours.

11.3.3 Remove Plug

Remove charging plug and store charger away, and store or use control unit as desired.

Do not charge the control unit controller while in use. The control unit will be locked when charging.

11.4 Power Supply Indicators

A green LED on the power supply indicates trickle charging or disconnection. A red LED on the power supply indicates charging status.

12.0 Cleaning

Cleaning the device will assist in longevity of the product and ensure optimal functionality.

⚠ CAUTION!

1. Always turn off your device before cleaning and keep battery attached to wheel.
2. Ensure charging socket cover is attached when cleaning.
3. Do not wet the charging port.
4. Do not use control unit controller while cleaning wheels as there is a risk of hand entrapment.

12.1 Cleaning Products

Do not use abrasive agents, detergents, or high-pressure cleaners (can scratch the components and damage the product seals). Avoid contact with solvents such as degreasers or methylated spirits.

12.2 Wet Weather

Avoid using the device in wet weather. Dry the device immediately after exposure to wet weather.

12.3 Cleaning Interval

Clean at least once per month, or after using in muddy/sandy terrain. If using in corrosive environments, you must routinely check for signs of corrosion on components during regular cleaning and increase cleaning intervals.

If external electrical components get wet, dry using a soft cloth after use (such as charging socket).

12.4 Cleaning Method

Clean device with a soft damp cloth and wipe parts dry using a soft dry cloth.

⚠ CAUTION!

Potential damage to equipment

Do not use pressured water jets to clean device. High pressure water cleaning will damage the device and void warranty.

12.5 Hygiene When Being Reused

- Prior to the product being re-used, it must be carefully prepared. All surfaces which come into contact with the user must be treated with a disinfection spray.
- To do this, you must use a disinfectant as authorised/ recommended in your country, for rapid alcohol-based disinfection for medical products and medical devices, which must be disinfected quickly.
- Please be aware of the manufacturer’s instructions for the disinfectant you are using.
- In general, a complete disinfection cannot be guaranteed on seams. We therefore recommend that you dispose of seat and back slings to avoid micro-bacterial contamination with active agents according to your local infection protection law.

13.0 Maintenance

It is recommended that the M90 be taken to a Sunrise Medical authorized dealer for maintenance and service every year. This guideline interval may vary with the product's degree of utilization and the behavior of a user. Ultimately, the degree of use and user behavior is the responsibility of the operator, and therefore the need for maintenance should be assessed accordingly.

13.1 Maintenance Information

- Must be serviced by a Sunrise Medical authorized dealer.
- Contact your nearest Sunrise Medical authorized dealer to know whether a spare part is available.

13.2 Inspection Checklist

The user must follow inspection steps each time they operate the device. For further information see section 6 'Inspection of Device'.

1. Check for clothing entrapment.
2. Check wheelchair brackets.
3. Check wheelchair brakes.
4. Check for foreign object inhibiting the device.
5. Check tyre wear and pressure.
6. Ensure batteries are charged.
7. Check the device is not damaged.
8. Check the control unit can move freely.
9. Check device for any broken components, unusual wear, or other indicators of excessive wear. Discontinue use if damage is found and contact a Sunrise Medical authorized dealer.

13.3 Periodic Maintenance

- Check tyre pressure is between 586-1000 Kpa, while also checking the wheel wear/tread is sufficient, before using the M90.

This is to ensure user safety and to maintain optimal functioning of the device. Using the M90 with flat tyres can damage the tyres and rims, inhibit performance, and reduce the effectiveness of handbrake/manual brake lever.

- Check tyre pressure at least once weekly to ensure optimal performance of powered wheel, and to prevent excessive wear or puncture.
- Charge the batteries before every use, and check for low battery warning before use.

Long Storage: If batteries are going to be stored for more than 2 weeks, fully charge both batteries prior to storage, and then every 3 months of non-use, to preserve longevity of the battery life.

⚠ CAUTION!

Never exceed the maximum tyre pressure. Tyres should only be replaced by a Sunrise Medical authorized dealer.

