

INFO
recumbent
technology

...recline in style!

Deltatx



Operating Manual and Service Instructions for HP VELOTECHNIK Delta tx

HP
VELOTECHNIK

July 2024



Serial number of your Delta tx and its parts:

Introduction

Dear customer

thank you for buying a recumbent tricycle designed by HP VELOTECHNIK and congratulations on your choice for a new reclined riding experience! With this high quality tricycle, you will enjoy many years of great riding pleasure.

Your safety and satisfaction are our main concern. On the following pages, this manual will inform you about important safety notes as well as maintenance and care instructions.

Even if you have many years of experience with bicycles please do take your time to read this manual carefully before the first ride. HP VELOTECHNIK designed your Delta tx with the latest recumbent technology that partly needs special treatment and care.

In this manual you will find detailed instructions on how to optimize your tricycle to meet your demands and riding style as well as your size and weight. In addition to this, we have put together a collection of information on care and maintenance as well as special technical advice from our engineers. Please be reminded: Send us the attached warranty registration form for your extended warranty (see page 66).

This guide helps you to keep your Delta tx in perfect condition so you will always experience maximum comfort, safety, and fun.

Enjoy yourself and have a great ride!

Paul J.W. Hollants, Dipl.-Ing. Daniel Pulvermüller
and the HP VELOTECHNIK Team

P.S. Additionally, workshop videos for attaching accessories and working on your Delta tx can be found at www.hpvelotechnik.com.

Content

Parts designation

Safety instructions

General safety instructions

Intended use

Loading capacity

Carrying luggage

Final assembly

Bolts and nuts

Quick release levers

The first miles

Safety instructions

Legal requirements

Working on the Delta tx

No alteration of parts

Frame number and identification marks

Added parts and accessories

Fairings

Replacement of parts

Taking children with you

Trailers

Electric assist system

Riding your Delta tx trike

Learning the new riding technique

Before every ride

How to ride correctly and safely

Clothing

Clipless pedals

Increasing the strain

6 Handling instructions

Adjusting your Delta tx

Seat types

Cleaning

Headrest

Raincover

Adjusting to leg length

Adjusting the handlebars

Adjusting the stem

Adapting the cables

Handlebar grips

Steering damper

Segmenting

Segmenting the Delta tx

Putting the tricycle back together

Lighting system

Lighting system

Indicator lights system

Brakes

Operating the brakes

Parking brake

Maintenance

Hydraulic brakes

Gear system and chain

Handling of the gear system

Derailleur gears

Adjusting the gear system

Chain

Chain protection tubes

Chain roller

Content

Wheels	46	Maintenance and care	
Unmounting the wheels	46	Maintenance routine	66
Tires and tubes	48	Wear and tear	66
Spokes	48	Cleaning and conservation	66
		Storing the tricycle	67
		Transport in a car	68
Headset, Pedals	49		
Adjusting the headset	49	Disposal	68
Pedal mounting	49		
		Tightening torques	69
Adjusting the rear suspension	50	Torque table	69
Suspension and damping	51		
Coil spring element DNMDV-22	52	Warranty	70
Air shock ROCKSHOX Monarch	55	Warranty policy	70
		Warranty pass	71
Swingarm pivot	57	Your personal warranty pass	71
Design and maintenance	57		
		Service plan	81
Drivetrain	58		
Intermediate gear	58		
Secondary drive	60		
Rear axle	61		
Freewheel	61		
Removal of the rear axle	62		
Replacement of the bearings	62		
Replacing the chainring on the rear axle driver	62		
Mudguards	64		
Rear mudguards	64		
Water bottle cages	65		

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For latest product information and manuals visit our website at www.hpvelotechnik.com.

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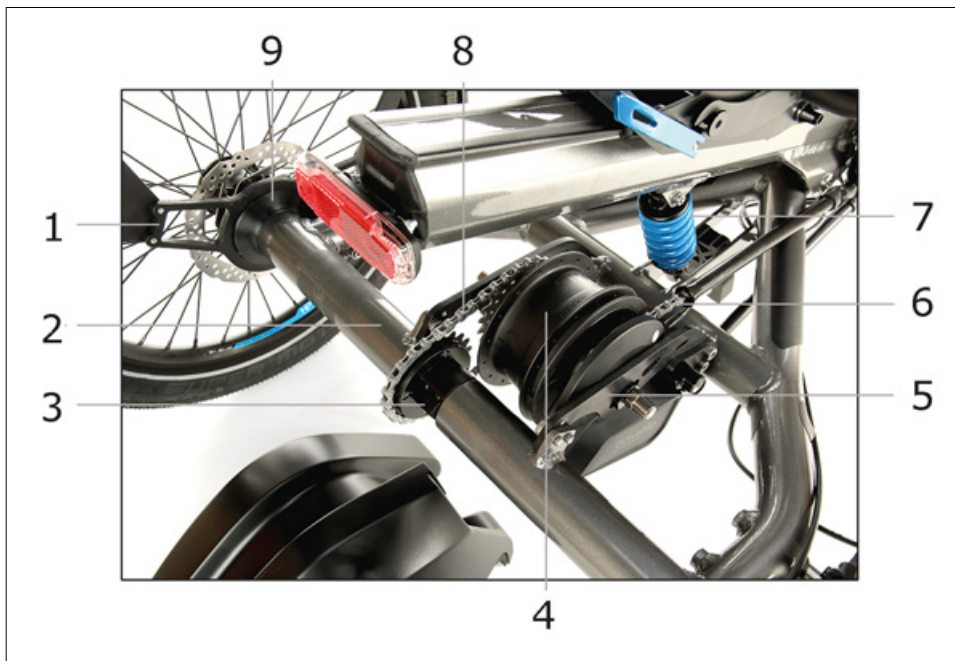
Parts designation



The figure shows a Delta tx. The configuration of your tricycle may differ.

- 1 ErgoMesh seat
- 2 seat adapter
- 3 mudguard brackets
- 4 intermediate gear cover
- 5 rear frame part
- 6 chain protection tube
- 7 front wheel with fork
- 8 front frame part
- 9 drive unit
- 10 stem (three-part)
- 11 handlebars

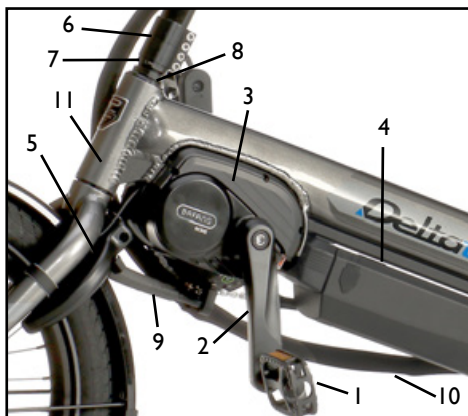
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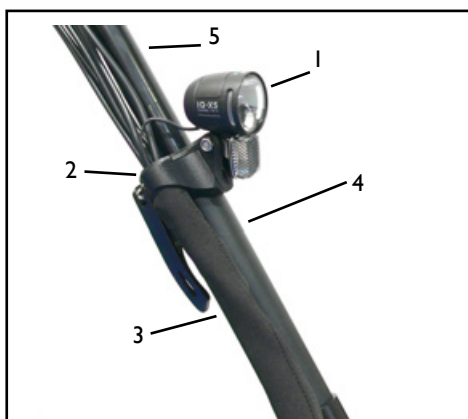
View with removed wheel driver cover.

- 1 brake support sheet
- 2 rear swingarm
- 3 axle driver
- 4 intermediate gear
- 5 swingarm
- 6 intermediate gear support sheets
- 7 primary chain
- 8 suspension element
- 9 secondary chain
- 10 wheel driver cover

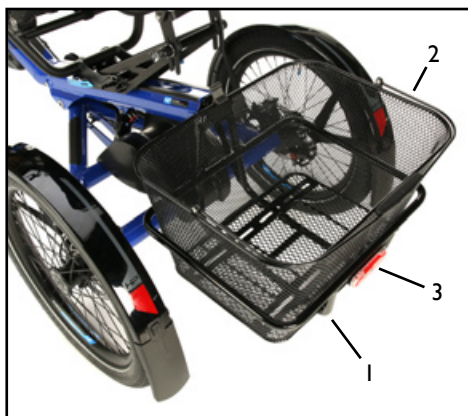
Parts designation



- 1 pedal
- 2 crankarm
- 3 drive unit
- 4 battery
- 5 frame lock
- 6 stem clamp
- 7 steerer clamp
- 8 headset adjuster
- 9 steering damper
- 10 cable hose
- 11 head tube



- 1 front light
- 2 front light and cable holder
- 3 cable hose
- 4 stem lower part
- 5 stem middle part



- 1 rear rack
- 2 basket
- 3 rear light

General safety instructions

The manuals of component manufacturers such as the electric assist system manufacturer, the brake manufacturer, the gear system manufacturer, and the pedal manufacturer also belong to this manual. They give detailed information on operating and maintaining these specific parts. Please read the manuals of the part manufacturers as carefully as this manual. Please provide this manual to any other user of your recumbent. Before your first ride carefully familiarize yourself to your Delta tx.

The maintenance and adjustment of this recumbent partly requires special tools and skills. Do only works within your limits and, for the purpose of your own safety, do not go beyond. Should you be uncertain at any point, get in contact with your local dealer.

The instructions in this manual apply only to a completely assembled HP VELOTECHNIK tricycle with standard parts from the series production of HP VELOTECHNIK.

The texts in the grey boxes are particularly important for your safety. Please read them carefully. Please note: The signs explained below will be used in this document without being explained again!

Danger!

Texts beginning with „Danger“ indicate hazardous situations, that can result in minor injuries, serious injuries or even death.

Attention!

Texts beginning with "Attention!" indicate hazardous situations that could result in minor injuries or damage to material.

Intended use

Your HP VELOTECHNIK tricycle is designed for use on streets and paved roads.

This tricycle is not designed for being used in racing and off-road riding, for jumping or acrobatics. You must not ride across curbs, stairs, etc.

The HP VELOTECHNIK Delta tx is an Electric Power Assisted Cycle (EPAC) according to EN15194. It comprises an electric drive that supports the rider up to a speed of 25 km/h or 20 mph, depending on the regulations in your country. These bikes are also referred to as “Pedelects”.

Using the tricycle on public roads is only allowed if it has been equipped with the accessories that are required by the applicable traffic regulations of the country in which you are using it.

Read the chapter “Riding your Delta tx trike” before your first ride and get acquainted to the riding behaviour of your recumbent trike.

The bike is intended to be used by persons aged 14 or older. Adolescents or persons with restricted mental health must be instructed by a supervisor. They must be able to understand and act on all safety recommendations and instructions in this operating manual.

Using this bike is not permissible for persons with significant perceptual disorders, insufficient power and mobility or medical indications that forbid safe participation in traffic.

Pregnant persons need to be especially careful as there is an increased risk of injury.

General safety instructions

The lifespan of this trike is 10 years or more under normal operating conditions and when properly maintained

Damage through inappropriate use, assembly errors, accidents, or similar activities and wilful damage results in the loss of any warranty. The intended use also includes the precise observation of the prescribed usage and maintenance regulations and instructions.

Load capacity

It is important to adjust the spring stiffness of the suspension according to the load, see the chapter about adjusting the suspension in this manual, page 50.

The maximum load (rider + luggage) is 145 kg (320 lbs). The maximum total weight (bicycle + rider + luggage) is 180 kg (396 lbs). The lower limit is valid. With a coupled trailer, the maximum total weight must not exceed 180 kg (396 lbs) as well.

Carrying luggage

Carrying luggage is only allowed on the special rack designed by HP VELOTECHNIK. The HP VELOTECHNIK rack is intended for use with the respective basket. For bicycle bags there is a special bag mount available. Smaller bags can be attached to the seat using the ErgoMesh side bag mounts.

Take care that your luggage is safely stored on the racks. Bags must be tightly fastened to the racks so they cannot move. Make sure that loose parts like straps or belts cannot touch the wheels, the derailleur, or the suspension. Take care that your luggage does not cover the lighting system and the reflectors of your tricycle and that they stay fully functional.

Danger!

Additional loads can affect the handling of your tricycle considerably. If you plan on riding with heavy luggage we advise you to make a test ride on a street with no traffic to get used to the new situation.

Maximum load:

rear rack: 25 kg (55 lbs).

bag mount: 12 kg (26,5 lbs)

side bag mount: 5 kg (11 lbs) each

Please keep in mind the maximum overall load allowed (bike + rider + luggage 180kg (396 lbs)).



Delta tx with rear rack and basket

General safety instructions

Final assembly

Your tricycle has been delivered to your specialist dealer only partly assembled.

Your dealer has to have carefully finished the assembly, perhaps altered the specification of your tricycle to meet your special requirements and performed a test ride. Please make sure that this pre-delivery service is recorded in the Warranty Pass at the end of this manual.

All screws must be checked and tightened, especially on the handlebars, stem, knuckles, swingarm pivot and wheels. Please follow the tightening torque settings listed in the table on page 69.

Deraillleurs and brakes must be checked and adjusted. Please follow the instructions in the manuals of the parts manufacturers that come with this manual.

Bolts and nuts

Screws gradually settle in and hence they can come loose. Therefore, check the screws regularly if they are tightened appropriately with a torque wrench.

In the tables on page 69 you will find the prescribed tightening torques, they refer to greased screws.

Grease will prevent your screws from seizing in their threads so that they won't unscrew anymore. In particular, screws made of stainless steel are susceptible to this and therefore have always to be put in with grease.

Do use high quality acid free grease, if possible a lubricant with added solid particles like Teflon or MoS₂. Their ingredients still work

properly after the thinner grease has been removed from the contact surfaces. Alternatively, you can use threadlocker that you apply to the screw before you put it into the thread.



Attention!

Screws must be tightened with prescribed tightening torque. In this manual tightening torques are given in "Nm" (Newton meter). Always use a torque wrench wherever a torque setting is given in this manual. Never rely on "feeling". Screws tightened too much or not enough can break, which can lead to dangerous accidents. In case you don't own a torque wrench have your bicycle mechanic do the respective work. You will find tables with the prescribed torque settings on page 69 in this manual.

Always check the screws very diligently for signs of corrosion. Rust at the screw heads may also lead to the screw seizing in the thread. When the metallic and shiny coating of galvanised screws comes off and discloses dull, grey-brown steel you have to exchange the screw.

When exchanging screws only use screws of the same type. Screws come in different strength classes. Please only use galvanised screws of the same type and strength, corresponding to the German strength class 8.8 or stainless steel screws grade A2-70, when not given any other recommendation. When in doubt, please ask your specialist dealer.

General safety instructions

Quick release levers

Quick release levers hold wheels and seat in position. A quick release lever consists of two basic parts: the lever on one side provides the clamping force. With the adjusting nut on the other side you adjust the clamping tension on the screw thread.



Danger!

Incompletely or improperly closed quick release levers can result in parts coming loose and hence in a crash, possibly resulting in serious injury.

Close quick release levers properly as described in this chapter.

Check the proper setting of quick release levers always before riding, especially when the bicycle has been unattended.

To open the quick release, move the lever away from the frame. In doing so the inscription "open" should be visible on the lever. To close the quick release, move the lever with power in the other direction so that the word "close" is visible on the outward side of the lever. At the start of the lever's motion, for, say, half of its movement, the lever should move very easily, without any clamping action.

In the second half of the lever's movement the force on the lever should increase considerably, corresponding in the end to 15-20 kg (46 lbs). In its final position, the lever should come parallel with the tricycle and should not stick out to one side.

Check the security of the lever by attempting to twist the lever. If the lever can be made to pivot around in a circle the clamping is too loose. You must re-open the quick release, hold the lever and increase the clamping tension. Do this by screwing the adjustment nut

on the other side by half a turn. Close the lever and check the clamping anew.



Danger!

All quick releases must be properly closed before riding.

In closed condition the quick release lever must be positioned close to the frame or fork! In closed condition the tip of the lever must always face backwards. This prevents the quick release lever from opening during the ride due to picking up objects.

Finally, check that the part being secured is firmly fixed: Lift each wheel several inches off the ground and give it a slap onto the tire from above. A properly fixed wheel will remain secure in the frame's dropouts.

Parts that are fastened with a quick release open easily. Thus, they are more susceptible to theft. Therefore, always secure the wheels with a lock when you park your tricycle. It is also possible to exchange the quick releases with special security screws (e.g. from PITLOCK) that can only be opened with a special tool. For this please consult your local specialist dealer.

