

**A FREE
MIND
IN
MOTION**

**[zoom] SERVICE
MANUAL**

ZOOM UPHILL



Read this Service Manual and follow all instructions and warnings to reduce risk of serious injury or death.
For assistance, contact your local Zoom reseller.

NOTE:

Service Manual illustrations are for demonstration purposes only.
Illustrations may not reflect exact appearance of the actual product.
Specifications subject to change without notice.



Zoomability AB

Declare under our sole responsibility that the product:

Type of equipment: ***4-wheel off-road vehicle***

Brand Name / Trade Mark: ***Zoom Uphill***

Is in conformity with the provision of the:

Medical Device Regulation (EU) MDR:2017/745C for medical devices.

Contact Information

General questions: info@zoomability.com

Service requests: service@zoomability.com

Zoomability AB – Headquarters

Brandthovdagatan 24

72135 Västerås

SWEDEN

Table of Contents

1 INTRODUCTION	5
1.1 About this manual	5
1.2 Checklist to follow after receiving the ZOOM from the factory	5
2 Technical specifications	6
3 System description	7
3.1 Introduction	7
3.2 Electrical system	7
3.2.1 Main harness	7
3.2.2 Throttle	7
3.2.3 Cruise control and Speed limit selector	7
3.2.4 Forward/Reverse switch	8
3.2.5 Batteries (2 pcs)	8
3.2.6 Brakes (Left and Right)	8
3.2.7 Swivel chair switch (part of the optional swivel chair)	8
3.2.8 Light kit (optional)	8
3.2.9 Contactor	8
3.3 Motors	8
3.4 Mechanical system	8
3.4.1 Brake system	8
3.4.2 Steering column	8
3.4.3 Forks	8
3.4.4 Chassis	8
3.4.5 Seat	8
3.4.6 Battery holders	8
4 ZOOM maintenance and care	9
5 Troubleshooting guide	11
6 Repairs	14
6.1 Introduction	14
6.2 Electrical system	14
6.2.1 Main harness	14
6.2.2 Throttle	20
6.2.3 Cruise control and Speed limit selector	24
6.2.4 Speed limit selector	24
6.2.5 Forward/Reverse control	25
6.2.6 Batteries and battery chargers	26
6.2.7 Brakes (left and right)	28
6.2.8 Swivel chair microswitch (part of the optional swivel chair)	28
6.2.9 Light kit (optional)	30
6.2.10 Contactor	31
6.3 Motors	33
6.3.1 Motor description	33
6.3.2 Changing controller card	33
6.3.3 Programming instruction for MP5 motors	35
6.4 Mechanical system	38
6.4.1 Introduction to the mechanical system	38
6.4.2 Changing the wheel	45
6.4.3 Repairing a flat tire	45
6.4.4 Changing the bearing in ZOOM MP5 motors	46

6.4.5 Changing the brake disk.....	47
6.4.6 Changing brake pads	48
6.4.7 Changing brake callipers	49
6.4.8 Changing brake handle	49
6.4.9 Changing brake hose.....	50
6.4.10 Bleeding the brake system	50
6.4.11 Adjusting the play in the steering column bearings	53
6.4.12 Exchanging the steering braces and double link	54
6.4.13 Adjusting the steering	55
6.4.14 Changing the driver's seat	55

1 INTRODUCTION

1.1 About this manual

This service manual describes the ZOOM Uphill MP5, its functions, parts and service instructions.

The main subjects are:

- Maintenance
- Service
- Electrical system
- Mechanical system
- Troubleshooting
- Repairs
- Installation of options
- After delivery checklist
- Recommended tools

Zoomability also offers a training program where service technicians can become certified after finishing the course and passing a final test.

1.2 Checklist to follow after receiving the ZOOM from the factory

- Check that the ZOOM is manufactured according to the order and delivery sheet.
- Check that all cables and brake fluid hoses are attached to the ZOOM in a professional way and with zip ties.
- Check that the serial number is correct.
- Start the ZOOM in Forward (F) mode and check that all wheels are driving forward, turn to Reverse (R) mode and check that all-wheel are driving backwards. (With the ZOOM on a box.)
- Check that the cruise control key is working for all four wheels. Push the brakes and check that the cruise function is disabled. (With the ZOOM on a box.)
- Start the ZOOM and brake slightly with the right and left brakes. Check that the motors stop driving. (With the ZOOM on a box.)
- Check that the brake system doesn't leak any fluid. Check that fluid levels in the system are at specified levels.
- Option:** Check that the front and rear lights are working.
- Check and adjust the tire pressure to 22-29 Psi.
- Check that the adjustment of height for the steering/speed lift works properly and smoothly.
- Check that the batteries are correctly assembled and locked-in in the correct way.
- Check that the batteries can be removed and replaced properly.
- Check that the key switch turns on and off the power and that all keys are working.
- Check that there are no marks and scratches on the paint etc.
- Option swivel seat:** Check that the swivel seat locks in properly and that the main power is cut off when the seat is out of its normal driving position.
- Check the parking brake.
- Option Hitch:** Check that the hitch is correctly attached.
- Option Fishing kit:** Check that the fishing kit is correctly attached.
- Option Gun rack:** Check that the Gun rack is correctly attached.
- Option rear mirror(s):** Check that the rear mirror(s) are correctly attached.
- Drive the ZOOM and test the following:
 - Check the cruise control.
 - Check the three-speed modes.
 - Check that the ZOOM is driving forward in the correct way.
 - Check that the ZOOM is driving backwards at a slower speed in the correct way.
 - Check that the brakes are working normally.
 - Check that there are no strange noises when you turn the handlebar left and right.

2 Technical specifications

Wheelchair class:	C
Maximum speed:	12 mph/20 kph In some markets the maximum speed is limited to 9.3 mph/15 km/h alt. 7.5 mph/12 kph. With the optional Speed Selector there are two additional reduced speeds (medium /low).
Acceleration:	0-12 mph/0-20 km/h in less than 2 seconds.
Braking distances:	Forward horizontal at 12 mph/20 kph: 13 ft/4 m Reverse horizontal at 3.7 mph/6 kph: 2 ft/0.7 m Forward downhill at 12 mph/20 kph: 23 ft/7 m Reverse downhill at 6 mph/10 kph: 10 ft/3 m (According to ISO 7176-3)
Maximum curb height (up and down):	4 in./10 cm
Uphill tipping angle:	>25 degrees
Sideways tipping angle:	>20 degrees WARNING! Tipping angles may differ depending on rider body weight and body composition. Use extreme caution when riding on leaning surfaces and over obstacles.
Torque:	4 x 52,5 Nm/210 Nm
Power:	4 x 1000 W/4 kW
Range:	Theoretical maximum is 25 miles/40 km on one charge on smooth surface. Off road range is approximately 15-19 miles/25-30 km. Range will vary depending on rider weight, throttle use and terrain.
Weight (without user):	238 lb/108 kg
User max weight:	300 lb/136 kg
Height:	30 in./75 cm
Length:	53 in./135 cm
Width:	30 in./75 cm
Ground clearance:	7 in./17 cm
Rider adjustments:	Telescopic handlebar, adjustable foot plate and seat positions
Brakes:	Hydraulic disc brakes on all four wheels: DOT4 brake fluid.
Batteries:	2 x detachable LiFePO4 48 V/10 Ah rechargeable batteries
Number of charging cycles per battery:	>800
Battery charge time:	2-4 hours
Tire / tube dimension:	2.50-12
Rec. tire pressure:	22-29 psi/150-200 kPa/1.5-2.0 bar
Options:	Foam seat insert Swivel seat for easier entry/exit Light kit Hitch kit Hunting kit Fishing kit Mobile phone holder Handlebar bag Leg holder Suspension kit Draw bar for wheelchair Leg extension kit Accessory boxes

3 System description

3.1 Introduction

This chapter describes the structure and functionality of the ZOOM Uphill MP5 (hereinafter referred to as “ZOOM”) electrical and mechanical system components, looking at both overall and component levels.

Section 3.2 describes the electrical system, design, function, wiring and components, while section 3.3 provides a similar description of the mechanical parts of the ZOOM. This with the purpose of giving a deep enough understanding of the systems for maintenance, service, troubleshooting and repairs.

3.2 Electrical system

The first section of this chapter gives a brief overview of the electrical system components, while the following section shows the overall schematics together with how the different connectors are wired and end with a list of the connector’s pins and the corresponding signals in the system.

The ZOOM electrical system consists of the following components:

(Graphically shown in the physical block diagram below)

- Main cable harness
- Cruise control and Speed limit control
- Throttle
- Forward/Reverse control
- Batteries and charger
- Brakes (Left and Right)
- Swivel chair switch (optional)
- Light kit (optional)
- Motors

3.2.1 Main harness

The MP5 main harness is the centre of the ZOOM’s electrical system. It connects the two batteries’ power to the motors and conducts the signals from the controls to the motors and lighting.

3.2.2 Throttle

The ZOOM’s throttle has three functions:

- Key switch for powering the ZOOM electrical system ON/OFF.
- Battery indicator showing the charge status of Battery 2 (Rear motors battery).

- Send a throttle signal to the motors to adjust the speed of the ZOOM.

The throttle control unit is available as either a twist motion or a thumb lever unit.

ZOOM is as standard, delivered with a right thumb (or twist) throttle handle installed, but a left thumb or twist throttle handle can be added depending on the user’s need (this will still leave the key switch and battery indicator active on the right throttle handle, see chapter 6.2.2).

3.2.3 Cruise control and Speed limit selector

The cruise control unit is a control function that consists of two switches, the speed limit selector that allows the user to set three maximum speeds for the ZOOM and then a second switch, the cruise control ON/OFF that enables the ZOOM to run at a set speed without using the throttle. Note that the Cruise control only can be activated when the Speed limit selector is in positions High and Medium.

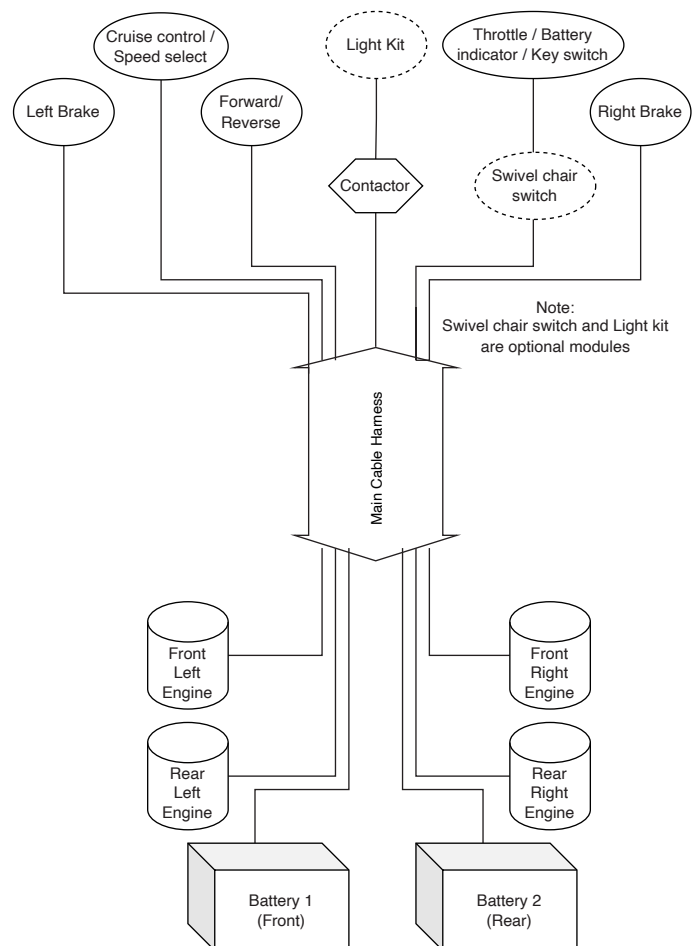


Fig. 3.1 Physical block diagram over electrical system components

3.2.4 Forward/Reverse switch

The Forward/Reverse switch is used to set the direction the motors will move.

3.2.5 Batteries (2 pcs)

Two 48V/10Ah batteries supply the ZOOM motors with power driving and other functions. Battery 1 (connector marked B1) on the left side drives the front motors, while Battery 2 (connector marked B2) on the right side drive the rear motors. The batteries are charged by external 58,4V/3A chargers.

3.2.6 Brakes (Left and Right)

When either brake lever is pressed, the micro switch inside sends a brake signal to the motors, which disconnects the power and sets the motors in free-wheel mode. The left brake handle controls the hydraulic disc brakes on the rear motors, while the right brake handle controls the hydraulic disc brakes on the front motors (Optionally the ZOOM can be delivered with single-handed brake system.)

3.2.7 Swivel chair switch (part of the optional swivel chair)

The swivel chair switch is a micro switch located under the driver seat and connects in series between the throttles key switch and the contactor. With the chair in the forward direction, the swivel chair micro switch is closed, and the ZOOM can be started. (The swivel chair is an optional feature and can be installed at any time.)

3.2.8 Light kit (optional)

The Light kit for the ZOOM is a complete kit to enable the ZOOM to be operated in the dark. It consists of white front light, two red rear lights, an ON/OFF switch, and all wiring needed to install the kit. (The light kit is an optional feature and can be installed at any time.)

3.2.9 Contactor

The contactor functionality is as a relay, which, when the key switch (and optionally, the swivel chair switch) is closed, uses an electromagnetic coil to activate a switch that turns the main power for the motors.

3.3 Motors

There is one motor built into each of the four wheels of the ZOOM, one to drive each wheel. The wheels consist of an electric motor, a control card (circuit board) and a hydraulic disk brake. They are all iden-

tical, except for the left vs right motors' direction of rotation being reversed.

3.4 Mechanical system

This chapter gives a brief overview of the ZOOM's mechanical components in order to explain the overall main mechanical parts of the ZOOM.

The ZOOM mechanical system consists of the following components:

- Brake system
- Steering column
- Forks (holding the motors to the chassis)
- Chassis, with central axle and divider
- Seat (2 types)
- Battery holders

3.4.1 Brake system

Consist of two handlebar-mounted brake levers, with a brake cylinder connected to the disc brake callipers' mounted on the motors. The left brake lever controls the two rear brakes, while the right brake lever controls the two front brakes.

3.4.2 Steering column

Consist of inner- and outer steering columns. Connects the handlebar to the steering braces to control the front wheels.

3.4.3 Forks

Each motor is mounted in a fork, which is connected to bearings to the chassis through the central axle and divider.

3.4.4 Chassis

The chassis is the central part of the ZOOM, a platform where all other components, electrical and mechanical, are mounted.

3.4.5 Seat

The ZOOM can be delivered with two kinds of seats, a fixed or a swivel seat. The swivel seat can be turned 90 degrees to the left or the right for easy entry. Both versions have the same cart seat.

3.4.6 Battery holders

The batteries are mounted behind the seat on battery plates attached to the battery holders.

4 ZOOM maintenance and care

Tools

- 8 mm open-end spanner
- 10 mm open-end spanner
- 11 mm open-end spanner
- 12 mm open-end spanner
- 2 x 13 mm open-end spanner
- 13 mm socket wrench
- 22 mm open-end spanner
- 22 mm socket wrench
- Torque wrench
- Hammer
- Rubber mallet
- Allen key 2.5 mm
- Allen key 3 mm
- Allen key 5 mm
- Allen key 6 mm
- Flat-noosed pliers
- Wire cutter
- Phillips screwdriver
- Tire pressure gauge
- Tire air pump
- Soldering iron
- Digital voltmeter
- Heat gun
- Clear hose inner diameter ca 5 mm (for bleeding the brakes)
- Jar to collect the brake fluid
- (alternatively) Brake bleeding tool
- PC with Windows operating system (for programming)
- ZOOM controller card programming cable (for programming)
- ZOOM battery (for programming)

Liquids

- LocTite 243 (medium)
- LocTite 270 (strong)
- Casco AquaTät 3873 or LocTite 5926
- Mild soap for washing
- DOT4 Brake fluid
- Brake cleaning spray
- WD40 or CRC 5-56

The ZOOM is characterized by its robust and relatively simple design. All parts are replaceable. The ZOOM has no parts that require lubrication. To keep the ZOOM in good condition, please follow the below recommendations.

Riding style

Enjoy your ZOOM to the fullest but remember it is not an indestructible machine. Overly rough riding, such as hitting large rocks and tree stumps, or some other extreme handling, may cause damage and, as a result, require significant repairs and maintenance.

Cleaning

Clean gently with a moist brush or sponge. Keep running water away from the wheel centres and batteries. Do not use a pressure washer.

Storage

Store the ZOOM indoors at room temperature when not in use. Keep clean and dry.

Batteries

The batteries are designed to maintain performance for >800 charges. Only use replacement batteries supplied by Zoomability or by your local ZOOM reseller.

Brakes

Replace brake pads if they are worn down or damaged. Damaged brake discs must be replaced before riding. If the brake system has leaked brake fluid, locate and repair the leak. Refill the system with DOT4 brake fluid and bleed the brake system until all air bubbles are removed. Always ask your local ZOOM reseller for advice and/or to perform service and maintenance. Note: Always rinse off any brake fluid that is splashed on the ZOOM parts or frame with water.

Tires (repair)

The tires mounted on the ZOOM are designed to provide good all-around performance. Worn-down tires should be replaced for optimal grip. The tires have inner tubes that must be replaced or repaired in the event of a puncture.

