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Operating manual and service instructions

March 2011

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Introduction

Dear customer,

thank you for buying a recumbent trike designed by HP VELO-TECHNIK and congratulations on the purchase of your new Scorpion! With the Scorpion, a high-quality touring trike, you will enjoy many years of exhilarating riding pleasure.

Your safety and your satisfaction are our main concern. On the following pages, this manual will inform you about important safety issues 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. Your recumbent trike is designed with the latest recumbent technology by HP VELOTECHNIK that partly needs special treatment and care.

In this manual you will find detailed instructions on how to optimize your Scorpion 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. Important: Please send us the attached warranty registration form for your extended warranty (see page 60.)

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

Enjoy yourselves and have a great ride!

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

Introduction

The manuals of component manufacturers such as 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 using it.

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 Scorpion with standard parts from the series production of HP VELOTECHNIK.

On special demand HP VELOTECHNIK delivers frame kits to put a specialist dealer in a position to assemble a tricycle individually. In this case the manuals on the operation and maintenance of the parts only represent a guideline, please read every manual of every part manufacturer separately. The specialist dealer is responsible for the expert assembly, please contact him for detailed information! A tricycle that has been assembled from a frame kit must always be tested and approved by a qualified bicycle mechanic before your first ride.

Caution! The texts in the grey boxes are particularly important for your safety. Texts that begin with "**Danger!**" mark an immediate danger for your life and your health. Please read them carefully.



General safety instructions

Intended use

Your Scorpion is a tricycle for the use on streets and paved roads. The fully suspended Scorpion fs trike can also be used on unpaved roads.

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

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.

The first miles

The first 300 km (186 miles) are an 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 61. This first service is the prerequisite for further use of the tricycle and for your warranty claims.

Legal requirements

When you ride your trike on public roads it must comply with national legislation and guidelines. These will 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 trike 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.

The safety equipment on your trike must be checked before every ride and maintained in proper condition.

General safety instructions

Load capacity

The maximum load (rider + luggage) is 130 kg (286 lbs). The maximum total weight (bicycle + rider + luggage) is 150 kg (330 lbs). The lower limit is valid. 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 16.

With an attached trailer, the maximum total weight must not be higher than 150 kg (330 lbs)

safely stored on the racks. Bags must be tightly fastened to the racks so they can not move. Make sure that loose parts like straps or belts can not touch the wheels, the derailleur, or the suspension.

The rear rack is designed for standard bike panniers or HP Velotechnik 'banana-style' bags.

Take care that your luggage does not cover the lighting system and the reflectors of your trike and that they stay fully functional.

Carrying luggage

Luggage transport is only allowed on the special racks designed by HP VELOTECHNIK .

Maximum load:

Rear rack 25 kg (55 lbs)

Lowrider rack (Scorpion fx) 25 kg (55 lbs)

When a rear rack is mounted you have to make sure that when the rear suspension is fully compressed there is at least a 1 cm ($\frac{1}{3}$ ") distance between the rear tire or mudguard and the rear rack. If you want to increase this distance you have to decrease the suspension travel of the rear suspension element with clip-on spacers. For that purpose please consult your local dealer.

Additional loading can influence the handling of your trike 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.

The load should be placed as close to the body of the rider as possible, since this results in better riding performance. You can also improve the handling of the trike by positioning the center of gravity of the luggage as low as possible, so pack heavy items in the bottom of your panniers. Be careful that your luggage is

Transport in the car

The best way to transport your tricycle is inside the car. Take care that it does not lie on the derailleur.

If you want to transport it outside the car we recommend a roof-rack or a rear carrier. Take care to fasten your tricycle at the frame only.

Please remove any parts that could come loose during transport (seat cushion, water bottles, luggage bags, pumps, pennants, etc.).

Do not take kids with you

The Scorpion is not designed for the transport of children. You are not allowed to mount a child's seat. It is only allowed to transport children in a trailer that has been specially designed for that purpose.

Trailers

You are allowed to use trailers (double trail only) up to 40 kg (88 lbs) with the Scorpion.

If you have a rear rack on your trike, most trailer couplings can not be used as the rack will hit the trailer when the suspension compresses. With the HP VELOTECHNIK / WEBER coupling with lowered adaptor plate trailers with Weber-mounting will fit on trikes with rack.

Always check that the suspension and the trailer still work properly after you have mounted the trailer.

Added parts and accessories

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

Caution! 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 handlebar like fairings, handlebar fittings, bottle holders, etc. may impair your safety due to additional loading or clips with sharp edges.

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

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

Fairings

As a front fairing for the Scorpion, you may use the Streamer fairing offered by HP VELOTECHNIK. Please take care to assure a good vision over the fairing and sufficient freedom of movement below.

Please take into account that any fairing makes the tricycle more prone to crosswind influences. In strong wind or gusts of wind unsafe situations may occur. Please remove the fairing before riding in such weather conditions.

General safety instructions

Replacement of parts

The replacement of parts relevant for safety (especially brakes, lighting system, stem, handlebar, knuckles, drivetrain, suspension elements) should only be done with original parts by a bicycle mechanic, since it requires a certain degree of skill, suitable tools and mechanical aptitude.

Any technical change you perform on your own is at your own risk!

Danger! If any part is deformed (e.g. due to an accident or overload), especially frame, knuckles, handlebar, 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!

No alteration of parts

Caution! You are not allowed to perform any work on the parts of the tricycle, especially frame, fork, handlebar 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.

Final assembly

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

Your dealer has carefully finished the assembly, perhaps altered the specification of your trike 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 handlebar, stem, knuckles, swing arm pivot and wheels. Please follow the tightening torque settings listed in the table on page 59.

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

Screws and bolts

Caution! Screws must be tightened with prescribed tightening torque. In this manual tightening torques are given in "Nm" (Newtonmeter). 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 a table with the prescribed torque settings on page 59 in this manual.

Adjusting the leg length

Before the first ride: adjusting your new Scorpion

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

In order to adapt the Scorpion as closely as possible to your body dimensions and to find your ideal position you need to adjust the front boom, seat and handlebars.

Danger! All procedures described here require a certain degree of skill, suitable tools and mechanical aptitude. After any adjustment perform a static check and take a test ride on a quiet street, away from traffic. If you have any doubts please contact your local dealer.

If your trike is equipped with the optional front boom-quickadjust, please read the instructions in the separate manual in addition to the following instructions.

Adjusting the leg length: moving the front boom

In order to adjust the leg length you have to move the front boom (the front part of the frame where the cranks are mounted) in the main frame. Unscrew the bolts M8x35 under the main tube with a 6 mm Allen key. Take a grip on the front derailleur tube or both cranks and move the front boom further into the frame or pull it out while cautiously turning it.

Before you pull out the front boom shift the chain to the smallest chain ring and sprocket. Turn the cranks a little bit backwards while pulling. Thus the chain is not under tension.



Unscrew the clamping bolts to adjust the front boom.

Caution! After you have unscrewed the clamping bolts take them off and examine them for deformation. Lubricate threads and heads thoroughly. Then re-fit the bolts. If they don't turn easily you will have to replace the bolts.

Adjusting the leg length

Adjust the front boom 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 bike.

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

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, pedaling 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.



Adjust the front boom so that your knee will not be fully straightened when pedaling.

Danger! When you insert the front boom, the front boom and the inner wall of the tube must be totally free from grease, otherwise it will not clamp properly and may turn while you are riding.

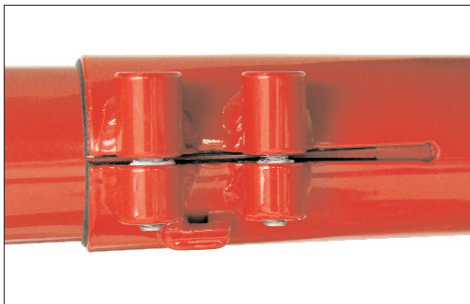
For riders with short leg length the front boom has to be cut by a bicycle mechanic, so it can be inserted maximum possible. It is important to trim the end of the tube neatly. The bare metal of the shortened tube end has to be protected against corrosion with a paint stick or wax spray.

Caution! When you move the front boom take care that its end does not damage any light cables that possibly come out of the main frame. Please inform yourself about the length of the front boom on your trike before you do any work. While moving the front boom you also have to move the light cables. The light cable must never be stressed by pulling.

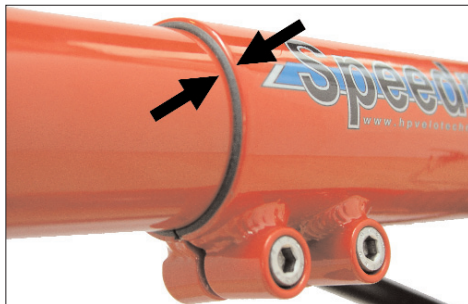
The maximum insertion of the front boom is limited by possible heel strike of the frame's cross bar, depending on the rider's shoe size. Please check before riding your trike that there is enough heel clearance. For shorter riders under 175 cm body height we recommend to use shorter cranks.

On the left underside of the front boom there is a fine line. Align this line with the sticker on the main tube's front end right above the clamping bolts to adjust the bottom bracket to a horizontal position. Additionally, you can look beyond the bottom bracket shell at the rear wheel axle and align the front boom parallel to it. Align your eyes with the bottom bracket axle and not the front derailleur tube. Then sit down on your tricycle and check the position.

Tighten the bolts with a torque wrench (tightening torque 14–16 Nm). On your first ride check whether there is sufficient clamping.



The rear end of the front boom must never be visible in the clamping slot.



The plastic bush between front boom and main frame must be visible at all time.

Caution! The minimum insertion depth of the front boom into the main frame is 8 cm (3 1/5"). The end of the front boom must not be visible in the clamping slot when you look at the main frame from below, since this may result in a damage of the frame.



If the bush is missing or not aligned properly or the screws are tightened too much, the frame can break!

Danger! There must be a bush (a slotted tube of plastic with edges to the front and the clamping slot) in the main frame's front boom hole that is glued in the frame. This bush ensures safe clamping of the front boom and protects the paint. It is important to take care that this bush is always visible at the front end of the main frame. The lower slot has to be aligned in coincidence with the slot in the main frame. If this bush is missing or moved to the back of the tube while inserting the front boom, safe clamping is no longer guaranteed, even if it seems to be the case at first glance. If the front boom is not clamped properly it may turn and lead to a fall. A missing or misaligned bush will lead to frame damage.

Danger! If the bolts are tightened too much or bent, the screw or the frame can break! If the clamping is insufficient the front boom can turn during a ride which may cause your feet to slip from the pedals and lead to injuries.

Adjusting the leg length

After moving the bottom bracket tube your dealer has to adjust the chain length. By default the Scorpion comes with a very long chain so the adjustment range of the tricycle can be fully used without the need to lengthen the chain.

After the basic adjustment of the leg length done by your dealer before handing over the tricycle, the chain has to be shortened so that the derailleur cage is not fully turned forward while shifting on the largest chain ring in front and the smallest sprocket behind. The derailleur must still be able to compensate a length change of the chain of at least 4 cm (1 1/2"). In order to choose the right chain length, please consult the manual of the derailleur manufacturer.