The first miles

The first 300 km (186 miles) are important for breaking in the tricycle. During the first use of a new tricycle the screws may settle and become loose. Cables and spokes may stretch. Bearings may show play. Please be very attentive during that period.

After 300 km or after two months at the latest you will have to take your tricycle to a bicycle mechanic for the first service. Please record this first service and the works performed in the warranty pass on page 71. This first service is the prerequisite for further use of the tricycle and for your warranty claims.

Safety instructions

Legal requirements

When you ride your tricycle on public roads it must comply with national legislation and guidelines. They vary from country to country.

In general, there are minimum standards for brakes, reflectors and lighting systems, as well as usually a general duty to ensure that your vehicle is in roadworthy safe condition. There will also be a duty to ride in a safe and responsible manner.

If you ride your HP VELOTECHNIK tricycle in traffic you should be sure to observe all the applicable laws and regulations. In most countries, including Germany and the UK, two independent braking systems are required. Do not ride with only one brake working!

Please contact your local dealer to find out about your legal obligations.

As an addition, we recommend to mount a flag on a pole for better visibility in traffic. You can find a bracket for the pole integrated in the ErgoMesh seat.

The safety equipment on your tricycle must be checked before every ride and maintained in proper condition. Traffic regulations may change. Please check currently valid regulations or ask your specialist dealer.

Working on the Delta tx



Attention!

Your bicycle has moving parts. Your fingers or other body parts can be squeezed by moving parts. When carrying out adjustment, maintenance and repair work, make sure that your bicycle is standing securely and work attentively.

No alteration of parts



Attention!

You are not allowed to perform any work on the parts of the tricycle, especially frame, fork, handlebars and seat, which might endanger their solidity.

These works include drilling holes, welding, brazing, paint methods that add heat or any other chemical treatment. If any of these works is done improperly it may result in a loss of strength by direct damage or increased susceptibility to corrosion.

Frame number and identification marks

The frame number is placed on the left side of the frame at the beginning of the seat rail. If the seat rail is pushed all the way to the front, it covers the frame number and must be pushed to the rear to be read. Please refer to chapter "Adjusting to leg length" on page 27.

The frame number is also located on the front of the head tube on a badge and on the inside cover of this manual. In case of deviations, the number on the seat rail is always decisive.

Safety instructions



The frame number is placed on the left side of the frame at the beginning of the seat rail.

If you want to add an additional identification mark, we recommend to use adhesive stickers.

However, an additional identification mark can be engraved on the head tube.

Added parts and accessories

Attention!

Mounting additional parts or accessories is at your own risk. It is important that you carefully read the installation guide of the manufacturer. Additions to the handlebars like fairings, handlebar fittings, bottle holders, etc. may impair your safety due to additional loading or clips with sharp edges.

Additional accessories may impair the function of your recumbent tricycle. We advise you to generally ask your dealer before you mount any special parts or accessories to your tricycle.

Take care that the handlebars, the wheels, and the suspension always stay moveable. You must not add any parts to the handlebars or the seat that might endanger the rider through sharp edged or pointed shapes while steering, getting on and off the tricycle or bumping against something.

Before you purchase a bell or an additional lighting system make sure that these accessories conform to your national laws and regulations.


Fairings

Mounting a fairing to the Delta tx is not allowed.

Replacement of parts

Parts relevant for safety (especially brakes, lighting system, stem, handlebars, fork, drive train, suspension elements) should only be replaced by original parts by a bicycle mechanic, since this requires a certain degree of skill, suitable tools and mechanical aptitude.

Any technical change you perform on your own is at your own risk! Please note that the manufacturer's warranty may expire.

 **Danger!** If any part is deformed (e.g. due to an accident or overload), especially frame, knuckles, handlebars, seat mountings, pedals, cranks and brakes, it is not allowed to use it any further or repair it. Do not try to straighten bent parts. You must replace them for your own safety. If you do not replace a damaged part it can result in a total failure of the part and you may be seriously injured!

Safety instructions

Replacement of parts: Pedelec

Electric assist systems are carefully tested by HP VELOTECHNIK before they are used on HP VELOTECHNIK recumbents.

Part of this tests are chain forces. The chain forces are especially determined by the assist system itself and the size of the mounted chainrings. It is not allowed to mount other electric assist systems to HP VELOTECHNIK bikes than the ones specified by HP VELOTECHNIK.



Danger! HP VELOTECHNIK recumbents can be damaged by the use of drivetrain components not approved by HP VELOTECHNIK. For example, frame breakage may occur. This damage can lead to accidents with injuries or even death. Under no circumstances must the components of the drivetrain lead to higher chain forces other than specified by components originally installed by HP VELOTECHNIK.

Taking children with you

HP VELOTECHNIK tricycles are not designed for the transport of children. You are not allowed to mount a child's seat. To take children with you, you can use a trailer that has been specially designed for that purpose.

A trailer can easily be missed in traffic! Use colorful flags and permitted lighting accessories to make it more visible. Ask your specialist dealer for safety accessories.

Inform yourself about the legal requirements for child transport with bicycles in your country!

Trailers

To connect the trailer to your Delta tx you must use the trailer hitch provided by HP VELOTECHNIK. You are allowed to use trailers (double trail only) up to 40 kg (88 lbs).

Static load on the coupling joint must not exceed 6,5kg. With a coupled trailer, the maximum total weight must not exceed 180 kg (396 lbs).

A special straight towbar must be used. Else, the towbar may touch one of the rear wheels when cornering.

Read the manual of the trailer manufacturer carefully and check for speed regulations, maximum load capacity as well as regulations for trailers on public streets in your country or state.

Remember that your bicycle is longer when towing a trailer, and riding behaviour is different due to the additional weight.

Make sure you can ride your bicycle safely and feel comfortable with its behavior before riding in public traffic.

Electric assist system

The Delta tx is equipped with either a BAFANG or a SHIMANO STEPS electric assist system. They differ noticeably in control characteristics:

The STEPS motors from SHIMANO use a torque sensor to measure how much force is exerted on the pedals and adjust the motor assistance accordingly. As a result, you accelerate and ride faster if you pedal harder than if you pedal less hard.

Safety instructions

The BAFANG M300 motor controls the power output and thus your speed via the assistance level set on the display, regardless of the force with which you pedal.

Be sure to also observe the operating and safety instructions as well as the information on storing the battery in the operating instructions of the drive system.



Attention!

Ignorance may lead to mistakes and accidents. Read the electric assist system's manual before initially operating the system.



Danger!

Chargers and rechargeable batteries can explode, burn, generate smoke or cause an electric shock if handled incorrectly during the charging process. Corrosive liquid can escape from rechargeable batteries. This can lead to property damage and injuries or even death.

Only use the provided original battery or batteries explicitly approved by the manufacturer of the electric assist system. If there is any doubt ask your specialist dealer.

Never drop the battery! This may cause internal damage that can not be identified from the outside.

In case the battery experienced a considerable shock, i.e. in an accident, it must be replaced.

Do not use the battery if there is any suspected damage. Disconnect the battery from the bicycle and store it outside of buildings in a well-ventilated, non-flammable environment. Contact your specialist dealer for advice and further diagnosis.

Pay attention to the disposal information in this manual and in the manual of the electric assist system.

Observe the following **precautions**:

1. Be sure to observe the original operating instructions for charger and rechargeable battery. Keep the instructions. Make the instructions available to any other user.
2. Do not ship a rechargeable battery, as rechargeable batteries must be handled separately as hazardous goods. In case of complaints, contact your specialist dealer.
3. Do not open, damage or repair the charger or the rechargeable battery.
4. Protect the charger and battery from heat, e.g. from strong sunlight or radiators.

Pay attention when charging:

1. Only use intact charger and rechargeable batteries.
2. Only use the specified charger for charging.
3. Choose an indoor location that is ventilated, dry, dust-free, and has a smoke detector.
4. Place the charger and the rechargeable battery on a fireproof surface when charging.
5. The charger, rechargeable battery and plug must not be in a damp or even wet state. Also check the contacts of the rechargeable battery. Moisture must not be allowed to condense on the rechargeable battery i.e. allow the battery to adapt its temperature af-

Safety instructions

ter moving it from a cold to a warmer environment.

6. Do not cover the charger, battery, or plugs with cloths or other flammable material.

7. Children and people with reduced physical, sensory or mental capabilities are not allowed to charge a rechargeable battery.

8. Do not allow children to play in the vicinity.

9. Charge the rechargeable battery only under supervision.

10. Pull the plug out of the socket as soon as the battery is charged or the charger is not in use anymore.

Behavior in case of pollutant leakage, heat development, flames

Liquid is leaking from the battery:

- Immediately disconnect the charger from the socket.
- Immediately stop using the battery.
- Protect eyes, skin and textiles from leaking liquid. If liquid from the battery has entered eyes, rinse them immediately with plenty of water; do not rub, then consult a doctor.
- If liquid has got onto skin or textiles, rinse with plenty of water.

Smoke or fumes are coming out of the battery:

- Immediately disconnect the charger from the socket.
- Immediately stop using the battery.
- Avoid inhaling smoke or fumes.

Heat development or flames:

- Immediately disconnect the charger from the socket.
- Immediately stop using the battery.
- In case of fire, take appropriate measures (call the emergency number, get yourself and others away from the fire, try to extinguish the fire with proper measures, await fire fighters and ambulance).

Note that every battery loses capacity over time. That means it becomes weaker. This kind of wear and tear is normal and depends on application conditions, number of charging cycles, and environment temperature. However, the capacity also decreases when the battery is not used. A weakened battery can still be used but the range of the electric assist system will be reduced.

Disconnect the battery from the bicycle when it is not used for a longer period of time. This prevents discharging by connected devices. Store and use the battery best in a temperature range between 5°C and 20°C (41°F to 68°F).

Recharge your battery regularly even when the bicycle is not used. If the battery is not charged over a period of several weeks it may enter a state of deep discharge by self discharge. The battery can be damaged permanently, then. Deep discharge is not covered by warranty.

Some electric assist manufacturers offer smartphone apps to adjust the electric assist system. Never operate those apps while riding the trike! By changing the setup of the electric assist system the driving behaviour may change considerably. After changing any setup parameters get acquainted to the new characteristics in safe, traffic-free environment first.

Riding your Delta tx

Learning the new riding technique

Your new tricycle has been assembled by your dealer and adjusted together with you as described on the pages 20 and following in the chapter "Adjusting your Delta tx".

Before you sit down on your tricycle and enjoy your first ride please make yourself familiar with the instructions on riding technique and handling.

You need to get used to your recumbent tricycle regarding the different riding position and the different driving behaviour of multi-track vehicles. Make sure that also all other users of this tricycle will have read this manual carefully prior to the first ride. If there is any unclarity get advice from your specialist dealer.

Before the first ride the users of this recumbent have to practice and make themselves familiar with the different handling. We recommend to practice on a quiet road away from traffic. Before you ride the tricycle in traffic you must master the handling completely.



Attention!

When getting on and off the tricycle, make sure to avoid pulling at the handlebars. To get off the tricycle, swivel the handlebars to one side, sit upright on the front seat edge and then stand up to the other side. If you pull firmly at the handlebars, the steering can be damaged.



Danger!

Never touch the ground with your feet while the tricycle is still moving. The feet can be caught on the ground and be pulled backwards which could lead to a serious injury. We recommend using a pedal binding system like clipless pedals (see p. 19) or the pedal with heel support provided by HP VELOTECHNIK.

Never ride freehand!

Always keep all three wheels on the ground while riding. If you are cornering too fast, your tricycle can be upset and fall over. Lean into curves when turning sharply. At high speed, keep your upper body quiet as any upper body movements can influence the steering of the tricycle. Practice cornering away from traffic to learn what speed is safe at a specific turning angle. If you lift up a rear wheel, immediately steer in the opposite direction to bring it safely back to the ground.

Never brake while cornering! Trikes with two wheels rear and one wheel in front tend to lift the inner rear wheel when braking force is applied in corners.

Be particularly careful when turning or cornering on inclines. There is an increased risk of tipping sideways. In case you don't feel safe, dismount your bicycle and push it till you reach a level area.

You can use the push assist on your electric assist system to assist you.

Riding your Delta tx

Danger!

Never brake hard when rolling backwards! The brake force may be so high that the trike turns over to the back. This may lead to serious injury.

Get used to braking when rolling backwards away from traffic carefully. Brake moderately!

Danger!

When accelerating hard, especially when starting off, the front wheel can lift off the ground. The trike will be unsteerable then. In this case, stop pedaling immediately, pull both brake levers and lean forward towards the handlebars. Otherwise the trike may tip backwards which may cause damage and serious injury.

The following factors of substantial influence on acceleration and starting torque can be controlled by the rider:

- selection of transmission ratio, i.e. the gear when starting off
- assist level of the electric assist system
- the leg force when pedaling

The smaller the selected gear, the harder you push the pedals, and the higher the assist level - the higher the risk of the front wheel leaving the ground or you tipping backwards.

Danger!

It is important to control the trike's acceleration depending on the riding situation, your riding ability and the load on your trike.

It is a situation similar to starting off with a motorcycle where you also have to carefully apply the throttle in order to keep your front wheel on the ground.

The front wheel tends to lift off more easily

- on inclines
- with heavy luggage on the rear rack or high luggage center of gravity
- with heavily loaded luggage bags mounted on the seat
- when towing a trailer
- with tall riders or with the seat pushed far back
- with low seat back angle
- when using high seats (HS version)
- with accessories mounted to the seat such as water bottles or walking aid mounts
- with the stem extended far back.

Wear a helmet for your safety!

Familiarize yourself with the behaviour of your Delta tx with different starting gears and different assist levels on flat and traffic-free terrain first. Mastering this, you can try starting on inclines. Start on slopes with little incline and increase inclination with increasing experience. Always ride slowly on inclines and avoid stopping on the incline. In case you had to stop on an incline first select a medium assist level, then restart. Lean your upper body forward. Only pedal so hard that your trike gets moving.

Riding your Delta tx

Avoid starting off or accelerating hard on inclines greater than 10%, e.g. underground car park exits. In case you don't feel safe, dismount your trike before the incline and push it. Some electric assist systems allow to adjust the power output of each assist level using a software or a smartphone app. Ask your dealer for details. We recommend to use the maximum power only if you are able to deal with all riding situations reliably.



Danger!

Do not ride without the rear rack mounted. It is an important safety feature. It reduces the risk of rolling over when tipping backwards. If the rear rack has been damaged in an accident it must be replaced before using the trike again!

To reduce the risk of rolling over backwards HPVVELOTECHNIK offers an anti-tip device. It consists of two rollers that are mounted on the underside of the rear rack. We recommend to install this anti-tip device especially when using the strong SHIMANO STEPS EP801 Cargo drive unit, when using the highest assist level frequently or when the above mentioned factors that contribute to front wheel lifting apply to you.

Please note the reduced ground clearance with an anti-tip device mounted. The anti-tip device, the rear rack, or the frame of the Delta tx may be damaged if you ride over curb stones or steps contrary to the instructions given in this manual.

The anti-tip device does not prevent the front wheel from lifting off the ground. Rolling over backwards on steep inclines can not be completely ruled out even with mounted anti-tip device. You should therefore still follow the instructions for safe riding given above!

Never deliberately provoke a situation in which your tricycle tips onto the anti-tip device. The anti-tip device is not intended to bear load when towing the trike or to ride on the rollers.



Danger!

Recumbent bicycles have a lower seating position than upright bikes. Some road users may therefore more easily overlook recumbent bicycles, for example, when a car reverses out of a parking space onto the road. Ride with foresight.

Riding with foresight is especially important while riding in darkness. You yourself have a much better view than others perceive you. Ride defensively. We recommend mounting a well visible and reflecting flag to the tricycle while using it in traffic. Find more information about lighting systems on page 35. Please contact your dealer for more information.

Before every ride

Check before every ride:

- bell, lights and, if mounted, indicator lights must be working and properly fixed
- brakes must work correctly, brake levers must be properly fixed
- on hydraulic brakes, make sure that there is no leakage on the brake hose
- wheels must be in a good condition: tires pumped up well, rims must be trued up correctly and there must be a good profile on the tires and no damage to their sidewalls
- suspension parts must be properly fixed and well working
- all bolts, nuts and quick releases must be fixed tightly, check also after having left alone your bike for a while
- no deformation and damage on the frame parts or fork• handlebars, stem, and seat must be fixed and in the correct position

Do not use your bike in case any defect has appeared in the procedure. If you witness a loose part, unusual play, or an unexpected sound during your ride stop immediately. Contact a bike repair shop when you can not fix the problem yourself.