14.0 Troubleshooting

If the M90 is not working as expected, please check the following points:

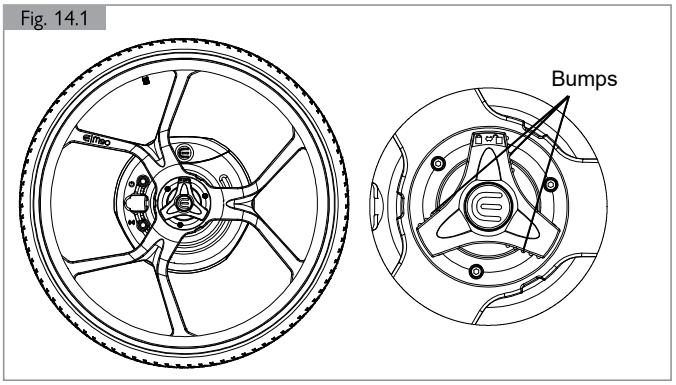
14.1 Check Charge

Plug USB-C charging plug into the control unit controller. Plug the other end into your charging device.

14.2 Check Mode

Check that you have switched the wheel to 'power' mode by pressing on the bumps of the engagement switch until it stops rotating. (Fig. 14.1)

Fig. 14.1



14.3 Restart

Carry out a system restart by holding the power button on the control unit for three seconds, then turn the system back on.

If your problem persists after attempting all of the above steps, please contact a Sunrise Medical authorized dealer for further assistance.

15.0 Storage and transport

15.1 Transport

Transport of M90 is preferred in the carry case, or attached to chair, with the battery removed, stored safely and securely.

Shipping lithium-ion batteries or taking them with you on airplanes is strictly regulated. The guidelines may vary depending on the airline. In all cases, contact your airline or carrier, before you transport or want to send a device which operates on lithium-ion batteries on an airplane.

- The M90 is intended to be packed for shipping with reasonable ease, compliant with air, railroad and sea transport, with batteries conforming to IATA regulations (Under 100-Watt Hours (Wh) limit per battery).
- The device must always be switched off when being transported.
- If travelling on a plane, enter “Flight” mode by pressing and holding power button on each wheel for 5 seconds. This mode does not affect the control unit, only the state of the wheel. The control unit can be turned off normally. Upon successfully entering flight mode, a short beep will sound from the Control Unit.
- To exit flight mode, press the power button on the wheel again to operate normally.

⚠ WARNING!

1. The battery of the M90 contains lithium-ion cells. For shipping or transportation, you must comply with the relevant legal guidelines.
2. The guidelines for shipping lithium-ion batteries or transportation in an airplane may change. It is essential that you contact your airline or travel operator in order to obtain information about the current guidelines before you start a trip or plan shipping.
3. Defective batteries cannot be transported in an airplane under any circumstances.
4. If your battery is defective, please contact your Sunrise Medical authorized dealer to find out how to proceed. In this case, special conditions apply for transporting hazardous products.
5. In all cases switch the battery off for transportation and protect the contacts on the underside of the battery against short circuiting.

15.2 Storage

15.2.1 Battery Storage

- Protect the battery immediately upon separating from the battery charger or motor. Never allow any moisture or foreign particles (e.g. metal fragments, small nails, filings or other conductive metals) to get into the battery.
- Avoid storage in humid areas to prevent corrosion on the plug contacts.
- Do not expose the battery to moisture of any kind during storage (water, rainwater, snow, etc.).
- Before storing it, charge the battery and check its charge status every 3 months.
- Store the battery in a cool and dry location where it is safe from damage and unauthorised access.
- Do not keep your battery in places where the temperature is outside the range listed in Section 17.0 Technical Data.
- Avoid direct sunlight.
- When the battery is not in use, recharge it at least every 12 weeks to prevent damage.

15.2.2 Device Storage

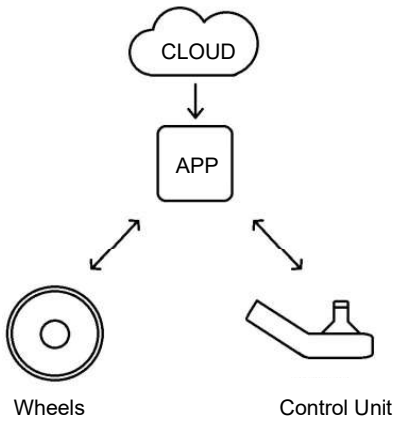
- Store the device in a dry place, protected from rain and snow.
- Cover the device during long-term storage in order to protect it from dust.
- Do not store the device at temperatures outside the range listed in Section 17.0 Technical Data.
- After a long period of storage, check the condition of the tyres before setting off.