Recommended tire pressure: 22-29 psi/150-200 kPa/1.5-2.0 bar.

1. Switch off the main power with the key switch and disconnect the batteries.
2. The entire wheel must be completely removed to repair a flat tire. Only perform a repair on your own if you are experienced in similar tasks; oth-

erwise, seek help from a motorcycle or bicycle repair shop.

3. Ensure the ZOOM key switch is turned off.
4. The wheel is removed by first cutting off the plastic locking straps holding the cables and mudguards. Disconnect the cables by pulling apart the electric connectors.
5. Loosen the lug nuts on each side of the wheel using a suitable socket wrench. Remove the wheel. Never engage the disc brakes when the wheel is off, as the space needed for the brake disc is needed when mounting the wheel back in position.
6. Empty any remaining air in the tire. Pry off the tire from the air valve side using motorcycle-size tire spoons.

Note: If necessary, it is recommended to use a tire slip paste to make the process easier.

7. Pull out the inner tube and repair the leak using an inner tube patch kit or replace it with a new tube. If you replace the tube with a new one, you must remove the existing washer and nut from the new tube's valve.
8. Install the repaired/new inner tube inside the tire and pry back the tire on the rim. Be careful not to damage the inner tube in the process. It is recommended to use a tire slip paste to make the process easier and reduce the risk of damaging the new inner tube.
9. Put the wheel back in position on the fork and ensure the brake disc is in between the brake pads. Tighten the wheel nuts (66 lb-ft/90 Nm) while ensuring a straight wheel alignment.
10. Reconnect the electrical cables and carefully strap in position the cables and mudguards with new locking straps. Make sure the motor cable cannot accidentally touch the nuts on the disc brake.

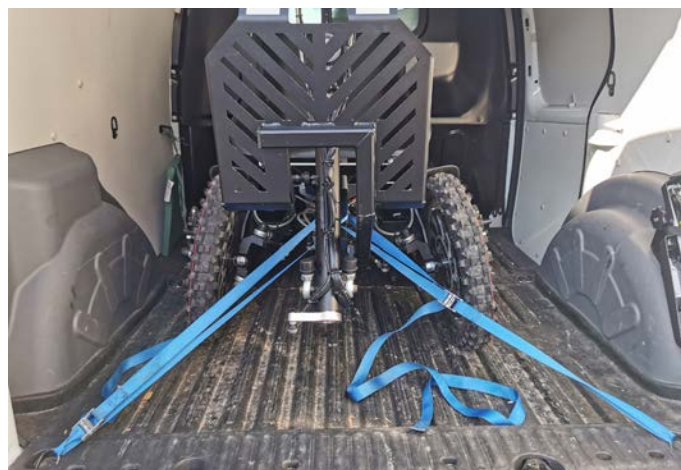
Spare parts and support

Contact Zoomability/reseller/distributor to order spare parts, batteries, or advice on the use of the product.

Transporting

Transport the ZOOM using suitable vehicles and trailers. Always ensure the ZOOM is firmly secured with proper tie-downs or ratchet straps. Use a tarp or similar cover to protect the ZOOM from rain and dust transporting on an open trailer or truck.

Secure the rear part of the ZOOM for transport
Pull the straps through the labelled tie-down positions at the rear forks and tighten them, as shown below.



Secure the front part of the ZOOM for transport
Pull the straps through the labelled tie-down positions at the chassis below the front of the seat, and tighten it as shown below.



WARNING! Do not fasten the straps by the steering column!

Turn off the key switch on your ZOOM before loading and attach the parking brake after the ZOOM is securely in place.

Every vehicle tie-down system is different, and it is important that you follow the instructions for your vehicle system.

WARNING! Do not hold on to the brake discs when lifting the ZOOM. You can cut your fingers if the wheels rotate.

Note: Hold on to the wheel forks or wheel nuts when lifting the ZOOM. Use gloves.

5 Troubleshooting guide

The following troubleshooting guide describes several faults and events that can occur when you use the ZOOM, together with suggested remedies.

Note that the guide cannot describe all the problems and events that may occur, and you should always contact your service provider or ZOOM technical support if you need additional assistance.

Event	Fault indicator	Possible cause	Remedy	
ZOOM does not start.	ZOOM does not start.	The battery(s) are discharged.	Charge the batteries.	
		The cable(s) to the batterie(s) has come loose.	Check cable connectors.	
		The swivel chair is not in the driving position.	Make sure the swivel chair is in the driving position facing forward.	
		The throttle and/or Cruise control/Speed selector connector on the steering column has disconnected.	Check and, if necessary, re-connect the two connectors.	
		The contactor is faulty.	Replace the contactor.	
		The Key switch in the throttle is faulty.	Replace the throttle.	
		The swivel chair micro switch is broken or need adjustment.	Replace or adjust the swivel chair micro switch.	
	The contactor clicks when you turn on the ignition key, and the battery indicator LED does not light up.	The cable to the throttle has come loose.	Check throttle cable connector.	
	The Battery indicator diodes do not light up when the key switch is turned ON, but the installed light kit is functioning.	The Battery indicator diodes do not light up when the key switch is turned ON, but the installed light kit is functioning.	Damaged contactor.	Check the contactors function.
			Damaged throttle or connection in, or to, the throttle's Binder connector to the main harness.	Check the throttles function. Check the throttle's Binder connector.
Damaged connection in, or to, the main harness Binder connector to the throttle.			Check the main harness Binder connector.	
The ZOOM cannot be charged.	The ZOOM cannot be charged.	The cable or connector from the charger to the batteries is broken.	Check the connector and the cable.	
		Batteries are aged or damaged.	Exchange battery.	
		Charger not working.	Replace the charger. Wrong voltage supply.	
The ZOOM cannot be driven even if the contactor 'clicks' and the Battery indicator lights up.	The ZOOM cannot be driven even if the contactor 'clicks' and the Battery indicator lights up.	The parking brake is activated.	Release the parking brake.	
		The ZOOM is locked.	Unlock the ZOOM.	
		The throttle is faulty.	Check the throttle's function.	
		The Binder connector in throttle is faulty.	Check the throttle's Binder connector.	
		The switch in the Speed selector/Cruise control is faulty.	Check the Speed selector/Cruise control's function.	
		The Binder connector in the Speed selector/Cruise control is faulty.	Check the speed selector/Cruise control's Binder connector.	

Event	Fault indicator	Possible cause	Remedy
ZOOM only moves in forward OR reverse direction.	ZOOM only moves in forward OR reverse direction.	Faulty F/R switch.	Check the F/R switch's function.
One of the wheels is rotating in the wrong direction	One of the wheels is rotating in the wrong direction	Faulty controller card is not detecting the F/R signal.	Check or replace the controller card.
The ZOOM switches itself off after a certain period.	The ZOOM switches itself off after a certain period.	The contactor is overheated.	Let the ZOOM cool down and try again.
		Batteries are close to depleted.	Charge the batteries.
		Battery life span expired.	Replace the batteries.
		One battery cell is damaged.	Replace the battery.
The ZOOM feels unstable while driving.	The ZOOM feels unstable while driving.	The tire pressure is too low.	Check and adjust the tire pressure.
		Wheels are loose.	Tighten the wheel nuts.
		Worn steering brace.	Exchange the steering brace.
		Frame bent after a, for example, a collision.	Straighten the frame.
		One brake pad stuck to the brake disc.	Clean or replace the caliper.
		Faulty adjustment on the front wheels.	Adjust the front wheel alignment.
		The motor is damaged.	Replace the motor, or controller card.
			Check that the controller cards programming is correct.
		Play in the steering.	Check for play in the steering column's bearings. Tighten if necessary.
Play in the lower steering link(s).			
The handbrakes feel soft.	The handbrakes feel soft.	Brake fluid level too low.	Add brake fluid.
		Air in the brake system.	Bleed the brake system.
Squeaking brakes.	Squeaking brakes.	Brake pads worn out.	Replace the brake pads.
		Dirt in the brakes.	Clean the brakes.
The ZOOM moves slowly.	The ZOOM moves slowly.	Speed limit selector broken.	Replace the speed limit selector.
		Brakes activated.	Release the brakes.
ZOOM moving sideways while braking.	ZOOM moving sideways while braking.	One motor's brake pads are worn.	Replace the brake pads.
		Low tire pressure at one side.	Inflate the tire to recommended pressure.
		There is air in one side's brake system.	Bleed the brake system.
Swivel seat unstable.	Swivel seat unstable.	Bushing worn or loose.	Replace the bushing.
		Fastening bolts loose.	Tighten the bolts.
The Swivel seat cannot move.	The Swivel seat cannot move.	The lock mechanism is broken.	Replace the lock mechanism.
		Bushing worn or stuck.	Replace the bushing.
Flat tire.	Flat tire.	Valve in the inner tube is dirty.	Replace the valve.
		Punctured tire.	Repair or replace the inner tube.

Event	Fault indicator	Possible cause	Remedy
It rattles and vibrates when driving at certain speeds.	It rattles and vibrates when driving at certain speeds.	Loose mudguard.	Replace or tighten the cable ties.
		Batteries are loose.	Tighten the batteries.
		The swivel seat locking mechanism is loose.	Adjust or replace the swivel seat locking mechanism.
The ZOOM suddenly loses power, and the battery indicator turns off, only to turn on again when the throttle is released.	The ZOOM suddenly loses power, and the battery indicator turns off, only to turn on again when the throttle is released.	Low charge in the batteries, possibly in combination with that the ZOOM has to work hard, for example in an uphill or on a soft surface.	Charge the batteries.
		The battery's BMS might be faulty	Change the battery.
		One cell in the battery is faulty so that the BMS turns off the battery.	Change the battery.
ZOOM feels sluggish.	Slow when accelerating but can still reach top speed. Slowing down fast when there is a slight uphill.	Batteries are damaged.	Change batteries.
		Wrong controller software settings.	Check the controller settings.
	Lift the ZOOM and check if all four motors move as they should without any jerky motions.	Oxidized main switch (MP2 MOTORS) or contactor (MP5).	Replace the main switch or contactor.
		Oxidised motors connectors.	Disconnect the batteries and spray contact cleaner or CRC 5-56 (WD-40) in the connectors and clean with a cotton swab. Be careful not to bend the small pins while cleaning. Reconnect batteries and try again.
		Damaged motor connectors or damaged wires.	Inspect the motors connectors and cables for damage, and that the round connectors on the forks are secure.

6 Repairs

6.1 Introduction

This chapter of the service manual describes how to service and repair the ZOOM MP5 (hereinafter referred to as “ZOOM”), looking at both total and component levels. Each chapter begins with a deeper description of the components’ function and builds and thereafter continues to, when applicable, describe steps that should be taken to test the functionality of the module. Last is instructions on how to replace the component.

Section 6.2 handles the electrical system, section 6.3 ZOOM’s motors and their programming while section 6.4 cover the mechanical parts of the ZOOM.

6.2 Electrical system

This chapter shows how the ZOOM electrical modules are designed, tested, repaired, or replaced in case there are faults with the ZOOM Uphill’s working. Like earlier, they are shown module by module.

WARNING! Before doing any of the tests or operations on the electrical system, disconnect both batteries unless otherwise specified!

6.2.1 Main harness

The ZOOM main harness is the main line of the ZOOM. It connects the batteries to the motors and conducts the signals from the controls to the motors and lighting. See Fig. 6.2.1.

Apart from wiring and connectors, the harness is equipped with a 40V/1A diode on each of the +5Vcc wires from the motors (connector E1, E3, E5, E7, pin G) that ensures continued +5V supply to the throttles Hall effect sensor in the case of failure of one, or more motors control cards +5V fail.

There is also a 400V/3A flyback diode over the contactor’s coil poles intended to reduce current spikes feedback into the system when the key switch turns off.

Note: In earlier models of ZOOM MP5, the flyback diode was installed separately and not as part of the main harness assembly. When working with these models, be careful and mark the flyback diodes installation direction to make sure it is reinstalled correctly when service is done.

Schematic Main harness v1.0)

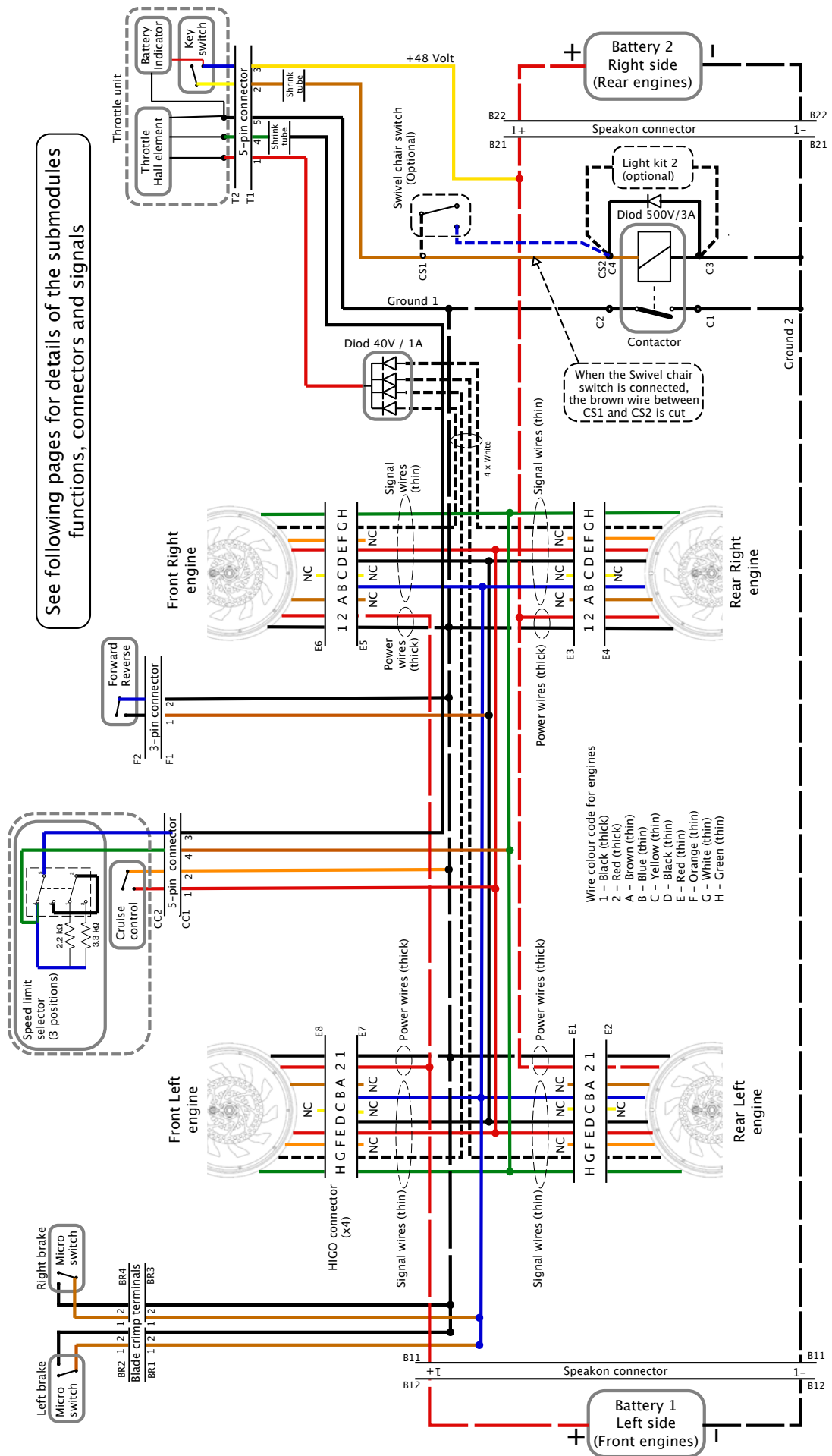
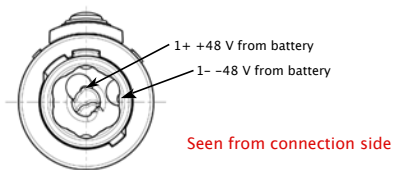


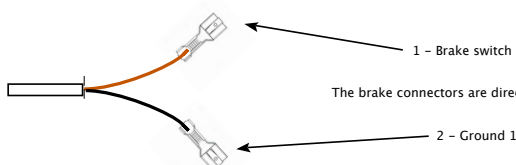
Figure 6.2.1 Electrical system/main harness v1.0 schematics.