Danger! After the chain has been shortened it must be closed with a special closing link or a chain riveting tool that expands the rivet while riveting (i.e. ROHLOFF- Revolver). A poorly joined chain may break and thus lead to damage or injury. Chain length adjustments or chain changes should be done by your bicycle mechanic.

Caution! Take care that the chain tubes have a clearance of at least 5 cm (2") to the rear derailleur and the front derailleur even under maximum tension of the chain and make sure that the tubes are held tight in their fastenings. The front upper tube can be moved to the rear for length adjustment. Shorten the tubes if necessary. If the end of the chain tube gets in touch with the rotating chain rings it can be locked-up and destroyed. The chain tubes must be prevented from moving by a rubber tube over the retention spring.



Check that there is at least a 5 cm (2") clearance between the end of the chain tube and other parts of the drive train.

After adjusting the front boom the gap in the clamping slot between the front boom and the main frame should be sealed with wax or silicone in order to protect your frame from the penetration of water and dirt and hence damage through corrosion which may lead to a broken frame.

We recommend to slightly readjust the front boom every 3 months so that knees 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 pedaling. In addition we recommend to ride 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. You will find more information about this on page 25.

Adjusting the seat position

Adjusting the seat length

Your Scorpion is equipped either with the ErgoMesh® mesh seat or the adjustable BodyLink® seat from HP VELOTECHNIK.

The following instructions refer to the BodyLink seat. Length, seat back angle and lower seat angle are adjustable for this seat. The adjustment of the seat length and the proper seat angle is crucial for a comfortable feeling while riding your recumbent.

The upper curve of the seat back in the area of the shoulder blades determines the correct seat length: Through this shape the shoulder and neck area is lifted from the recumbent position so that the head rests in a natural and relaxed position. For this reason you shouldn't need a head rest if you have the right seat position. On long rides, a head rest can increase your riding comfort as you can relax your neck for a few seconds by leaning back. You can mount our custom headrest to your existing seat.

The seat is too small when you have the impression that your back is pressed too much into a "hunchback". It is too large when you have the impression that the seat angle is too far back when you are in the most upright position, or when you hit the upper seat edge with the back of your head when you look upwards.

Adjusting the seat length

Take off the seat cover (see page 54). Open the quick release lever for the seat back angle adjustment, so that the seat is not bent with inner tension. Loosen the 4 screws at the inner side of the seat back with an allen key SW4 a few turns. Step behind your trike and hold the seat back with both hands. Pull or push the seat back to achieve the preferred seat length. To achieve the smallest possible seat length, move the 2 upper screws from the top to the middle holes.

Tighten all 4 screws with 5–6 Nm. Move the seat back rest to the preferred angle and close the quick release lever firmly. Reinstall the seat cover

Caution! Do not loosen or tighten the 4 screws in the lower seat part to adjust the seat length. Maximum tightening torque of these screws is 3–4 Nm.

Caution! To avoid noise from the seat when loaded, the contact surfaces between the two seat shells need to be separated by self-adhesive plastic sheets and all contact surfaces of seat and seat mountings and frame need to be lubricated with grease.

Length adjustment of the Airflow cushion

The optional Airflow-cushion consists of two parts, that connect in a V-type shape. Loosen the velcro mounting of the upper part, and place it in the desired position, then fasten the velcro.

Adjusting the seat back angle

A great advantage of the BodyLink® seat on your Scorpion is the possibility to adjust the seat back angle very quickly. For beginners or rides in the city you can choose an upright seat position for a better view, and for longer rides you can choose a flat position for better aerodynamics.

The seat back is fastened with a quick release lever on a slotted aluminum seat mounting. You can adjust the seat back angle by 10 degrees by simply opening the quick release lever. In the medium seat position the angle is about 35° from horizontal.

Adjusting the seat position

Adjusting the seat back angle is easy when you push the seat back with your hands on the backside close to the seat mounting into the desired position. By pulling at the upper seat edge, tension may be created which causes the adjustment mechanism to lock up.

Because of the flexibility of the BodyLink® seat and the special shape of the seat mountings, the seat effectively pivots around a central axis, approximately in the area of the lower lumbar vertebrae. This is the place where you support most of your pedaling force while riding, so this point determines the distance to the pedals. The advantage of this design is that you adjust the distance from the seat to the bottom bracket only once as described above, a change in the seat angle does not require an adjustment of the front boom.

Adjusting the front seat edge

The front seat edge can be slightly lowered to accommodate smaller riders. With a lower front seat edge, it is easier to put your feet on the ground without pressure from the seat edge on the back of your legs. With a higher front seat edge, the seat will give more support and avoid the feeling of „sliding down the seat“ that occurs with upright seat angles.

To adjust the front seat edge, open the quick release lever at both the lower and the upper seat half, so that the seat is not under inner tension. Thus you need less force for the adjustment. Push or pull the seat front edge firmly to reach the desired position and close the quick release lever firmly. Then adjust the seat back angle as described above.

If the quick release lever pressure is too loose when closed, open the lever and turn the screw on the end of the quick release axle clockwise. The low profile design of the screw head gives more clearance for the drive train.

Adjusting the lumbar support

The BodyLink® seat is ergonomically shaped and supports the natural S-curve of your spine. Forces from pedaling are supported in the area of your lower back just above your hips. The amount of support in this area (lumbar support) is adjustable by moving the seat back and lower seat against each other.

To get more lumbar support, lower the seat front edge and put the seat back in a more reclined position.

To get less lumbar support, rise the front seat edge and put the seat back more upright. For maximum adjustment, loosen the 4 screws for the seat length adjustment in the seat back. Thus the lobes of the lower seat part can move more easily into the desired shape. Tighten the screws and quick releases as described above.

Caution! The three quick releases have to be closed firmly (tightening force 15-20 kg / 45 lbs) to safely hold the seat. You must not open them while riding. After they have been closed the imprint "close" must be visible. If the quick releases are not properly tightened the seat can move while riding and you may lose control over your tricycle.

Adjustment of the head rest

Both seat types can be equipped with a head / neckrest which is adjustable in height and angle. Use the long holes and the screw hidden under the cushion (BodyLink-seat) or the mounting clamp (ErgoMesh-seat) for setting up the correct position.

Caution! Do not push or carry your trike on the head rest, this may damage the head rest or the seat!

Adjusting the handlebars

Adjusting the handlebar angle

By changing the angle of the handlebars you can adjust the position of the grip to the length of your upper body and your arms.



Handlebar width and angle are adjusted with the clamp at the stem under the main frame.

The handlebar consists of two parts. They are mounted to the stem by a slotted clamp on each side. The adjustment range in width is 3.5 cm on each side, giving a total range of 7 cm (approx. 2 3/4").

Caution! Do not exceed the handlebar width over the „Max“ mark, otherwise a safe clamping is not possible.

Most riders are comfortable with a 85° angle so that the bent grips point upwards and slightly forward. The more upright the grip position and the narrower the handlebar width, the larger the minimum possible turning circle as the handlebars touch your legs or the seat earlier.

In order to change the angle or the width, loosen the screws of the stem/handlebar clamping. Move the handlebars until they are in your favourite position. Tighten the clamping screws with 8–10 Nm. Check the correct clamping of the handlebars by sitting down on your trike and pulling the handlebars. Doing so the handlebars must not turn in the stem.

Danger! If the handlebar grips are adjusted pointing too far forward or too wide, your hands or the brake levers can touch the front wheels or mudguards when cornering sharp, leading to injury. Make sure you have at least 5 cm (2") clearance between brake levers and front wheels / mudguards at all steering angles.

Caution! If the handlebar grips are adjusted pointing to far forward, the handlebar can touch and damage the track rods when cornering sharp. Make sure the handlebars contact your legs or the seat first before touching the track rods. Damages track rods must be replaced.

If the clamping screws are tightened too hard, the handlebar may be deformed, and no proper clamping can be achieved.

Please take care that the clamping area of the stem is thoroughly trimmed and there are no sharp edges which may cause handlebar failure.

While riding you should allow your arms to rest in a relaxed position on the handlebars. Do not push or pull on the handlebars. If the handlebars turn in the stem clamping during the ride stop immediately and tighten the clamping screw of the handlebars. If the handlebars are not sufficiently clamped the handlebars or the stem may be damaged or deformed. In this case, safe clamping can no longer be guaranteed, not even with the correct tightening torque, and handlebars and stem have to be replaced.

Your bike shop can supply a special fitting lubricant that increases friction between handlebar and stem.

Adjusting the handlebars

Caution! When getting on and off the trike, make sure to avoid pulling at the handle bars or stepping on the tie rods. To get off the trike, sit upright on the front seat edge and then stand up. Grip the front wheels or the seat back as an extra support, not the handlebars. If you pull firmly at the handlebars, the steering mechanism can be damaged.

Adjusting the cable length

Caution! After having adjusted the handlebar 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 handlebar is at maximum angle. Also avoid large bows that could be caught up by the front wheels or other parts or touch objects under your trike.

You can make smaller adjustments by moving the cables in their guides at the frame and the stem, so there is enough clearance for all movements. If this is not the case you will have to have your specialist dealer shorten the cables or replace them by longer ones.

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

Handlebar grips

The grips on the handlebar 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 handlebar.

Adjusting the suspension

Purpose of suspension adjustment

Your Scorpion is equipped with a rear swing arm for the suspension of the rear wheel. This system compensates slight bumps on the road to make riding more comfortable and to reduce stress for your tricycle.

A well-adjusted suspension improves the traction of your tricycle on uneven roads. Especially when riding in a bend this allows a higher speed and also improves safety.

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 pedaling influence, rhythmic body movements or permanent wavy underground

Suspension and damping

The suspension system of the rear swing arm consists of a spring and a damper.

Often, the terms suspension and damping are used inaccurately 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 swing arm is suspended with a steel coil spring in the standard version. The optional rear shock DT-SWISS XM180 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 pedaling forces within a crank revolution or the rhythmic up and down movement of the legs.

In case you have mounted the optional suspension element DT-SWISS XM180, the hydraulic damping of the rear suspension is adjustable.

Adjusting the suspension

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 the Scorpion with a considerably lower damping 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.

In addition to this, varying pedaling forces have very little influence on the suspension of the tricycle due to the No Squat design of the suspension system of the Scorpion. 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 Millimeters) or "lbs./inch" (Pounds per Inch). Sometimes you only find "lbs." printed on the springs.

The spring stiffness of the optional air shock DT-Swiss XM180 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. (Which 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 trike.

Adjusting to load

The luggage carrier of the Scorpion is mounted to the suspended part of the frame. That way your luggage is also fully suspended and it spares the material. Most notably, even under heavy load the suspension will compensate an uneven road much better and quicker compared to a design where the luggage carrier is mounted to the unsuspended parts, e.g. the rear swing arm.

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 for bumps while riding. Your suspension will bottom out more often.