Pull out the key of the frame lock (optional equipment) as it may come loose due to vibrations while driving

How to ride correctly and safely

Always carry your tricycle over stairs and curb stones. Do not ride through big road holes. Especially when road holes are filled with water it is very difficult to guess how deep they really are.

Appropriate riding style

Always adjust your speed to the traffic, the road and the weather conditions. Ride slowly in curves and on unknown roads. Always ride at a safe distance from other road users, and when riding in a group never ride side by side.

When you approach a traffic light never ride past the line of waiting cars since even the most attentive car driver may not see you due to your riding position.

Keep in mind that electrically assisted recumbents can reach speeds that are unfamiliar to other traffic participants. Ride defensively. Apply higher speeds only in safe situations.

Danger!

In case you hit an obstacle, frame and steering may be damaged which can result in a serious fall. At first, the damage may be unnoticed. This can lead to accidents. Please check your tricycle immediately for deformations and cracks. If you are in doubt, please consult your local dealer.

Riding your Delta tx

Clothing

Riding a tricycle is a potentially dangerous activity. Accidents may happen even when you take care of every safety instruction prescribed.

We recommend you to wear an approved bicycle helmet that fits well. Wear clothes that are made especially for bicycle riding. They provide a great amount of comfort and safety. Make sure that parts of your clothing like wide pants, scarfs, or rain capes will not get caught in the steering mechanics or other moving parts of the bike. If you're wearing wide pants use clips to protect them from getting caught in the chain – or go for the old fashioned way and put the pants in your sockets.

When you fall with a recumbent tricycle you'll usually land on the side of your hips and your hands. Wearing reinforced cycling trousers and gloves reduces the danger of skin injuries considerably.

Clipless pedals

The pedals of your Delta tx can be exchanged to pedals featuring a clipless binding system. Due to the rigid connection between shoe and pedal you don't have to keep your foot on the pedals with pressure anymore. This enables a more relaxed and round pedalling movement where you may even pull a little on the pedals. Without this connection to the pedals your feet may come off suddenly which may result in a fall. Modern system pedals with binding therefore contribute to safe riding.

At first you will have to practice with these pedals to make sure that you can get off quickly in dangerous situations. Please read the manual of the pedal manufacturer and have your dealer explain the setup and use of the pedals to you. In the beginning set the release force of the binding to a low value to make sure you can get off safely at any time.

Please use exclusively the original shoe plates / cleats compatible to your pedals, do not use any other brand. Using shoe plates / cleats that are not compatible the binding system won't work properly.

Increasing the strain

We recommend you to perform only short rides without much power during the first weeks.

Always use a low gear and ride at high cadence. Only after having acquired some training do increase the strain slowly.

When you ride on a recumbent you use different muscles than on a conventional bicycle, and they have to be trained first. The more reclined rigging position requires your muscles and blood transport system to slowly familiarise with the new position. In case of an overload the blood circulation in your legs may be affected which shows in loss of power, a prickling in the toes, falling asleep of the legs or cramps. When riding in a sporty way it can take up to 6 months until your body has become accustomed to your new recumbent.

Riding your Delta tx

If there is pain in your knees occurring while riding this is usually the result of too much force put into the pedals at too low cadence. The good support of the back sometimes misleads to putting the full power of the legs in the pedal, similar to the leg training machines in a fitness center. When you repeat it regularly it is harmful for the knees. Pain in the knees often results from an overuse of the muscles in the knee that can also be strengthened by exercise. Also, increase your pedalling cadence to get the same power output with lower leg force.

Also, a wrong adjustment of seat position to the leg length (in most cases too short) can lead to pain in the knees. There is a lot of bicycle literature and magazines that give examples on how to build up your muscles for riding bicycles efficiently.

The pedal cadence should range between 60 and 80 revolutions per minute and not fall below 60 even uphill. If necessary have the transmission adjusted according to your riding style and environment by your specialist dealer.

In case of prolonged symptoms please contact a medical doctor.

Adjusting your Delta tx

Your position on the recumbent bicycle is essential for your riding comfort, well-being, and efficient cycling. Therefore, you should adjust the seat, handlebars, and suspension to your individual requirements.

Danger!

The works described below require appropriate tools and manual skills. Mistakes can lead to accidents. Perform mechanical test at standstill and a test ride after each adjustment. Should you be uncertain at any point get in contact with your specialist dealer.

Seat types

Product description

HP VELOTECHNIK offers two different types of mesh seats for the Delta tx: ErgoMesh seat and ErgoMesh Premium seat.

ErgoMesh seats feature a rigid aluminium frame which is covered by a fabric mesh that is attached to the seat frame by adjustable straps.

ErgoMesh Premium seats feature a frame that consists of two separate parts that are connected by a hinge. This makes it possible to adjust back frame and lower seat frame independently.



ErgoMesh Premium seats feature a hinge.

All ErgoMesh seats feature adjustable OrthoFlex upholstery in four hook-and-loop bags in the seat mesh.

ErgoMesh and ErgoMesh Premium seats are available in 4 different versions each: Standard, XL (wide), HS (high), and HS XL (wide and high).

The XL version's seat back is ca. 3 cm longer (1.2") and the overall width is ca. 5 cm (2") wider than the standard version.

The HS version provides a ca. 11 cm (4.3") higher seat position.

The HS XL version's seat back is ca. 3 cm (1.2") longer and the overall width is ca. 5 cm (2") wider than the standard seat. It also provides a ca. 11 cm (4.3") higher seat position.

Danger!

Due to the increased height of HS and HS XL seats the tricycle tends to tip over easily. This can lead to serious accidents. Get acquainted to the driving behaviour. Ride especially careful in corners!

Attention!

When storing the seat, please take care not to bend or break the seat connection sheets. Protect the edges of the seat mountings with padding to avoid scratching other objects with the seat mountings.

Adjusting your Delta tx

Seat adapter

The seat is connected to the frame of the Delta tx through a seat adapter. This adapter provides the tried-and-tested HP VELOTECHNIK seat adjustment system in connection with a lengthwise seat position adjustment on a seat rail integrated in the tricycle frame.

The levers are positioned on the left side in the direction of driving.

The seat adapter is attached to the seat rail with 2 quick-releases with blue levers. They can only be opened and closed, screws prevent twisting. By turning the nut on the opposite side the setting can be adjusted.



Right side (in direction of travel) of the mounted seat adapter with seat frame. The blue lever is shown in light gray in the picture.

The seat is fixed to the adapter's connection points by three quick releases. These levers are situated on the left side in driving direction.



Left side (in direction of travel) of the mounted seat adapter with seat frame. The quick-release clamp with blue lever (shown in light gray in the picture) is used to attach both the seat to the seat adapter and the seat adapter to the seat rail.

! Attention!

The levers of the seat adapter's quick releases need to be aligned parallelly to the frame tube. Quick release levers that face downwards and protrude the seat adapter may damage the intermediate gear cover.



Attention! When the tricycle is not secured against rolling away it may lead to accidents. Adjust the position of the pads and the seat mesh straps only when the parking brake is applied.

ErgoMesh seat: adjusting the seat frame

To adjust the angle of the ErgoMesh seat loosen the quickrelease levers on the left side. Move the seat into the desired angle and close the quickrelease levers.

Check that the quick releases fully lie on the respective face of the seat connection sheets.

Adjusting your Delta tx

ErgoMesh Premium seat: mounting and adjusting the seat frame



ErgoMesh Premium seat
1 - seat connection sheet of the back frame
2 - middle seat connection sheet
3 - seat connection sheet of the lower seat frame

To mount the seat to the adapter, fold it and slide the middle seat connection sheet onto the middle connection tube as well as the lower seat connection sheet on the lower connection tube. This is done by a slightly rotational movement. Tighten both quick releases.

Then fold up the seat back and align the upper seat connection sheet with the upper quick release. Slide the sheet into the connection by further unfolding the seat back. Tighten the quick release lever.

To adjust the seat back angle the upper quick release must be opened. To adjust the angle of the lower seat frame the middle and lower quick release must both be opened.

After adjusting the seat parts close the quick release levers. Check that the quick releases fully lie on the respective face of the seat connection sheets.

To adjust the backrest in a more upright position the HP VELOTECHNIK seat angle adapter is available.

ErgoMesh and ErgoMesh Premium: Adjusting the mesh

ErgoMesh and ErgoMesh Premium seat are both ergonomically shaped and support the natural S-curve of your spine. Forces from pedaling are supported in the area of your lower back just above your hips (lumbar support).

A number of tension belts on the back side of the seat frame allow the adjustment of the seat net to your needs. Does the seat feel too soft or gives you the feeling of sitting on the seat frame, increase the tension of the belts on the back side of the seat. Is it hard or uncomfortable, or do you feel like slipping off when going through curves, release the belts in the relating area.

It may be necessary to put a high force on the belts to apply sufficient tension to the belts. If it can not be done by hand, make use of a flat nose pliers and pull the loose end of the belts firmly. To easily loosen the belts, pull up the round end of the strap retainer.

OrthoFlex upholstery



Inserting the OrthoFlex upholstery

There are four OrthoFlex pads enclosed in your seat. They can be inserted into your seat mesh according to your personal needs.

Adjusting your Delta tx

The long pads are for the seat back, the short pads for the lower seat.

Open the "OrthoFlex"-labelled bag (hook-and-loop locked) and slide in the pad. Close the hook-and-loop flap of the bag. Sit on the trike and check the position of the pads for comfort. Adjust if necessary.

Cleaning

All seat covers, including the belts, are washable by hand and with a gentle detergent. Do not wash the seat covers in the washing machine. Let them be air dried. Do not dry them in the dryer.

Headrest

Both seat types can be equipped with a headrest / neck rest. Its height and inclination is adjustable at the clamp. After having opened the quickrelease levers the headrest can be swivelled around the seat frame tube. At the same time the headrest frame can be pulled upwards or downwards to set the height of the headrest.

Raincover

To keep the seat dry when your tricycle is parked HP VELOTECHNIK offers a raincover.

It can be carried in the bag the ErgoMesh seat is equipped standard with respectively in the additional bags of the ErgoMesh Premium seat.

Attention!

The rain cover is intended to protect the seat from getting wet. Other utilisation may cause damage.

Do only use it to cover the seat and do not sit down on the raincover.

Adjusting to leg length

Optimum adjustment of the Delta tx to your leg length is crucial for a pain-free, comfortable, and efficient ride. To adjust the tricycle to your leg length the seat adapter that carries the seat is slid back and forth on the main frame.

Open the two blue quick release levers on the seat adapter. Do not open the other quick release levers as this will change the adjustment of the seat angle.

Grab the seat adapter and push it forwards or pull it backwards until the correct position of the seat is reached. Close the two blue quick release levers.



The seat adapter can be slid on the rear frame for adjustment

Adjust your seat position in a way that your leg is fully extended when your heel (wearing flat shoes) is in the foremost position on the pedal. Experience shows that the pedal-to-seat distance on a recumbent can be slightly longer than on a conventional bicycle.

While you are pedalling, the ball of your foot should be positioned above the centre of the pedal axle.

Adjusting your Delta tx

It is important that your leg is not fully straightened when the crank is in the foremost position. If the distance is too long it is difficult to overcome this dead point, pedalling becomes uncomfortable and there is too much strain on the sinews of your feet and legs. If the distance is too short you may suffer from knee pain.

We recommend to slightly readjusting the seat every 3 months in order to provide a slightly different position to your muscles and ankles. You might also find a more comfortable and more efficient riding position. A wrong adjustment may lead to pain in your knees and inefficient pedalling. In addition, we recommend riding with a high pedalling cadence, which means to pedal fast and with little pressure. Pedalling with too much pressure may also lead to pain in the knees. Read more about it in the chapter "Increasing the strain" on page 22.

Adjusting the handlebars

While riding you should allow your arms to rest in a relaxed position on the handlebars. Do not push or pull the handlebars. Adjust the position of the brake levers together with the handlebars. The hand should lie in the straight extension of the arm and should not be considerably bent at the wrist.

In order to change the angle of the handlebars loosen the screws of the stem/handlebar clamping. Move the handlebars until they are in your favourite position. Tighten the clamping screws with 7–9 Nm.

Attention!

When getting on and off the tricycle, make sure to avoid pulling at the handlebars. To get off, swivel the handlebars to one side, sit upright on the front seat edge and then stand up to the other side. Pulling firmly at the handlebars can damage the steering.

Attention!

If the handlebars are not clamped securely, the handlebars or stem may get damaged or deformed. This can affect the steering and lead to accidents. In the event of such damage, secure clamping is no longer guaranteed, even with the correct tightening torque. Handlebars and stem must be replaced. If the handlebars twist in the stem clamping while riding, stop immediately and tighten the handlebars clamping screw to 7–9 Nm.

Attention!

If the clamping screws are tightened too strong, the handlebars may be deformed and no stable clamping can not be achieved. This can lead to accidents. Always tighten the clamping screws with a torque of 7–9 Nm.

Adjusting the stem

Components

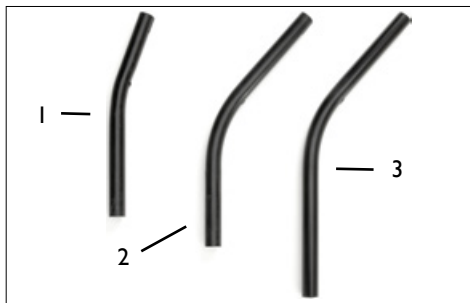
The Delta tx stem consists of three single parts that provide a variety of adjustments.

1. The lower stem part is the stem base. Its lower clamp is opened to disassemble the stem from the fork when the tricycle is segmented for transportation.

2. The middle part is available in 3 sizes.

1. For people under 1.65 m (5.5 ft) the short stem middle part often is the right choice. For people of average height between 1.60 - 1.90 m (5.3 - 6.5 ft) HP VELOTECHNIK recommends the standard stem middle part. This allows to adjust the arm position individually. For tall people from about 1.90 m (6.3 ft) an optimum position can usually be achieved with the unshortened standard middle stem part.

Adjusting your Delta tx



The middle stem part is available in three versions:

1 - short

2 - standard

3 - long

3. The stem upper part connects the handlebar to the stem. The length of the stem and the angle of the handlebars can be individually adjusted.

As body proportions vary greatly from person to person these are only approximate sizes.



Adjustment options of the Delta tx stem

Adjustment

To change the position open the M6 screws of the respective clamp and slide the stem part in or out. Observe the minimum insertion depths!

After adjustment is done tighten the screws again (tightening torque 7 – 9 Nm).



Minimum insertion depths of the stem parts:

The clamping slot (middle part) resp. the hole (lower part) of the outer stem part must be completely covered by the inserted stem part.



Danger!

If the inner stem part is pulled out too far, the clamping is not secure and damage to the stem can occur.

Damage to the stem can cause loss of control over the tricycle while riding. This can lead to accidents resulting in injury or even death.

Make sure that the end of the inner stem part is pushed in far enough:

Upper stem part/middle stem part: The clamping slot of the outer stem part must be completely covered by the inner stem part.

Middle stem part/lower stem part: There is a hole in the stem below the clamp. It must be completely covered by the inner stem part.

Lower stem part/head tube: Insert it until stop.

Shortening a stem part

The upper stem part and both versions of the middle stem part can be shortened at the bottom end. After sawing off, the edges must be deburred and protected against corrosion e.g. with touch-up paint. The lower stem part must not be shortened.

Upper stem part:

Slide the upper stem part as deeply as possible into the middle stem part. The distance between the handlebar mount and the clamp is the maximum length you should shorten to maintain the largest possible adjustment range despite the shortening.

Standard stem middle part: shorten max.

60 mm (2.3") at the bottom end.

Short stem middle part: shorten max. 20 mm

(0.8") at the bottom part.

Adjusting your Delta tx

Adapting the cables

The cables are protected by 2 neoprene hoses, which are partially overlapping. Starting below the front light holder the cables should lie inside the neoprene hose. After adjusting the stem adjust the cable position by sliding them further into or pulling them out of the front light holder. Hence, the cable bow under the bottom bracket becomes larger or smaller. Adjust the overall length of the neoprene hoses accordingly by varying the length of the overlapping section.

For larger adjustments it may be necessary to open one of the zippers.

Cover all contact areas where cables move and touch the frame with sturdy transparent tape. This protects the paint against scratching and wear or deeper going frame damages.



Attention! After having adjusted the handlebars position you have to readjust the length of the brake cables and shifter cables. The cables have to run smoothly without any sharp turns and they should not be bent sharply or stretched when the handlebars are at maximum angle. Also avoid large bows that could be caught up by the front wheels or other parts or touch objects under your tricycle.