Contacts on cable harness

B11, B21 (Battery connector female)

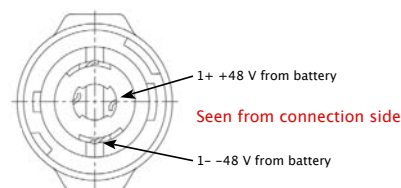


BR1, BR3 (Brake connector female)

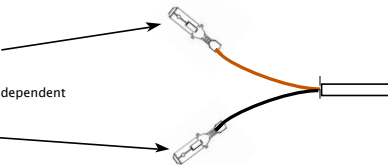


Contacts on external unit

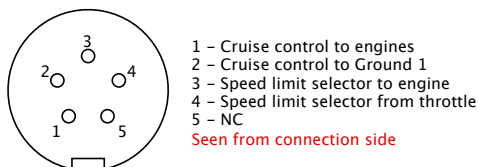
B12, B22 (Battery connector male)



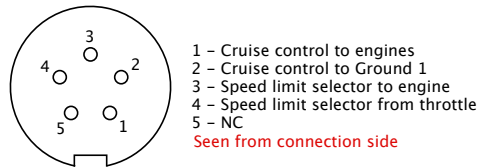
BR2, BR4 (Brake connector male)



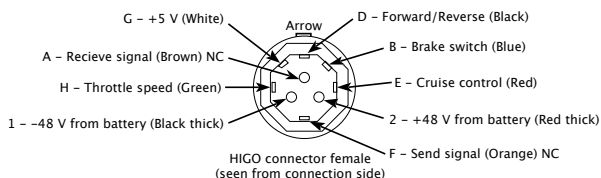
CC1 (Cruise control connector female)



CC2 (Cruise control connector male)

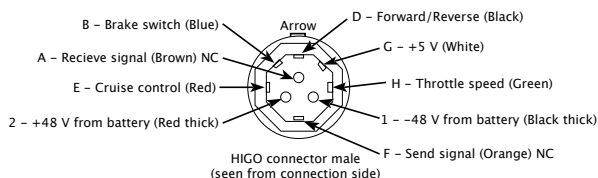


E1 (Engine connector female)



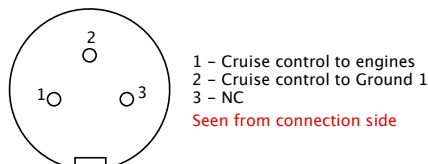
Note that while the Arrow placement can differ between contacts, the order of the pin configurations is always the same and is identified by A and D next to each other, while 2 and 1 don't have any pins next to them.

E2 (Engine connector male)

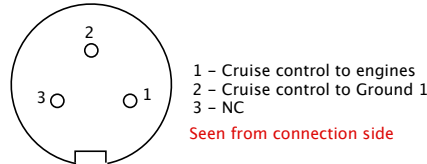


Note that while the Arrow placement can differ between contacts, the order of the pin configurations is always the same and is identified by A and D next to each other, while 2 and 1 don't have any pins next to them.

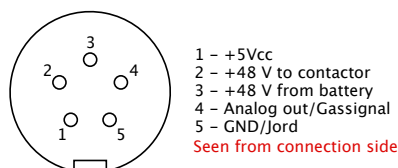
F1 (Forward/Reverse connector female)



F2 (Forward/Reverse connector male)



T1 (Throttle connector female)



T2 (Throttle connector male)

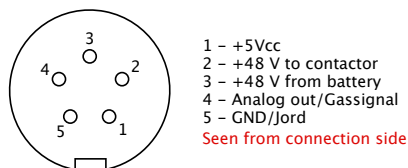


Figure 6.2.2 Connector pin specifications.

Signals and functions

Contact ID from	Pin	Contact ID to	Pin	Signal	Function
B11	1+	E5, E7	2	+48 V to front motors	Supply front motors with 48V power when activated by the key switch and optional swivel chair switch.
B11	1-	Ground 2	-	-48 V from batteries	Supply front motors with 48V power when activated by a key switch and optional swivel chair switch.
B12	1+	Battery 1 +	-	+48 V from Battery 1	Supply front motors with 48V power when activated by the key switch and optional swivel chair switch.
B12	1-	Battery 1 -	-	-48 V from Battery 1 or ground	Supply front motors with 48V power when activated by the key switch and optional swivel chair switch.
B21	1+	E1, E3	2	+48 V to rear motors	Supply rear motors with 48V power when activated by the key switch and optional swivel chair switch, also connecting +48V to key switch and battery charging indicator for activation of contactor.
B21	1-	Ground 2	-	-48 V from batteries	Supply rear motors with 48V power when activated by the key switch and optional swivel chair switch, also connecting +48V to key switch and battery charging indicator for activation of contactor.
B22	1+	Battery 2 +	-	+48 V from Battery 2	Supply rear motors with 48V power when activated by the key switch and optional swivel chair switch, also connecting +48V to key switch and battery charging indicator for activation of contactor.
B22	1-	Battery 2 -	-	-48 V from Battery 2 or ground	Supply rear motors with 48V power when activated by the key switch and optional swivel chair switch, also connecting +48V to key switch and battery charging indicator for activation of contactor.
BR1	1	E1, E3, E5, E7	B	Left Brake switch motor	Stops power to the motor when the brake lever is pressed, and the switch is closed.
BR1	2	Ground 1	-	Left Brake switch ground	Stops power to the motor when the brake lever is pressed, and the switch is closed.
BR2	1	Left brake microswitch	-	Left brake microswitch	Stops power to the motor when the brake lever is pressed, and the switch is closed.
BR2	2	Left brake microswitch	-	Left brake microswitch	Stops power to the motor when the brake lever is pressed, and the switch is closed.
BR3	1	E1, E3, E5, E7	B	Right Brake switch motor	Stops power to the motor when the brake lever is pressed, and the switch is closed.
BR3	2	Ground 1	-	Right Brake switch ground	Stops power to the motor when the brake lever is pressed, and the switch is closed.
BR4	1	Right brake microswitch	-	Right brake microswitch	Stops power to the motor when the brake lever is pressed, and the switch is closed.
BR4	2	Right brake microswitch	-	Right brake microswitch	Stops power to the motor when the brake lever is pressed, and the switch is closed.
C1	-	Ground 2	-	Contactor switch Ground	Grounding the signal through the contactor switch when closed.
C2	-	Ground 1	-	Contactor switch power on	Grounding the signal through the contactor switch when closed.
C3	-	Ground 2	-	Contactor relay coil Ground	Grounding the contactor relay coil.
C4	-	T1	2	+48V to contactor	Receiving a signal from throttle key switch for power on and from swivel chair switch if connected.
CC1	1	E1, E3, E5, E7	E	Cruise control	Setting cruise control on/off when open/closed.
CC1	2	Ground 1	-	Cruise control to Ground 1	Setting cruise control on/off when open/closed.
CC1	3	T1	4	Speed limit selector to Motors	Setting value for speed limit.

Contact ID from	Pin	Contact ID to	Pin	Signal	Function
CC1	4	E1, E3, E5, E7	H	Throttle speed	Setting value for speed limit.
CC1	5	NC			
CC2	1	Cruise control switch	-	Cruise control switch	Sending cruise control signal switch to motors.
CC2	2	Cruise control switch	-	Cruise control switch	Sending cruise control signal switch to motors.
CC2	3	Speed limit selector	5	Speed limit selector from the throttle	Connecting the Speed limit selector to throttle to control maximum speed.
CC2	4	Speed limit selector	4	Speed Limit selector to Motors	Connecting the Speed limit selector to throttle to control maximum speed.
CC2	5	NC			
CS1	-	T1	2	Chair switch	Connecting the chair switch in series with the key switch circuit. (optional)
CS2	-	C4	-	Chair switch	Connecting the chair switch in series with the key switch circuit. (optional)
E1, E3, E5, E7	1	Ground 1	-	-48 V from battery	Connecting motors to ground.
E1, E3	2	B21	1+	+48 V from battery 2	Connecting rear Motors to battery 2 +.
E5, E7	2	B11	1+	+48 V from battery 1	Connecting front Motors to battery 1 +.
E1, E3, E5, E7	A	NC			
E1, E3, E5, E7	B	BR1, BR3	1	Brake switch	Motors receive brake signal from brake levers.
E1, E3, E5, E7	C	NC		NC	
E1, E3, E5, E7	D	F1	1	Forward/Reverse	Reversing motors when the switch in Forward/reverse control is in closed mode.
E1, E3, E5, E7	E	CC1	1	Cruise control	Receiving instruction for motors cruise control ON when the switch in Cruise control is in closed mode.
E1, E3, E5, E7	F	NC	-	Send Signal	
E1, E3, E5, E7	G	T1	1	+5V	Supplying throttles Hall effect sensor with +5V (through diode pack) from motor
E1, E3, E5, E7	H	CC1	4	Throttle speed	Motor receiving throttle speed voltage from throttle T1(4) after passing through the speed limit selector CC1(4)
E2, E4, E6, E8	1	-48 V from battery on the motor	-	-48 V from battery 2+	Connecting motors to ground.
E2, E4	2	+48 V from battery on the motor	-	+48 V from battery 1+	Connecting rear Motors to battery 2 +. (positive)
E6, E8	2	+48 V from battery on the motor	-	+48 V from battery	Connecting front Motors to battery 1 +. (positive)
E2, E4, E6, E8	A	Receive signal on the motor	-	Receive signal	(Not used in harness.)
E2, E4, E6, E8	B	Brake switch on the motor	-	Brake switch	Motors receive brake signal from brake levers.
E2, E4, E6, E8	C	NC			(Not in use.)

Contact ID from	Pin	Contact ID to	Pin	Signal	Function
E2, E4, E6, E8	D	Forward/Reverse on motor	-	Forward/Reverse	Reversing motors when the switch in Forward/reverse control is closed.
E2, E4, E6, E8	E	Cruise control on motor	-	Cruise control	Receiving instruction for motor cruise control ON when the switch in Cruise control is closed.
E2, E4, E6, E8	F	Send signal on the motor	-	Send signal	(Not used in harness.)
E2, E4, E6, E8	G	+5V on motor	-	+5V	Supplying throttles Hall effect sensor with +5V (through diode pack) from motor.
E2, E4, E6, E8	H	Throttle speed on the motor	-	Throttle speed	Motor receiving throttle speed voltage from throttle T1(4) after passing through the speed limit selector CC1(4).
F1	1	E1, E3, E5, E7	D	Forward/Reverse	Connecting signal from motors Forward/reverse port to Forward/Reverse control.
F1	2	Ground 1	-	Forward/Reverse	Grounding Forward/Reverse signal from motors when the switch is closed.
F2	1	Forward/Reverse control switch	-	Forward/Reverse	Connecting signal from motors Forward/reverse port to Forward/Reverse control.
F2	2	Forward/Reverse control switch	-	Forward/Reverse	Grounding Forward/Reverse signal from motors when the switch is closed.
T1	1	E1, E3, E5, E7	G	+5 Vcc	Supplying throttles Hall effect sensor with +5V (through diode pack) from motor.
T1	2	C4	-	+48 V to contactor	Output +48V to close contactors coil when the key switch is closed. (The signal passes through chair switch if installed.)
T1	3	+48 V from battery 2	-	+48 V from battery 2	Input feed +48V from the battery to throttles key switch and battery indicator.
T1	4	CC1	3	Analog out/gassignal	Analog throttle signal from Hall effect sensor to set motor speed.
T1	5	Ground 1	-	GND/Jord	Grounding Hall effect sensor and throttles battery indicator.
T2	1	Vcc on Hall effect sensor		+5 Vcc	Supplying throttles Hall effect sensor with +5V (through diode pack) from motor.
T2	2	Key switch out on the throttle		+48 V to contactor	Output +48V to close contactors coil when the key switch is closed. (The signal passes through swivel chair switch if installed.)
T2	3	+48V in on throttles key switch and Battery indicator		+48 V from battery 2	Input feed +48V from the battery to throttles key switch and battery indicator.
T2	4	Hall effect sensor output		Analog out/gassignal	Analog throttle signal from Hall effect sensor to set motor speed.
T2	5	Throttles ground (Hall effect sensor and battery indicator)		GND/Jord	Grounding Hall effect sensor and throttle battery indicator.

Table 6.2.1 Signal names and connectors.

Function test

In the case of components not working, check with a diode tester or resistance meter if there are any broken connections in the main harness for the function in question. Take care to remember that the diodes and other components in the harness might be direction dependant.

Repairs / Replacement

To replace the cable harness:

1. Turn off the key switch and remove the batteries
2. Remove the driver's seat according to instructions in section 6.4.14 and locate the main harness and connectors and note them down or mark the cables. (it might be necessary to mark the connectors if the labels have been made illegible by wear and dirt.)
3. Cut off the cable ties holding the harness.
4. Remove the cover over the contactor.
5. Remove the contactor by loosening the two screws holding it to the chassis.
 - a. Note that if an optional Light Kit is installed, the contactor will have two additional wires connected
 - b. If a swivel chair switch is installed, follow the wire from the switch towards the cable harness and cut it off where it is joined to the harness.
6. Remove the cable harness and put the new one in place
 - a. If a swivel chair switch is installed, cut off the cable shoe (contactor connector C3 (M4 screw)) on the new harness as close to the cable shoe as possible and re-join the swivel chair wire to the new harness wire.
7. Install the new contactor and reconnect it to the harness
 - a. Remember to also reconnect the Light Kit if installed.
8. Reconnect all contacts to the harness.
 - a. Remember to be very careful to make sure that the connectors to the motors are in the right position.
 - b. Be careful not to mix up the connector to the Throttle with the Cruise control.
 - c. Then reconnect all the remaining contacts.
 - d. Remember to put on shrink tube over the connectors.
9. Secure the new harness with cable ties as the old harness was.

10. Replace the seat and turn into the driving position
11. Reinstall the batteries, and test that everything is working:
 - a. Turn on the key switch and control that the battery indicator lights up
 - b. If installed, check that the light switch is turning on/off the light
 - c. Properly seated, slowly increase the throttle to make sure it is working correctly.
 - d. At a low speed, engage first the left brake until the ZOOM comes to a complete stop. Repeat with the right brake.
 - e. Step by step by step set the speed selector switch in HIGH, MID, resp. LOW positions and control that it is working properly.
 - f. Set the Speed selector switch back at HIGH and while driving forward, engage the Cruise control to ensure the ZOOM now is driving at a fixed speed until the throttle again is engaged.

6.2.2 Throttle

Described in more detail later in this section, the ZOOM's throttle has three functions:

- Key switch for powering the ZOOM's electrical system ON/OFF
- Battery indicator showing the charge status of Battery 2 (rear)
- Send a throttle signal to the motors to adjust the speed of the ZOOM.

The right throttle has three functions, throttle, key switch, and battery indicator. The left throttle never has any other function than the throttle function. The ZOOM's throttle is built so that even if a left throttle is installed, the right throttle is always needed for full functionality.

Throttle variants

There are four versions of the throttle adapted for the user's individual needs (See pictures in table 6.2.2):

- Left twist throttle, without key switch and battery indicator
- Left thumb throttle, without key switch and battery indicator
- Right twist throttle, with a key switch and battery indicator
- Right thumb throttle, with a key switch and battery indicator

Left		Right	
Twist throttle	Thumb throttle	Twist throttle	Thumb throttle
			

Table 6.2.3 The 4 throttle variants for ZOOM MP5.

Right throttle description

The electrical schematic for the right throttle variants is shown in figure 6.2.3 and its functions are described in the following sections.

(Note: The connecting wire and LED colours indicated in the schematic might vary between batches)

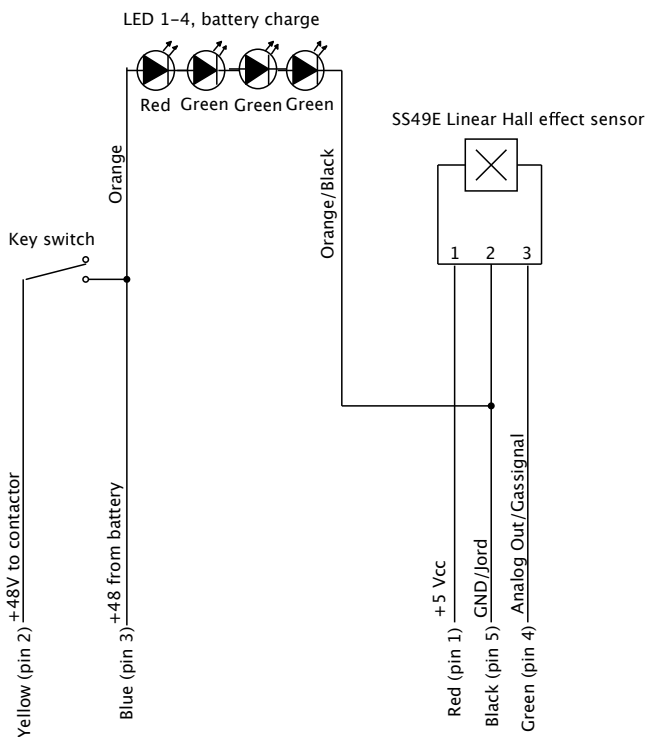


Figure 6.2.3 Schematic, right throttle.

Throttle and Hall effect sensor

All throttle variants are controlled by a linear Hall effect sensor type SS49E which is powered by +5 Vcc in and its output depending on the position of the throttle.)

The throttle control unit is available as either a twist motion or a thumb lever unit. According to the driver's needs, this throttle unit can also be comple-

mented with a throttle on the left side so that only the battery indicator and key switch are active on the right.

The Hall effect sensor consists of three pins and is powered by +5V from the motors (pin 1) (see table 6.2.1 and figure 6.2.4), pin 3 is a ground reference pin and pin 2 is a linear analogue output.

This analogue output is dependent on two magnets (inside the movable section of the throttle) relative distance from each side of the Hall effect sensor and gives a linear control output current between 0.8 to 4,2 V (ca $V_{cc} - 0,8V$) on "Analog Out"/"Gassignal".

Note: The sensitivity of the engine is set so that it will only react to voltages between 1,25 till 3,8 V.

Key Switch

The key switch is an ordinary key-operated ON/OFF switch (marked with "1"/"0"= on the throttle) located on the right throttle handle. It is connected between the battery's + pole and the contactor's coil and will, when closed, activate the contactor coil. This switches on the main power to the motors and the ZOOM's electrical system as well as turns on the battery charge indicator LED. With the swivel chair option installed, the key switch is connected in series to the Swivel chair switch so that the chair must be in the driving position (facing front), or the contactor will not switch on.