The suspension of the front wheel is less affected since luggage at the rear rack almost only puts weight on the rear wheel. Only in case of heavy luggage on the lowrider under the seat there is an influence on the front wheel.

In order to compensate the variations in the load you can change the pre-load. 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: the Scorpion offers a lot of suspension travel for a touring trike (80 mm). When you choose the spring rate to have the full 80 mm 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 DT-Swiss XM180 can be easily pumped up to compensate load increases.

Adjusting the rear suspension element

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.

For the rear suspension of the Scorpion a spring element is combined with a hydraulic damping unit in a suspension element. The damping results from fluid friction of an 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.

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.

The Scorpion comes standard with a steel spring rear shock. As an option you can get the air shock DT-Swiss XM180 that uses air as spring medium.

Steel spring rear shock

The preload determines how far the suspension compresses when you are sitting on the tricycle while standing still.

For maximum riding comfort the suspension should compress by about 30% of the total suspension travel while you sit on the tricycle in driving position.

For that purpose measure the distance between the two suspension element bolts or between rear rack and rear wheel while the trike 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 trike either by adjusting the suspension pre-load 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 pre-load turn the adjustment ring on the threaded part of the suspension element by hand. Turning the adjustment ring clockwise (looking at it from behind) reduces the preload, turning it counterclockwise you screw the adjustment ring towards the spring and increase the suspension pre-load. It is helpful to turn the spring together with the adjustment ring.

Adjusting the suspension



Steel spring suspension element with fixed damping rate.

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.

You can find more information on changing springs in this manual under "Maintenance and Care", page 42.

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 crashes.



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

Air shock DT.Swiss XM180

Please follow the instructions in the separate manual provided by the rear shock manufacturer.

This rear shock contains pressurized air in a main („positive“) air 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 a progressive spring behaviour, whereas steel springs have a 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 back end of the air shock. The valve is protected by a metal valve cap.

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 bar). Take off the pump quickly.

Recommended pressure settings

<i>load</i>	<i>pressure</i>
up to 80 kg (183 lbs)	6.5 bar
up to 100 kg (230 lbs)	7.5 bar
up to 130 kg (286 lbs)	9.0 bar

Maximum allowed pressure is 18 bar.

Danger! Take care that the rear wheel or mudguard or suspension element never hit the frame, seat or rear rack box while the suspension is fully compressed.

Therefore fully deflate the air shock. Have a second person sit down on the tricycle and make the suspension bottom out by pushing 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 have your trike dealer mount an additional spacer inside the air shock. In case you don't, the mudguard may break suddenly or the rear wheel might be blocked which can lead to serious crashes.

Adjusting the suspension

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.

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 Scorpion 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.



Air Shock DT-Swiss XM180 Damping ist adjusted with the red knob at the rear end. The shock must be installed with the lock-out lever on the backside facing down to avoid a collision between lever and frame when the suspension is moving.

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.

Adjusting the front suspension (Scorpion fs)

Danger! While adjusting the front suspension, never load the tricycle, e.g. by resting on the seat or loading the racks when your hands or tools are close to the suspension struts. Your hands may be bruised when the suspension compresses.

In addition to the suspended rear swing arm, the Scorpion fs is equipped with a suspended front axle. It is designed as a so called *McPherson* strut. That means, the left (or right) suspension strut's upper end is supported in the frame while it is linked to a single wishbone on its bottom end. The front wheel is directly attached to the suspension strut, which is the knuckle at the same time.

Inside the suspension strut a steel spring is combined with MCU-elastomers. The front suspension is damped by friction between stanchion tube and a circular elastomer band situated between the bushings as well as by friction inside the elastomers.

To decrease body roll in during fast cornering and to provide high comfort at the same time, the front axle is equipped with a stabilizer bar. This bar is linked elastically with both wishbones and the main frame. As the stabilizer bar works as a torsional spring, it supports the outside wheel's suspension while cornering.

For maximum comfort, 30% of the suspension travel should be used when you sit on your trike in a normal driving position (the same is valid for the rear suspension). For the Scorpion fs front suspension, this means 20 mm of travel (so called "sag").

Your Scorpion fs has reached a sag of 20 mm when the upper edge of the knuckle which you can feel underneath the shock boot coincides with the lower edge of the headtubes of the main frame. You can fine tune this sag according to your weight and your additional luggage by adjusting the preload of the springs. To change the spring rate in a wider range, you can replace the steel spring or interchange elastomers and spacers inside the suspension struts. For further instructions, please see the chapter "Maintenance and Care" on page 44.

To adjust the preload of the front suspension, unscrew the strut end cap using a hex key size 5. Now the preload adjuster is visible, which can be turned by a hex key size 5, too.

Turn the preload adjuster counter clockwise to decrease preload, turn it clockwise to increase preload. The maximum depth is limited, so stop turning when resistance rises suddenly. After adjusting, place the cap on the strut and tighten it gently (1-2Nm).

Danger! The mounted spring is under tension. Do not remove the preload adjuster when adjusting the spring preload. Make sure the adjusting disc's thread is fully screwed into the stanchion tube. Otherwise it may become loose and hurt you.

The damping rate can be altered by exchanging the elastomer bands inside the suspension struts, see "Removing and disassembling the suspension struts" on page 47.

Learning the new riding technique

Learning the new riding technique

Your new tricycle has been assembled by your dealer and adjusted together with you as described on the previous pages under "Adjusting your new tricycle". Before you sit down on your trike and enjoy your first ride please make yourself familiar with the instructions on riding technique and handling.

To ride this recumbent you will have to make yourself acquainted with the different riding position. Make sure that you and all other future users of this tricycle will have read this manual carefully prior to the first ride. If you are in doubt please consult your local 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.

Caution! When getting on and off the trike, make sure to avoid pulling at the handle bars or stepping on the tie rods. To get off the trike, sit upright on the front seat edge and then stand up. Grip the front wheels or the seat back as extra support, not the handlebars. 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 could be caught on the ground and be pulled backwards and dragged under the cross bar which could lead to a serious injury. We strongly recommend to use a pedal binding system like clipless pedals or toe clips and straps.

Keep all three wheels on the ground while riding. If you are cornering too fast, your trike 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 trike.

Practice cornering away from traffic to learn what speed is safe at a specific turning angle.

If you lift up a front wheel, immediately steer in the opposite direction to bring it safely back to the ground.

Danger! Please be aware that due to your low seat height other road users may notice you very late. Ride anticipatory with this in mind. This is especially important while riding in darkness. You yourself have a much better view than others perceive you. Ride defensively. We recommend to mount a well visible and reflecting flag to the tricycle while using it in traffic. Please ask your dealer for more information.

Protective clothing, Clipless Pedals

Wear protective clothing

Riding a tricycle is a potentially dangerous sport where accidents can happen even when you take care of every safety instruction prescribed.

We recommend you to wear an approved bicycle helmet that fits well. Protect yourself by wearing special sports clothing that fits tight and is reflective. If you're wearing wide pants use clips to protect them from getting caught in the chain - or use an old fashioned method and put the pants in your sockets.

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

Use clipless pedals

The pedals of your Scorpion can be upgraded on demand with a binding system. As soon as you are comfortable with riding your Scorpion you should use those clipless pedals. 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 pedaling 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 a dangerous situation. Please read the manual of the pedal manufacturer that comes with this manual and have your dealer explain the 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.

Please use exclusively the original shoe plates / cleats from the manufacturer of the pedals, do not use any other brand. If you're using shoe plates that are not authorised the binding system won't work properly.

Strain, Riding freehand, Way of riding

Slowly increase the strain

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

Always use a low gear and ride with a high pedaling frequency. 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 very high position of the bottom bracket 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 you feature a sporty way of riding it can take up to 6 months until you have become accustomed to your new recumbent.

If there is pain in your knees occurring while riding this is usually the result of too much power put into pedaling. 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, a wrong adjustment of the front boom to the leg length (in most cases too short) can lead to pain in the knees.

Your pedaling cadence should stay between 80-100 revolutions per minute and not fall below 60 revolutions when going uphill. If necessary have your specialist dealer adjust the gear range to your riding style and the terrain you usually ride.

You will find many tips on proper training for cyclists in miscellaneous books and magazines for cyclists.

In case of persistent problems please consult your doctor.

Do not ride freehand

Danger! In order to ride safely you have to keep both hands at the handlebar. Even when signaling keep at least one hand at the handlebar. Otherwise, unforeseen bumps in the road or oscillations of the steering may lead to a serious fall.

How to ride correctly and safely

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 you ride 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 low riding position.

Way of Riding, Quick release levers

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

Quick release levers

Quick release levers hold wheels and seat in position.

Danger! An incompletely or improperly closed quick release can result in parts coming loose, and hence in a crash, possibly resulting in serious injury.

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.

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 lie 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.

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 or KRYPTONITE) that can only be opened with a special tool. For this please consult your local specialist dealer.

Brakes

Brakes

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

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

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

If your trike is equipped with a rear brake or a parking brake, use this brake only as an emergency brake in the unlikely event of a failure of the front brakes. If the rear wheel is locked up, the trike can immediately spin around and slide to the side. Remember which lever pulls the front brake and which the rear brake.

Danger! In case you get into a situation like that during an emergency stop you have to let go of the brakes immediately, balance your trike and brake again. 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.

Do not brake in a bend, always brake before a bend. Braking increases the risk of slipping. Especially when it is wet the rear wheel immediately slides out of the bend while braking and this can result in a serious fall!

As an option, you trike can be equipped with a coupled braking system with one brake lever operating both front brakes.

For optimum handling soem braking systems provide the option to adjust the distance between the brake grip and the handlebar with a small hex-headed screw at the grip, please see the respective manual for details.

The braking effect of modern braking systems can be more powerful than what you have been used to until now. Brake carefully. When you brake too hard with the front brake the rear wheel may lift off the street and the trike may tumble over.

If you should hear any unusual sounds while braking the brake pads might be worn out. Do not use your trike any further until you have checked the brake pads according to the manual of the brake manufacturer or asked your local dealer to do so.

Danger! Please note that the braking distance is much longer when it is wet or when the trike is heavily loaded. When riding on wet, sandy, icy or slippery roads you have to use the front brake very carefully to avoid that your front wheels slip. If they do so you will no longer be able to control your trike, which might lead to a serious crash.

Danger! Always make sure that the disc and brake pads are free of oil and grease. If these parts are dirty please do not use your tricycle. You can clean oily discs with alcohol or a special spray. Oily brake pads have to be replaced. If you are in doubt, please have your specialist dealer maintain your braking system.

Danger! Disc brakes can overheat on long down hill rides, fade and fail! On down hill 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! Never touch neither the brake disc nor the brake caliper after long braking as this may cause serious injury (risk of burns).

New braking systems, new brake pads and new brake discs need a break-in period to achieve maximum brake power. This period lasts for about 30-40 stops from about 30 km/h (20mph), which should be done in a safe area without traffic.