Handlebar grips

The grips on the handlebars are susceptible to wear and tear. Have your grips replaced by your bike shop once they don't feel comfortable any more. The grips always need to be attached firmly to the handlebars.

Steering damper

The steering damper pulls the front wheel to the center position, where it rolls straight ahead. The steering damper prevents unwanted vibrations from building up when driving slowly, thus contributing to a smooth and safe ride.

Adjustment



1 - Steering damper

The adjustment nut is located in front of an additional support nut under a protection tube.



1 - Steering damper

2 - Adjustment nut

The support nut is removed in the picture.

If the adjustment nut is turned to the right, the effect of the steering damper is increased and the steering is slightly stronger.

If the adjustment nut is turned to the left, the effect of the steering damper becomes softer and the steering goes a little easier. Proceed in small steps of approx. half a turn.

Segmenting

The Delta tx trike can be segmented into three pieces plus seat in order to make the tricycle ready for transport. Two of the three parts stay connected with each other.

The front part includes the front frame, front wheel, cranks, motor, and battery. The rear part consists of the rear frame, swingarm, gearing system and rear axle. By means of the cables and wires the stem-handlebars-assembly stays connected to the rear frame part in a flexible way. To secure the stem for transport, it can be fixed on the underside of the rear frame part using a special mounting bracket on the swingarm and a hook-and-loop fastener



The Delta tx segmented

Segmenting the Delta tx

1. Pull the parking brake.
2. Remove the basket if there is one.
3. Remove the seat:



Attention!

If the foremost seat connection sheet protrudes the seat adapter, it can scratch the rear rack when you pull out the seat adapter together with the mounted seat. If necessary, open the required quick release levers and pull the front edge of the seat slightly upwards.

Open the 2 blue quick release lever. (The black quick release levers stay closed, they are needed to adjust the seat angle only.) Grab the seat adapter and pull it backwards until the seat adapter together with the seat is detached from the seat rail.

4. Dismount handlebars and stem:

If a front brake is installed, unhook the shift cable out of the brake lever and detach the cable from the stem.

The stem needs to be taken off the fork's steerer tube. To do so, open the two M6 hexagon socket screws in the second clamp counted from bottom. Do not open the two M6 Torx screws in the lowest clamp. Position the pedals horizontally.



1 - Allen screws to secure the stem on the fork.
2 - Torx screws for the fork clamping

5. The cable pack is held magnetically underneath the motor. Detach the cable pack from the magnet.
6. Place stem and handlebars under the rear frame part. Insert the stem into the rubber bracket mounted underneath the swingarm. Fix the handlebars to the rear rack or the rear axle tube with the two hook-and-loop straps provided there.

Segmenting



The stem is fixed to the rear frame part.

7. Fasten the cable pack to the right swing arm.
8. Remove the primary chain:
To protect your hands, put on the enclosed gloves. Remove the chain from the front chainring by removing it from the bottom to the top. Swing the chain carefully backwards and slide it between the swingarm tubes.



Slide the chain between the swingarm's tubes.

9. Disassemble the frame:
Front frame part and rear frame part can be separated from each other after loosening 2 screws. They are located at the lowest point of the frame on the left side of the Delta tx.



The M6 screws clamp the frame.

Place a padding on the floor under the connection area. Pull the frame parts apart, a slight shaking motion will help. Note that the frame part that is not held will fall as soon as it is released from the frame part you are holding. Support both frame parts so that the cables inside don't get damaged. Place both frame parts on the padding. Disconnect the cable connections.

Putting the tricycle back together

1. Put the enclosed gloves on and place both frame parts on a padding.
2. Stabilize the front frame part between your legs.
3. Connect the cables.
4. First attach the two halves together at the top, then slide them together.



Attention!

When assembling the two frame parts, the cables inside can be squeezed. This can damage the cables. Make sure that the cables are not squeezed during assembly.

Segmenting

5. Tighten the connecting screws alternately with 8–10 Nm.
6. Loosen the chain from the rear frame part and place it from above over the chainring.
7. Detach the handlebars from the rear rack or rear axle tube and the stem off the the rubber bracket. Slide the stem into the fork's steerer tube and set it straight to the front wheel.
8. Tighten the stem screws alternately with 7–9 Nm. If there is a front brake, hook the cable into the brake lever and attach the cables to the stem.
9. Align the cable pack and attach it to the magnet under the motor.
10. Slide the seat adapter with seat gently from behind onto the seat rail. Set the seat back to your desired position and close the two blue quick release levers.
12. Insert the basket.



Danger!

If clamping areas are not assembled correctly, the connection may fail while riding the tricycle. Uncontrollable driving situations and accidents with serious injury or even death may occur.

Before riding your tricycle, make sure the frame parts and the stem are securely clamped. Cables or wires must run freely. The handlebars must turn easily and freely. All seat quick releases must be closed properly. Please pay attention to the instructions about quick release levers on page 11.

Do not start a journey if a clamping connection is defective. In this case contact your specialist dealer for assistance.

Lighting system

Lighting system

For riding your tricycle on public streets, it is equipped with a lighting system according to German StVZO regulations. Do not only use your lights in the dark but also in the twilight of dusk and dawn. Always keep in mind that other road users may only see you very late or not at all. The electric assist system's battery also supplies the power for the lighting system. Even after shutting down the drive unit due to low battery status, the lights will keep on operating for at least 2 hours.

Cables and connectors can be affected by corrosion or mechanical damage. Therefore, check the lighting system before every ride.

Operation

The lighting system is switched on and off via the switching function of the electric drive system. Please also note the original manual of the electric assist system manufacturer.

Danger!

The cables inside the frame are connected to the electric drive system and are live. Damage to the cable connection may result in a short circuit and consequently in failure of the electric drive system. If a defect should occur, contact a specialist dealer.

Indicator lights system

The HP VELOTECHNIK indicator lights system is a device for showing a planned change of direction in road traffic. There is an indicator switch with 2 green LEDs mounted on the handlebars. On both front and rear end of the tricycle there is a right and left indicator light.

When riding in road traffic with a defective indicator system, give hand signals to indicate a change of direction. The indicator lights are attached to slightly flexible arms. If necessary, you can adjust them carefully.

Operation

Switch on the electric assist system. Press the switch button with the arrow pointing to the right: the indicator lights on the right side flash at the front and at the rear. Both LEDs on the switch flash. Move the push button of the switch to the middle position to stop the flashing. This does not happen automatically. The left indicator is activated accordingly by the switch button with the arrow pointing to the left.

The indicator lights on the switch indicate that the system is working correctly, not on which side the lights are flashing. A failure of a LEDs indicates a defect. In this case, contact a specialist dealer.

Brakes

Your tricycle is equipped with a powerful high-quality braking system. Please read the separate manual of the brake manufacturer that comes with your tricycle for details.

Operating the brakes

Make yourself familiar with the braking system. In the standard assembly, both rear wheel brakes are operated separately: The left brake lever operates the left rear brake, the right brake lever operates the right rear brake.

If your tricycle is equipped with coupled brakes for the rear and an additional front or rear brake remember which lever operates the coupled brakes and which the additional brake.

If your tricycle is equipped with a front wheel brake remember which lever operates the front brake. Apply the front brake gently as too hard braking may lead to locking-up of the front wheel.

Danger!

Make sure to brake evenly using both hands. Braking unevenly or only one side could influence the steering of your tricycle. Maximum braking performance is only achieved when braking with both hands.

The braking effect of modern braking systems can be more powerful than what you have been used to until now. Brake carefully.

If you are not familiar with the brakes we recommend you to train at first at low speed and with little braking effect until you find the correct dose for an emergency stop. Practice on a quiet road away from traffic.

Try to avoid braking in bends, though if necessary, touch the brakes carefully! Braking increases the risk of slipping. Especially when under wet conditions the wheels may immediately slide out of the bend while braking. This can result in a serious fall!

If you should hear any unusual sounds while braking the brake pads might be worn out. Do not use your tricycle any further until you have checked the brake pads according to the manual of the brake manufacturer or before having your tricycle checked by your local specialist dealer.

Danger!

Heavy load will affect braking behaviour. This can lead to serious accidents. Test driving and braking behaviour of the heavily loaded tricycle way from traffic. Adjust your way of riding accordingly!

Danger!

Please note that the braking distance is much longer when riding on wet, sandy, icy or slippery surfaces. This can lead to serious accidents. Ride with special care under such circumstances. You have to use the front brake very carefully to avoid that your front wheel slips and the tricycle slides sideways.

Ensure the handling comfort of the brake levers. With some brake levers the distance between lever and handlebars can be adjusted according to the size of your hands.

Brakes

Danger!

Never brake hard when rolling backwards! The brake force may be so high that the tricycle turns over to the back. This may lead to serious injury.

Danger!

Disc brakes can overheat on long downhill rides, fade and fail! On downhill rides, do not brake constantly, but in several intervals with higher pressure. If you notice that the brake power starts to fade, stop immediately and let your brakes cool down.

Danger!

Oil, grease, and dirt on brake discs, brake calipers and brake pads reduce the brake force considerably. This can lead to serious accidents.

Be careful not to stain brake parts when cleaning the bike or lubricating the chain. Do not ride with stained brake discs or brake pads.

You can clean oily discs with alcohol or a special spray. Oily brake pads have to be replaced.

Contact your specialist dealer in case of questions!

Danger!

Brake discs heat up during braking. Touching them may cause skin burns.

Never touch the brake disc or the brake calliper directly after braking!

Parking brake

Always secure your tricycle against rolling away when parked. In the standard assembly, the brake levers are equipped with a parking brake hook-and-loop strap that locks the pulled lever.

As an option the Delta tx can be equipped with a parking brake that is operated with a thumb-shifter mounted on the handlebars. It is connected with an additional brake caliper at the right rear or at the front wheel. Make sure to fully open the parking brake before you start riding.

If your tricycle is equipped with a parking brake, use this brake only as an emergency brake in the unlikely event of a failure of the rear or front brakes.

Preferably park your tricycle on a horizontal surface. The tricycle should not be parked on inclines greater than 10%.



The parking brake lever

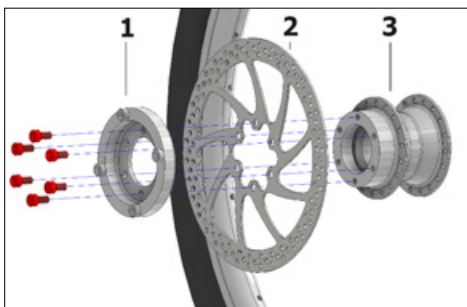
Brakes

Maintenance

The brake pads suffer from wear due to friction and have to be exchanged then. Depending on riding conditions, they can last between a few hundred up to several thousand kilometres. Please read the manual of the brake manufacturer carefully.

Replacement of a brake disc

To replace the brake disc you must first remove the rear wheel as described on page 46. Loosen the 6 screws of the wheeldriver. Remove the wheeldriver together with the brake disc. Replace the brake disc with a brake disc of the same type. When installing the brake disc, observe the specified torques and secure the screws of the brake disc and wheeldriver with threadlocker medium-strength.



1 - wheeldriver
2 - brake disc
3 - wheel hub
The spokes are not shown.

Check before every ride:

- that the braking system does not have any damages or leaks by activating the lever, holding it and checking the hose, the hose connections, bleeding screws, and reservoir lid for possible leaks

- that the brake lever pressure is okay by pulling the lever and ensuring that full braking performance is achieved before the lever touches the handlebars. If this is not the case, pull the lever several times (pump) until it feels firm.

Hydraulic brakes

Hydraulic disc brakes on HP VELOTECHNIK tri-cycles use low viscosity mineral oil. Please read the brake manufacturer's manual that comes with the tricycle.

! Danger!

All maintenance work on the hydraulic system of your brakes may only be carried out by a qualified technician. In case these works are carried out without the required knowledge and skills the braking system might fail which can lead to a serious crash

Hydraulic disc brakes feature a fully automatic pad wear adjustment. Brake pads and discs are subject to wear; therefore regularly check the thickness of your brake pads and discs and replace them if necessary. The minimum thickness of the brake pad is 1 mm, of the brake disc it is 1,7 mm. For further and more detailed information on your disc brake model please refer to the brake manufacturer's manual.

! Danger!

If the brake pads or the brake disc are worn out (pads: thickness less than 2,5 mm including metal back, disc: thickness less than 1,7 mm) the pads may be torn out of the calliper while braking. This leads to total loss of brake power and can cause serious accidents.

Regularly check the thickness of brake pads and brake discs. Do not ride the tricycle with worn-out brake pads or brake discs.

Brakes

Attention!

Activating the brake when the wheels are not mounted causes the brake pads to move in the brake caliper.

This complicates remounting of the wheels.

Never activate the brake lever with the brake pads not in place or with the wheel dismounted. When you transport the bicycle without wheels always insert the transport clips (a plastic part) delivered with your tri-cycle into the brake caliper.

Carefully separate brake pads that have moved together with a screwdriver to be able to remount the wheel. Do not damage the brake pads. Use a plastic tire mount lever for example.

Attention!

Activating the brake when the bike is upside-down may cause air bubbles to enter the hydraulic system.

This can cause brake inoperability and serious accidents.

Never activate the brake lever when the tri-cycle is upside-down. Check the braking system for a good pressure point after every transport. Operate the lever slowly several times. This makes the air bubbles get out of the brake hose. If the pressure point continues to feel soft you must not ride the tri-cycle! A specialist dealer needs to bleed the whole braking system.

Gear system and chain

Handling of the gear system

With the gear system you can adjust the pedalling frequency, i.e. the number of revolutions of the crank per minute, to the terrain and the desired speed.

Your pedalling frequency should stay between at least 60 – 80 revolutions per minute and not fall below 60 while going uphill. If necessary, consult your local dealer and have him adapt the gear range to your style of riding.



Attention!

Some electric assist systems require a parameter update when the size of chainrings or sprockets were changed. Not updating the system can cause malfunctions of the electric assist.

Your Delta tx is equipped with drivetrain divided into two sections: The primary drive from the crank to the intermediate gear, and the secondary drive from the intermediate gear to the rear driving axle.

The primary drive contains the derailleur type or hub type gear system, which is situated in the swingarm and forms the intermediate gear.



The intermediate gear with ENVIOL gear hub

The hub used in the intermediate gear transmits the power to the rear driving axle through a sprocket mounted in place where normally a brake disc is mounted on the hub (secondary drive).

The whole intermediate gear mechanics is covered in order to prevent things from getting caught up in the moving parts.

Changing gears is done by a twist shifter, an electric switch or automatically, depending on your configuration.

Riding a recumbent requires foresighted gear shifting. With manual gear system before stopping you should timely change in a low gear to make it easy to start off again, without having to pedal heavily.



Danger!

Practice shifting gears on a traffic-free street. Doing this in traffic could distract your attention from possible dangers.

Derailleur gears

You should only change the gears while you keep pedalling, smoothly and without applying great force, at all time the chain is moving between the sprockets.

Due to the long cables that expand under pressure and the housing that compresses under pressure it may be helpful for changing gears quickly to turn the bar end shifter a little bit farther than necessary to select a gear and turn it back to the indexed position once the chain has properly shifted ("overshift").

Gear system and chain

Attention!

Under no circumstances allow the tricycle to roll back while changing the rear gears, or try to pull the tricycle backwards when the gear shifter lever has been moved, as this will damage the rear derailleur.

Adjusting the gear system

Please read the manual of the gear system manufacturer carefully before working on the gear system.

Your dealer will adjust your derailleur gearing system carefully before handing over the tricycle. But during the first 300 kilometres (186 miles) of riding the cables can stretch, making the gear indexing imprecise.

The chain then climbs only hesitantly onto the next sprocket. When the chain does not climb up easily after shifting, tense the cable by adjusting the adjuster barrel where the shift cable touches the rear derailleur.

Turn the adjusting screw counter clockwise in small steps of half a turn. Check after each adjustment whether the chain moves smoothly up to the next larger sprocket. To do this, either turn the cranks by hand or ride the tricycle. When the chain climbs up easily, you need to check that it still goes down easily onto the smallest sprocket. If necessary, turn the adjuster barrel a little more and then try shifting gears again.

All moving parts of the gear system are affected by wear. Cleaning and lubricating these parts frequently can prolong the life of these parts. However, they will have to be replaced once worn out.


The cables have to be checked, cleaned and serviced regularly. Expect more wear and corrosion when the tricycle is often parked outside in bad weather conditions.