Figure 6.2.4 Throttle key switch markings 0=OFF / 1=ON.

Battery indicator

The battery indicator is located above the key switch on the right throttle handle. It consists of 4 LED's, to indicate the charge of the rear motor's battery (Battery 2). When the key switch is in the ON position, the LED's will light or shut off at the following voltages:

Note: Table 6.2.3 refer to throttles with only red and green indicator LED's, while Table 6.2.4 refer to throttles with red, yellow and green LED's.

Battery voltage	LED 1 red	LED 2 green	LED 3 green	LED 4 green
< 37				
37 - 44				
44 - 46				
46 =<				

Table 6.2.3 Battery indication LED voltage range, Red/Green version.

Battery voltage	LED 1 red	LED 2 yellow	LED 3 green	LED 4 green
< 46				
46 - 48.9				
49 - 52				
52 =<				

Table 6.2.4 Battery indication LED voltage range, Red/Green/Yellow version.

Left throttle, description

The left throttle works in a similar way as the right throttle but consists of only a Hall effect sensor, and no key switch or battery indicator is included in this unit. The schematic is shown in figure 6.2.5:

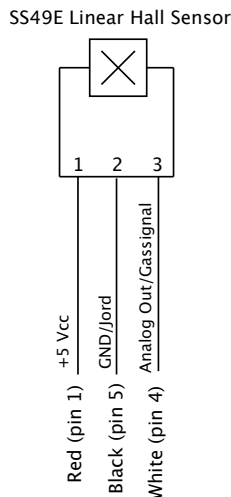


Figure 6.2.5 Schematic, left throttle / Hall effect sensor.

The left throttle is connected to the main cable harness by a special 5-pin connector assembly to which the right throttle also is connected at the opposite end. This allows the right throttle key switch and battery indicator signals to pass through while the throttle signal is supplied from the left throttle. The image below shows the construction of the left throttle assembly, while the next schematic shows a simplified view of the wiring of the left and right throttles when connected to the connector assembly.

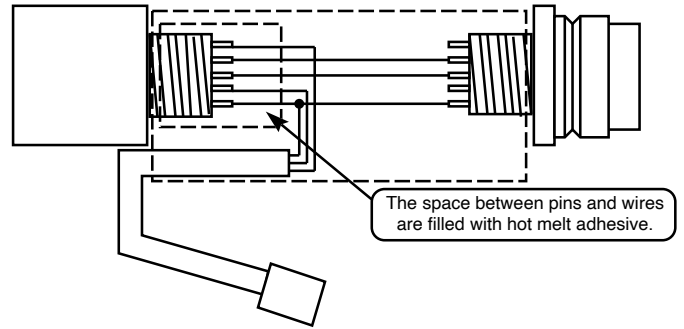


Figure 6.2.6 Connector assembly, left throttle.

It is important to note that the left throttle cannot be used stand-alone and that a right throttle must be installed in order to install a left throttle.

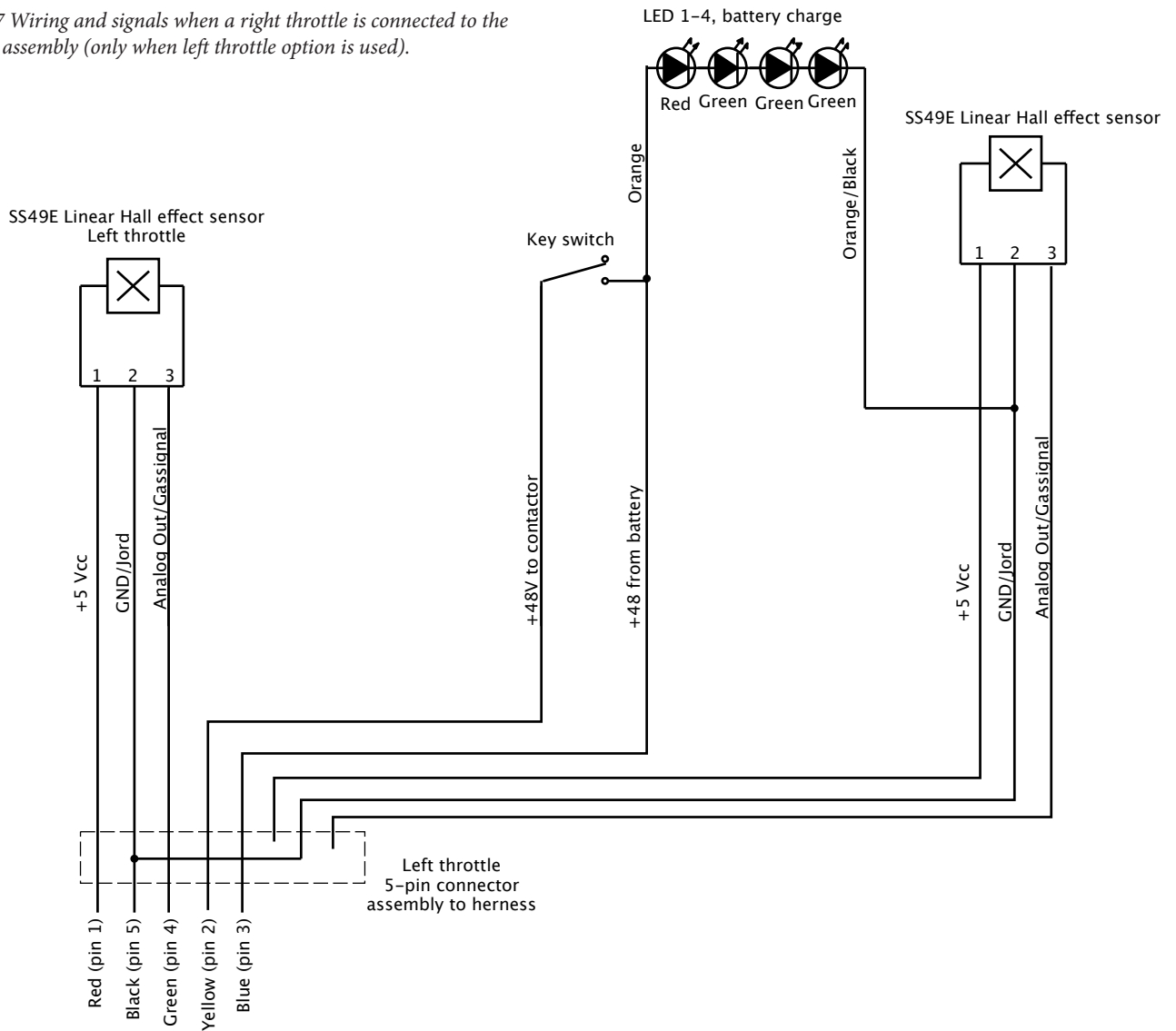
Function test

(For connector pin numbering and signals, see figure 6.2.3)

Controlling left and right throttle output with DVM and power supply

1. Connect a fixed +5 V power supply to Vcc (pin 1), with ground/minus to GND (pin 5). (Pin numbers refer to the Binder connector seen from the connection side)
 - Note:** Wrong polarity on pins 1 and 5 might result in a destroyed Hall effect sensor!
2. Connect the DVM between analogue out/Gassignal (pin 4) and GND (pin 5).
 - a. When the throttle is in the neutral position, the output should be ca 0,8 V.
 - b. When the throttle is in the maximum position, the output should be ca 4,2 V.
3. If any of the measurements in step 2a and 2b does not correspond to the given values, the non-functioning throttle module (left or right) is faulty and should be replaced.

Figure 6.2.7 Wiring and signals when a right throttle is connected to the left throttle assembly (only when left throttle option is used).



Controlling key switch function with DVM

1. Connect a Digital Voltmeter (ohmmeter or a diode tester) to the right throttle's male 5-pin connector pin 2 and pin 3. (pin numbers refer to Binder connector seen from connection side) (for connector pin numbering and signals, see figure 6.2.3)
2. While turning the key switch ON and OFF repeatedly, make sure that the connection is opened/closed accordingly.
 - a. If a left throttle is also installed on the ZOOM, repeat steps 1 and 2 on the male 5-pol connector on the left throttle's connector assembly.
3. If any of the tests fail, the non-functioning throttle module (left and/or right) is faulty and should be replaced.
- 5 (for connectors pin assignments, see connector drawing in figure 6.2.2)
2. With the Power supply turned on:
 - a. With a fixed voltage supply higher than 48V, all the LEDs should light up simultaneously.
 - b. With a varied power supply, slowly turn up the voltage until it reaches max 58V and observe the LED's lighting up according to tables 6.2.3 and 6.2.4.
3. If a left throttle is also installed on the ZOOM, repeat steps 1 and 2 on the male 5-pol connector on the left throttle's connector assembly.
4. If any of the tests result in a failure, the non-functioning throttle module (left and/or right) is faulty and should be replaced.

Controlling the battery indicator's function with DVM and power supply

1. Connect a fixed or adjustable power supply (max voltage 58V) to the ZOOM right throttle's 5 pin connector with +V to pin 3 and -V/GND to pin

Repairs / Replacement

If problems are found with the left and/or right throttle, it is recommended for safety reasons that they are not repaired but instead replaced with a new unit.

1. Turn off the ZOOM by turning the ignition key to the OFF position.
2. Disconnect both batteries.
3. Follow the cable from the throttle handle until you reach the connector. Disconnect the connector (you pull the connector apart without twisting). There is a shrink tubing over the connector that you carefully remove by cutting it off. You will probably also need to cut off some cable ties. Be careful not to damage the cables.
 - a. Note that if a left throttle is replaced, there will be a connector assembly (see description above) where both the main harness as well as the right throttle are plugged into the left throttles connectors.
4. When replacing a thumb throttle, the rubber handle first needs to be removed.
5. Loosen the small Allen screw on the throttle handle that holds it in place on the handlebar, and then pull the throttle control straight out. Install the new one and tighten the Allen screw just as tight as needed to secure the throttle control. Check that it is possible to pull the brake lever completely without touching the throttle control.
6. Connect the connector, do not forget the new shrink tubing. Make sure that the small white lines on the connectors are opposite each other when you press the contacts together. Move the shrink tubing so that it is straight over the connector and heat it gently with a hot air gun so the shrink tubing shrinks and closes around the connector. Reattach the cables with cable ties so that they lie neatly and do not risk getting in conflict with anything.
7. Reconnect the batteries
8. Get seated in the ZOOM and turn the ignition key, and test drive.

6.2.3 Cruise control and Speed limit selector

The cruise control and speed limit selector unit is a control component that consists of one switch, the speed limit selector that allows the user to set three maximum speeds for the ZOOM, and then with a second switch, cruise control ON/OFF enables the ZOOM to run at a set speed without pulling the throttle. Note that the Cruise control only can be activated when the Speed limit selector is in positions High and Medium. See figure 6.2.8.

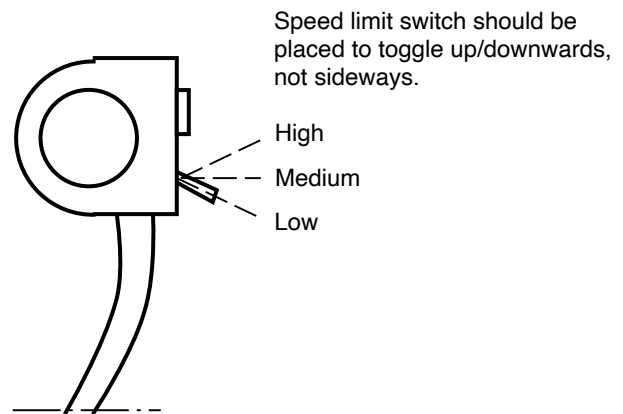


Figure 6.2.8 Switch positions, Speed selector.

Cruise control switch

The cruise control switch consists of an ON/OFF switch connected between the motors' cruise control output and the electrical systems ground to active the Cruise control function of the motors and keep a fixed speed according to the current throttle setting. The cruise control switch is deactivated if the user pulls the brake lever or increase/decrease the throttle.

Function test

Controlling cruise control switch function with DVM

1. Connect a Digital Voltmeter (ohmmeter or a diode tester) to the cruise control unit's male 5-pin connector pin 1 and pin 2.
2. While turning the cruise controls, switch ON and OFF repeatedly, and make sure that the connection is opened/closed accordingly.
3. If the test shows that the switch is not working in a correct manner, the cruise control module is faulty and should be replaced.

6.2.4 Speed limit selector

The speed limit selector is a three-way flip toggle switch that enables the driver of the ZOOM to set a max speed limit for the vehicle. The set speed limits are country-specific, relative to the max speed allowed:

- HIGH (approximately 20 kph/12 Mph)
- MED (approximately 10 kph/6 Mph)
- LOW (approximately 5 kph/3 Mph)

The wiring of the speed limit selector is shown in figure 6.2.9:

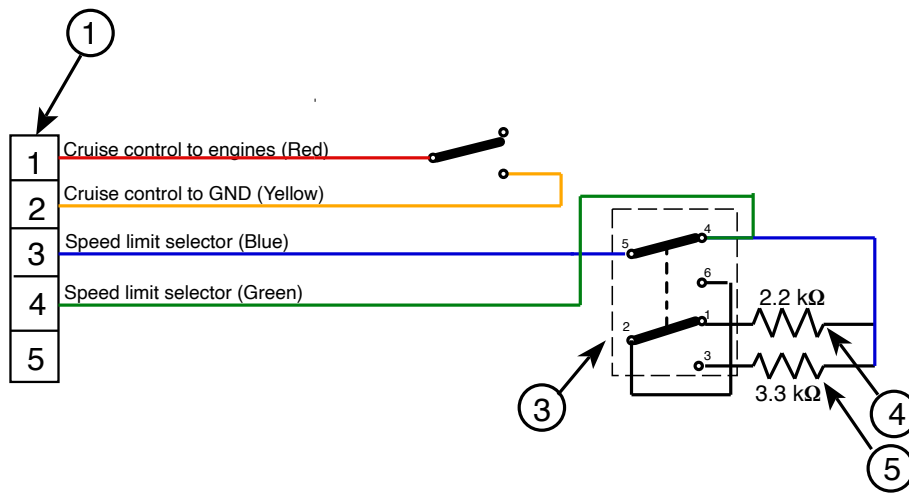


Figure 6.2.9 Schematics, Cruise control and Speed selector.

Function test

Controlling speed limit selector function with DVM

1. Connect a Digital Voltmeter in ohmmeter mode to the cruise control unit's male 5-pin connector pin 3 and pin 4. (for connectors pin assignments, see connector drawing in figure 6.2.2)
2. Repeatedly move the switch between LOW, MEDIUM and High-speed positions (see the figure above), and observe the resistance readings on the DVM and compare to below:
 - a. LOW (switch pointing downwards) – 3.3 kOhm
 - b. MEDIUM (switch in the middle position – 2.2 kOhm
 - c. HIGH (switch in upwards position) – 0 Ohm
3. If any of the positions do not correspond to the values above, the cruise control module is faulty and should be replaced.

Repairs / Replacement

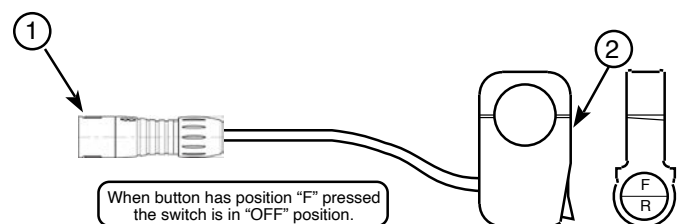
If problems are found with the Cruise control / Speed selector (CC/SS), it is recommended for safety reasons that it is not repaired but instead replaced with a new unit.

1. Turn off the ZOOM by turning the ignition key to the OFF position.
2. Disconnect both batteries.
3. If a left throttle is installed in the ZOOM, remove it according to the instructions in section 6.2.2.
4. Follow the cable from the CC/SS until you reach the connector. Disconnect the connector (you pull the connector apart without twisting). There is a shrink tubing over the connector that you carefully remove by cutting it off. You will probably also need to cut off some cable ties. Be careful not to damage the cables.
5. Loosen the screws on the CC/SS handle that hold

it in place on the handlebar, and then pull the CC/SS straight out. Install the new one and tighten the screws just as tight as needed to secure the CC/SS.

6. Connect the connector, remember the new shrink tubing. Make sure that the small white lines on the connectors are opposite each other when you press the connectors together. Move the shrink tubing so that it is straight over the connector and heat it gently with a hot air gun so the shrink tubing shrinks and closes around the connector. Reattach the cables neatly with cable ties so that they do not risk getting in conflict with anything.
7. If the ZOOM is equipped with a left throttle, replace it again using the instructions in section 6.2.2. Check that it is possible to pull the brake lever completely without touching the throttle control IF a left throttle is installed.
8. Reconnect the batteries.
9. Get seated in the ZOOM and turn the ignition key on, and test drive with the switch in all Low, Medium and High positions.

6.2.5 Forward/Reverse control



Assembly

Figure 6.2.10 Assembly, Forward/Reverse switch.

Schematic

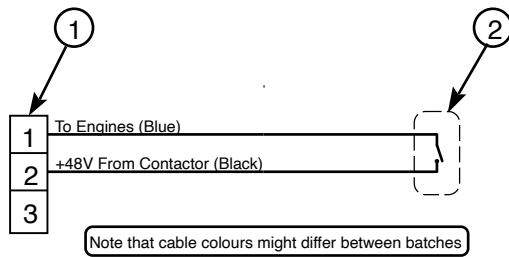


Figure 6.2.11 Schematic, Forward/Reverse switch.