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 connections for possible leaks.
- that the brake lever pressure is ok by pulling the lever and ensuring that full braking performance is achieved before the lever touches the handlebar. If this is not the case, adjust the cable or change the brake pads, for hydraulic disc brakes pull the lever several times (pump) until it feels firm.
- check the hydraulic braking system for the correct pressure by pulling the lever, holding the pressure and checking the hose connections, bleeding screw and compensating tank for possible leaks.

Parking brake

Always secure your trike against rolling away when parked.

In the standard assembly, the brake levers are equipped with a parking brake-button that locks the pulled lever. To release the parking brake, pull the brake lever.

As an option the trike can be equipped with a parking brake that is operated with a thumb-shifter mounted at the handlebar. It is connected with a V-brake at the rear wheel. Make sure to fully open the parking brake before you start riding.

Gear system

Gear system

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

Your pedaling frequency should stay between 80-100 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.

Your Scorpion comes standard with a derailleur gear or with a internal hub gear system. The following section refers to the derailleur gear system only. Please also refer to the manual of the gear manufacturer.

You operate the gear changer with the grip-shifters or bar end shifters on the handlebars.

The right lever for the rear derailleur has an index derailleur system that positions the chain always on the chosen sprocket, so that you don't have to "search" for the gears.

The left barend shifter is not indexed so you have to adjust the front derailleur while shifting by slightly moving the shifter to stop the front derailleur from dragging against the chain while pedaling.

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

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

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

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").

When the chain length has been properly adjusted you can choose every combination of front chain rings and rear sprockets to shift gears. However, it is useful to ride the lowest gears (the biggest rear sprocket) with the smallest chain ring, the middle gears with the middle chain ring and the highest (fastest) gears with the biggest chain ring.

The setup of the chain rings and sprockets leads to an overlap of some gears. This means that different combinations of chain rings and sprockets can result in the same gear ratio. It would be possible to arrange a gear system so that double gears do not occur but this requires a lot of concentration when you shift gears while riding, since you will always have to change the rear sprockets as well as the front chain rings. If you would like to change the setup of your gears please consult your local dealer.

Danger! Practice shifting gears on a traffic-free street. In the course of this make yourself familiar with the functioning of the bar end shifters. Doing this in traffic could distract your attention from possible dangers.

Lighting system

Lighting system

If you want to ride your trike on public streets, it must be equipped with a legal light system. Do not only use your lights in the dark but also in the twilight of dusk and dawn. Due to laws and regulations the brightness of bicycle lights may be considerably lower than that of other vehicles. Therefore always keep in mind that other road-users may only see you very late or not at all.

For the Scorpion, HP VELOTECHNIK offers a dynamo light systems with a tire dynamo or a hub dynamo.

Both light systems come with strong LEDs for headlamp and rear light. The LEDs last considerably longer (approx. 100.000 working hours) than a light bulb. For your safety the light system has a parking light system both at the front and at the rear light, which makes the LEDs shine on approximately 10 minutes after you have stopped riding. The electronic system is maintenance free. Because of the capacitors used you don't have to worry about batteries.

The cables and the contacts can be affected by corrosion or mechanical damage. Therefore, check the light system before every ride.

Tire dynamo

You turn on the light system with the tire dynamo at the rear wheel by unlocking the swivelling dynamo. For this purpose you press the red button at the dynamo until it moves towards the rear wheel. To turn the light off, swivel the dynamo back to its initial position by hand.



You switch on the tire dynamo by pressing the red button. To switch off the dynamo move it away from the wheel.

Danger! Do not try to move the dynamo while riding, your hands can be caught in the wheel and be injured! To turn the light system on or off stop riding, get up from your trike and only then move the dynamo.

Danger! The dynamo must always be safely fastened to the bracket at the frame, so that it can not turn. If the screws come loose the dynamo can get caught in the spokes and block the rear wheel - danger of a serious fall! Always check the position and secure attachment of the dynamo before a ride.

You can adjust the pressure of the dynamo against the wheel with the turning knob at the side. The pressure is right when the dynamo wheel just does not slip at the wheel, if the light flickers, the pressure is too low and you have to increase it. The dynamo should be positioned in a way that the extension of the dynamo axle points through the center of the wheel. Take care that the dynamo is mounted safely and can't be turned. Worn dynamo wheels can be exchanged. Please ask your specialist dealer.

Folding (Scorpion fx / fs)

Taking off the seat

Open all three quick release levers of the seat mountings. Unscrew the nut of the upper seat quick release approximately 4 turns. Turn the quick release levers of the middle and lower seat quick release counter clockwise approximately 4 turns.

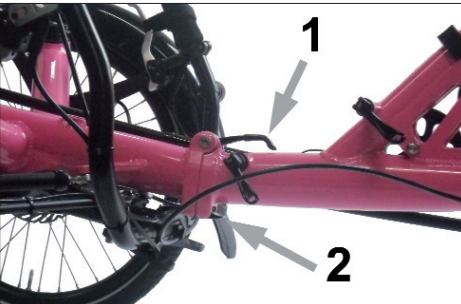
With a lowrider rack or water bottle mounting installed, space is limited and it may be easier to hold the quick release lever and turn the flat nut on the right side (chainside) of the seat mountings with a 5 mm Allen key.

Pull the lower seat half out of its mountings, then the upper seat half.

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

Folding the frame

Your Scorpion fx / fs folding hinge features a snap-in function. It makes folding easier and prevents the frame from folding even when the quick release is not fastened.



To fold the frame stand in front of the main frame's crosstube and look to the rear wheel. Grab the quick release lever on top of the folding hinge (1) and pull it upwards. Swivel the lever until it touches the front frame part.

Use your right hand to pull the whole hinge upwards a little bit. At the same time press the securing tab (2) downwards with your thumb. Now lower the frame to open the folding hinge.

Lower the frame until the protection plate below the stem touches the ground.

Grab the rear frame part and swivel it to the front. The strap mounted to the seat tube must be inserted into the fastener mounted under the left crossbeam. Press the frame parts together until the rubber bumper attached to the seat tube touches the front frame part.

The chain tubes are connected by a flexible rubber joint positioned in the area of the folding hinge. Make sure all cables and electric wires are long enough to allow proper folding.

Taking off the front wheels

To achieve an even smaller package, you can take off the front wheels (see page 56). It is also possible to remove the mudguards in addition (see page 52).

Unfolding

To unfold and reassemble your trike, please follow the steps above in the opposite order. Make sure that after unfolding the quick release lever rests on the front frame part. Else the snap-in mechanism will not work properly.

Lift the folding hinge until the securing tab snaps in.

Now close the quick release lever until it touches the rear frame part.

Danger! Before riding your trike, make sure the quick release is securely closed. The securing tab must be locked and the quick release lever must be lay on the rear frame part. Cables or wires must run free. The handlebar must turn easily and freely. All seat quick releases must be closed properly.

Maintenance and care, Brakes

Maintenance and care

Your Scorpion 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.

Caution! 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.

For a quick overview of the works to be done take a look at the Warranty Pass on page 62.

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.

Brakes

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 kilometers. Please read the manual of the brake manufacturer carefully.

Cable operated (mechanical) brakes

The brake pads of your brakes are worn when you can pull the lever further and further to the handlebar before the pads touch the rim.

To compensate the wear of the brake pads you can tighten the cable with the adjuster barrel where the cable touches the brake lever. First loosen the locknut, then unscrew the barrel so far that the wheel still turns, barely not touching the pads, hold the barrel and tighten the locknut again towards the brake lever housing. Take care that the barrel's slot points downwards to prevent moisture from entering.

Caution! Damaged cables with single wires sticking out have to be replaced immediately. Otherwise your braking system may fail - danger! Please take care that the cable ends are always protected with a cap. Always keep the cables shortly trimmed. Leaving too much cable extending past the cable anchor can result in the cable catching in the rotor or wheel causing the wheel to lock up.

Caution! Keep the brake cable clean where it is not protected by the cable housing. Due to the mounting position of the brake lever, moisture and dirt may enter the cable and cause drag and excessive wear. Lubricate the ends of the cable to protect against moisture.

Brakes

Mechanical disc brakes

To readjust the brake pads you have to use the big red knobs on each side of the brake caliper. Adjust the inner and the outer pad evenly. In case you are not sure, have this adjustment work done by a qualified bike mechanic.

Check your brake pads frequently as explained in the manual supplied by the brake manufacturer. Worn brake pads, oily or damaged pads must be replaced immediately by a qualified bike mechanic.

Hydraulic brakes

Hydraulic brakes on HP VELOTECHNIK bikes use low viscosity mineral oil that, contrary to DOT brake fluid used in cars, does not absorb water. Thus, you don't have to change the oil. Please read the brake manufacturer's manual that comes with the trike. In case of a damaged hose or any leakage of oil always consult a qualified technician in a bike shop.

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

Hydraulic disc brakes on the Scorpion 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 incl. metal back is 2,5 mm, of the brake disc it is 1,7 mm. Please also 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 caliper while braking. This leads to total loss of brake power.

Caution! 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 use the transport clips delivered with your trike or put a piece of cardboard in the brake caliper to replace the disc. Carefully separate brake pads that have moved together with a screwdriver.

Caution! Keep the brake lever clean. Due to the mounting position, water and dirt can collect inside the lever around the hydraulic cylinder. This may lead to excessive wear or leakage of the hydraulic system.

Danger! The hose at the left knuckle must not be routed under the track rod. This may lead to snapping off the hose. The hose should leave the caliper slope upwards and run in a wide bow to the track rod. The zip ties fixing the hose to the track rod must be tightened properly to prevent it from moving.



The bow of the hose is routed under the track rod: Danger of snapping off the hose (cf. arrow).

Gear system

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 trike. 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.

Adjusting the gear indexing for the rear derailleur

Adjust the adjuster barrel where the shift cable touches the rear derailleur. Do it 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 trike.

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.

Danger! 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, getting stuck or damaging the spokes, which may result in serious falls. The adjustment of the end-limit adjusters is a job for the professional bike mechanic.

Danger! If the trike falls over, the derailleur or its mounting can be bent which results in a change of the derailleur movement range. Check the movement range and have it readjusted by your bicycle mechanic, if necessary.

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 trike is often parked outside in bad weather conditions.

Caution! 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

Chain

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 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 Scorpion is approximately 2.5 times longer than a standard bicycle chain (approximately 3.8 m). But it also lasts longer since a chain only wears while bending at the sprockets and the chain rings.

Use a good chain oil that won't leave a sticky film on the chain. The chain oil must not contain any aggressive chemical substances that might affect the surface of the chain tubes or chain idler.

Specialist stores sell biodegradable lubricants. HP VELOTECHNIK recommends a DryLube-type lubricant. This lubricant is purely based on PTFE (Teflon) that keeps the chain clean and dry. This way dirt simply falls off and the tubes always stay clean.

It is important that you clean the chain with a cloth before lubricating. Otherwise the fresh oil 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 oil off the bearing parts, stays there and dilutes the fresh oil so that a sufficient lubrication is not guaranteed. If you have treated the chain with a solvent you will have to heat it up with a hot air gun or boil it in chain grease.