16.0 Cybersecurity

16.1 Introduction

Ensure that sections of the Owner's Manual relating to processes and performance of the device under situations such as battery charging, wheelchair engagement, OTA updating mode engagement, feedback on the OTA updating application, steering response with their specific tuning parameters are all understood. Any changes to behaviour that can be observed can indicate potential cybersecurity events. If you are experiencing changed wheelchair behaviour or you would like more clarity regarding how your device operates, contact your Sunrise Medical authorised dealer.

Fig. 16.1 Connectivity During OTA Updating Process



16.2 Security: OTA Updating Process

Figure 16.1 indicates the means by which the OTA updating application connects to your device and ensures that the correct firmware is installed. A user shall note that all devices that are to be updated successfully enter the correct mode. Ensure that the Control Unit displays Cyan LEDs and so do the Wheels. Ensure to follow all prompts in the OTA application and do not close or minimize the application until the update process is finished. Refer to section 4.4.16.1 for information regarding this process, as well as section 4.3.11 for contraindications.

16.3 Security: Understanding Your Device

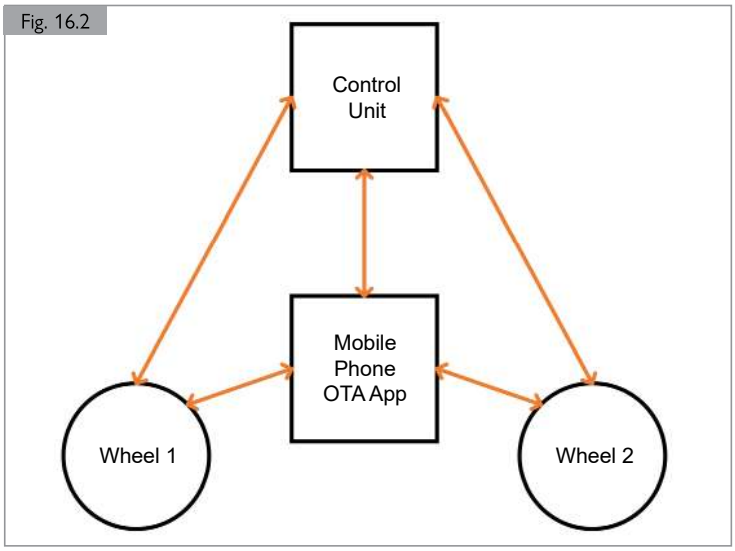
The below table outlines the Bluetooth connection ports available to the Empulse M90. If you believe that any of the below ports are not operating as expected, or an end point that is different to those stated in the below table, contact your Sunrise Medical authorized dealer as soon as possible.

Table: Interfaces of the Empulse M90 and List of Ports Available

Port Name	Type	Ingoing, Outgoing, or Both	Approved End-points	Function
Bluetooth Port Wheel	**BLE**	**Both**	**Control unit, mobile app**	**Allows operation of the medical device. Allows OTA update.**
Bluetooth Port Control Unit	**BLE**	**Both**	**Wheel 1 and 2, mobile app**	**Allows operation of the medical device. Allows OTA update.**
Mobile OTA App	**BLE**	**Both**	**Control unit, wheel 1 and 2, charging dock**	**Allows OTA update.**

The below M90 System View Diagram (Fig. 16.2) gives further context of these connections.