Attention!

If the chain shifts over the smallest or the biggest sprocket you have to readjust the end-limit adjusters of the rear or the front derailleur. Incorrect adjustment can lead to the chain coming off or getting stuck which may result in falls. The adjustment of the end-limit adjusters is a job for a professional bicycle mechanic.

Attention!

The ground clearance of the derailleur cage between the rear wheels is limited. Pay attention not to ride over high bumps or cross curbstones that decrease ground clearance even more. The derailleur cage may be damaged which results in failure of the gear system.

 **Attention!** Damaged cables that show for example single wires have to be changed immediately. Otherwise they may damage your gear system. Take care that the ends of the cables are protected with fitting caps.

Chain

The Delta tx drivetrain contains two chains. One longer chain is for the primary drive, one short chain is for the secondary drive.

The chain is a wearing part that has to be lubricated regularly and to be changed at signs of excessive wear and tear. The amount of

Gear system and chain

wear depends on maintenance and care as well as on the circumstances of your ride (rain, dirt, salt). Regular cleaning and lubricating can increase the chain's lifetime, nevertheless the chain has to be changed when its wear limit is reached.

Lubricating the chain

Diligent lubrication is important. The chain of your Delta tx is approximately 2 times the length of a standard bicycle chain (approximately 2,6 m (7,8 ft)). But it also lasts longer since a chain only wears while bending at the sprockets and the chain rings.

Use good chain lubricant that won't leave a sticky film on the chain. The chain lubricant must not contain any aggressive chemical substances that might affect the surface of the chaintubes or chain idler. It is important that you clean the chain with a cloth before lubricating. Otherwise the fresh lubricant washes the dirt that clings to the chain into the gaps and the bushings where the dirt causes heavy wear.

Do not use any solvents to clean the chain! The solvent washes the lubricant off the bearing parts, stays there and dilutes the fresh lubricant so that a sufficient lubrication is not guaranteed.

An effective protection against corrosion is crucial for a long chain life. Some minutes after you have treated the chain rub it with a cloth to remove superfluous lubricant from the outer surface. Wax the chain thoroughly with a wax spray. The wax keeps off water, protects from corrosion and makes dirt fall off easily.

If the chain has become wet after riding in the rain you should put your bicycle in a dry and heated room, and every day you should turn

the crank and so move the chain until it is dry again. Otherwise it is difficult for the moisture in the chaintubes to evaporate which may lead to corrosion of the chain.

Replacing the chain

The chain is one of the parts of the tricycle that will wear out. This shows in a stretching of the chain. Worn out chains do not fit the sprockets and chain rings anymore and wear them away very quickly.

Check the chain for lengthening regularly. For this purpose, try to remove the chain from the chain ring. The chain may come off to a maximum of 5 mm (0,2"). For a more precise reading you can buy a chain measurement gauge in your bicycle shop.

Only use chains that are suitable for the gear system of your tricycle. Otherwise a precise gear shifting is not guaranteed any more. Please consult your dealer on this topic. He will also assist you in checking your sprockets and chain rings. A new chain does not fit a worn sprocket or chain ring.

HP VELOTECHNIK delivers spare chains by the meter via your dealer. For this purpose, please indicate the exact length of your chain or order it a little bit longer if you want to be sure it fits. You will need approximately 2,6 m (7,8 ft) of chain.



Attention!

Some chains have sharp edges. This will make the chain tubes to wear faster. When changing the chain take care that the new chain does not show any sharp edges or burrs.

Gear system and chain

The chain length has to be fitted so that the arm of the derailleur is not fully stretched when you shift on the big rear sprocket. The derailleur must still be able to compensate a shortening of the chain by 4 cm. Please also see the manual of the derailleur manufacturer on the choice of the correct chain length.

⚠ Attention! The chain has to be closed with a special joining link or a chain riveting tool that expands the ends of the rivet while riveting (ROHLOFF revolver). A poorly joined chain may break, you can come off the pedals and fall. If you are in doubt, please have adjustments of the chain length or the changing of the chain be done by your bicycle mechanic.

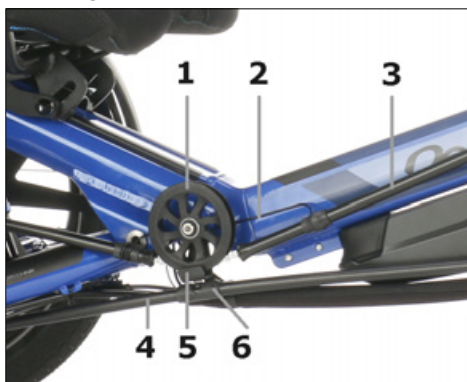
Take care that the joining link is not bigger in size than the other chain links to avoid irregular chain sounds. Every time you change the chain you also have to apply a new joining link. There are different types of joining links available fitting different types of chains.

Every interchange of the chain requires the use of a new joining link. Make sure to use a joining link that is suitable for your chain.

Make sure that any chain links in the chain are not stiff, as this can cause some annoying and not obvious problems with the gear system.

Make sure that you have not twisted the chain 180 degrees before joining it back together.

Chain protection tubes



- 1 - chain roller
- 2 - retention spring front
- 3 - upper front chaintube
- 4 - lower chaintube
- 5 - chain catching hook
- 6 - holder of the lower chaintube

The chain protection tubes are made of a long lasting plastic that features very low friction, slow wear and good noise damping. The tubes protect your clothes against the chain oil as well as the chain against dirt from the road. The upper tubes are fastened with an interchangeable retention spring, the lower tube runs through an adjustable clip.

The tubes are worn by the chain and have to be cut at the ends and expanded again (or exchanged) after 3.000 – 5.000 km approximately, depending on the chain type and the overall riding condition. You can extend this maintenance interval by turning the tubes by a quarter turn from time to time so that they do not keep wearing out in the same place.

The intensity of the wear depends mainly on the chain type. In order to perform any work at the chaintubes you'll have to open the chain and finally close it again. Please see also the instructions on "Chain" on page 41.

Gear system and chain



Danger!

If the end of a chaintube gets into the rotating parts of the drive train the drive train can be blocked and the chaintubes may be destroyed.

Take care that the chaintubes keep at least a 5 cm distance to the rear and front derailleur when the chain is stretched to the maximum.



Danger!

Without proper fixation the chaintubes can be pulled forward into the chain roller or the front chainring. This can lead to the chaintubes being destroyed and accidents.

The chaintube's ends that face the chainroller are protected against moving by a tight rubber hose and the retention springs. Make sure that the tubes are well fastened at least once a month.



Danger!

If the chaintube is worn out in the area of the retention springs the chain slides over the metal and damages them. The wire may break and the chaintube will get caught in the chain roller or chainring. This can lead to accidents.

Check the chaintubes for wear in this area monthly. If necessary exchange the chaintubes or contact your specialist dealer.

Expanding the tube ends

The ends of the tubes are expanded like a trumpet so that the chain can enter smoothly without friction and without making noises. When the ends are worn out you can renew them by expanding them again. Remove the chain by opening the joining link or open it with a special chain riveting tool. Cut the worn part of the tube exactly perpendicular with a sharp knife.

Heat the last 5 – 10 mm (0.2–0.4") at the end of the tube with a gas burner, a hot air gun, or a candle and turn it permanently until the colour of the utmost edge turns from a dull black to a shiny black. Take care that the tubes don't catch fire. At any rate work in a place with sufficient ventilation.

Expand the end with a proper tool, e.g. the rounded grip of a screwdriver. Quench the expanded end immediately with cold water.

If the tube is too short after you have cut it so that there is not enough protection anymore it has to be replaced. You can buy spare tubes either as uncut tubes or already cut into the correct length, complete with retention spring from your specialist dealer.

Replacing the tubes

In order to exchange single parts in the upper chaintubes cut the old tube at the retention spring at the chain roller and pull the remaining part off the spring. Now move the smooth part of the new tube through the spring and rubber tube, then expand the tube end as described above.

Gear system and chain

Changing the complete upper chain protection or the retention spring

Remove the bolt in the chain roller with an Allen key 6 mm. Take off the chain roller, the washer and the chain retention hook.

The end of the threaded tube in the frame is protected with a plastic tube. Take the retention spring off this plastic tube and put on the new retention spring. Turn the spring so that the retention springs run under the spacer to the tubes and the wires lie between frame and chaintube; that way the spirals face outwards.

Push the bolt back through the chain roller, the washer and the chain retention hook, secure the thread with threadlocker and tighten the bolt with 17 – 19 Nm. The recessed side of the chain roller has to face to the frame. Make sure the washer is placed between chain roller and plastic tube / frame.

The distance of the upper chaintube to the chainwheel can be adjusted by sliding the tube in the retention spring. It must be secured with the rubber tube over the spring.

Changing the lower chaintube

The chaintube is connected to the mounting plate by a rubber sleeve. For dismantling the chaintube, grab the sleeve on its rear end and pull it together with the chaintube to the rear. The rubber sleeves will release the rear tongue of the mounting plate then. Swivel the chaintube sideways. Having done that pull the chaintube to the front to release the sleeve from the front tongue of the mounting plate. Replace the chaintube and mount it by following the above steps vice versa.

Chain roller

The chain roller guides the chain below the seat to the rear wheel. The chain roller has a big diameter and it has a higher area in the middle to make the chain move as smoothly as possible. Due to this higher area the chain does not lie on the roller with its sharp edged links but with the bushes in the middle that work like small bushings. In addition to a very low rolling resistance it also supports a quiet chain movement.

A chain retention hook between the frame and the chain roller locks the roller at the bottom and keeps the chain on the roller when you pedal backwards.



Attention!

If this chain retention hook is missing the chain may fall down. When you start pedalling then the chain roller, the seat or the frame may be damaged through the chain. Please consult your local specialist dealer in case this hook is missing.

The chain roller wears slowly and gradually shows a sprocket shape in the higher area in the middle. When this middle area is worn completely the links of the chain will run on the roller. In that case you will notice that the chain makes more noise while running and you should change the roller. You can purchase the plastic part without the bearing or the complete roller through your dealer.

The bearings must not be treated with a jet of water from a high-pressure cleaner or with solvents since this may destroy the sealings and remove grease from the bearings. If the bearings don't move smoothly anymore you'll have to replace them.

Gear system and chain, **Wheels**



Attention!

The roller comes with two maintenance free sealed bearings. The bearings are exchangeable. Between the bearings there is a spacer that keeps the correct distance. If you forget to put in the spacer after you have dismounted the bearings, they will be destroyed when you tighten the screw while remounting them.

Dismounting and mounting of the chain roller

To dismount the chain roller, the chaintubes need to be removed. See also hints on replacing the chain protection tubes (page 43). The chain roller is not symmetrically shaped; the recessed side of the chain roller has to face to the frame, the flat (logo) side outwards.

Unmounting the wheels

Front wheel

The front wheel is mounted with a quick release. Open the quick release and unscrew the quick release nut a couple of turns in order to overcome the fall out protection of the fork to disassemble the front wheel.

When closing: make sure to properly close the quick release lever.



Attention!

The front wheel is fastened with a quick release mounting and therefore it is susceptible to theft. For this reason, always lock the wheel along with the frame to a solid object when you park your tricycle somewhere.

Rear wheels

To remove a rear wheel of the Delta tx first the disc brake caliper needs to be removed from the brake disc because the brake disc stays attached to the removed wheel. For doing this there are two possible ways:

1. Remove both mounting screws of the brake support sheet (1). Then the brake including the sheet and the possibly mounted mudguards come off with the wheel and can be separated from the wheel afterwards.

2. Remove both caliper mounting screws (2) and take away the brake caliper.

In both cases, slide the transport clip between the brake pads, as soon as the brake caliper no longer encloses the brake disc. The transport clip is a small plastic plate and is supplied with the Delta tx.

Wheels



Brake support sheet screws (1) and caliper mounting screws (2)

Having done one of these two operations the central bolt of the wheel needs to be removed with a 8 mm allen key.



The central bolt needs to be opened.

On the right side you'll have to prevent the rear axle from turning e.g. by applying a chain whip to the axle-mounted secondary sprocket.



When dismantling the right rear wheel or mounting the left rear wheel: Use a chain whip to fix the axle mounted sprocket.

When the central bolt is removed the wheel can be pulled off to the outside. In case it won't move easily put a rod or backing-out-punch through the hole of the cover cap which is attached to the brake support sheet. Do not position the rod or punch on the sprocket of the freewheel, but on the wheel driver. (See also the illustration in chapter "Freewheels" on page 61.) Gently apply some hammer blows with a rubber mallet on the rod to loosen the wheel.

To reassemble the wheel make sure the surfaces of the axle are clean and have a thin film of grease applied. Put back the mudguards-and-brake-assembly onto the disc and stick the wheel back on the axle. Apply some threadlocker on the central bolt and screw it back into the axle (20 – 22 Nm). This time, when working on the left side wheel the axle has to be stopped from turning. Screw in the mounting screws of the brake support sheet and tighten them with 7 – 9 Nm. In case you only removed the brake caliper, put it back in place, screw in and fasten the mounting screws with 7 – 9 Nm.

Danger!

If a wheel comes loose while riding, a serious accident may occur. When reinstalling the wheels, secure the fastening screws with threadlocker and observe the specified torques.

Wheels

Tires and tubes

The correct air pressure is decisive for smooth running and a good protection against punctures. The maximum pressure is printed on the sidewall of your tire. You might find an indication of the minimum required pressure on the sidewall of the tire as well.

Since the tubes in the tires gradually loose air you should check the air pressure before every ride.

The tubes come with Presta valves (also called French valves or Schläverand valves). They are very airtight and easy to pump up.

To do so, first screw off the valve cap. Now you see a small threaded rod with a knurled nut that comes out of the valve. Loosen the knurled nut as far as it is possible.

To pump up the tire and check the pressure you need a pump with a gauge, preferably a solid floor pump. Put the knob of the pump on the valve, push it completely on the valve and then retract it a little bit. Now you can pump up your tire easily.

After you have pumped up the tire to the desired pressure pull off the pump knob. Secure the valve by turning the knurled nut on the threaded rod properly against the valve body. Finally put on the valve cap again.



Danger!

Check your tires for damage on a regular basis. You should exchange tires with worn threads or damaged sidewalls. Damaged rim tapes have to be exchanged immediately. Damages at the tires may lead to a sudden burst of the tire and thus result in a serious fall and injury.



Danger! Never pump up your tires beyond the maximum pressure. The tire may burst while riding or come off the rim, which may result in a serious fall and injury.

After you have exchanged the tires please check if the wheels turn freely and check the minimum distance between mudguards and frame.

When you exchange tires please note the maximum width limit of 62 mm (approximately 2.4"). On all wheels you have to use tires of ETRTO size 406 (20").

Spokes

The spokes of the wheels connect the rim to the hub. They transmit the braking power of the disc brakes, and in addition they transmit the pedal forces at the rear wheel.

The tricycle requires a high spoke tension ($> 1000 \text{ N}$) as the wheels have to bear high side loads. Any damaged spokes must be replaced immediately.



Attention! To true up the wheels you need special skills, please have this work done by an experienced bicycle mechanic.



Danger! Take care that your spokes are always in perfect condition and the spoke tension is balanced. Do not ride with wheels that run untrue or wheels with loose or missing spokes. These faults may lead to a total failure of the wheel while braking and result in a serious fall!

Headset, Pedals

Adjusting the headset

The fork of the Delta tx is supported by an A-Head type headset. The headsets must be adjusted in order to let the fork turn easily without showing play.

To check the bearing play, pull the front brake and grab the upper bearing cup with your other hand. Now move your tricycle back and forth. In case there is no front brake mounted grip the fork blades and move the fork forth and back. If the bearing has play the upper cup moves noticeably in contrast to the head tube.

There is a special headset adjusting device mounted between headset and fork clamp which makes it possible to remove headset play without opening the fork clamp (the clamp directly above the head tube, equipped with Torx screws).



1 - headset adjusting device

To remove headset play open the lateral 2 mm hexagon socket set screw for some turns. Use a flat 36 mm headset wrench and turn the upper part of the adjuster counter-clockwise until no more play is noticeable, but the fork can still be turned easily in the bearing. Check the fork for play again. When finished secure the

upper part against turning by gently retightening the 2 mm hexagon set screw.

Pedal mounting

The threads of the pedal axles are different for left and right to prevent them from becoming loose while pedaling.

Tightening direction for the pedal axles is in the same direction like the crank turning direction while pedalling forward. Therefore the right pedal has standard thread, the left pedal has left handed thread.