Danger! Take care not to pour any oil on the rims, brake discs or the tires. The braking system could fail or the tires could slip away suddenly. The oil affects the rubber of your tires and can damage it. While lubricating cover the surrounding area.

An effective protection against corrosion is crucial for a long chain life. Some minutes after you have oiled the chain rub it with a cloth to remove superfluous oil 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 tubes to evaporate which may lead to corrosion at the chain.

Changing the chain

The chain is one of the parts of the trike that will wear out. This shows in a stretching of the chain. Worn out chains do not fit the sprockets and chain rings any more 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. For a more precise reading you can buy a chain measurement gauge in your bike shop.

Only use chains that are suitable for the gear system of your trike. 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. We recommend rust resistant Rustbuster-chains from KMC with smoothly rounded edges. They also provide a good gear changing performance.

Caution! When you change the chain take care that the new chain does not show any sharp edges or burrs.

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 3,8 m of 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 chain ring in front and 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.

Caution! 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.

See that the joining link is not bigger in size than the other chain links to avoid irregular chain sounds. We recommend the joining links by KMC. Every time you change the chain you also have to apply a new joining link.

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 tubes

Chain tubes

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. Please see also the instructions on "Chain" on page 34.

In order to perform any work at the chain tubes you'll have to open the chain and finally close it again. Please see the instructions on "Chain" on page 34.

The distance of the upper chain tube 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.

Caution! Take care that the chain tubes keep at least a 5 cm distance to the rear and front derailleur when the chain is stretched to the maximum, and that the tubes are well fastened. If necessary you will have to shorten the tubes. If the end of a chain tube gets into the rotating parts of the drivetrain the drivetrain can be blocked and the chain tubes may be destroyed.

Caution! The rear ends of the upper chain tube have to be secured against moving with a tight rubber tube over the retention spring. Without the rubber tube the chain tube may be dragged forward into the turning chain roller or chainring and thus be damaged by the chain.

Caution! Check the chain tubes frequently if they are damaged or defective. Replace defective chain tubes immediately. If the chain tubes are worn in the area of the retention spring or tube mountings, the chain will touch the retention spring, leading to failure of the spring and mountings. As a result, the chain tube can get into the drive train and block it!

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 power 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 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. Now you expand the end with a proper tool, e.g. the rounded grip of a screwdriver. Quench the expanded end immediately with cold water.

Take care that the tubes don't catch fire. At any rate work in a place with sufficient ventilation.

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.

Changing the tubes

In order to exchange single parts in the upper chain tubes 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.

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 chain tube; 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 Loctite 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.

Changing the lower chain tube

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

Chain roller

Chain roller

The chain roller guides the chain below the seat to the rear wheel and is an essential part of the HP VELOTECHNIK No Squat design. It ensures that the suspension is not influenced by pedaling.

Compared to other models 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.

Caution! If this chain retention hook is missing the chain may fall down. When you start pedaling 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 chain roller is not symmetrically shaped; the recessed side of the chain roller has to face to the frame, the flat side outwards.

Caution! 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 dismantled the bearings they will be destroyed when you tighten the screw while remounting them.

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.

Dismounting the chain roller

See the notes on changing the chain tubes, page 36.

The chain roller is mounted with a special high strength screw of the German strength grade 12.9 and it may only be replaced by a screw of the same type and strength.

Front wheel alignment

Measuring toe-in

Both front wheels should be parallel to each other, viewed from above the trike, compare picture below.

The condition of the front ends of the front wheels being closer together than the rear ends of the front wheels (b_v smaller than b_h) is called toe-in, the condition of the front ends of the front wheels being further apart than the rear ends of the front wheels (b_v larger than b_h) is called toe-out. The measures are taken at wheel axle height on the rim sidewalls.

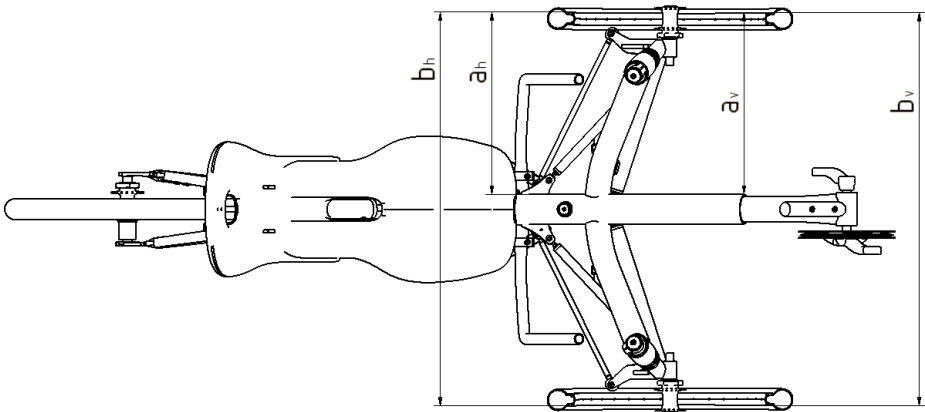
If the front wheel alignment is incorrect, you will suffer excessive tire wear and increased tire drag. Check your front wheel alignment regularly. The proper tolerance on toe-in is 0–2 mm (1/16"). For correct measuring properly trued wheels are required.

To check the toe setting turn the handlebars into the neutral position, so that the wheels are aligned straight forward. Measure the distance between the front inner or outer edges of the front wheel rims and the rear inner or outer edges of the front wheel rims 25 cm (10") above the ground.

The distance between the front edges b_v must be 0–2 mm (1/16") smaller than the distance between the rear edges b_h . If the Scorpion fs is checked in unloaded condition, the proper tolerance for toe-in is 2–4 mm (1/16"–1/8"). Then, a similar toe-in value as with the unsuspended trikes is reached under normal riding conditions with the front wheels deflected by ca. 20 mm.

It is important to measure the distances at the same height of 25 cm (10") above the ground, as the front wheel are not exactly perpendicular to the ground, viewed from the front of the trike. Measuring at varying heights results in measuring errors.

Scorpion, Scorpion fx:	$b_h - b_v = 0 - 2$ mm
Scorpion fs, unloaded:	$b_h - b_v = 2 - 4$ mm
Scorpion fs, deflected by 20 mm (riding position):	$b_h - b_v = 0 - 2$ mm



Adjusting toe-in

The front wheels are held by knuckles which can turn at the ends of the main frame. The knuckles are connected by tie rods to the handlebar stem.

The rod ends consist of ball-and-socket bearings that can be screwed in or out of the tie-rod for length adjustment.

Length adjustment is done at the inner tie-rod end, at the connection to the handlebar stem. The outer rod-end is screwed completely into the rod and secured with threadlocker. Do not try to turn this side of the rod end.

First make sure that the handlebar is aligned perpendicular to the main frame tube. Identify which wheel (or perhaps both wheels) needs adjustments of the toe-in by measuring the distance between rim wall and main tube on the most forward point and on the most backward point of the rim (value a_v and a_h in the picture). The distances should be roughly identical for one wheel.

Remove the bolt that connects the inner rod-end to the handlebar stem, note the washer. Hold the rod-end with a wrench and loosen the nut that is screwed against the rod-end.

Screw the rod-end into the tie-rod to enlarge the distance b_v between the front edges of the front wheel. Screw the rod-end out of the tie-rod to decrease the distance of the front wheel edges. Attach the tie-rod to the handlebar stem and measure the toe-in as described above. Repeat the adjustment process until you reach the required toe-in setting.

Align both rod-ends parallel to each other. Grip the rod-end with a wrench and tighten the nut against the tie-rod with 4–5 Nm.

Danger! The rod-end must be screwed at least 8 mm into the tie-rod. If it is screwed out too far, the thread could tear out and the trike could become unsteerable. This means that with a standard length of the thread of the rod-end of 24 mm, a maximum of 11 mm visible free thread length is allowed between rod-end and lock-nut. The lock nut must be screwed tight to the tie-rod, otherwise the rod-end could loosen up or play could develop.

Caution! Do not move the rod-end beyond its limits, or it will be destroyed or get excessive play. Always hold the rod end with a wrench or secure the tie rod with a wrench against turning when tightening the lock nut.

Put the washer on the sheetmetal bracket at the handlebar stem and the rod end on top of it. Insert the bolt and tighten the self-locking nut.

Caution! Make sure the washer is between rod end and bracket to allow the full movability of the rod end.

On the other side of the track rod the rod end is mounted on the underside of the knuckle. Note: There is an additional spacer between washer and rod end.

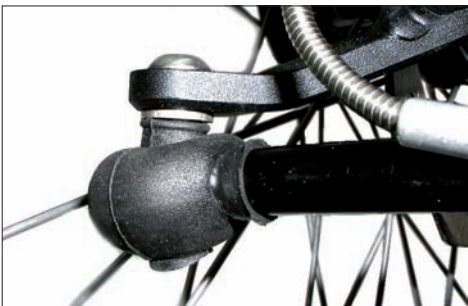
Danger! Secure the thread of the bolt with Loctite adhesive. Check all connections of the steering system before every ride. If a connection loosens, the trike becomes unsteerable which may lead to serious injury.



Scorpion / Scorpion fx: The rod end is mounted on top of the handlebar sheetmetal bracket with a washer in between.



Scorpion fs: A washer must be located between rod end and the sheetmetal bracket.



Scorpion fs: Track rod assembly at the knuckle

Rear suspension element

Rear suspension element

Changing the steel spring (DV-22)

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:

up to 80 kg (176 lbs): 350 lbs./inch
up to 100 kg (220 lbs): 450 lbs./inch
up to 130 kg (286 lbs): 550 lbs./inch

In addition to this, your dealer can also use springs with other spring rates or special light-weight springs made of titanium.

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:
DV22: 83 mm (70-90 mm)

In order to change the spring you will have to remove the rear screw and swivel away the rear frame.

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.

Danger! If the bicycle does not stand on the ground while undoing the screws of the suspension element the rear swing arm 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 swing arm comes down in a controlled and gentle way by putting up a solid string or zip tie between the main frame and the rear swing arm.

Danger! When the bicycle is standing on the ground the frame and the swing arm 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 swing arm and suspension element and your bicycle may be damaged.

Move the rear swing arm 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 and length 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 play any more. If there is a safety spring ring, push it back into the slot on the thread.

Move the rear swing arm back up and connect the rear end of the suspension element with the rear swing arm using the bolt. Lubricate the bolt thoroughly.

Secure the screws of the suspension element with threadlocker 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 your new bicycle" on page 18.

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 pre-load 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 Spring" on page 42.

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



The bushings of the rear spring element need to be lubricated once a year.

Hydraulic dampers are affected by wear and tear through normal use. It depends on the usage of the trike, 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. 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 effect 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 trike.