Fig. 16.2



17.0 Technical data

GENERAL	
Maximum User Weight	100kg
Maximum Weight Overall	130kg
Class of Medical Device (Australia)	Class 1
Country of Manufacture	Australia
Ingress Protection (IP) Rating	IP64 rating (Dust Tight/Water Splashes from any angle)
WHEEL	
Distance Range Approx. (*)	15 km (ISO 7176–4)
Rated Slope (*)	3°, Standards tested to 6° slopes, with the capability to climb steeper slopes of up to 6° for short distances.
Regenerative Braking	Up to 18% Recovery
Rated Voltage	Charging Input: 27 V to 28 V DC (@ 1A DC); Battery Input: 21.6 V (nominal)
Motor Power Rating	150 W (Per wheel)
Speed	Maximum 6 km/h (3.7 mph)
Optimal Operating Air Temperature Range	0 to +30°C
Extreme Operating Temperature Range	-10 to +40°C
Wheel Tyres	Schwalbe Right Run Plus (Grey Striped) (610mm x 25mm)
Wheel Diameter	610mm
Connection (to Controls)	Bluetooth 5
Sound frequency and alarms	2900 +/- 500Hz and 70dB
(WHEEL) BATTERY PACK	
Battery Type	Lithium Ion Cells (Rechargeable) (86.4Wh); UN38.3 certified
Nominal Voltage	21.6 V; Cut-off: 16V
Rated Battery Capacity	4 Ah
Battery Charging Time	6 Hours (full charge)
Battery Service Life	300 cycles of normal use to retain 80% capacity.
Cubic Battery Size	164 x 68 x 66 mm
Operating Temperature Range	0 to 55°C
Charging Temperature Range	0 to 55°C
Storage Temperature	-20 to +60°C

CHARGING DOCK	
Rated Voltage	Input: 27 V to 28 V DC (@ 2A DC); Battery Output: 2x 21.6 V (nominal) (@ 1A DC)
Rated Power	56 W
Battery Charging Time (full charge) Approximately	4-5 Hours
Optimal Operating Air Temperature Range	0 to +30°C
Extreme Operating Temperature Range	-10 to +40°C
POWER SUPPLY	
Type	Off-board
Rated Input Voltage Range	100 V to 240 V
Rated Power	110 W
Rated DC Output Current	4.0 A
Rated DC Output Voltage	28 V
Optimal Operating Air Temperature Range	-29°C to 35°C
CONTROL UNIT	
Battery Type	Lithium Ion Cell (Rechargeable) (3.7Wh); UN38.3 certified
Charging Power Source	USB-C (5V, 400mA)
Rated Voltage	3.7 V
Rated Battery Capacity	1 Ah
Battery Charging Time (full charge) Approximately	4-5 Hours
Battery Service Life	300 cycles of normal use to retain 80% capacity.
Charging Temperature	0 to +45°C
Storage Temperature	-20 to +60°C
WEIGHT OF COMPONENTS	
Wheel (Individual)	5.3 kg
Battery Pack (Individual)	0.6 kg
Total Weight without Batteries (Pair)	10.6 kg
Total Weight with Batteries (Pair)	11.9 kg
Control unit Controller with Dock	0.25 kg
Charging Dock	**0.41 kg**

Software Bill of Materials (SBOM) Off-the-shelf(OTS)/Software of Unknown Provenance (SOUP) Used in the Device

SOUP/OTS Title	Manufacturer	Version	Release Date	End of Support Date	Supplier	Cybersecurity Information	Where it is Used in Device
nRF5 Software Development Kit "nRF5_SDK_17.1.0_ddde560"	Nordic Semiconductor	17.1.0	August, 2021	Not Supplied by Manufacturer	Nordic Semiconductor https://www.nordicsemi.com/	https://infocenter.nordicsemi.com/topic/struct_sa/struct/sa.html	nRf52 Processor software - any part related to radio communications. (Bluetooth) Thus, OTS/SOUP is used in Control Unit nRF MCU, Wheel nRF MCU, and Charging Dock nRF MCU.
nRF5 Soft Device "s140_nrf52_6.1.1_softdevice	Nordic Semiconductor	6.1.1	November, 2018	Not Supplied by Manufacturer	Nordic Semiconductor https://www.nordicsemi.com/	https://infocenter.nordicsemi.com/topic/struct_sa/struct/sa.html	nRf52 Processor software - any part related to radio communications. (Bluetooth) Thus, OTS/SOUP is used in Control Unit nRF MCU, Wheel nRF MCU, and Charging Dock nRF MCU.

(*) see Warning below:

⚠ WARNING!

Range ability depends on the terrain, user weight, prevailing driving conditions, and regenerative braking energy recovery. Stopping distance on slopes can be significantly greater than on level ground.