The pedals need to be tightened with high torque in order to keep them from loosening. Observe the recommended torque in the manufacturer's manual. Use a 15 mm open end wrench for tightening. On some pedal types, a 6 mm hexagon socket is present on the inside axle face. Then an Allen key can be used for mounting the pedals.

Mount the pedals with grease on the threads to make disassembly easier.

Adjusting the rear suspension

Suspension and damping

Suspension allows compensation of bumps and roughness of the track for advanced comfort and reduce forces on the tricycle frame and on the rider.

A well-adjusted suspension improves the traction of your tricycle on uneven roads. In order to achieve maximum riding comfort, the suspension settings have to match your weight as well as the road condition.

The goals of the adjustment are:

- maximum use of the available suspension travel without the suspension frequently bottoming out
- quick reaction of the suspension without obvious oscillation after having passed a bump
- avoiding self-enforcing oscillations, that means increasing oscillations of the suspension system due to pedalling influence, rhythmic body movements or permanent wavy underground

The improvement of road holding the suspension gives you a plus of safety. The suspension system of the rear swingarm consists of a spring and a damper.

Often, the terms suspension and damping are used inaccurate in everyday language. The spring is the elastic element that compresses and expands due to the load changes, which e.g. occur on bumpy roads. While expanding, the spring releases the same energy it took to compress it.

The rear swingarm is suspended with a steel coil spring in the standard version. The optional rear shock ROCKSHOX Monarch uses air as spring medium.

The damper slows down the process of compression and expansion. That means the tricycle does not immediately "spring" back to the initial position or even further than that after having passed a bump. The damper converts spring energy into friction and finally into heat, and thus takes away energy from the suspension system. The damper prevents the spring from swinging uncontrolled after an initial stimulation. In addition, the damper helps to avoid self-enforcing oscillations of the suspension caused by recurrent stimulation like pedalling forces within a crank revolution or the rhythmic up and down movement of the legs.

In case you have mounted the optional suspension element ROCKSHOX Monarch, the hydraulic damping of the rear suspension is adjustable. The more you increase the rebound setting, the slower the system comes back to the normal position after a compression.

Adjusting the suspension



Danger!

While adjusting the rear suspension element never load the tricycle e.g. by resting on the seat or loading the rear rack when your hands or tools are close to the suspension element. Your hands may get caught and squeezed when the suspension compresses.

You should always set the damping as low as possible to give the tricycle the possibility to quickly react even to several bumps in a row. You can ride a recumbent tricycle with a considerably lower damping rate than for example a MTB: due to the relaxed and steady position of the body the recumbent does not experience extreme variations in the load as it is known from dancing on the pedals while riding uphill on a mountain bike.

Adjusting the rear suspension

In addition to this, varying pedalling forces have very little influence on the suspension of the tricycle due to the design of the suspension system of the tricycle. So when you adjust the damping, always start with a low damping rate.

It is necessary to choose the correct spring stiffness to have a well operating suspension system. The spring stiffness is a measure for the compression of a spring at a certain load. It is either given in "N/mm" (Newton per Millimetres) or "lbs/inch" (Pounds per Inch). Sometimes you only find "lbs." printed on the springs.

The spring stiffness of the optional air shock ROCKSHOX Monarch is set by adjusting the air pressure.

The suspension is designed in a way that the spring is compressed partly when you sit down on your tricycle. This is called negative suspension travel (or "sag") and it enables the spring to expand on bumpy roads. (This is in fact a definitely positive feature.) You should choose a spring stiffness with which this negative suspension travel takes up around 30% of the overall suspension travel. This value usually provides a very comfortable ride on your suspended recumbent tricycle.

Adjusting to load

The luggage carrier of your Delta tx is mounted to the suspended part of the frame. This way your luggage is also fully suspended and it spares the material.

Additional luggage changes the load on the wheels and their suspension. The springs are further compressed initially through the load and there is less suspension travel left for bumps while riding. Your suspension will bottom out more often.

In order to compensate the variations in the load you can change the preload of the spring. For details see the following chapter.

Theoretically adjusting the preload can compensate for a load change of approx. 10 kg (23 lbs) at the rear wheel. In case of higher variations in the load you will have to exchange the spring with a spring with different spring rate. In practice, you can often do without it: With a suspension travel of 80 mm (3") on the rear there is a lot of suspension travel. When you choose the spring rate to have the full 80 mm (3") at your disposal when your recumbent is under maximum load, you will have a somewhat smaller but still very comfortable suspension travel when you ride without luggage.

The optional air shock ROCKSHOX Monarch can be easily pumped up to compensate load increases.



The optional air shock ROCKSHOX Monarch

Adjusting the rear suspension

Coil spring element DNM DV-22

The Delta tx comes standard with the coil spring element DNM DV-22. The suspension element consists of a steel coil spring combined with a hydraulic damping unit.

The damping results from fluid friction of oil flowing through thin holes of a valve in between two chambers inside the damper. A slightly noticeable sound that may occur from this oil flow is normal. Due to the fluid friction, the spring element may heat up, therefore touch the spring element after a ride only very carefully.

For a maximum of riding comfort, the system should use about 30% of its travel while you sit on the tricycle in driving position. ("sag").

Adjustment

The preload determines how far the suspension compresses when you are sitting on the tricycle while standing still. Therefore, it is necessary that you have mounted the correct spring stiffness according to your weight, also see page 53.

you will find more information about changing the springs. Measure the distance between the two suspension element bolts or between rear frame end and ground while the tricycle is unloaded as well as while sitting on the tricycle in riding position. Also take into account possible luggage.

Find out the total suspension travel possible for your tricycle with the method described above, depending on the mounted add-on-parts and clips on the piston rod. The static compression should amount to about one third of the overall suspension travel.

You can affect this negative suspension travel depending on how much you weigh and how much you load your tricycle either by adjusting the suspension preload for fine tuning or by replacing the spring with a spring with a different stiffness in the rough tuning.

In order to adjust the suspension preload, turn the adjustment ring on the threaded part of the suspension element by hand. Turning the adjustment ring clockwise reduces the preload, turning it counter clockwise you screw the adjustment ring towards the spring and increase the suspension preload. It is helpful to turn the spring together with the adjustment ring.

The adjustment ring should be turned not more than five turns (measured from the relaxed position) towards the spring. If the suspension compresses still too far even after six turns, the spring is too soft and has to be replaced by a harder spring. A too high preload with a too soft spring will not take advantage of the full comfort potential.



Danger!

The adjustment ring has always to be screwed on so far that the spring has no play when unloaded. Otherwise the adjustment ring could come loose through shocks while riding and the slotted rear spring retention disc comes off. In that case the suspension element may be damaged or the rear wheel can hit the frame or rear rack, which may lead to serious falls. Always have an initial preload of at least half a turn on the spring.

Adjusting the rear suspension

Danger!

The suspension elements are filled with gas under high pressure. Never try to open the damper or to remove the screw at the gas tank. Inside the damper there are no user serviceable parts. In case of damage you will have to take the complete suspension element to your dealer.

Danger!

Take care that the rear wheel or mudguard or suspension element never hit the frame, seat, rear rack or luggage box while the suspension is fully compressed. Therefore, relax the spring completely by turning the spring retention disc on the thread of the spring element as far as possible (before this, push the possibly existing safety spring ring from its slot in the threaded section as far as possible). Have a second person sit down on the tricycle and make the suspension bottom out by leaning on the seat or the rear rack. If the distance between the wheel or mudguard and the frame, seat, or rear rack is smaller than 1 cm you will have to mount an additional spacer. In case you don't, the mudguard may break suddenly or the rear wheel might be blocked which can lead to serious accidents.

Changing the steel spring

You can buy the spring for the rear suspension element in different spring rates at your dealer.

We recommend the following spring rates, depending on the overall weight:

Load Spring stiffness

- up to 80 kg: 850 lbs/inch
- up to 110 kg: 1100 lbs/inch
- up to 145 kg: 1500 lbs/inch



The suspension travel is adjusted by adding clips to the piston rod of the spring element.

In addition to this, your dealer can also use springs with other spring rates.

In most cases the rate is printed onto the spring. Pay attention to the correct imprint since the term "B650" that sometimes occurs does not necessarily mean 650 lbs/inch!

Spring length: DV-22: 70 – 90 mm (2.8"–3.5")

In order to change the spring, you will have to remove the upper of the suspension element's mounting screws and swivel away the swing-arm. Hold the main frame of your bicycle in a work stand.

If there is a safety ring at the thread of the suspension element. Move it to the end so you can unscrew the adjustment ring completely and then turn it to the outer position at the end. Remove the slotted spring retention disc at the other end. Loosen the screws of the rear suspension element with two Allen keys and push the screw out of the suspension element's eye.

Adjusting the rear suspension



Danger!

If the bicycle does not stand on the ground while undoing the screws of the suspension element, the rear swingarm may come down uncontrolled afterwards and hurt you seriously. In addition to this the cables of the gear system and the brakes may overstretch and you will have to replace them. Ensure that the rear swingarm comes down in a controlled and gentle way by putting up a solid string or zip tie between the main frame and the rear swingarm.



Danger!

If the tricycle is standing on the ground the frame and the swingarm come up against each other. Please make sure that this happens in a controlled and gentle fashion. Put a cloth between the contact surfaces. Otherwise, if they come up against each other uncontrolled your hands may get caught between main frame, rear swingarm and suspension element and your bicycle may be damaged.

Move the rear swingarm down carefully. While doing this, take care that you don't bend or stretch any cables. Remove the spring from the suspension element and put on the replacement spring. Make sure the new spring has the same diameter as the old spring and that it is supported safely by the adjustment ring. Put back the slotted spring retention disc on the piston rod. If necessary, compress the spring a little bit. The spring retention disc has to match its support at the end of the suspension element.

Secure the spring by tightening the adjustment ring until the spring doesn't show any more play. If there is a safety spring ring, push it back

into the slot on the thread.

Move the rear swingarm back up and connect the rear end of the suspension element with the rear swingarm using the bolt. Lubricate the bolt thoroughly. Secure the screws of the suspension element with threadlocker (e.g. LOCTITE 243) and tighten the screws with 6 – 8 Nm. After having exchanged the spring you have to readjust the spring preload as described in the chapter on "Adjusting the suspension" on page 50.

Cleaning and lubricating

Do clean the suspension element, especially the polished piston rod, if it is dirty. Remaining dirt and sand can damage the seals of the hydraulic system and so shorten its life considerably.

We recommend you to protect the suspension element from dirt with an elastic cover that you can buy at your local dealer when riding on dirty roads regularly. From time to time grease the thread for the spring preload with a drop of acid-free oil.

Thus, you can always turn the adjustment ring easily by hand. Once a year you have to grease the pivots of the suspension element. For that purpose, dismount the suspension element as described under "Changing the steel spring" on page 52.

Remove the plastic spacers and pull the metal tube out of the bushing. Lubricate the bushing and the tubes with grease. Finally remount the suspension element.

Hydraulic dampers are affected by wear and tear through normal use. It depends on the usage of the tricycle, the amount of dirt on it and the maintenance and lubrication. After 3000 km the damper must receive an inspection by a trained mechanic, worn out parts or the hydraulic cartridge can be replaced then.

Adjusting the rear suspension

Due to wear of the seals oil can leak from the damper. The internal oil can become foamy. This may lead to some noise when the damper is working. This noise does not affect the function of the damper. Only if there is no obvious damping after the first 5 mm of travel, the damper should be replaced.

Please also note the maintenance instructions of the damper manufacturer provided with your tricycle.



The bushings of the rear spring element need to be lubricated

Air shock RockSHOX Monarch

This rear shock contains pressurized air in a chamber as suspension medium. Air shocks are lighter than steel spring rear shocks. Another advantage is that the spring stiffness can be easily adjusted with an air pump: By increasing the pressure the spring becomes harder.

Air shocks have progressive spring behaviour, whereas steel springs have linear spring behaviour. This means that the air shock gets progressively harder, e.g. it is much stiffer when fully compressed than when only slightly compressed. The advantage of this progressive spring behaviour is the good bottom-out protection when heavily loaded. The valve for the air chamber is located at the upper end of the air shock. The valve is protected by a metal valve cap.

To be able to attach an air pump to the valve on the Delta tx you must either dismount the cover of the intermediate gear or screw on an angle valve adaptor.

To pump up the air shock you need a special air pump designed for bicycle air shocks. It must feature a fitting Schrader valve adaptor and a pressure indicator. When attaching or removing the pump to/from the valve, you will lose some air pressure (about 0,5 – 1,0 bar). Take off the pump quickly.

Maximum allowed pressure: 18 bar

Adjusting the damping

By adjusting the damping, you can adjust the performance of the suspension precisely to your individual riding situation. A rough street with many harsh bumps that occur in a row or even cobblestones needs a low damping rate while a road with long stretched bumps that occur more regularly needs a stronger damping to achieve a smooth road holding.

When you add a lot of luggage you will need to adjust the spring stiffness; in that case an adjustment of the damping may even give you more riding comfort.

Finally, the oil used in the damper becomes thicker and more viscous at lower temperatures, which can be compensated through a change in the damper setting.

Please note that you can seriously spoil the riding comfort by a bad damper setting, especially caused by unsystematic playing with the knobs that may result in much too high damping values. In the worst case the suspension element will neither compress nor decompress. If you are in doubt, please consult your local dealer.

Adjusting the rear suspension

The rebound damping prevents an eventual "jumping" of the rear wheel and provides a good traction. By improving the road surface contact the suspension of the recumbent tricycle also increases your riding safety.

A higher damping value prolongs the time until the decompression movement is finished. Only then can the suspension compensate the next shock with the full suspension travel.

Therefore, when you ride on very bumpy streets with shocks that occur fast in a row you might want to use a lower damping value.

A good setting for maximum comfort is achieved when the rear wheel decompresses completely after a shock and then oscillates only once. In order to check the adjustment, you will need a second person that compresses the suspension by pushing the tricycle down while you are sitting on the tricycle in the riding position. The other person can then observe the suspension movements.

In order to adjust the damping during decompression, turn the adjustment knob on top of the rear end of the suspension element. If you turn the knob in direction of the „-“, you will get less damping and thus faster decompression. Turning the knob in direction of the „+“ will give you more damping and thus slower decompression.



Attention!

When mounting the Air shock to the frame, take care to place it in correct position: The lever must not get in contact with the frame or swingarm when the shock is being compressed.

Swingarm pivot

Design and maintenance

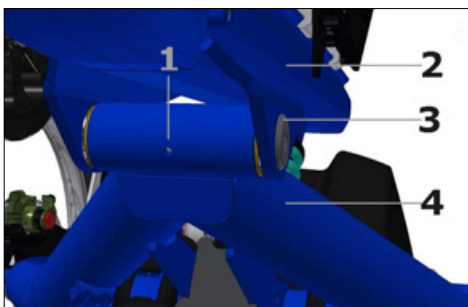
The rear swingarm pivot comes with maintenance-free bushings. They feature a self-lubricating system with Teflon particles. They sustain a very high load and they show almost no wear.

In case you notice play or a creaking noise at the rear swingarm please check the two screws that fix the axle in the frame. The bushings are exchangeable. For that purpose, you will have to dismount the rear swingarm and send it together with the axle via your specialist dealer to HP VELOTECHNIK. After installation the bushings are machined to adjust them.

Loosening the axle screws

The Delta tx rear swingarm uses special axle screws that are equipped with fitting surfaces.

To disassemble the rear swingarm, the axle can be secured against rotation by inserting a thin metal rod (e.g. a 3 mm hex wrench) through the drilling in the rear swingarm (see figure) into the receiving hole of the axle. Then loosen the two axle screws and unscrew them completely. Note that there is a special washer on each side between axle and frame, which you have to install again later.



- 1 - drilling
- 2 - frame
- 3 - axle screw
- 4 - rear swingarm

Mounting the rear swingarm

Do not forget to place the special washer mounted ex factory on each side of the axle. Be careful not to damage the fitting surfaces in the frame's attachment brackets when inserting the screws.



- 1 - washer, 2 - bushing

! Attention!

If the washers between main frame and the swingarm bushings are missing the bearing will not work properly. This may lead to frame damage.

Make sure there is a special washer between the bracket sheet and bushing on each side.

When tightening the axle screws, make sure that the axle does not rotate (by using the rod as described above). Tighten them with 17 – 19 Nm. If you are unsure or in doubt, contact your specialist dealer.

! Danger!

If the screws at the axle are not tightened properly play and noise may occur. Possibly the frame will be damaged. In extreme cases the swingarm may come loose which can lead to a serious fall. Secure the axle screws with threadlocker. Tighten the axle screws with a torque of 17–19 Nm.