Front suspension (Scorpion fs)

Customizing the front suspension

The Scorpion fs' front suspension can be customized by different measures:

- adjusting the preload (see page 21)
- exchanging the elastomers or spacers
- exchanging the steel springs
- exchanging the stabilizer bar
- exchanging the damping elastomer bands

According to your order, the Scorpion fs comes with standard suspension setup either up to 90 kg or above 90 kg.

Standard suspension setup up to 90 kg:

- steel spring soft (red)
- 4 MCU elastomers 30 mm
- 1 spacer 30 mm
- stabilizer bar soft (white)
- low damping rate (elastomer bands 1,6 mm)

Standard suspension setup above 90 kg:

- steel spring hard (yellow)
- 4 MCU elastomers 30 mm
- 1 spacer 30 mm
- stabilizer bar hard (grey)
- low damping rate (elastomer bands 1,6 mm)

Enclosed for individual setup:

- 2 MCU elastomers 30 mm
- 2 spacers 30 mm
- 2 elastomer bands 1,7 mm, high damping rate

These standard setups can be customized. As an example, you can find curves of different options in the diagram. The curve shape shows the characteristic of the suspension setup.

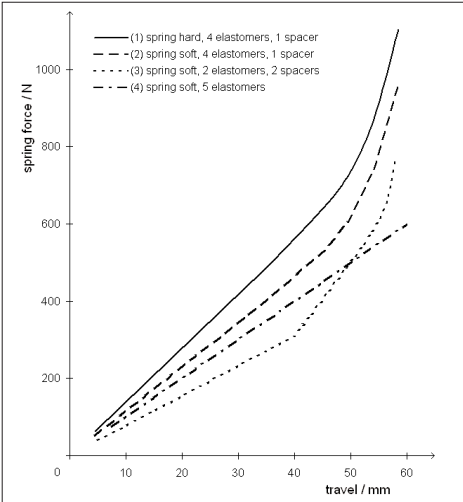
The characteristic is referred to as linear when the curve of suspension force related to suspension travel forms a straight line. Force and travel are related to each other by a constant factor, called spring rate, throughout the whole suspension travel. This is a typical characteristic of steel springs.

The characteristic is referred to as progressive (or rising rate) when the spring rate increases with suspension travel. In the diagram, this results in a curve with a left bend. Due to their design, elastomers and air springs show this characteristic (MCU elastomers show an almost linear characteristic in the first part of their travel, see curve nr. 4).

Tuning your suspension bases on the choice of the steel spring according to your usual load. The soft spring moves the area of operation to low rider and luggage weight, the hard spring to high rider and luggage weight. The suspension characteristic is not affected by choosing another steel spring with different spring rate. Varying the number of elastomers and their relation to the number of spacers inside the steel spring changes the area of operation as well as the suspension characteristic. It is allowed to have one or more blank spaces out of the five spaces available for elastomers or spacers. In this case the load during the first part of the travel is only taken by the steel spring and the elastomers only affect the suspension after the travel of the blank spaces is used up.

Caution! Do not install more than two spacers in one strut, otherwise the full suspension travel can not be reached. Spacers should always be installed at the top of the stack inside the spring to give room for the screw in the top cap. The setup must be similar in both suspension struts of your trike.

Caution! The suspension must be set up in a way that avoids permanent bottoming out (a clearly recognizable bumping into the end stops). Permanent bottoming out may reduce the components' life time.



If you use your Scorpion fs under different conditions and changing loads as well as on good and bad surfaces, a setup with a progressive characteristic for the whole travel is recommended to get a comfortable suspension under all conditions of use. The elastomers support the steel spring from the beginning. By changing the relation between the number of elastomers and number of spacers, you can influence the suspension characteristic and the maximum force the strut can bear before it bottoms out. Examples in the diagram are the curves nr. 1 and nr. 2 which show the standard setups. They feature moderate progression and increased maximum load compared to a single steel spring. (Setup: spacer-spacer-elastomer-elastomere-elastomer)

Will your Scorpion fs always face the same load and only high quality roads, for example, you may tune your suspension characteristic to a more linear behaviour in the first two thirds of travel and a high progression in the remaining third. The linear part provides very high comfort. The progression at the end prevents the strut from frequently bottoming out due to unusual high loads.

A characteristic like this (3) can be achieved by a steel spring which is responsible for taking all the load at first and will be supported by only a few elastomers towards the end of travel. (Example setup: empty-spacer-spacer-elastomer-elastomer)

To exchange elastomers or spacers, the end cap and the preload adjuster (which is under tension) must be removed. Having done so, the steel spring and the inside elastomers and spacers can be taken out. The lower support of this suspension package is an axial bearing which consists of three parts. This bearing or its parts may stick to the spring (caused by lubricant). Make sure this axial bearing is mounted under the spring in the correct order (washer-bearing-washer) during reassembly. If there are elastomers left in the strut, a thin needle pricked into will help to remove them. Now the springs, elastomers, and spacers can be recombined. When screwing in the preload adjuster disc, make sure it is aligned straightly. It must be screwed in against spring force, therefore the assistance of a second person might be asked.

Caution! Make sure that the axial bearing was mounted correctly between spring and support plate inside the strut during assembly. A missing or wrongly placed axial bearing may damage the suspension strut or lead to steering heaviness.

Front suspension (Scorpion fs)

Stabilizer bar

To decrease body roll while cornering, the Scorpion fs is equipped with a stabilizer bar. As long as the spring deflection height is the same on both front wheels, the stabilizer bar has no effect. If one single wheel is moving upwards (e.g. the outside wheel due to the dynamic forces at high speed cornering), the stabilizer bar works as a torsional spring and increases the spring rate of this wheel. Besides, it transmits parts of this wheel's load to the opposite wheel's suspension strut which then supports the higher-loaded wheel. As a result of this the single-sided suspension on bad quality roads will be harder compared to both wheels moving at the same time in the same direction.

If you prefer a very comfortable ride, it is possible to mount the soft (white) stabilizer bar in spite of high loads and appropriate spring setup. However, the Scorpion fs will lean more outwards in fast driven corners.

If you prefer a sporty style of riding with a minimum of body roll, you may also use the hard (grey) stabilizer bar with a soft spring setup.

To remove the stabilizer bar, simply unscrew both bolts which connect the stabilizer bar brackets to the frame plates. Now the stabilizer bar can be pulled out of its bushings in the wishbones. The aluminium brackets can be removed afterwards. Assembly is done in reversed order.

Caution! Before inserting the countersunk bolts, make sure the brackets are fitted planar to the frame plates and the hole centers are aligned to each other. Otherwise you may damage the threads and destroy the brackets.

Removing and disassembling the suspension struts

To provide a long lasting, faultless function of the front suspension, the struts must be maintained regularly according to the service plan on page 62. During design, great importance was attached to keep the bearings of the front suspension free from dirt and moisture. That's why the struts are equipped with a shock boot with vent holes situated inside the frame's steering tubes. This makes sure that predominantly clean and dry air is exchanged. Depending on the area and conditions the Scorpion fs is operated in and under, dirt and moisture could nevertheless reach the bearings inside. Hence it is necessary, especially after riding under rainy and snowy or offroad conditions, to check the struts for dirt and clean them. Under extreme conditions, we recommend to shorten the maintenance intervals given in the service plan.

Danger! While adjusting the front suspension, never load the tricycle, e.g. by resting on the seat or loading the racks when your hands or tools are close to the suspension struts. Your hands may be bruised when the suspension compresses.

Caution! Use aging-resistant, lithium soap based grease to lubricate. Never use grease containing solid lubricants such as molybdenum disulfide or zinc sulfide.

Caution! Never clean your tricycle and especially parts of the suspension with a pressure washer or steam cleaner. These devices remove lubricant and transport dirt into the bearings which causes higher wear.

Caution! Always secure the wishbones or track rods by tying them to the frame (e.g. using zip ties) to make sure they won't move until their stop. This would damage the spherical plain bearings and rod ends.

To clean the suspension strut occasionally, clean the shock boot and slide it down completely. Clean the stanchion tube thoroughly with a soft, dry cloth. Apply a thin layer of grease or suitable oil. Finally, slide back the shockboot to its original position.

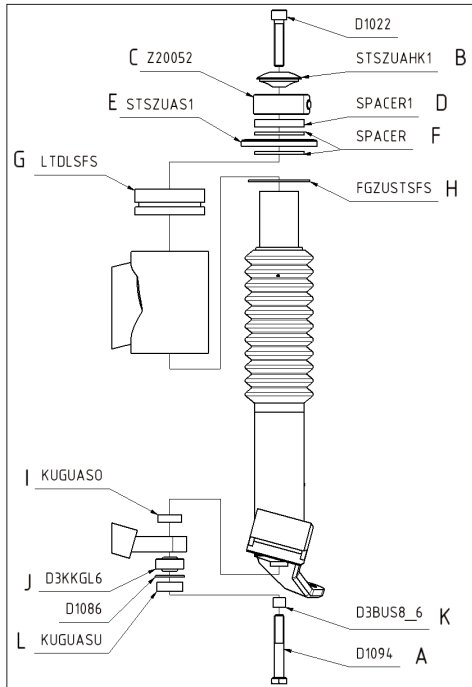
In case the suspension strut does not move smoothly, check the tightening torques of the fender clamp (if installed), see page 52.

To maintain the suspension strut according to the service plan or to exchange the elastomer bands for damping adjustment, it has to be removed and disassembled. Therefore, fit the Scorpion fs to a workstand in a way that provides easy access to the respective front wheel. Remove the front wheel. Remove the brake caliper according to the manufacturer's manual. Unfasten the fender (see page 52). Demount the stabilizer bar as described above.

Unscrew the outer rod end of the track rod from the suspension strut. The lower collar of the rubber cap must be slid upwards to access the self-locking M6 nut.

Unscrew the hex bolt M6x40 **A** at the strut's lower end, which connects the strut with the wishbone.

Now remove the end cap **B** at the suspension strut's upper end. Unscrew and remove the clamp **C** as well as the spacer **D, F**, cap **E** and spacer **F** below. Pivot the strut in a way that it may pass the wishbone and push it downwards to slide it out of the elastomer bearing **G**. In case the strut won't pass the wishbone, you have to dismount the wishbone's rear pivot point.



Exploded view of the suspension strut assembly

Front suspension (Scorpion fs)

Slide off the washer **H** at the suspension strut's upper end. For further disassembly, cut the zip tie at the bottom of the shock boot **I** and slide the shock boot off the strut. Now screw in an auxiliary bolt, e.g. M6x20, on the underside of the strut for approximately 4mm. Grab the suspension strut firmly at the knuckle (lower black part) and beat the screw head with a rubber hammer to release the piston **6** inside.



Applying grease to the bushings.



A hammer blow on the auxiliary bolt releases the piston inside the knuckle.