Function test

Controlling the Forward/Reverse switch function with DVM

1. Connect a Digital Voltmeter in ohmmeter mode to the Forward/Reverse control unit's male 3-pin connector pin 1 and pin 2. In the normal case, this should be the Blue and Black wires, respectively. (for connector pin numbering and signals, see figure 6.2.2 in this service manual)
2. While turning the Forward/Reverse switch ON and OFF repeatedly, make sure that the connection is opened/closed accordingly and that the switch is in the ON (closed) position when R (reverse) is pressed.
 - a. Note that with the switch in the FORWARD position, the resistance should be infinite, while with the switch in the REVERSE position, the resistance should be close to 0 Ohm. If the resistance reading with the switch in the REVERSE position show ca 35 Ohm, the switch is connected the wrong way (through the internal lamp) and need to be corrected since this will make the switch incapable of putting the ZOOM into Reverse if the lamp fails. In the normal case, the 35 Ohm reading (lamp connected) would be with black and brown wires connected. But the colours might differ between batches.
3. If the test results in a failure:
 - a. For a total failure, the non-functioning Forward/Reverse module is faulty and should be replaced.
 - b. If the resistance with the F/R switch in REVERSE is 35 Ohm, as mentioned above, the wiring should be changed so that the internal lamp is removed from the circuit (normal case, change from brown/black wires to blue/black wires as shown in the above schematic, the colours might differ between batches.)
 - c. After changing the wiring, test again according to step 2 above to ensure it is now working correctly.

Repairs / Replacement

If problems are found with the Forward/Reverse module, it is recommended for safety reasons that it is not repaired but instead replaced with a new unit.

1. Turn off the ZOOM by turning the ignition key to the OFF position.
2. Disconnect both batteries.
3. Follow the cable from the F/R module until you reach the connector. Disconnect the connector (you pull the connector apart without twisting). There is a shrink tubing over the connector that you carefully remove by cutting it off. You will probably also need to cut off some cable ties. Be careful not to damage the cables.
4. Loosen the screws on the back of the F/R module that holds it in place on the handlebar. This will let you remove the module completely. Install the new one and tighten the screws just as tight as needed to secure the F/R module.
5. Connect the connector, do not forget the new shrink tubing. Make sure that the small white lines on the connectors are opposite each other when you press the connectors together. Move the shrink tubing so that it is straight over the connector and heat it gently with a hot air gun so the shrink tubing shrinks and closes around the connector. Reattach the cables with cable ties so that they lie neatly and do not risk getting in conflict with anything.
6. Reconnect the batteries
7. Get seated in the ZOOM and turn the ignition key on, and test drive with the F/R switch in both Forward and Reverse positions.

6.2.6 Batteries and battery chargers

Two removable 48V/10Ah rechargeable LiFePO4 batteries supply the ZOOM's motors with power for driving and other functions. Battery 1 drives the front motors, while Battery 2 drives the rear motors. Battery 2 also connects to the throttle's battery charge indicator and the key switch and is used to activate the contactor to power up the ZOOM when the key switch is closed.

The batteries connect to the main harness through Neutrik Speakon connectors. For charging, they connect to the supplied charger of the model through a special, dedicated charging connector and are charged to a max of 58.4V.

Battery model: LFP-4810S Top Quality LiFePO4 Battery Pack for Electric Bikes -- 48V10AH
Large and safe LiFePO4 cells inside
BMS manages each cell for high reliability
Safety features: no explosion, no fire under collision, overcharged or short circuit
Weight: below 5.5kg
Capacities: 48V/10AH
Max. discharge current: 60A(16AH)
Max. continuous discharge current: 30A(16AH)
Charging cycles: >800 times

Note that the batteries are customized for use with the ZOOM and have a Neutrik SpeakOn connector at the short side facing downwards when mounted to provide a secure supply of power to the main motors.

Charging and battery care

Charging is performed with the included chargers that plug into the top part of the batteries by the handle.

1. Ensure the ZOOM is turned off and that its ignition key is removed before charging the batteries.
2. Ensure the input voltage selector on the chargers is correctly set for the outlet you are using, i.e., US 115 VAC, Europe and Australia 230 VAC. Keep the power switch of the charger in the "OFF" position until connected to the ZOOM battery and the wall outlet.
3. Plug the charger into a wall outlet and turn on the charger's power switch.
4. Plug in the charger's battery cable into the battery. The connector is positioned at the top of the battery by the handle. Lift the battery handle to expose the battery connector.
5. Charging is complete when the green LED on the charger lights up. Charging time is up to 2-4 hours for a full charge.
6. If the indicator lights on the charger do not light up, verify that the power outlet is functional. Consult a qualified electrician if needed.
7. After charging, disconnect in the following order:
 - a. unplug the battery
 - b. turn off the switch on the charger.
 - c. unplug the wall outlet

Note: The battery handle has to be folded down again after charging, or the ZOOM will not start.

Function test

If the ZOOM's driving range begins to go down compared to the range when new, or if the charger needs an unusually short time to charge a depleted battery (with a new battery, charging time is ca 3-4h), the batteries might need to be replaced. If the charging time is unusually long, the problem might be in either the battery or the charger.

Repairs / Replacement

Batteries that are not working or holding charge should be replaced according to the instructions below.

Removing and replacing batteries

If you need to remove the batteries for maintenance or transportation, follow these instructions:

1. Ensure the ZOOM is turned off and that its ignition key is removed before charging the batteries.
1. Remove the locking mechanism on the upper side of the batteries. No tools are required for battery removal.
2. Slide up the battery 2-4 in./5-10 cm along the plate to provide space for the blue battery connector to be disconnected from the battery. The connector plug, located at the under side of the battery is disconnected by pulling the metal locking mechanism and then twisting the connector counterclockwise.
3. With the battery cable separated from the battery, you can completely remove the battery by pulling it upwards until it separates from the holding plate.
4. With the left battery lock exposed, repeat the procedure to remove the second battery.
5. To mount the batteries back on the ZOOM, repeat the procedure in reverse order, i.e. mount the left side battery and lock and continue with the right side battery.

WARNING! Do NEVER attempt to open or disassemble the batteries in any way!

Note: Starting from chassis number ZUFE2120350, a new battery design with new battery plates was implemented on the ZOOM. The older ZOOM models (pre-ZUFE2120350) can be adapted to use the new batteries by installing a Battery adapter kit.

Battery charger

ZOOM is delivered with two separate 58.4V/3A (200W) chargers for simultaneous charging of its two batteries. The charger has 2 LEDs, one LED indicating that power is connected to the charger and one LED indicating if charging is in progress (RED) or charging is completed (GREEN). The chargers are adjustable for 230 or 115VAC.

6.2.7 Brakes (left and right)

When either brake lever is pressed, the microswitch inside closes and sends a brake signal to all four motors' brake input to set them in a free-wheel mode. The brakes will also activate the wheel-mounted hydraulic disc brakes and take the ZOOM to a stop. The left brake handle activates the rear wheels' brakes, and the right brake handle activates the brakes of the front wheels.

The right brake lever also has a parking brake function, so it can be locked into the brake position.

Assembly / Schematic

The microswitch for the brakes is located on the bottom side of the brake handles.

Figure 6.2.12 shows the right brake lever seen from below, with the microswitch outlined in white.



Figure 6.2.12 Location of the brake signal microswitch.

Function test

Controlling Brakes microswitch function with DVM

1. Connect a Digital Voltmeter (ohmmeter or a diode tester) to the microswitch two flat spade connectors.
2. While pulling the brake handle repeatedly, make sure that the connection is opened/closed accordingly.
3. If the test result shows that the switch is not functioning, the Brakes microswitch is faulty and should be replaced.

Repairs / Replacement

If mechanical problems are found with the brakes, it is recommended for safety reasons that they are not repaired but instead replaced with a new unit.

Brake lever Microswitch replacement

(This process is the same for both left and right brake levers, but note that a different switch is used for left vs. right side.)

1. Turn off the ZOOM power by the key switch and disconnect both batteries
2. Remove the two spade connectors from the main harness on the microswitch and unscrew the top right screw that secures the microswitch to the brake lever
3. Remove the faulty microswitch from the lever and replace it with a new, working switch (test the new one first with a DVM's resistance meter or diode tester.) Replace and tighten the screw.
4. Attach the main harness spade connectors to the new microswitch.
5. Reconnect the batteries, turn on the power by the key switch and control that the brake levers functions as intended.

6.2.8 Swivel chair microswitch (part of the optional swivel chair)

The swivel chair switch is a microswitch located under the driver seat and connects in series between the throttle's key switch and the contactor. With the chair locked into the driving position, the swivel chair switch is closed, and the ZOOM can be started. The swivel chair is an optional feature and can be installed at any time.

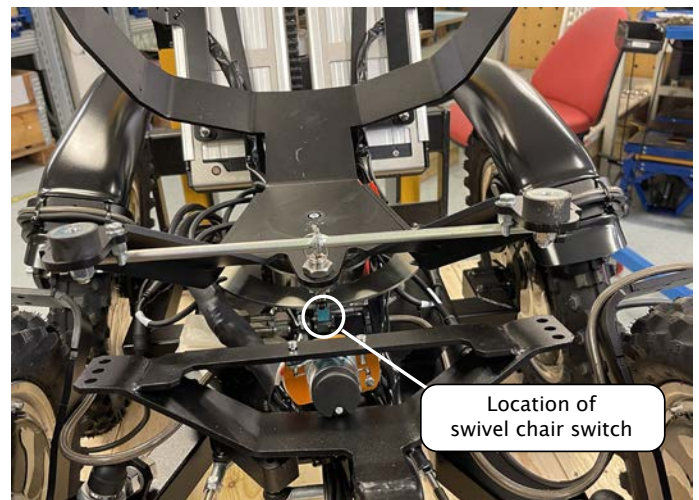


Figure 6.2.13 Location of the swivel seat microswitch.

Assembly / Schematic

See the main cable harness schematic earlier in this chapter. (Figure 6.2.1)

Function test

Electrical test of the swivel chair microswitch

1. Switch off the main power with the key switch and disconnect the batteries.
2. Remove the chair from the swivel base according to instructions in section 6.4.14.
3. Attach a DVM in resistance- or diode test mode between the contactor coil (pin C4 in the picture below) and the “1+” pin of the B21 Speakon battery connector on the cable harness (see figure 6.2.3 for pin assignments).

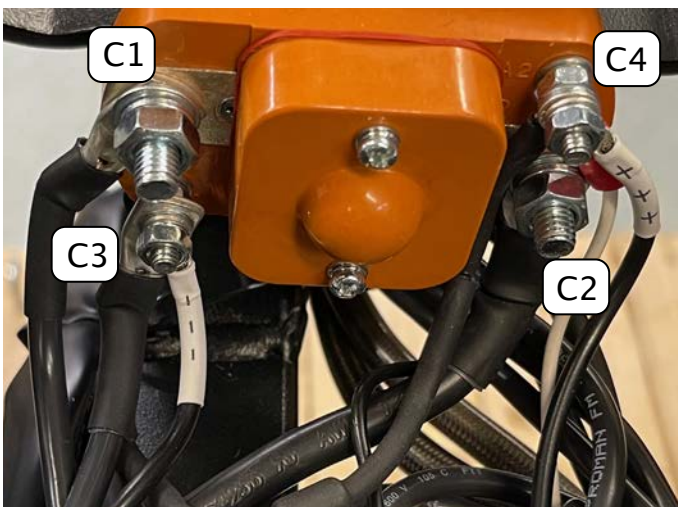


Figure 6.2.14 Contactors pole assignments. Note that the contactor normally is protected by a cover, while figure show contactor without cover.

4. Switch the key switch to ON, and by pressing the small lever on the swivel chairs microswitch, turn it in ON and OFF positions by pressing it down manually (not by moving the base of the chair in and out of the driving position) and observe the result on the DVM.
 - a. If the microswitch is working correctly, the DVM should show that the switch is closed when the lever is pressed
 - b. With the lever in the neutral position, the switch should be open.
 - c. If the switch is working in a correct manner, continue by making sure the microswitch lever is not bent by repeating steps 4a and 4b above, but this time test the switch function by moving the base of the chair in and out of the driving position.
5. If the switch is not working when tested, as mentioned in step 4, the switch needs to be tested without the key switch involved

6. Disconnect the throttle from the main harness (connector pair T1/T2)
7. Connect the DVM as before between contactor pin C4 and the main harness throttle connector T1, pin 2 (see figure 6.2.2 for pin assignments) and repeat steps 4a and 4b. (note that the key switch now is not involved)
8. If tests 4 and 8 above show that the switch is working properly, continue to test if the microswitch's level is correctly adjusted.

Mechanical arm test and adjustment

1. Check that there is no anomalous play in the seat and, if there is, that the swivel seat's plastic bearing is replaced.
2. Check that the upper nut is no more than 8 mm high, as indicated in the picture.

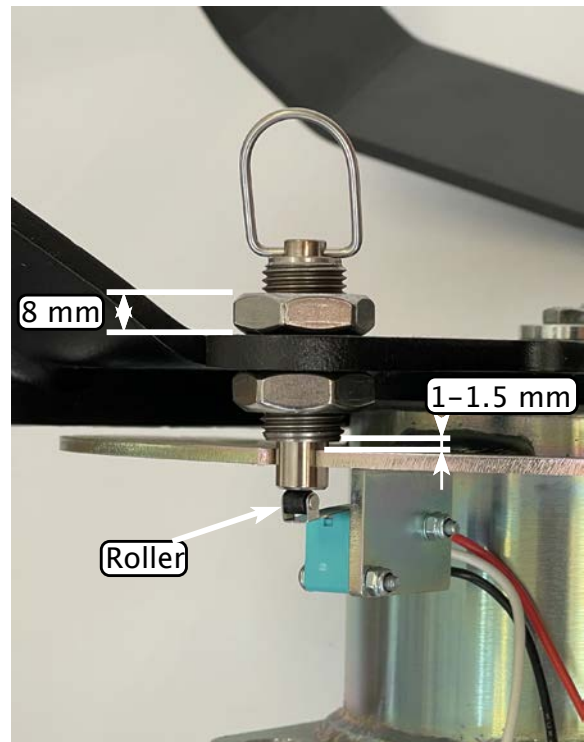


Figure 6.2.15 Swivel seat microswitch adjustments.

3. Turn the swivel seat and lock it in the drive position.
4. Check the clearance between the threaded part of the locking pin and the stainless plate (measurement 1-1.5 mm in the picture). If more than 1.5 mm, loosen the nuts and adjust. The pull ring must not rest on the top nut. Tighten the nuts firmly. If the clearance still is too large, you will have to press/bend the stainless plate upwards. To do this, you might need to remove the seat and the seat holder.
5. Turn the swivel seat to any other position than the drive position.

6. Check the roller at the end of the microswitch arm. See figure 6.2.16.

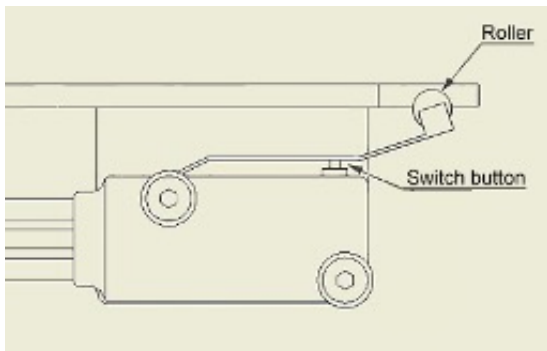


Figure 6.2.16 Swivel seat microswitch arm positioning.

The top of the roller must be between the stainless plates under and upper side and must not go above the upper side. If not, gently bend the micro switch arm with a plier. The microswitch lever should only rest lightly on the switch button, with small freedom of movement upwards and not be pressing against it.

Repairs / Replacement

1. Switch off the main power with the key switch and disconnect the batteries.
2. Remove the chair from the swivel base.
3. Cut the wires from the microswitch and remove it by loosening the fastening screws.
4. Replace with a new micro switch and resolder the wires.
5. Put back the chair.
6. Reconnect the batteries.
7. Turn the ignition key on and ensure that the chair switch is working correctly.
8. If the microswitch is not working properly, adjust the mechanical arm according to instructions earlier in this section “Mechanical arm test and adjustment”

6.2.9 Light kit (optional)

The Light kit for the ZOOM is a complete kit to enable the ZOOM to be operated in the dark. It consists of a 60V white front LED light, two red rear LED lights, an ON/OFF switch placed on the handlebar, and all wiring needed to install the kit. The light kit is powered by the 48V C3 and C4 connectors on the contactor. For schematics, see figure 6.2.17.

Each of the LED lamps of the light kit is protected by a fuse, the rear LED lights are individually protected by a 10A slow 5x20 mm fuse, while the front LED light is protected by a 10A 6.3x32 mm fast fuse. *The light kit is an optional feature and can be installed at any time.*

The light kit “GND” connects to contactor pin C4 (M4 screw) on the main schematic, and the light kit “+” connects to contactor pin C3 (M4 screw). Also see figure 6.2.14.