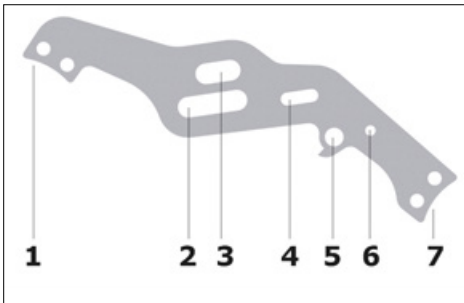
Drivetrain

Intermediate gear

The intermediate gear is located in the drive train of the Delta tx between crank and rear axle. It contains the gear system of the bicycle and therefore consists of a rear hub for derailleur gears or a gear hub. The primary chain transmits the drive power to the sprocket(s) on the right side of the hub (similar to a standard rear wheel). A sprocket is also mounted on the left side of the hub. From there, the power is transmitted through the secondary chain to the rear axle.

The intermediate gear is mounted to the swingarm with 2 support sheets. The support sheets for the intermediate gear are different for gear hubs and derailleur gears.

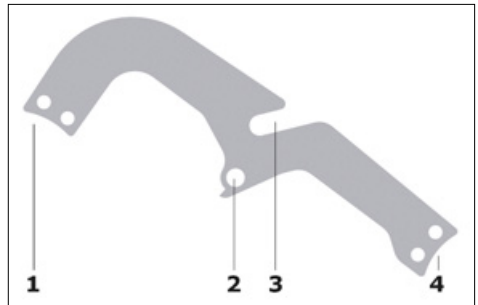
For gear hubs:



Support sheet for gear hubs. Function of the holes:

- 1 - attachment to the rear swingarm bracket
- 2 - axle support for NEXUS or ENVILO gear hub
- 3 - axle support for ROHLOFF gear hub
- 4 - torque support screw for ROHLOFF torque arm
- 5 - derailleur mount
- 6 - attachment of the adapter for an Alfine chain tensioner
- 7 - attachment to the front swingarm bracket

For derailleur gears:



Support for derailleur gears. Function of the holes:

- 1 - attachment to the rear swingarm bracket
- 2 - derailleur mount
- 3 - mounting slit for hub axle
- 4 - attachment to the front swingarm bracket

To replace a sprocket or cassette of the intermediate gear, the intermediate gear hub must be dismantled.

Dismounting the intermediate gear: gear hubs

1. Dismount the cover.
2. Loosen the axle nuts on both sides (NEXUS and ENVILO), with a ROHLOFF hub open the quick release and loosen the torque support screw.
3. Slide the intermediate gear in the slotted holes completely backwards to reduce the secondary chain's tension. Open the secondary chain.
4. Unscrew the screws of the left support sheet for the intermediate gear. Rotate the support by approx. 90° degrees, so you can remove it to the left.
5. Unscrew the axle nuts and take off installed washers, respectively remove the quick release axle (ROHLOFF).
6. Remove the primary chain. Pull the intermediate gear out of the right support sheet.

Drivetrain

Dismounting the intermediate gear: derailleur gears

1. Dismount the cover.
2. Open the quick release.
3. Slide the intermediate gear in the mounting slit completely backwards to reduce the secondary chain's tension. Open the secondary chain.
4. Remove the intermediate gear by sliding it forward out of the mounting slit.

Replacing the chainring on the left side of the intermediate gear

Remove the intermediate gear as described above. Replace the chainring with a chainring of the same type (22 teeth with 6x44mm IS2000 mounting pattern). If your Delta tx is equipped with a ROHLOFF hub, you need a special chainring (4x65mm), available by HP VELOTECHNIK, item number ZK1RF22.

Mounting of the intermediate gear: gear hubs

1. Insert the axle of the intermediate gear into the right support. Make sure to choose the designated drilling (see beginning of the chapter).
2. Slide the left support onto the axle and fix it with four screws to the swingarm (10 – 12 Nm).
3. Fasten the axle:
NEXUS and ENVILO: The external tab of the torque support has to point backwards.
ROHLOFF: Make sure the torque support engages the support screw.
4. Place the secondary chain on the chainring and close it.
5. Move the axle in the slot holes, to adjust the secondary chain's tension.
6. Tighten the axle nuts, respectively the quick release.

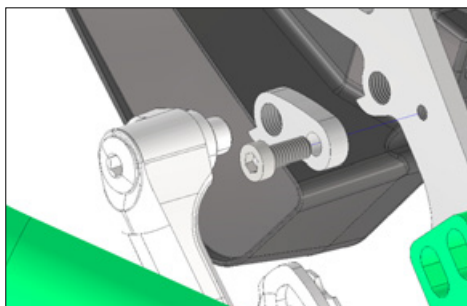
7. Place the primary chain.
8. Mount the cover

Mounting of the intermediate gear: derailleur gears

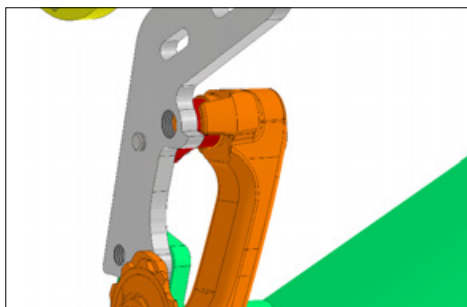
1. Place the intermediate gear between the support sheets, slide in the quick release axle and screw on the quick release nut.
2. Move the axle in the mounting slit, to adjust the secondary chain's tension.
3. Tighten the quick release.
4. Mount the cover.

Mounting the adapter for the ALFINE chain tensioner (ENVILO setup only)

The adapter aligns the chain line of the ALFINE chain tensioner to the chain line of the ENVILO hub.



Mounting of the adapter of the Alfine chain tensioner.



The adapter's external tab lies flat against the nose of the support. The Alfine chain tensioner lies on the external tab.

Drivetrain

Secondary drive

If the secondary chain's tension is too low, the secondary chain may slip off the sprockets. If the chain's tension is too high, the bearings will be overloaded and wear out quickly.

The secondary chain's tension can be increased by moving the axle of the intermediate gear forward in the slotted holes (gear hubs) respectively in the mounting slits (derailleur gears) of the support sheets of the intermediate gear. Note that with a ROHLOFF hub, the torque support screw for the torque arm must also be moved.

Check the secondary chain tension over the entire chain length by rotating the chainrings one turn.

The number of chain links of the secondary chain is:

Derailleur gears: 42 chain links

Gear hubs: 38 chain links

Rear axle

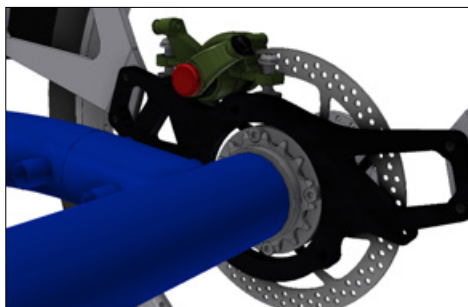
Freewheel

A freewheel is mounted between the rear axle and each of the two rear wheels. If a freewheel is damaged, it can be replaced with an identical freewheel. For the disassembly you need the HP VELOTECHNIK special tool "Tool for freewheel removal DET" (item number WZDETFL).

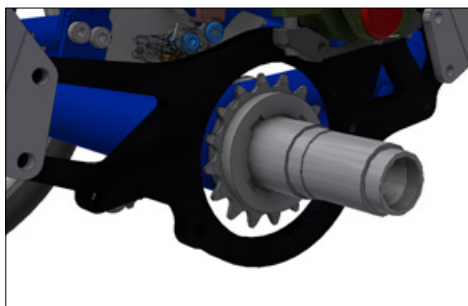
1. Dismount the rear wheel as described on page 46.
2. Dismount the cover of the intermediate gear.
3. Slide the intermediate gear in the slotted holes (hub gears) or in the mounting slits (derailleur gears) completely backwards to reduce the secondary chain's tension. Open the secondary chain and remove it.
4. To dismount a freewheel, you must fix the rear axle. To do this, lock the chainring on the axle driver using a chain whip.
5. Place the HP VELOTECHNIK special tool on the freewheel. Note the different threads of the freewheels: The freewheel on the right-side has a left-hand thread. The freewheel on the left side has a right-hand thread. Slide a rod or Allen key through the two holes of the special tool and unscrew the freewheel from the rear axle. Take care not to lose the bearing spacer behind it.
6. Clean and lubricate the thread and slide the bearing spacer onto the rear axle.
7. Screw the new freewheel onto the rear axle up to the stop. It is tightened by the driving force during riding.
8. Mount the rear wheel, the secondary chain and the cover. Note the informations on page 46 (rear wheel) and on page 60 (secondary drive).

Observe the specified torques and secure the screws with medium-strength threadlocker.

The left-hand-threaded 16 teeth freewheel is a special part that is available through HP VELOTECHNIK.

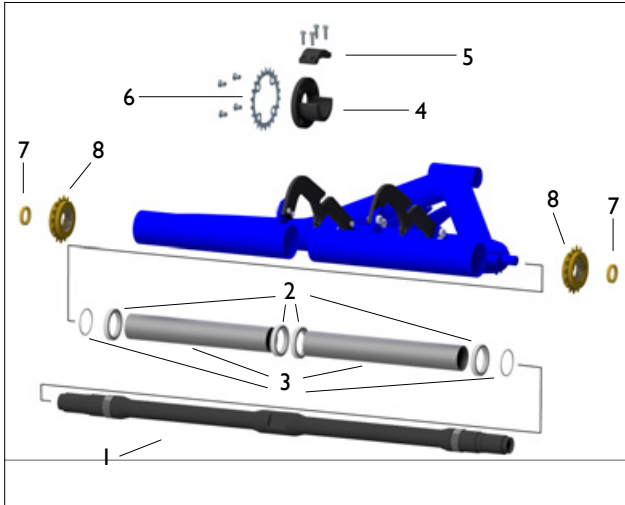


*View of the freewheel without cover:
The driving screws are fastened to the wheeldriver and engaged in the gear wheel of the freewheel.*



View of the freewheel from the outside, the rear wheel is removed.

Rear axle



- 1 - rear axle
- 2 - bearing
- 3 - bearing spacer
- 4 - axle driver
- 5 - axle driver clamp
- 6 - chainring on the axle driver
- 7 - elastomer ring (ENIOLO hub gear only)
- 8 - freewheel



Danger!

Works on the rear axle require specialist knowledge. Incorrectly performed work may result in damage and subsequently in accidents. Works requiring the removal of the rear wheel axle must be carried out by a qualified technician.

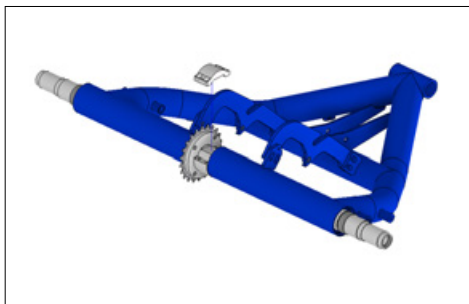
Removal of the rear axle, replacement of the bearings, replacing the chainring on the rear axle driver

HP VELOTECHNIK recommends to remove the rear axle with the help of a second person.

1. Remove the rear wheels as described on page 46.
2. Dismount the cover.

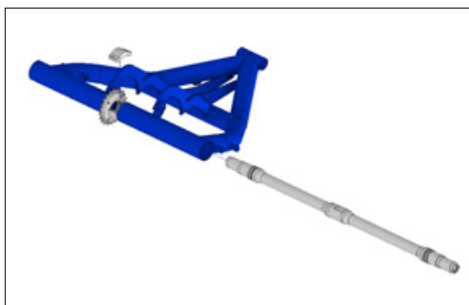
3. Loosen the quick release (derailleur gears and ROHLOFF) or the axle nuts (ENVIOLLO and NEXUS) of the axle of the intermediate gear. With a ROHLOFF hub you have to loosen the torque support screw. Slide the intermediate gear completely backwards to reduce the secondary chain's tension. Open the secondary chain and remove it.
4. Dismount the freewheel on one side.
5. On the same side, remove the bearing spacer from the rear axle.
6. Loosen the clamp of the axle driver.
7. Screw the central bolt of the rear wheel hub into the thread of the rear axle, place a padding and knock the rear axle out of the swingarm with a soft-face hammer. As soon as the end of the rear axle is inside the swingarm, you will need a long punch to knock it all the way out of the swingarm.

Rear axle

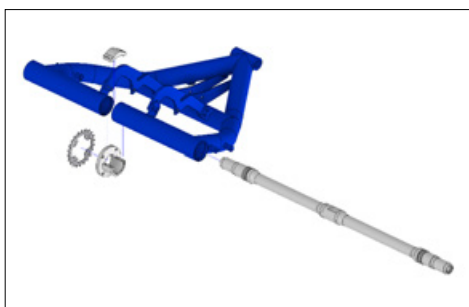


Loosening the clamp of the axle driver

8. Pull the rear axle driver out of the swingarm.



Removal of the rear axle



Disassembly of the chainring from the axle driver

The chainring must be replaced with a chainring of the same type (22 teeth with 4x64mm).

Mounting of the rear axle

It is possible that one or more bearings came loose when the rear wheel axle was removed. The exploded view at the beginning of this chapter shows the correct positions. Also note the position of the bearing spacers on the rear axle.

1. Lubricate the inner surface of the bearings and the bearing seats on the axle to prevent sticking.
2. Make sure that all bearings and bearing spacers are correctly seated in the swingarm.
3. Position the rear axle driver between the two inner bearings.
4. Screw the central bolt of the rear wheel hub into the thread of the rear axle, place a padding and knock the rear axle into the swingarm with a soft-face hammer.
5. Check the position of the bearings.
6. Check that the rear axle is positioned centered by adjusting the distances between the bearings and the slots for the circlips on the rear axle.
7. Fasten the clamp of the axle driver with 4 cylinder head screws M5x16 with 5–6 Nm.
8. Slide the circlip onto the rear axle so that the sharp-edged side is on the inside and the rounded side is on the outside.
9. Mount the freewheel as described in the chapter "Freewheel" on page 61.
10. Mount the rear wheels (instructions see page 46).
11. Place the secondary chain and close it.
12. Adjust the tension of the secondary chain as described in the chapter "Secondary drive" on page 60.
13. Mount the cover over the intermediate gear.

Mudguards

Mudguards are exposed to very strong vibrations especially at suspended wheels which may cause them to break. Please check the stays and mountings of the mudguards regularly for their position and check the mudguards themselves for cracks or deformations. Replace damaged mudguards immediately.

Danger!

If branches or other obstacles get caught in the wheels while riding and are moved around they may drag the mudguards along. The mudguard can possibly fold up between frame and tire and hence block the wheel, which may lead to a serious fall. If you hear any unknown noises while riding stop immediately and remove anything that might cling to the mudguards or the wheels.

Attention!

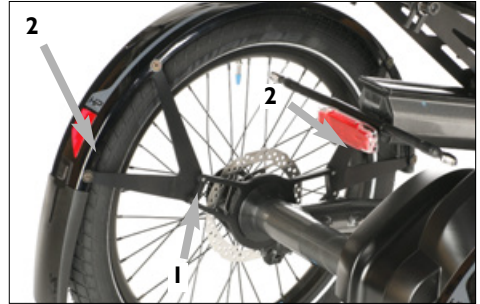
You must not mount additional parts like rear lights or reflectors to the mudguards since those may break then.

If a wheel is removed, the tricycle must not rest on the mudguard.

After having performed service work or after replacing mudguards check if the wheels turn freely. There has to be a distance of at least 7 mm (0.3") between mudguard and wheel.

Rear mudguards

Each rear mudguard on the Delta tx is attached to the trike by two sheetmetal brackets. These brackets are mounted to the mudguard's side flange by two screws and washers. The brackets themselves are fastened to the brake support sheet with two screws for every bracket.



Brake support sheet (1) and mudguard brackets (2)

To remove the mudguards those four screws between mudguard brackets and brake support sheet need to be unscrewed. The brackets stay attached to the mudguards.

Danger!

Make sure that the sheet metals are fastened with the correct tightening torque (7 – 9 Nm) and the screws are secured with threadlocker. Frequently check the assembly. If a sheet metal becomes loose, the fender may be caught by the wheels and lock the wheel or flung away. This may lead to serious injury or fall!

When remounting the mudguards always use threadlocker on the mounting screws. Tighten the screws with 7–9 Nm.