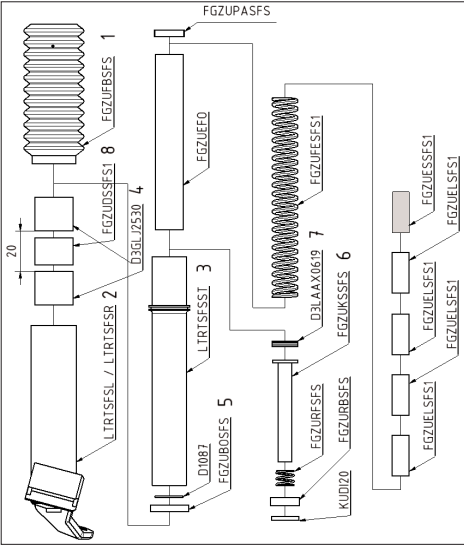
Remove the auxiliary bolt and slide the stanchion tube **3** (golden) out of the knuckle.

The elastomer band **8** can now be removed. Clean the sliding surfaces of the stanchion tube and the bushings **4**, as well as the inside of the knuckle **2**. Use a clean soft cloth. If there is noticeable play in the bushings or if the bushings are damaged, please contact your dealer. Lubricate the surfaces of the clean bushings **4**. Check the proper position of the bottom out elastomer **5** inside the knuckle. Apply a thin layer of grease on the stanchion tube **3**.

Caution! We recommend to use CONCEPT-LUBE available from HP VELOTECHNIK for best performance. You can also use aging-resistant, lithium soap based grease to lubricate. Never use grease containing solid lubricants such as molybdenum disulfide or zinc sulfide.

Insert the elastomer band without wrinkles in the knuckle between the two bushings. Slide the stanchion tube back into the knuckle. Use the auxiliary bolt once again. Tighten it properly at the lower end of the suspension strut to make sure the piston is in its correct position. If you are not able to fasten the screw (i.e. it can be turned on and on), you have to disassemble the springs (see "Customizing the front suspension", page 44, the axial bearing **7** may remain inside) and fix the piston with a long hex key size **5**. Slide on the shock boot and insert its upper end into the stanchion tube's groove. Slide on the washer **H**. Press the suspension strut into the elastomer bearing in the frame. Assemble spacer **F**, cap **E**, spacer **D**, clamp **C**, and end cap **B**. Fix the suspension strut in its elastomer bearing by tightening the end cap with 1-2 Nm and fasten the clamp. Remove the auxiliary bolt.

Connect the suspension strut with the spherical plain bearing in the wishbone by the M6x40 hex bolt (part order: strut - thin sealing ring **I** - pivoting bearing **J** - spacer 6mm long **K** with thick sealing ring **L** - screw head **A**). Tighten the screw with a torque of 10-12 Nm.



Exploded view of the suspension strut interior

Caution! Use threadlocker (e.g. LOCTITE 243) with all bolted connections that are not equipped with self-locking nuts, else the connections may become loose.

When mounting the rod end at the suspension strut, take care to assemble the parts in the correct order, from upside: screw head, steering lever, washer 6, spacer 6 mm length, rod end, self-locking nut M6. In case you have removed the rubber cap, circlip pliers will help you to reassemble.

Adjusting the front axle geometry (information for bicycle mechanics)

The Scorpion fs is equipped with adjustable wishbones. By adjusting the rod ends on the wishbones, the required axle specifications can be met. During assembly in our factory, the front axle was adjusted correctly. In case of replacement of worn-out or damaged parts the front axle needs to be readjusted. In unloaded condition, the following adjustment values must be met:

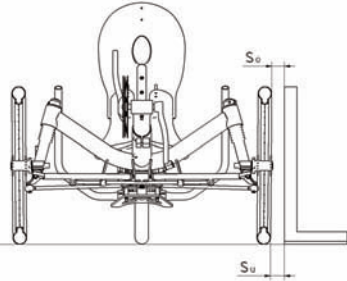
- toe: 2-4 mm toe-in
- camber angle: $+0,5^\circ$ ($+0,5^\circ/-1,5^\circ$)
- max. difference in camber angle left/right: $0,5^\circ$
- caster angle: $76,7^\circ$ ($+/-1^\circ$)

Caution! Always check the front axle specifications after accidents or unintended events such as riding through a deep road hole or contact with the curb at higher speed as well as after replacing axle components. An incorrect adjustment can lead to increased tire wear and uncontrollable handling.

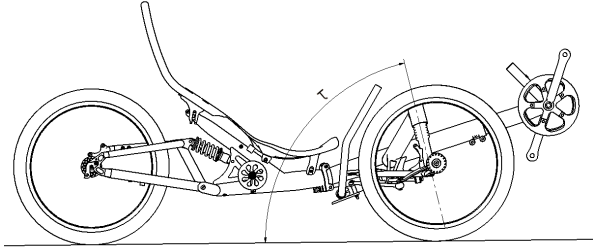
For measuring, the Scorpion fs must stand on a plane, non-inclined floor.

To measure the caster angle, the frontwheels must point straightforward and the fender clamp must be aligned parallel to the brake disc. Attach a protractor to the front side of the fender clamp. Align the protractor perpendicular to the ground. Make sure the protractor only touches the fender clamp and not the frame's headtube.

Front suspension (Scorpion fs)



Measures to adjust the camber angle



Caster angle τ on the suspension strut

To measure the front wheel's camber angle position a long square next to the wheel coincident with the wheel axis. Set the lower distance between rim wall and square to 40 mm ($s_u = 40$ mm). The upper measure s_o between rim wall and square should be 36 mm (+0,5° positive camber) now and must be in a range of 32 (+1° positive camber) to 48 mm (-1° negative camber). The difference between the measure s_o on the left and right wheel must not exceed 4mm.

For adjusting works, the trike should be mounted in a workstand, best upside down. The stabilizer bar must be disassembled.

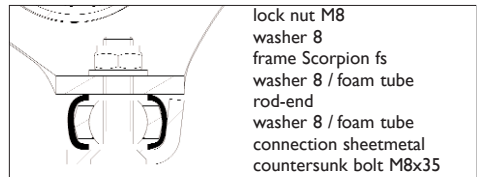
To adjust the front axle both rod ends of one wishbone must be disassembled from the frame. Loosen the counter nuts and screw in or out the rod ends according to the table on the left. Values in between can be interpolated.

Check the values after provisionally reattaching the wishbone and wheel on a plane floor. Repeat the adjustment if necessary.

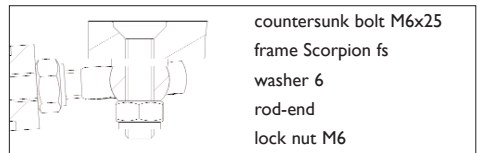
After having reached the correct setup, fasten the counter nuts of the rod ends with 4–5 Nm.

+ screw out - screw in	rotations of forward rod-end	rotations of backward rod-end	rotations of tie-rod rod-end
caster angle τ			
lower by 1°	+1	+2	+2
rise by 1°	-1	-2	-2
camber angle			
decrease s_o by 8mm	-2,5	-2,5	-4
increase s_o by 8mm	+2,5	+2,5	+4

Reattach the foam tube that covers the large rod ends and a short part of the oval wishbone tube. Mount the rod ends to the frame brackets.



Front wishbone mount parts order, tightening torque 13–15 Nm



Rear wishbone mount parts order, tightening torque 7–9 Nm

To finish the front axle setup measure and adjust the toe as described in "Front wheel alignment" on page 39.

Swing arm pivot

Swing arm pivot

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

In case you notice play or a creaking noise at the rear swing arm please check the two screws that keep the axle in the frame. They have to be secured with threadlocker.

Tightening torque: 17-19 Nm

Danger! If the screws at the axle are not tight enough this leads to play and noises when the spring compresses. In extreme cases the swing arm may come loose which leads to a serious fall. If the screws are too tight the thread of the axle may tear out or the screw may be damaged.

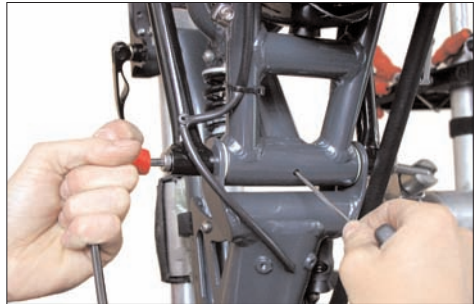
Caution! There has to be a big washer between the main frame and the end of the bushing else the bushing is not able to function without play and the frame will be damaged.

The bushings are exchangeable. For that purpose you will have to dismount the rear swing arm and send it together with the axle via your specialist dealer to HP VELOTECHNIK. After installation the bushings are machined to adjust them.

Unscrewing the axle bolts

In order to mount the rear rack or the lowrider the axle bolts have to be unscrewed. We recommend you to leave one screw in place each to prevent the axle from turning.

In case the rear swing arm is to be dismounted completely you can prevent the axle from turning by inserting a thin metal rod in the hole of the axle through the hole in the rear swing arm under the axle.



You can prevent the axle from turning by inserting a thin metal rod in the hole of the axle.

Headset, Mudguards

Adjusting the head set play

The knuckles that connect the front wheels to the frame are supported by A-Head-type headsets. (The following informations is not valid for Scorpion fs, please refer to page 44.)

The headsets must be adjusted in order to let the knuckles with the front wheels attached 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 trike back and forth. If the bearing has play the upper cup moves noticeably in contrast to the fixed part. In this case loosen the clamping screw of the clamp above the upper bearing and tighten the screw in the cap a bit more. Afterwards, fasten the clamp again.

To check whether the front wheel turns smoothly lift your bicycle at the frame so that the front wheel moves freely above the ground. When you hold the frame straight and push the handlebars slightly they should move smoothly from their middle position. If the bearing is too tight, loosen the clamping screw of the top clamp and loosen the hex-headed screw in the end cap a little bit by turning it counterclockwise. Fasten the clamp again afterwards.

Danger! The hex-headed screw in the cap only adjusts the play of the head set bearing. This screw will not safely hold the knuckle in the frame. Take care the clamp tightened as prescribed after you have finished your adjustment.

If your bike is not equipped with mudguards, there will be a spacer (5 mm) between cap and clamp. When mudguards are installed, the spacer is replaced by the mudguard mounting.

After adjustment of the head set bearing, align the mudguards in a way that they won't touch the front wheel.

Mudguards

Mudguards are exposed to very strong vibrations 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.

If the wheels are removed, the tricycle must not rest on the front mudguards. Loosen the screw between mudguard mounting and knuckle to remove the mudguard.

The front mudguards are adjustable in height to accommodate different tire heights by means of the slotted holes in the mudguard mounting.

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

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.

Mudguards, Water bottle cage

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 between mudguard and wheel.

Check whether the suspension can still be completely compressed with mounted mudguards. The mudguards, stays, mountings, and screws must not touch other parts under maximum compression.

Scorpion / Scorpion fx

The front mudguard mounting is attached by headset's cap and screw and fastened against the headset clamp. Make sure this clamp is fastened properly. The little screw in the mudguard mounting fits in the clamping slot of the headset clamp and secures the mounting against turning.

If you decide to uninstall the mudguards, replace the mudguard mounting with a 5 mm spacer.

Scorpion fs

The front mudguard mounting is attached to the knuckles by a clamp. To add the clamp to the knuckle, the suspension strut must be unmounted and the shock boot must be removed.