Function test

If one or two of the lights are functioning

Controlling the fuses

1. Turn off power to your ZOOM by the key switch and disconnect both batteries
2. Locate the correct fuse holder (2 pcs 5x20 mm for rear lights, 6,3x32 mm for front light) behind the ZOOM chair and remove the fuse
3. Use a DVM in resistance- or diode-testing mode to control that the fuse is working.
4. After testing the fuse, replace it if faulty.
5. Reconnect batteries when testing is done.

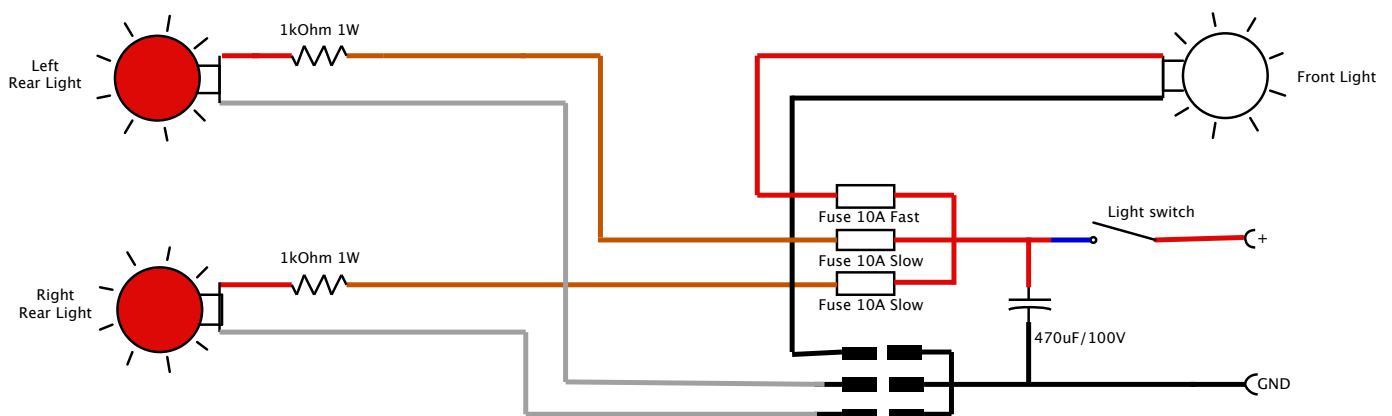


Figure 6.2.17 Schematic for Light kit.

If *NONE* of the lights is functioning

Controlling the light kit wiring

1. Turn off power to your ZOOM by the key switch and disconnect both batteries
2. Remove any of the fuses and connect a DVM in resistance- or diode measurement mode between the half of the fuse holder connected to the main switch (for the 5x20 mm fuse holder, this is the half with internal thread, for the 6,3x32 mm holder, it is the part with external threading)
3. Connect the other pole of the DVM to the contactor coils “+” pole (pole C2 in figure 6.2.14)
4. By toggling the lift switch ON/OFF, make sure it is working properly.
5. After measuring, reconnect the batteries.

Repairs / Replacement

Blown fuse

1. Turn off power to your ZOOM by the key switch and disconnect both batteries
2. Replace the identified blown. fuse with a new of the same value and size.
3. When the fuse is replaced, reconnect the batteries and turn on the key switch
4. Ensure the light is now working by turning it on by the light switch.

WARNING! DO NOT attempt to replace any of the fuses with fuses that have other specifications than the intended, or you risk causing severe damage to your ZOOM.

Light switch

1. Turn off power to your ZOOM by the key switch and disconnect both batteries.
2. Remove the light switch from the handlebar by loosening the two screws on the back of the switch.
3. Follow the light switch wire and cut away the zip ties holding it – remember the placement of the zip ties.
4. When the external PVC cover on the wires (490 mm long, Diameter 11 mm) is freed, push the PVC cover up until it's totally against the light switch. The end of the light switch's wire should now be visible, together with two joining points where they extend the switch's wire. The joints are covered by a shrink tube.
5. Cut the wires just below the joints, through the shrink tube and then remove any remaining shrink tube.

6. Remove the PVC cover from the old light switch cable and push it up on the new one.
7. Thread new shrink tubing on the wires going into the chassis (D=6 mm) and then solder or crimp the new Light Switch wires to the wires.
8. Put the shrink tube in position and heat it until it shrinks.
9. Reattach the light switch on the handlebar and tighten the screws.
10. Push the PVC cover down to its original position, and with new zip ties, refasten the cable to the ZOOM's frame.
11. When the above is done, reconnect the batteries and turn on the key switch
12. Ensure the light is now working by turning it on by the light switch.

6.2.10 Contactor

The contactor functionality is as a relay, which, when the key switch (and optionally, the swivel chair switch) is closed, uses an electromagnetic coil to activate a switch that turns the main power on to the motors.



Figure 6.2.18 Contactor location.

Function test

1. Turn the key switch OFF and remove the seat
2. With batteries still connected, keep the key switch OFF (and Chair switch OFF)
 - a. measure voltage over contactor coil pos. C3/C4 with DVM = 0V
 - b. measure voltage over contactor switch pos. C1/C2 with DVM = 48V
3. With batteries still connected, turn the key switch ON (and Chair switch ON)
 - a. measure voltage over contactor coil pos. C3/C4 with DVM = 48V
 - b. measure voltage over contactor switch pos. C1/C2 with DVM = 0V
4. Notes:
 - a. If step 2a above results in 48V (battery voltage), there is a problem with either the key- or chair switch. (Should not be any voltage over the contactor at that moment)
 - b. If step 2a is correct and 2b show 0V, there is a problem with the contactor (always ON, switch locked in ON position)
 - c. If step 3a is incorrect = 0V, there is either no power to the coil (fault in key- or chair switch) or a shorted coil in the contactor.
5. If the voltage over the contactor's switch is 48V with power on (both key switch and chair switch ON), the contactor is faulty.

Repairs / Replacement

1. Turn off power to your ZOOM by the key switch and disconnect both batteries.
2. Remove the driver's seat (see instructions in section 6.4.14) and locate the contactor according to figure 6.2.23
3. Remove the cover protecting the contactor.
4. Remove the four (six if a light kit is installed) wires connected to the contactor by the M4 and M6 screw terminals. Carefully note their position since dirt and wear might make positioning labels illegible.
5. Remove the contactor from the chassis by loosening the two screws attaching it.
6. Install the new contactor by following the steps above backwards.
7. When the seat is back in position, reconnect the batteries and turn on the key switch to check that the new contactor is installed correctly.

6.3 Motors

6.3.1 Motor description

A complete ZOOM wheel consists of a hub, where the motor and controller are located, a rim, tire, and the inner tube.

The motor is a Permanent Magnet BrushLess DC Motor (PMBLDC), powered and controlled through the motor cable, coming out of the centre of the brake disc. The cable is feeding power into a controller card mounted inside the wheel's hub, which converts the battery's DC to three-phase AC. The motor RPM is dependent on the frequency of the AC current from the controller.

The motor cable also contains several wires for control signals from the throttle, Forward/Reverse, cruise control and brakes. These signals control the motor's rotation speed and direction. The signal from the brake switches makes the motor turn off (not brake) when the brake lever is pulled. See figure 6.2.1 and 6.2.2 as well as table 6.2.1 for more information.

The motor is equipped with three Hall-effect sensors that sense the magnetic field of the motor's rotors. The sensors send information to the control card about rotation direction and RPM.

The left and right motors are essentially identical, but with the wiring of the controller card to the motor reversed for them to rotate in the opposite direction. **Note:** Make sure to order the right side and speed when replacing the motor.

Note that the front motors are powered by the left battery, while the rear motors are powered by the right battery, which also supplies power to the contactor and key switch to enable power on.

Some of the motor's control card settings are adjustable (see programming section). For example, the max speed or the acceleration can be lowered according to local regulations.

Out of the factory, the ZOOM is pre-set for a country-specific maximum velocity at a battery voltage between 42 and 62 V. If the supplied voltage is outside these values, the motors will not drive the ZOOM.

6.3.2 Changing controller card.

1. Turn off the ZOOM by the key switch and remove the battery connectors.
2. Carefully cut away the cable ties keeping the motor cable in place against the fork. (Some of the cable ties are shown in figure 6.3.1)



Figure 6.3.1 Location of cable ties for motor cable.

3. Disconnect the motor connector from the main harness by pulling them straight apart while holding the connectors, not the cable. Figure 6.3.2 shows the location of the connectors.



Figure 6.3.2 Location of motor connector.

4. Lift the ZOOM and loosen the nuts on the wheel axle and remove the wheel from the ZOOM.
5. Remove the nut and washers from the axle on the wire side of the wheel. Loosen the screws holding the brake disk and remove the brake disk. See figure 6.3.3.



Figure 6.3.3 Removing the brake disk.

- Remove the six screws holding the black cover in place and remove them. See figure 6.3.4.



Figure 6.3.4 Location of screws holding the black wheel cover.

- Free the wire from the axle. It is normally attached by a metal clip but sometimes by cable ties. See figure 6.3.5 for their location.



Figure 6.3.5 Location of motor cable attachment, in figure the clip version is shown.

- Remove the six screws holding the controller card as marked in the picture. Carefully loosen and remove the controller card by pulling it straight out from the wheel. It might have a tight fit, and carefully using a thin knife wedged in the small opening between the card and the wheel might make the removal easier. See figure 6.3.6.



Figure 6.3.6 Example of how to facilitate removal of controller card housing with a knife.

- Pull out the controller slightly until you have space enough to disconnect the three wires (blue, green, and yellow). Take note of the positions so that you can reassemble them in the correct order. Also unplug the black square connector from the card.

Note: The connector has a small locking pin (figure 6.3.7) that needs to be pressed against the connector to remove it.

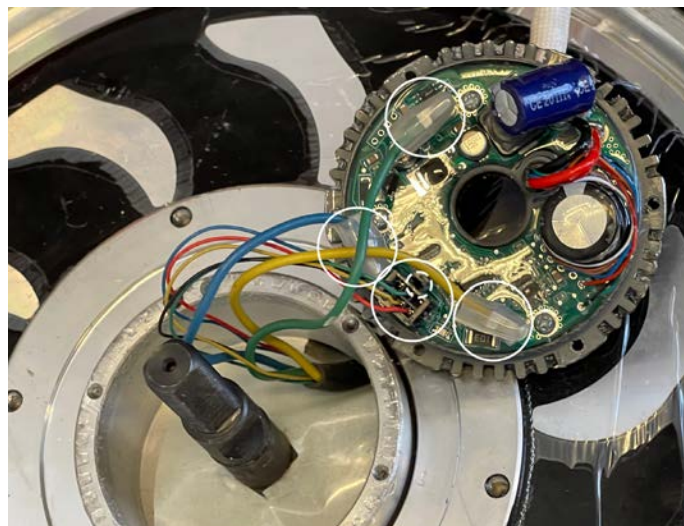


Figure 6.3.7 Removed controller card with wire connectors shown. Locking pin marked by dotted circle.

10. Now take the new controller card and follow steps 9 to 1 above backwards to reassemble the wheel. It might be difficult to reattach the metal clip holding the motor wire (step 7) since the new wire is straight and stiff. The screws for the brake disc need to be locked by LocTite 243 Medium.

The wheel should be mounted on the ZOOM so that the motor wire exits above the wheel axle. Do not forget the washers. Tighten the wheel nuts properly (66 ft-lb / 90 Nm). Control carefully that the motor wire moves free of the screws on the brake disk (picture). This is affected by how the wire is routed along the fork and the placement of the cable ties. Always attempt to route the wire so that it is as protected as possible from damage during possible interaction with stones, twigs and similar.



Figure 6.3.8 Correct routing of motor cable.

11. When reconnecting the motor to the harness, make sure that the arrow markings (and the connector's pins) are right opposite each other to avoid damage to the connector's pins when you push them together.

12. If possible, lift the whole zoom off the ground so that all wheels are spinning freely. Reattach the cables to the batteries and turn the key switch to check that all wheels are moving as intended, both forward and in reverse and that they stop when either of the brake levers is pushed in slightly. Also, test the Cruise control function at its Low, Medium and High settings.

6.3.3 Programming instruction for MP5 motors

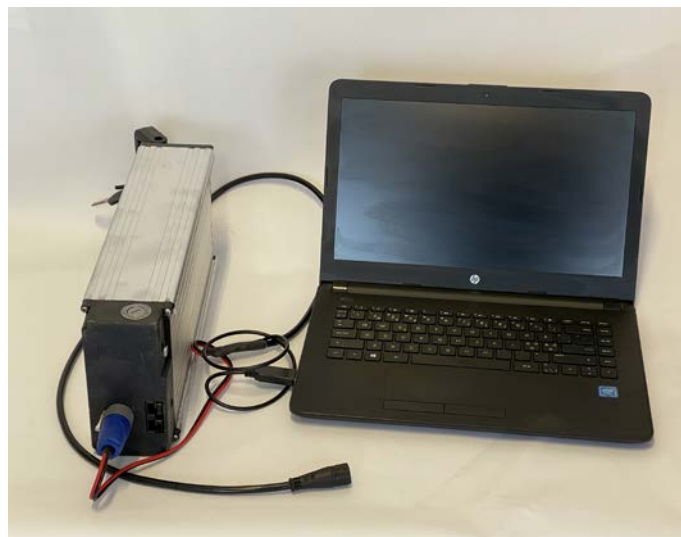


Figure 6.3.9 Equipment needed for MP5 motor programming.

You need:

- Windows computer with software PI-800.
- Programming cable. (P/N 990421)
- ZOOM Battery.

PI-800 software buttons

	Connect	Establish connection to controller card at chosen COM Port
	COMport	Select the COM Port the motor is connected to
	Upload	Read settings from controller card to software
	Download	Write settings from software to controller card
	Default	Reset changes in software to motor defaults
	Import	Import parameters to the software from a file on the PC (*.foc)
	Export	Export parameters from the software to the PC to a file (*.foc)

Table 6.3.1 PI-800 software buttons.

How to program:

1. If this is the first time running the software, first install the Controller card's USB driver "CH341SER.EXE", included with the software.
2. After installing the driver, restart the computer.
3. Install the programming software. (From file "PI-800.exe")
4. Connect the USB connector of the programming cable to the computer.

5. Connect the motor connector of the programming cable to the MP5 motor.
6. Connect the speakON connector of the programming cable to the battery.
7. Start the PI-800 software on your computer.
8. Select the COMport on your computer associated with the USB port you connected the cable to.
 - a. The COMport can be identified by (on WIN10) use of the Device manager
 - b. Press “Start” and type “device manager” in the search window.

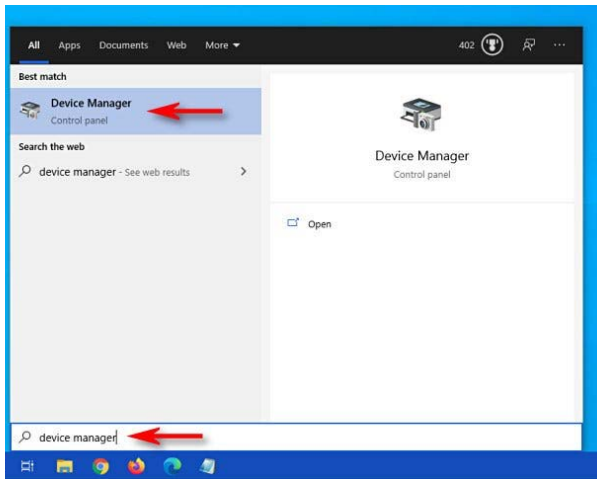


Figure 6.3.10 Opening the Device Manager in Windows.

- c. In the Device manager, identify the “Ports (COM & LPT)” section and look up the number of the COM port that your motor is connected to. Look up the device name "USB-SERIAL CH340 (COMx)" and take note of the number of the COM port.

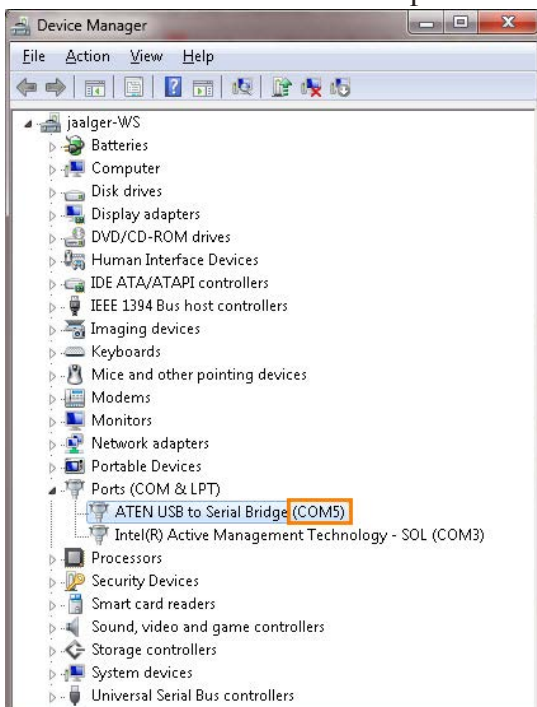


Figure 6.3.11 Locating the COMport used by PI-800.