18.0 Manufacturer specification

Manufacturer: Concourse Assistive Technology Pty Ltd
Address: 9 Hamley Road, Mt Kuring-Gai, 2080, NSW, Sydney, Australia Model: Empulse M90 Wheels CAT-SW-1W24

Maximum Occupant Mass: **100kg**

Disclosure information (ISO)			
Standard reference		Minimum	Maximum
	Overall length with leg rest	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Overall width	** _____mm	** _____mm
	Folded length	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Folded width	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Folded height	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Total mass	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Mass of the heaviest part	5.3kg	5.3kg
	Static stability downhill	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Static stability uphill	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Static stability sideways	*See retrofitted wheelchair manual	*See retrofitted wheelchair manual
	Energy consumption	12Km	15Km
	Dynamic stability uphill	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Obstacle climbing	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Maximum speed forward	N/A	6Km/h
	Minimum braking distance from max speed		1m
	Seat plane angle	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Effective seat depth	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Effective seat width	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Seat surface height at front edge	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Backrest angle	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Backrest height	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Footrest to seat distance	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Leg to seat surface distance	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Armrest to seat distance	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Front location of armrest structure	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Handrim diameter	N/A	19mm
	Horizontal location of axle	See retrofitted wheelchair manual	See retrofitted wheelchair manual
	Minimum turning radius	See retrofitted wheelchair manual	See retrofitted wheelchair manual

19.0 Disposal and recycling

NOTE: If the power assist device has been made available to you as part of a charity or medical loans scheme, then it may not belong to you. If it is no longer required, then follow the instructions to return it as given by the organisation that made the power assist device available to you.

Electrical and electronic equipment need to be disposed of separately to general household waste at specific state-provided locations. The correct disposal and separate collection of used appliances serves to prevent potential damage to health and the environment. It is a requirement for the re-utilisation and recycling of used electrical and electronic equipment.

Detailed information on the disposal of your used equipment can be obtained from your local authority, your waste disposal service, the specialist dealer from which you purchased the product, or your sales contact.

This information only applies to equipment which is installed and sold in the countries of the European Union and which is subject to the European directive 2002/96/EC. In countries outside of the European Union, deviating conditions apply to the disposal of electrical and electronic waste.

Materials Used:

In the following section, there is a description of the materials used on the power assist device, in view of the disposal or recycling of the power assist device and its packaging. There may also be special local regulations in force with regard to disposal or recycling, these must be taken into account when disposing of your power assist device. (This can include the cleaning or decontamination of the power assist device prior to disposal).

Steel:	Battery (ejector spring pin, shell screws, latch spring, latch adjustment screw)
Plastic:	Cover, Carry Case, Battery (rear shell, latch, cell spacer, cell core, cell end cap, cell mounting end cap, shell screw o-ring, front shell and seal assembly)
Packaging:	Cardboard
Battery:	Lithium-ion battery (hazardous product)

Please see battery section for more detailed information.

20.0 Nameplate

The nameplate is located on the device (see section 5 Description of Device) as well as on a label in the owner's manual. The nameplate indicates the exact model designation and other technical specifications. Please provide the following pieces of information whenever you have to order replacement parts or to file a claim:

SAMPLE

As we are committed to continually improving the construction of our wheelchairs and power assist devices, product specifications may vary slightly from the examples illustrated. All weight/dimensions and performance data is approximate and is provided solely for guidance.

CE All power assist devices must be used in accordance with the manufacturer's guidelines.

Concourse Assistive Technology
9 Hamley Road
Mount Kuring-Gai
NSW 2080, Australia

Type:	Product Name/SKU Number.
	Keep Device Dry.
-40°C 65°C	Storage temperature ranges apply for device.
	Maximum rated incline.
	Maximum total mass inclusive of wheelchair mass, occupant mass, and accessories.
	Consult instructions for use
	Manufacturer's address.
XXXX-XX-XX	Date of Manufacture.
	Wheelchair not intended to be used as a seat in a motor vehicle.
UDI	Unique device indicator located adjacent to this symbol.
MD	This symbol means medical device.
SN	Serial number.
CE	CE Mark
	The Regulatory Compliance Mark (RCM).
EC REP	European Authorized Representative.
UK RP	UK Responsible Person
CH REP	Swiss Representative's address
	Importer's address
	Wheelchair is not to be driven while engagement cam is in free-roll position. Refer to user manual.
	Must not be disposed of as household waste
Li-ion	Cells contain lithium
MR	MR unsafe.

ISO 7010-M002 Instruction manual/ booklet must be read! (Blue Icon)

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