The sheetmetal mounting bolts (facing the wheel) must be fastened with 5 Nm, the clamping bolt (facing the rider) with 2 Nm.

Caution! If the clamps on the suspension struts are fastened too tight, the knuckle may become deformed and the suspension won't work properly.

To turn the mudguards in order to get a smaller package, only the clamping bolt which faces the rider needs to be loosened.

To remove the mudguards unscrew the sheetmetal mounting bolts until the sheetmetal can be pulled out. The clamp may remain on the strut when the mudguards are uninstalled. Secure or remove the sheetmetal mounting bolts.

Water bottle cage

You can mount a water bottle cage with a special bracket behind the seat. The derailleur tube at the front of the frame comes with threaded inserts M5 for an additional water bottle cage as well.

An useful alternative to water bottles are systems with a "water bag" and a drinking hose, e.g. from SOURCE or CAMELBAG. You can simply strap them behind the seat or on the rear rack.

Seat cushion

Seat cushion

The standard seat cushion consists of a 1,4 cm thick layer of flexible EVA foam. This is a black foam material with closed cells that is also used in the production of high quality camping mats. It feels very comfortable without appearing too soft or spongy. It is waterproof so you can dry your seat with a sweep of your hand in case your bicycle has become wet.

Caution! The seat cushion is fastened with Velcro and you can take it off. For this purpose it is important not to simply grab the foam and take it off since the Velcro could come off. In order to take off the seat cushion lift up the upper part a little bit from the seat. Then you grab the cushion on both sides together with the end of the Velcro that sticks out slightly and remove the cushion slowly. In case the Velcro comes off fasten it again with a good glue.

Caution! Never expose the seat cushion to extreme heat or focused sunlight. The material warms up considerably. The heat may melt the glue of the Velcro. The seat cushion can be damaged when the rays of the sun are bundled through a lens. Take care to never leave any bubble wrap on the seat in the sun. The air bubbles in the film act like a burning glass and shrink the seat cushion.

For better ventilation, the Airflow Cushion is available as accessory. This cushion consists of several layers: A rigid mesh and a soft mesh, which provides for an approximately 1 cm thick air cushion with excellent circulation. These two layers are wrapped up in a cover that consists of fine mesh like it is known from high quality rucksacks.

You can wash the Airflow Cushion at 30° centigrade and it dries very quickly.

The seat cushion suffers from wear by constant use. The mesh parts under punctual pressure can be pressed together permanently after some time of usage. In order to still provide a good riding comfort, the Airflow Cushion features additional rigid mesh padding.

Raincover

To keep the seat dry when your tricycle is parked you can additionally purchase a raincover. It can be carried in the optional Microbag or in the bag the ErgoMesh seat is equipped standard with.

Caution! Don't sit down on the raincover. It may get hurt.

Wheels

Wheels

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). 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.



Before pumping up the tire, you have to unscrew the little knurled nut on the valve.

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! 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.

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.

When you exchange tires please note the maximum width limit of 50 mm (approximately, 2 "). You have to use tires of ISO size 406 (20") on all wheels. The tire width possible at your bicycle depends on the size of your rims. Please ask your local dealer.

Wheels, Cleaning and conservation

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

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.

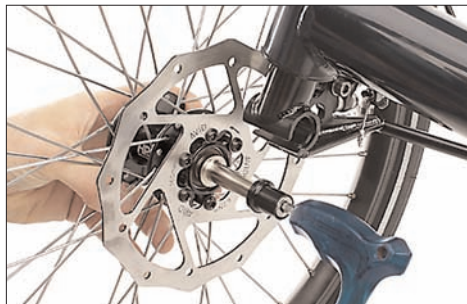
Danger! Take care that your spokes are always in perfect condition and the spoke tension is balanced. Do not ride with wheels that run untrue or wheels with loose or missing spokes. These faults may lead to a total failure of the wheel while braking and result in a serious fall!

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.

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

The wheels are fastened with a quick release mounting and therefore they are susceptible to theft. For this reason always lock the wheels along with the frame to a solid object when you park your bicycle somewhere.

To remove a front wheel, loosen the bolt in the locking part at the inside of the knuckle at least 6 mm. Pull the locking part away from the knuckle. Pull the wheel a few mm away from the knuckle and slide the axle through the slot in the knuckle.



Loosen the bolt inside the locking part to remove the wheel from the knuckle.

Take care not to bend the brake disc. When reinstalling the wheel, slide the disc carefully between the brake pads and take care not to damage them. Tighten the screw in the locking part with 8–10 Nm.

Cleaning and conservation

The frame of the Scorpion has a high quality and environmentally friendly powder coating. The surfaces of the aluminum 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 affect 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" aluminum 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 with 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 special cleansing agent for bicycles in addition.

Caution! 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.

Caution! Do not use any high-pressure 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.

While cleaning your bicycle check it for any cracks, scratches, deformations, damaged parts, loose spokes etc. If you are in doubt please consult your local bike shop.

Caution! 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 trike, 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 35.

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.

Caution! Take care that after folding the trike there are no parts rubbing against the frame. This may damage the paintwork.

Storing the bicycle, Screws and bolts

Storing the bicycle

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".
- 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.

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.

Screws and bolts

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

In the following table you will find the prescribed tightening torques, they refer to greased screws!

The grease also prevents 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.

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, gray-brown steel you have to exchange the screw.

When you exchange screws please 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. If you are in doubt please ask your specialist dealer.

Tightening torques for screws

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	tightening torque
V-brake:			
-brake lever	handlebar/grip	M6 key size 5	4 Nm
-brake caliper	caliper/frame	M6 key size 5	5–7 Nm
	cable clamping	M6 key size 5	6–8 Nm
disc brake:			
-brake lever	handlebar/grip clamping	M6 key size 5	4 Nm
-brake caliper	caliper/frame	M6 key size 5	7–9 Nm
-brake disc	disk/hub	M5 Torx T25	5–6 Nm
-brake housing	brake lever	key size 8	4 Nm
dynamo	dynamo/adaptor	M6 key size 5	6–8 Nm
	adaptor/frame	M5 key size 4	4–6 Nm
suspension element	element/frame	M6 key size 4	6–8 Nm
rear rack	at the seat tube	M6 key size 5	7–9 Nm
rear swing arm	axle/frame	M8 key size 6	17–19 Nm
b.b. set	cartridge/frame		50–60 Nm
chain roller	roller/frame	M8 key size 6	17–19 Nm
crank	crank/axle	key size 8	35 Nm
	chain ring screws	key size 5	8–11 Nm
hub	cassette ring		38–42 Nm
	front hub quickmount	M8 key size 5/6	8–10 Nm
quick release	wheel/frame		9–12 Nm
pedal	pedal/crank	key size 15	35–40 Nm
shifting lever	twist shifter	key size 3	2–2,5 Nm
	barend shifter	key size 6	5–6 Nm
derailleur	derailleur/frame	key size 5	8–10 Nm
	cable clamping	key size 5	4–6 Nm
mudguard	stay/frame	M5 key size 4	4–5 Nm
seat	upper seat part / seat mt	M6 key size 4	5–6 Nm
	lower seat part / frame	M6 key size 4	3–4 Nm
frame	front boom clamping	M8 key size 6	14–16 Nm
front derailleur	front derailleur/frame	M5 key size 5	5–6 Nm
	cable clamping	M5 key size 5	4–6 Nm
handlebar	handlebar/stem	M6 key size 5	8–10 Nm
stem	main axle / bearings	key size 6	6–8 Nm
headset	headset clamp	M6 key size 5	4–6 Nm
	clamp on SFS stanchion t.	M6 key size 5	2–3 Nm
	steering rod / mountings	M6 key size 4	7–9 Nm
front axle	wishbone / strut	M6 key size 10	10–12 Nm
	wishbone / main frame	M8 key size 5	13–15 Nm
	wishbone / main frame	M6 key size 4	7–9 Nm

Warranty

Warranty

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 of the Scorpion against damage through material or manufacturing defects. This warranty applies only to the original purchaser.

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 trike is also not covered. The onus rests with the purchaser. The warranty is void if any of the instructions in this manual are neglected.

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

In case of damage the dealer has to send the damaged 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 trike 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 Pass

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 trike 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 trike to a qualified bicycle mechanic for a thorough check.

The service plan on the next page 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.

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.

Service Plan

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 tread 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
suspension element	clean and oil thread, push rod, air chamber lubricate bushes replace worn out parts / hydraulic cartridge
suspension struts front axle	check shockboot and clean stanchion tube disassemble, lubricate check for play replace worn out parts
rear swing arm	check function and bearing play, tighten axle screws
bottom bracket bearings	check bearing play
rims	check wall thickness, wear, condition
chain	grease and check for wear
chain tubes	check for wear expand ends or exchange tubes
chain roller	check for wear, check bearing
crank	check, tighten
paintwork	conserve and repair
wheels	check alignment and spoke tension
handlebar	check for damage / bends check track rod for proper mounting
headset	check bearings, grease

see page	before every ride	monthly	annually	note
30	• •		•	
55	•	•		
27 / 32	• • •	•		
42		•	• ▲	
		• •	• ▲	every 6 months
51			▲	
			▲	
55			▲	
35	•			
37		•	▲	
39		•	▲	
			▲	
56		•		
40		•		
13	•		▲	
52			▲	

Warranty Pass

Service plan (continued)	
parts	work
hubs	check bearing play and brake discs mounting
pedal	check bearing play, check binding mechanism
frame	check clamping of the front boom clean and conserve check for damage, damage to paintwork
quick release	check correct closing
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

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.

see page	before every ride	monthly	annually	note
			▲	
			▲	
7 56	●	● ●		
26	●			
34	●	●		
59		●		
52		●		
55	●			
13 / 52	●		▲	replace stem every 2 years
32 / 34			▲	

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.

Warranty Pass

Your personal Warranty Pass

name:

address:

telephone:

frame no:
(stamped into gusset of the main frame)

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's Signature and Stamp::

service at delivery

At the delivery of a new Scorpion

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

(When you assemble a frame kit please list the components on an extra sheet and attach it to this Warranty Pass.)

1st service

No later than 300 kilometers or 2 months after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

2nd service

No later than 3000 kilometers or one year after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty Pass

3rd service

No later than 6000 kilometers or two years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

4th service

No later than 9000 kilometers 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 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 or five years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty Pass

7th service

No later than 18000 kilometers or six years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

8th service

No later than 21000 kilometers or seven years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

9th service

No later than 24000 kilometers or eight years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

10th service

No later than 27000 kilometers or nine years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

Warranty Pass

11th service

No later than 30000 kilometers or ten years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

12th service

No later than 33000 kilometers 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 or twelve years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

14th service

No later than 39000 kilometers or thirteen years after the purchase.

Order No.:

milage approx. km:

Date:

Dealer's Stamp and Signature:

Exchanged or additionally mounted parts:

NEW
recumbent-
technology



HP **II**
Velotechnik

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