9. After selecting the correct COM port, click on the “Connect” button.

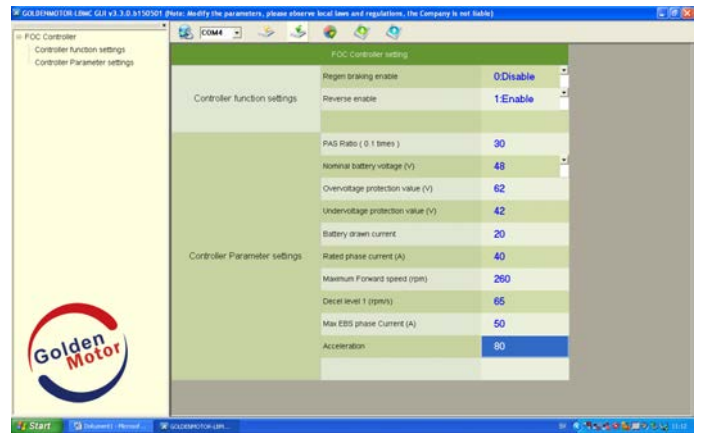


Figure 6.3.12 Selecting correct COMport and connecting to PI-800.

10. Click “OK” in the dialogue that appears.

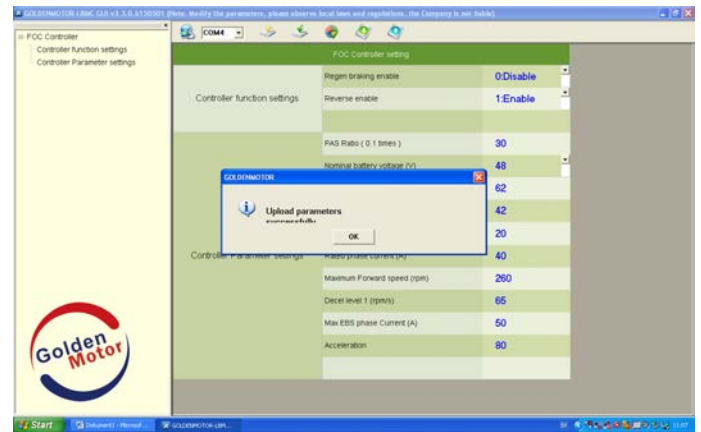


Figure 6.3.13 Confirmation of successful upload.

11. Now the motor's setting parameters are shown in Fig 6.3.14.

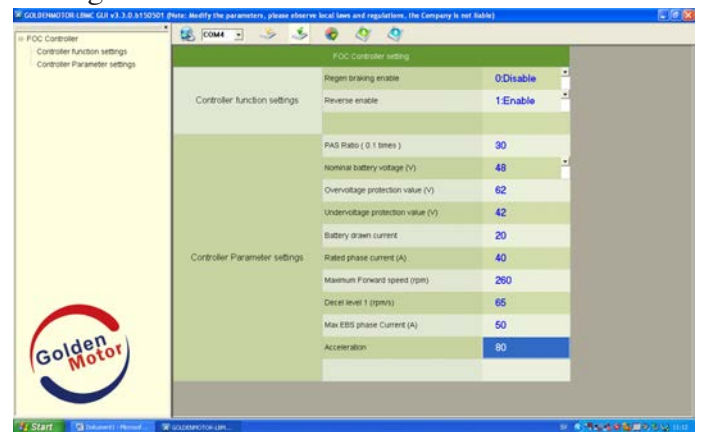


Figure 6.3.14 Motors current settings are now loaded into PI-800.

12. Start by making a backup of the current motor settings: After the motor's current settings are downloaded, proceed to press “Export”. In the dialogue box, name the file and save it in a convenient location.

13. Proceed to change values:
 - a. If you want to change individual value(s) or do not have a prepared file over the settings: Click twice on the value you want to change and edit it.
 - b. If you want to upload the new values to the motor from a settings file instead of changing an individual value, click on the “Import” button and select the settings file with the settings you want to send to the controller.
 - c. Press the “Download” button to write the settings to the controller. If successful: you get a “Download parameters successfully” response.
14. If the downloaded settings were changed by manual input and not from a settings file, you might want to save a backup of them for future use by following step 12 above.
15. Disconnect the programming cable from the battery.
16. Disconnect the programming cable from the motor.
17. Connect the next motor by starting from point 3 on this list.

WARNING! Not disconnecting the programming cable from the battery before disconnecting it from the motor might result in a damaged controller card!

If you get the “No response because of timeout” response, you have the wrong COMport selected or have forgotten to connect the battery.

Default values as shown below:

Regen braking enables **0:Disable**
*If this is “Enable,” the motor will regenerate when braking. **WARNING:** Never set the “Regen braking enable” to “1” (Enabled), With the ZOOM’s asymmetrical wheelbase, the strong braking effect from the motor brake might cause the ZOOM to lose control or tip over.*

Reverse enable **1:Enable**
If this is “Disable”, it will not be possible to put the Zoom in reverse with the F/R control.

PAS Ratio (0.1 times) **30**
This is for measuring the pedal cadence on a bike (not in use in this ZOOM model).

Nominal battery voltage (V)	48
Overvoltage protection value (V)	62
Undervoltage protection value (V)	42
Battery drawn current (A)	20
<i>The motor will be weaker at a lower value.</i>	
Rated phase current (A)	40
Maximum Forward speed (rpm)	260
100 rpm ~ 8 km/h (5 mph)	
145 rpm ~ 12 km/h (7.5 mph)	
195 rpm ~ 15 km/h (9.3 mph)	
260 rpm ~ 20 km/h (12.4 mph)	
Decel level 1 (rpm/s)	65
<i>The maximum reverse speed in rpm. 65 rpm ~ 5,5 km/h. (“Decel level 1” is specified as “Maximum reverse speed” in the controller card drawing.)</i>	
Max EBS phase Current (A)	50
<i>This adjusts the level of the regenerative braking. High value equals high braking.</i>	
Acceleration	70
<i>100 makes the throttle very sensitive, and values under 60 make the Zoom accelerate so slow that it can be difficult to cross the busy streets.</i>	

You are responsible for the settings being within the legally approved values of the user’s country. Secondly, if any value is outside of Zoomability approved values, Zoomability disclaims all liability, and any warranty ceases immediately. It may also happen that the ZOOM becomes illegal to drive (different max speeds in different countries), and even this is your responsibility.

6.4 Mechanical system

6.4.1 Introduction to the mechanical system

Exploded view and parts list ZOOM with swivel seat

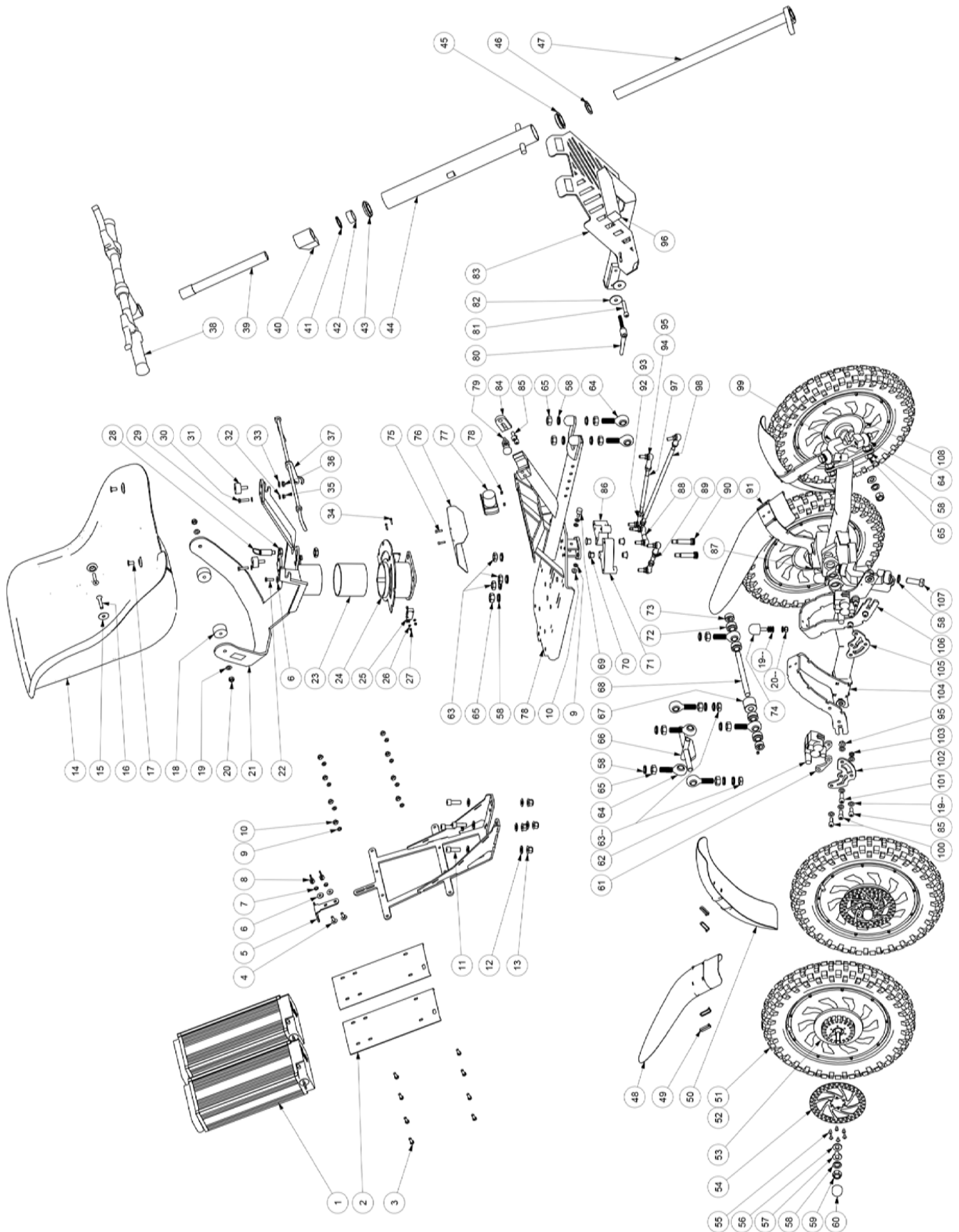


Figure 6.4.1 Exploded view of ZOOM with swivel seat.

Exploded view and parts list ZOOM with fixed seat

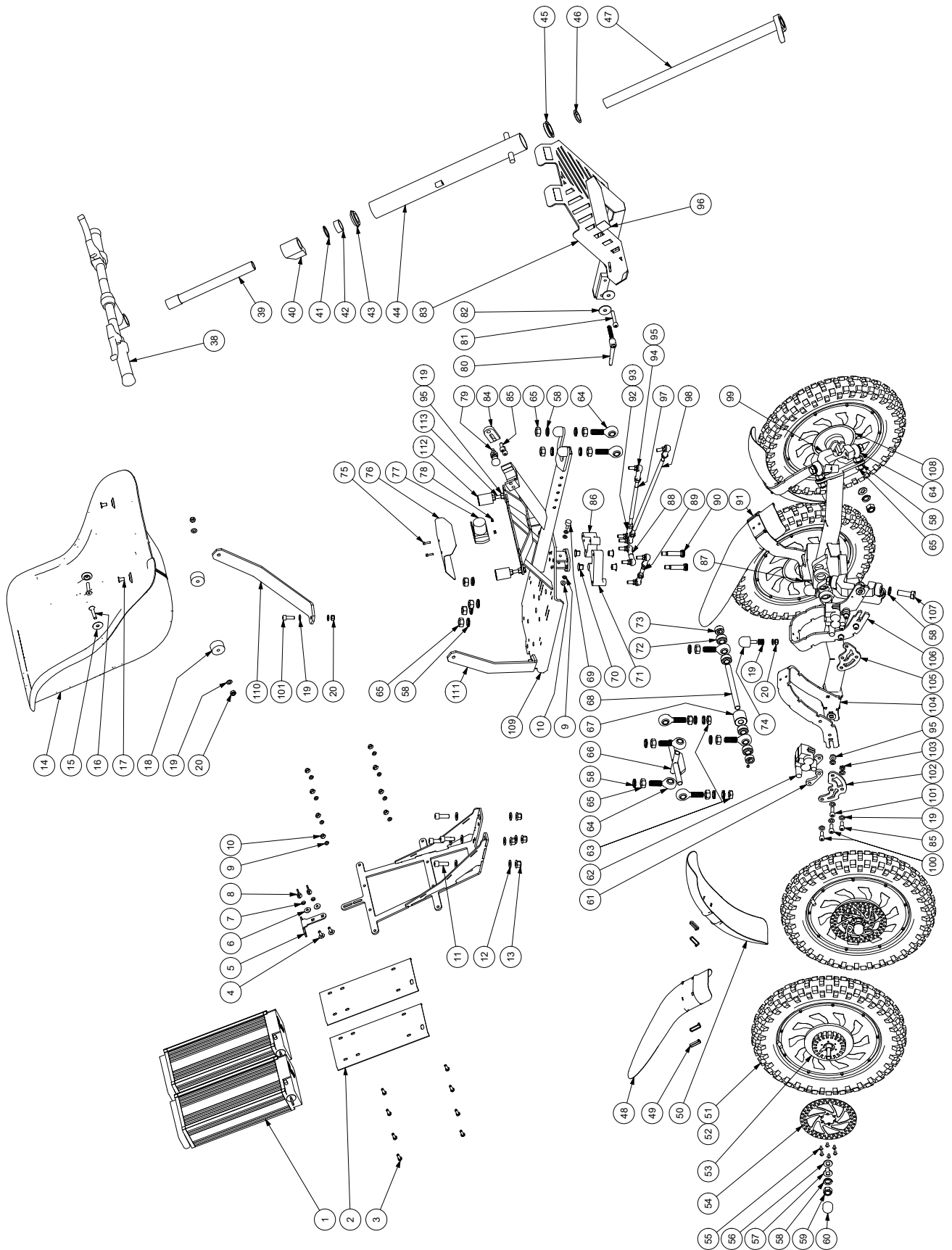


Figure 6.4.2 Exploded view of ZOOM without swivel seat.

Position	Qty.	Description	Spare part No.
1	2	Battery Zoomadapted	990040
2	2	Battery plate (from S/N nnn350)	990544
3	8	M6SH 8.8 FZB DIN 933 M6x16	
4	2	ISO 8678 - M6 x 20	
5	1	Battery clasp plate	
6	3	DIN 9021 - 6,4	
7	2	DIN 128 - A6	
8	2	DIN 315 - M6	
9	15	BRB FZB DIN 125 6,4x12x1,5	
10	9	M6MF 8 FZB DIN 6926 M6x1	
11	4	MC6S 8.8 FZB DIN912 M10x30	
12	8	BRB FZB DIN 125A 10,5x22x2	
13	4	LM6MF 8 FZB DIN 6926 M10x1,5	
14	1	XL Seat	990019
15	4	Seat washer	990011
16	2	MF6S 10.9 DIN 7991 M8x40	
17	2	MF6S 10.9 DIN 7991 M8x16	
18	2	Rubber distance	
19	36	BRB FZB DIN 125A 8,4x16x1,5	
20	6	LM6M FZB DIN 985 M8x1,25 lock	
21	1	Upper part	
22	1	ISO 4017 - M6 x 20	
23	1	Glide bearing	
24	1	Lower part	
25	1	Microswitch Omron D2VW-5L2-1M	990342
26	2	DIN 125 - A 3,2	
27	2	ISO 10511 - M3	
28	1	GN413 10-M16x1,5-A-NI stainless	
29	2	GN617.6-M16x1,5 NI 8 stainless	
30	2	ISO 4017 - M6 x 25	
31	2	GN351-30-15-M8-ES-55	
32	4	DIN 125 - A 6,4	
33	2	DIN 125 - A 8,4	
34	2	ISO 7045 - M3 x 20 - 4.8 - H	
35	2	ISO 10511 - M6	
36	6	ISO 10511 - M8	
37	1	Control arm	
38	1	Handle bar	
39	1	Speedlifter (spare part includes pos. 40, 41)	990402
40	1	Speedlifter extension	
41	1	Speedlifter ring	

Position	Qty.	Description	Spare part No.
42	1	Distance	
43	1	Upper bearing (kit with pos. 45)	990044
44	1	Steering column outer tube	
45	1	Lower bearing (kit with pos. 43)	990044
46	1	Bearing ring 38,8 mm	
47	1	Steering column inner tube	
48	2	Mudguard Rear (set of 2)	990092
49	8	Zip tie 4,8x150mm	
50	2	Mudguard Front (set of 2)	990015
51	4	Tire Mitas12x2,5	990320
52	4	Inner tube 12x2,5	990124
53	2	ZOOM MP5 motor Right (differ between countries)	See table 6.4.3
	1	Controller card (differ between countries)	See table 6.4.3
	1	Ball bearing large 6917-2RS (outside)	990039
	1	Ball bearing small 6302-2RS (inside)	990321
54	4	Brake disc 160 mm	990030
55	24	Torx screw M5x10 stainless	
56	8	Washer	
57	8	Moment washer	
58	36	NL14-Nord-Lock	
59	8	LM6M A2 DIN 985 M14x2 lock	
60	4	Nut cap (set of 4)	990037
61	4	Caliper distance	
62	4	Caliper 1.5	990127
	8	Brake pads for Caliper 1.5 (set of 2)	990029
63	2	M6M A2 DIN 934 M14x2 low	
64	12	Rod end bearing (total 12 pcs in the chassis)	990023
65	19	M6M A2 DIN 934 M14x2	
66	1	Divider	990012
67	1	Reinforcement for central axle (kit with pos 67, 68, 73)	990018
68	1	Central axle (kit with pos 67, 68, 73)	990018
	1	Central axle (separate)	990021
69	1	Shock absorber	
70	4	Glide bearing	
71	1	Lower steering link right	
72	2	Bearing (kit of 2)	990020
73	2	Locking ring for Central axle (kit with pos 67, 68, 73)	990018
	2	Locking ring for Central axle (separate)	990024
74	2	Shock absorber	
75	2	MC6S 8.8 FZB DIN912 M4x16	
76	1	Safety plate contactor	