Water bottle cages

Water bottle cages can be mounted using a special bracket behind the seat available from HP VELOTECHNIK.

A useful alternative to water bottles are systems with a "water bag" and a drinking hose, e.g. from CAMELBAK. You can simply strap them behind the seat.

Maintenance and care

Maintenance routine

Your tricycle is equipped with the latest bicycle technology that does not require much maintenance.

However, you will have to maintain your bicycle regularly, as it is with other vehicles too. At least once a year the bicycle has to be taken to a bicycle mechanic for an overall service. Only this way a long lasting and safe function of all parts of your bicycle can be guaranteed. It maintains the value of your bicycle as well as the fun and the safety while riding for many years.

Read in this chapter how to perform smaller maintenance and care works between the services. For a quick overview of the works to be done take a look at the service plan on page 81.



Attention!

The maintenance works on this recumbent partly require special tools and skills. Do only work within your limits and, in the interests of your own safety, do not go beyond. Should you be uncertain at any point, get in contact with your local dealer.

Wear and tear

As on many other vehicles, some parts on a bicycle are affected by wear and tear. The lifetime expectation of these parts depends on the intensity and type of use as well as on the maintenance and care. Please keep in mind that the process of wear and tear is normal and no reason for a warranty claim against your dealer or HP VELOTECHNIK. You will find more specific information on wear and tear in the chapters on the relevant parts.

Cleaning and conservation

The frame of your recumbent tricycle has a high quality and environmentally friendly powder coating. The surfaces of the aluminium parts are either polished or anodised. Threads and technical contact areas can be unfinished and must be protected with wax.

To keep the surfaces brilliant over many years and to protect them effectively against corrosion the bicycle has to be cleaned from dirt and then conserved.

Dried sweat but also environmental influences such as air pollution, dirt on the roads and especially grit affects the parts, and not only may this cause flaws but also serious structural damage of the parts by corrosion.

In contrast to a widespread belief particularly the "non-rusting" aluminium is dramatically affected by grit! This kind of damage may not be visible in the beginning but it leads to a serious danger when the part breaks. Clean and conserve your bicycle diligently!

The best things to clean your bicycle are warm water and a soft cloth. If your bicycle is very dirty first take a wet sponge to soften the dirt and then remove it. In case of bad grease or oil stains you should use a neutral, non-re-greasing rinsing agent.

While cleaning your bicycle check it for any cracks, scratches, deformations, damaged parts, loose spokes etc. Similar to all of its mechanical parts your bicycle wears over time and still has to bear high loads. In case of a part failure dangerous situations can occur and lead to damages and injuries. Any cracks, scratches, or color changes on loaded structures need further inspection and possibly part exchange. If you are in doubt consult your local bike shop.

Maintenance and care

Attention!

Do not use any cleansing agents that scrub or are chemically aggressive since they affect the paintwork. Before using any cleansing agent please test it at a part of your bicycle that is not immediately visible.

Attention!

Do not use any highpressure cleaner. The strong jet of water goes through the seals of the bearings, blows away the lube and causes corrosion of the bearing parts and the chain. In addition to this it may damage stickers.

Attention!

Any damage of the paintwork has to be cleaned from rust and repaired immediately, else the damaged part in the frame gives way to corrosion that nests in the surrounding paintwork. This can result in damage of the frame.

In case of small scratches at the surface of the powder coating of the frame or the surface of the seat you can simply polish them away. You can buy a special polishing agent for epoxy resins at a specialist dealer for boat building. Do not use a polish for metal!

After cleaning the tricycle, dry it and treat the paintwork and the metal surfaces with wax. You can purchase this wax from your local bike dealer as a convenient spray.

The wax passes moisture and flows into tiny gaps and pores. After some minutes the solvent evaporates and leaves a dull and glutinous film. Now polish the waxed parts of your bicycle with a soft cloth to make it real shiny.

Do not only wax the frame but also the spokes, hubs, screws and nuts etc. You can also conserve the chain with wax spray after lubricating it, see also the chapter on "Chain", page 41.

The frame has small holes for ventilation that prevent condensation in the frame. These holes must not be sealed. However, moisture may enter the frame through the holes. Therefore, protect the inside of your frame by applying wax spray through the holes.

Protect the parts where cables or chain tubes may scratch the frame. You can buy special stickers at your bike dealer or extra strong transparent tape at your do-it-yourself-store. That way you avoid scratches in the powder coating and coating coming off.

Storing the tricycle

Before storing your bicycle over a longer period of time, e. g. during winter, please take care of the following steps:

- Clean your bicycle and protect it from corrosion as described in the chapter on "Cleaning" on page 66.
- Store your bicycle in a dry and warm place. Avoid direct sun and storage close to the heating since it affects the rubber of your tires.
- Choose the smallest sprocket and the smallest chain ring. That way the cables are in the most relaxed position.
- The tubes of your tires lose air when standing over a longer period of time. If the bicycle then rests on flat tires, the tires may be damaged. Therefore, hang up your bicycle or check the air pressure regularly.
- Disengage the battery from the bike and observe the notes on how to store the battery on page 15.

Disposal

The winter months are a convenient period of time for the annual service since then you won't have to wait long for an appointment. Many dealers offer special prices for the winter check.

Transport in the car

The best way to transport your tricycle is inside the car.

If you want to transport it outside the car we recommend a trailer or a rear carrier. In addition to the wheels, attach the tricycle only to the frame. Remove the seat and any parts that could come loose during transport (water bottles, basket, pumps etc.).

Also disassemble the stem-handlebars-assembly (see chapter „Segmenting“ on page 32) and use additional straps to secure it under the rear frame part.

Disposal

Please inform yourself about the current regulations for the disposal of a bicycle or pedelec at your place of residence. If necessary, single parts (e. g. electrical parts, batteries, tyres and inner tubes) must be disposed of separately. Pedelec batteries must never be disposed of with household waste, but can be disposed of in a specialist shop or at a local collection point.

Tightening torques

The values indicated are meant for a friction value $\mu=0,125$ (greased threads and screw heads). They only refer to the indicated parts. Please do always follow the values given in the manuals of the parts manufacturers since the following values may not be up to date due to changes in the product line!

part	connection	screw size	tightening torque
disc brake			
- brake lever	handlebars/lever housing	M6 size 5 / size 4	4 Nm
- caliper	caliper/brake supp. sheet	M6 size 5	7–9 Nm
- brake disc	disc/hub	M5 Torx T25	5–6 Nm
- brake hose	hose/lever housing/caliper	SW8	4 Nm
suspension element	element/swingarm	M6 size 5	6–8 Nm
rear rack	rack/mainframe	M6 size 4	7–9 Nm
		M6 size 5	7–9 Nm
	basket securing	M6 size 4	4 Nm
rear swingarm	axle screw	size 8	12–14 Nm
drive unit	drive unit/frame		
	-BAFANG	M8 size 13	11–13 Nm
	-SHIMANO	M8 size 5	11–13 Nm
chain roller	roller/frame	M8 size 6	17–19 Nm
crank	crank/drive unit	size 8	35 Nm
	chainring center screw	size 5	8–11 Nm
intermediate gear	cover	M5 size 3	2 Nm
	cassette ring (derailleur gear)		38–42 Nm
	quick release		see page 11
	hub gear nuts	size 15	see hub manual*
	sheetmetals/swingarm	M8 size 5	10–12 Nm
secondary drive	chainring/intermediate gear	size 4	5–6 Nm
	chainring/axle driver	size 5	8–10 Nm
pedals	pedal/crank	size 15	35–40 Nm
shifter	twist shifter	size 3	2–2,5 Nm
rear derailleur	derailleur/sheetmetal	size 5	8–10 Nm
	cable clamp	size 5	4–6 Nm
quick release			see page 11
brake support sheet	sheetmetal/swingarm	M6 size 5	7–9 Nm
mudguard	sheetm. bracket/mudguard	M5 size 3	5–6 Nm
	sheetm. bracket/brake supp.	M6 size 5	7–9 Nm
battery rail	BAFANG rail/frame	M5 size 4	6–8 Nm
	SHIMANO brackets/frame	M5 size 3	3 Nm
frame clamp	front frame/rear frame	M6 size 5	8–10 Nm
fork	fork steerer/clamp	M6 Torx T30	7–9 Nm
handlebars	handlebars/stem upper pt.	M8 size 6	7–9 Nm
stem	clamp lower pt./middle pt.	M6 size 5	7–9 Nm
	clamp middle pt./upper pt.	M6 size 5	7–9 Nm
rear axle	axle driver clamp	M5 size 4	5–6 Nm
	central bolt	M8 size 8	20–22 Nm
	wheel driver/hub	M5 size 4	5–6 Nm
	wheel dr. towing screws	M5 size 4	5–6 Nm

Warranty

Warranty policy

Your authorised dealer has to fully set up and adjust your bicycle, so that safe function is guaranteed. The dealer has to make a final safety check and carry out a test ride.

Your cycle dealer is obliged by law to ensure, among other things, that your bicycle is not affected by defects which materially diminish its value of suitability for the described purpose. The exact details will vary according to the country. In Germany, this liability ends two years after purchase.

In addition to this HP VELOTECHNIK offers a 10-year warranty on the frame against damage through material or manufacturing defects. This warranty applies only to the original purchaser.

Warranty is only valid for original parts from HP VELOTECHNIK. In case of warranty we will replace or repair the damaged part with a part of our choice or a new part equal to the old one (warranty obligation). We do not cover any transport, labour or any secondary costs.

Damage caused by wear and tear, corrosion or damage at the surface coating is excluded.

Damage caused by inappropriate use, inadequate care and maintenance, falls, crashes, overloading through excess weight, incorrect assembly or modifications to the tricycle is also not covered.

The warranty is void when using the bicycle for commercial purpose such as rental or leasing. Bike leasing for a personal use only is not excluded.

The warranty starts with the date of purchase (receipt of the tricycle dealer) of a new bicycle. The warranty is processed via the tricycle dealer who ordered the bicycle from us.

In case of damage the dealer has to send the damaged, cleaned frame to us so that we can check it, if asked to do so by us.

In case of warranty we will replace or repair the damaged part with a part of our choice or a new part equal to the old one (warranty obligation). We do not cover any transport, labour or any secondary costs.

In the event of any action that falls under warranty the original warranty period will not be prolonged and no new warranty will be given. If HP VELOTECHNIK refuses to count a repair as warranty case we will only carry out a repair with costs after having talked to the customer or his representative, the respective dealer.

It is necessary for the purchaser to fill in the enclosed warranty registration form to benefit from the extended warranty. This filled in form has to be sent to HP VELOTECHNIK within 4 weeks after the purchase.

The warranty is only valid when the warranty pass at the end of this manual has been filled in when you received your tricycle and when every inspection listed has been done and recorded by your bicycle mechanic within the described time schedule.

In the event of any warranty the warranty pass together with a copy of the proof of purchase has to be sent to HP VELOTECHNIK through your dealer.

This warranty does not have any influence on the rights of the purchaser according to his statutory rights.

Warranty

Your personal warranty pass

With the HP VELOTECHNIK Warranty Pass you can assure the safety and proper function of your tricycle for many years.

Like any other vehicle your tricycle has to be checked for safe operation before riding. Your bicycle has to be maintained at regular intervals, at least once a year you will have to take your tricycle to a qualified bicycle mechanic for a thorough check.

The service plan on page 81 shows you our mandatory maintenance and service works.

If you wish you can set an upper price limit for the service with your bicycle mechanic. If the necessary works exceed this limit you will be informed in advance.

Our tip: You can avoid seasonal waiting periods in spring and summer when you have your annual inspection done in the quiet months from October to January. Many bike shops then have special winter check offers. At any rate do make an appointment. Clean your bicycle prior to the inspection since then many of the checks by sight can be done quickly and at low cost.

Please have your specialist dealer record every inspection and service work in the Warranty Pass. This is a requirement for the validity of our extended warranty that exceeds the legal warranty.

Name:

Address:

Phone:

Frame no.:

(see page 13 / sticker on first page inside)

I have received the bicycle in good condition, adjusted to my size and performed a test ride. I have been informed about the correct use of the recumbent, the components like derailleur and especially steering and brakes as well as the necessity of regular service and maintenance. I will read the manuals prior to the first ride and have all future users read them too. I am aware that I need to send the warranty registration form to HP VELOTECHNIK within four weeks of the purchase to qualify for the extended warranty.

Date:

Customer's signature:

Dealer stamp and signature:

Warranty

Service at delivery

At the delivery of a new Delta tx

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

1st service

No later than 300 kilometers (190 mi) or 2 months after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty

2nd service

No later than 3000 kilometers (1900 mi) or one year after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

3rd service

No later than 6000 (3700 mi) kilometers or two years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty

4th service

No later than 9000 kilometers (5600 mi) or three years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

5th service

No later than 12000 kilometers (7500 mi) or four years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

6th service

No later than 15000 kilometers (9300 mi) or five years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

7th service

No later than 18000 kilometers (11,200 mi) or six years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty

8th service

No later than 21000 kilometers (13,050 mi) or seven years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

(190 mi)9th service

No later than 24000 kilometers (21,100 mi) or eight years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

I 0th service

No later than 27000 kilometers (16,800 mi) or nine years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

I 1th service

No later than 30000 kilometers (18,600 mi) or ten years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty

12th service

No later than 33000 kilometers (20,500 mi) or eleven years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

13th service

No later than 36000 kilometers (22,400 mi) or twelve years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty

14th service

No later than 39000 kilometers (24,200 mi) or thirteen years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

15th service

No later than 42000 kilometers (26100 mi) or thirteen years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Service plan

This service plan is intended to give you a rough overview over the required maintenance and service works. In no case it can replace the detailed instructions in this manual!

You can perform service works marked with a "●" if you have the required skills and tools as for example a torque wrench.

If you discover any defects while checking your bicycle they have to be repaired immediately. If you are in doubt please consult your local bike shop.

Works marked with a "▲" should only be carried out by a trained bicycle mechanic.

At the annual service the bicycle mechanic has to carry out all works listed as well as all services and maintenance works necessary according to the momentary technical standard and professional knowledge.

Please follow at any rate the manuals of the parts manufacturers.

The service intervals given in this Warranty Pass refer to an average use and a riding performance of 3.000 km per year.

When you ride more kilometres per year or often ride under bad conditions like rain, grit or dirt it is necessary to have shorter maintenance intervals.

In order to measure your riding performance we recommend to use a bicycle computer.

The regular service maintains the safe operation and the value of your bicycle. Not only does the completed Warranty Pass record the maintenance works for the validation of your warranty but also does it prove the care and the value of your bicycle - a good thing to have when you are going to sell your Scorpion one day.

Service plan

part	work
lighting system	check function adjust headlamp and rear light, check cable contacts clean reflectors, replace missing reflectors
tires	check air pressure check skin and sidewalls
brakes	check for damages check for leaking oil check rigid feel brake lever blades when pads reach rotor check brake pads for wear
rear suspension element	clean and oil thread, push rod, air chamber lubricate bushes replace worn out parts / hydraulic cartridge
Electric assist system	check the state of charge of the battery check the cabling and physical connections of the system
rear swingarm	check function and bearing play, tighten axle screws
gear system	check sprockets and chain for wear
rear axle	check, clean and grease bearing and bearing seat
rims	check condition
primary and secondary chain	grease and check for wear
chain protection tubes	check for wear replacing tubes/expanding the tube ends
chain roller	check for wear, check bearing
crank	check, tighten
paintwork	conserve and repair
wheels	check alignment and spoke tension

Service plan

see page	before every ride	monthly	annually	note
35	● ●		●	
48	●	●		
36	● ● ●	●		
50		●	● ▲	
15	● ●			
57			▲	
40			●	
61			▲	
46			▲	
41		●		
43		●	▲	
45		●		
40			▲	
66		●		
46		●		

Service plan

part	work
handlebars	check for damage / bends
headset	check adjustment
hubs	check bearing play and brake discs mounting
pedals	check bearing play, check binding mechanism
frame	check clamping of the main frame clean and conserve check for damage, damage to paintwork
quick releases	check correct closing function
derailleur	check for movement and function clean and lubricate
screws and nuts	check and tighten
mudguards	check for damage and correct position
valves	check for correct position and air tightness
stem	check clamping check clamping screws
cables	dismount, lubricate, replace if necessary

Service plan

see page	before every ride	monthly	annually	note
28			▲	
49			▲	
46			▲	
49			▲	
32	●			
66		●		
66	●			
11	●			
40	●			
		●		
69		●		
64		●		
48	●			
28	●			
			▲	
38			▲	