Position	Qty.	Description	Spare part No.
77	1	100A contactor	990007
78	2	LM6M A2 DIN 985 M4 lock	
79	1	GN817-BK-6-9	990010
80	1	GN300-S63-M8x50	990116
81	1	MC6S 8.8 FZB DIN912 M8x50	
82	2	SRKB FZB 9x35x2	
83	1	Footrest std. (complete kit)	980003
84	1	Holder locking pin	
85	6	MC6S 8.8 FZB DIN912 M8x20	
86	1	Lower steering link left	
87	2	Tube plug 40x40	990090
88	1	Double link	990647
89	1	Steering brace 80	990545
90	2	MC6SPB 12.9 OBEH ISO 7379 12x40-M10	
91	1	Chassis rear left	990017
92	3	Ball joint BL8D (M8x1,25 left)	
93	3	VM6M 8 FZB DIN 934 M8x1,25 left	
94	3	Ball joint BL8D (M8x1,25 right)	
95	8	M6MF 8 FZB DIN 6926 M8x1,25	
96	2	Tube plug 30x30	990013
97	1	Steering brace 185 (kit complete with ball joints)	990137
98	1	Steering brace 460 (kit complete with ball joints)	990129
	1	Steering brace 460 (without ball joints)	990115
99	1	Left front fork	990014
100	8	MC6S 8.8 FZB DIN912 M8x22	
101	6	MC6S 8.8 FZB DIN912 M8x25	
102	2	Caliper holder left	
103	4	ML6M A4 DIN 439-B M8x1,25	
104	1	Chassis rear right	990093
105	1	Caliper holder right	
106	1	Right front fork	990091
107	4	M6SH 8.8 FZB DIN 933 M14x40	
108	2	ZOOM MP5 motor Left (differ between countries)	See table 6.4.3
	1	Controller card (differ between countries)	See table 6.4.3
	1	Ball bearing large 6917-2RS (outside)	990039
	1	Ball bearing small 6302-2RS (inside)	990321
109	1	Chassis	
110	1	Rear seat plate left	
111	1	Rear seat plate right	
112	2	GN351-30-40-m8-ee-55	
113	2	M6SH 8.8 FZB DIN933 M8 x 50	

Table 6.4.1 Spare parts list for ZOOM without and without swivel seat.

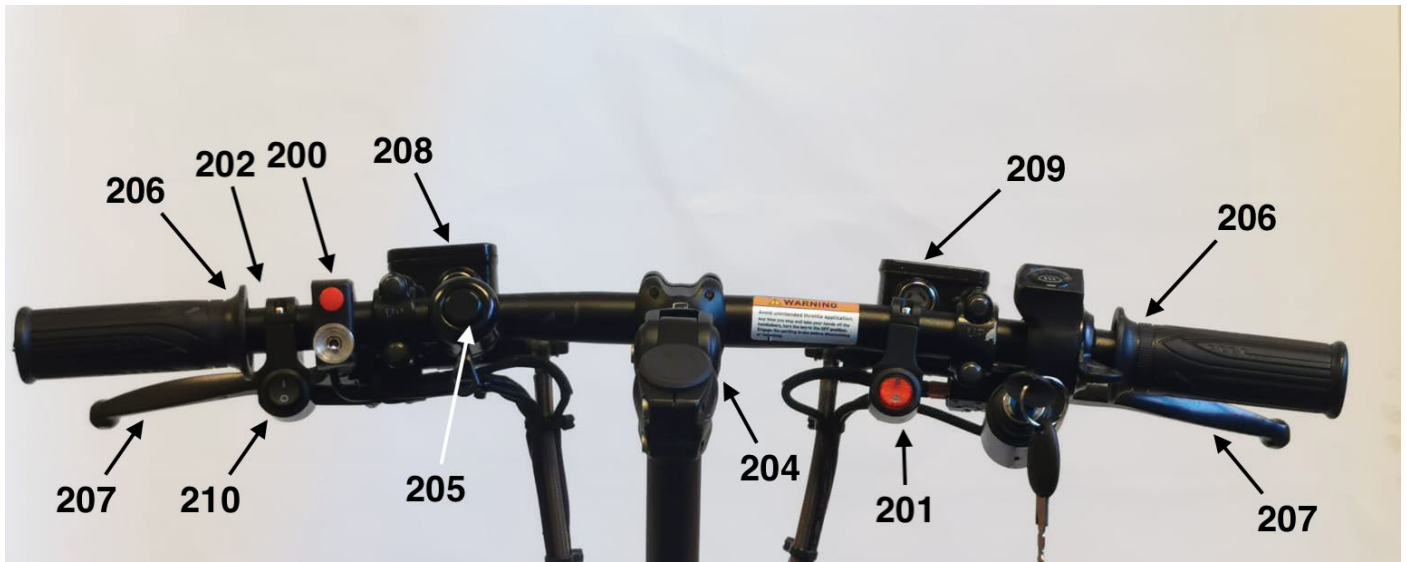


Figure 6.4.3 Detail over ZOOM handle bar parts and controls.

Position	Qty.	Description (handlebar parts and controls)	Spare part No.
200	1	Cruise control / Speed selector MP3, MP5	990005
201	1	F/R key MP5	990073
202	1	Left thumb throttle (not shown in photo)	990172
	1	Left twist throttle (not shown in photo)	990160
203	1	Right thumb throttle, yellow LED indicator	990543
	1	Right twist throttle, yellow LED indicator (not shown in photo)	990501
204	1	Adjustable stem 90-110 mm	990043
205	1	Bike bell	990045
206	1	Left or right hand side grip (used together with thumb throttle)	990095
207	1	Adjustable braking lever v 1.5 (pair, option)	990025
208	1	Brake lever cylinder M10 left v 1.5	990117
	1	Brake lever left v 1.5 (standard)	990027
	1	Microswitch brake lever left v 1.5	990121
	1	Parking brake locking left v 1.5	990122
209	1	Brake lever cylinder M10 right v 1.5	990026
	1	Brake lever right v 1.5 (standard)	990118
	1	Microswitch brake lever right v 1.5	990034
	1	Parking brake locking right v 1.5	990035
210	1	1/0 switch for light kit	990343

Table 6.4.2 Spare parts list for ZOOM handle bar and controls.

Note: If you are in need of any ZOOM part that are not listed as a spare part, please contact Zoomability or our representatives.

Description (Spare parts not listed in previous tables)	Spare part No.
Brake system	
Complete brake system filled and ventilated, single hand right v 1.5	990128
Complete brake system filled and ventilated, single hand right v 1.5	990128
Complete brake system filled and ventilated, standard v 1.5	990119
Brake tube, 820 mm v 1.5	990502
Brake tube, 700 mm v 1.5	990503
Brake tube, 1300 mm v 1.5	990504
Electrical parts	
Battery charger, HP 48V3A, EU cable	990002
Battery charger, HP 48V3A, US cable	990071
Cable harness, 3.5 MP5, complete	990004
Light kit 2.0 cable harness with lamps and switch	990041
Battery cable connector	990074
Battery chassis connector	990042
Main switch MP2	990008
Controller cards (See note 1 below)	
Programming cable for MP5 Motors and Controller cards	990421
Controller card MP5, 20 kph/12 mph	990096
Controller card MP5, 15 kph/9 mph	990047
Controller card MP5, 12 kph/7.5 mph	990048
Controller card MP5, custom speed	990049
Motors (See note 1 and 2 below)	
Motor MP5 wheel right, 20 kph/12 mph	990159
Motor MP5 wheel left, 20 kph/12 mph	990189
Motor MP5 wheel right, 15 kph/9 mph	990229
Motor MP5 wheel left, 15 kph/9 mph	990050
Motor MP5 wheel right, 12 kph/7.5 mph	990269
Motor MP5 wheel left, 12 kph/7.5 mph	990289
Motor MP5 wheel right, custom speed	990319
Motor MP5 wheel left, custom speed	990051
Motor MP5 wheel right, 20 kph/12 mph, with tire and inner tube	990052
Motor MP5 wheel left, 20 kph/12 mph, with tire and inner tube	990053
Motor MP5 wheel right, 15 kph/9 mph, with tire and inner tube	990054
Motor MP5 wheel left, 15 kph/9 mph, with tire and inner tube	990055
Motor MP5 wheel right, 12 kph/7.5 mph, with tire and inner tube	990056
Motor MP5 wheel left, 12 kph/7.5 mph, with tire and inner tube	990057
Motor MP5 wheel right, custom speed, with tire and inner tube	990058
Motor MP5 wheel left, custom speed, with tire and inner tube	990059
<p>Note 1: Maximum allowed speed differ between countries, make certain you order the correct version.</p> <p>Note 2: The direction of rotation for ZOOM MP5 motors differ between left and right side, make certain you order the correct version.</p>	

Table 6.4.3 Spare parts list for ZOOM not shown in Figures 6.4.1, 6.4.2 or 6.4.3.

6.4.2 Changing the wheel

1. Turn off the ZOOM by the key switch, then disconnect the batteries.
2. Cut off the cable ties holding the motor cable along the fork carefully. Figure 6.4.4 shows some of the cable ties, but follow the cable and cut off any that you find.



Figure 6.4.4 Location of cable ties for motor cable.

3. Hold the connector of the motor cables, not the cable, where they connect to the ZOOM main harness and pull them straight apart from each other. Figure 6.4.5 below show the connectors' location on MP5 ZOOM's.



Figure 6.4.5 Location of the motor connector.

4. Lightly loosen the nuts to the motors while the ZOOM is still on the ground. Then lift the ZOOM, so the wheels are free from the ground and completely remove the nuts. Remove the wheel from the ZOOM.
5. Now, reattach the new wheel to the ZOOM. Make sure that the cable comes out above the wheel axle. Do not forget the washers and tighten the wheel nuts to 66 lb-ft/90 Nm. If the

nuts are hard to tighten to the given torque while off the ground, tighten as well as possible, and then tighten further to the required torque when the ZOOM is back on the ground.) Ensure that the cable is routed free from the screws of the brake disc as in the picture. The cable routing is, among others, dependent on the placement of the cable ties. Try to route the cable so that it is as protected as possible when the ZOOM is driven into stones, twigs etc.



Figure 6.4.6 Correct routing of motor cable.

6. When you reconnect the motor to the ZOOM main harness, make sure that the connecting pin in the male connector is right across the ones in the female connector before pushing them together. The connectors have arrows indicating the right direction to connect them.
7. While the ZOOM is still off the ground, reconnect the batteries and turn on the power by the key switch to make sure that all wheels move as they should. Both forward/backwards and that they stop when either of the brake handles is pulled in slightly. Also, test the cruise control.

6.4.3 Repairing a flat tire

The tires mounted on the ZOOM are designed to provide good all-around performance. Worn-down tires should be replaced for optimal grip. The tires have inner tubes that must be replaced or repaired in the event of a puncture.

Recommended tire pressure: 22-29 psi/150-200 kPa/1.5-2.0 bar.

1. The entire wheel must be removed to repair a flat tire. Only perform a repair on your own if you are experienced in similar tasks; otherwise, seek help from a motorcycle or bicycle repair shop.
2. Ensure the ZOOM key switch is turned off and that the batteries are disconnected.
3. Remove the wheel according to the instructions in section - 6.4.2 “Changing the wheel” steps 2 to 4.
4. Empty any remaining air in the tire. Pry off the tire from the air valve side by using motorcycle-size tire spoons.

Note: If necessary, it is recommended to use a tire slip paste to make the process easier.

5. Pull out the inner tube and repair the leak using an inner tube patch kit or replace it with a new tube. If you replace the tube with a new one, you must remove the existing washer and nut from the new tube’s valve.
6. Install the repaired/new inner tube inside the tire and pry back the tire on the rim. Be careful not to damage the inner tube in the process. It is recommended to use a tire slip paste to make the process easier and reduce the risk of damaging the new inner tube.
 - a. It is recommended to fill the inner tube slightly before installing, to reduce the risk of damage.
7. Reinstall the wheel according to the instructions in the following section - “Changing the wheel” steps 5 to 7.



Figure 6.4.7 Removing the brake disk.

5. Unscrew the screws holding the black cap and remove it. See figure 6.4.8.



Figure 6.4.8 Location of screws holding the black wheel cover.

6.4.4 Changing the bearing in ZOOM MP5 motors

WARNING! The magnets inside the motors are very strong, be careful not to get hurt if a tool suddenly gets pulled towards them when working on the motors.

1. Turn off the ZOOM by the key switch, then disconnect the batteries.
2. Remove the wheel according to the instructions in section - 6.4.2 “Changing the wheel” steps 2 to 4.
3. Steps 6 to 11 below concern bearing change on the outside of the wheel. Steps 2 to 15 concerns the bearing on the inside of the wheel.

Change the bearing on the outside of the wheel:

4. Remove the nut and the washer from the wheel axle. Loosen and remove the screws holding the brake disk and remove the disc as shown in figure 6.4.7.

6. Remove the nine Allen screws holding the rim cap and pull off the rim cap. Since there is a seal mounted between the rim and the cap, it might be a bit tight to remove. If so, use two knives, thin wide screwdrivers or similar on opposite sides of the rim cap to pry it off. See figure 6.4.9, notice the location of one of the nine allen screws at the tip of the knife.



Figure 6.4.9 Prying off the rim cap.

7. Most commonly, the bearing will now be attached on the side of the rim.
8. Drill 4 x 4 mm holes in the rim as shown in the figure 6.4.10, then while using a small pin and hammer, tap through the holes exchanging in a circular direction at the bearing until it falls out.

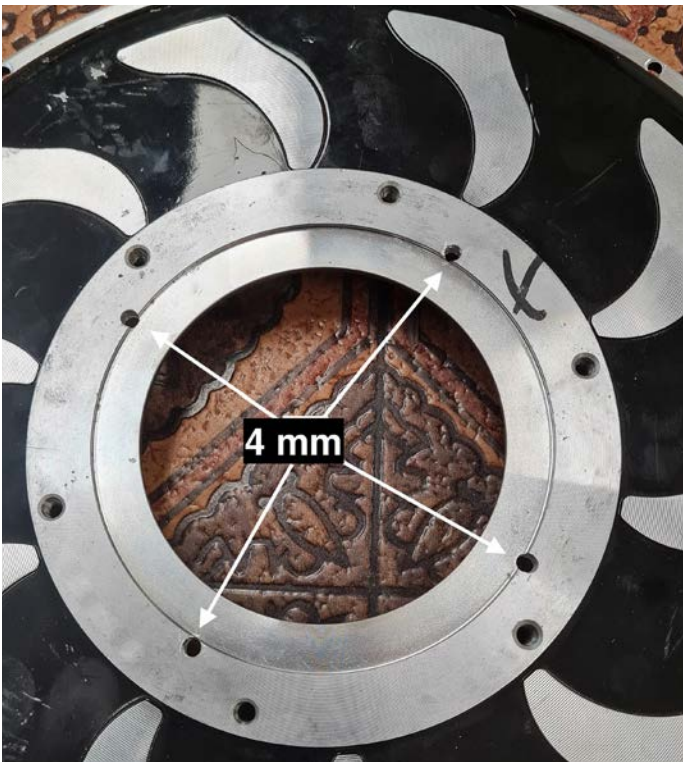


Figure 6.4.10 Drill 4 mm holes to tap out the bearing.

9. Replace the new bearing on the rim side and follow the steps backwards to reassemble. If the valve of the inner tube is located on this side, make sure that the opening matches the valve opening in the rim. Add a thin layer of sealant (Casco AquaTät 3873/LocTite 5926) around the edge of the rim before the screws are tightened.

Change the bearing on the inside of the motor:

10. Remove the nuts and washers from the wheel axle and, if necessary, polish the axle smooth. Rust and unevenness might make it difficult to remove the bearing from the axle.
11. Remove the nine Allen screws holding the rim cap and pull off the rim cap. Since there is a seal mounted between the rim and the cap, it might be a bit tight to remove. If so, use two knives, thin wide screwdrivers or similar on opposite sides of the rim cap to pry it off. See figure 6.4.8, notice the location of one of the nine allen screws at the tip of the knife.
12. The bearing is now probably stuck on the axle as below or on the rim side. If stuck on the axle, it is probably rust or similar on the axle that keeps it stuck, and it's then necessary to remove some of the material with a sanding paper. If the bearing is stuck in the rim side, it can carefully be tapped by a screwdriver or similar to get loose.
13. Replace the new bearing on the rim side and follow the steps backwards to reassemble. If the valve of the inner tube is located on this side, make sure that the opening matches the valve opening in the rim. Add a thin layer of sealant (Casco AquaTät 3873/LocTite 5926) around the edge of the rim before the screws are tightened.
14. Reinstall the wheel according to the instructions in section 6.4.3 "Changing the wheel" steps 5 to 7.
15. While the ZOOM is still off the ground, reconnect the batteries and turn on the power by the key switch to make sure that all wheels move as they should. Both forward/backwards and that they stop when either of the brake handles is pulled in slightly. Also, test the cruise control.

6.4.5 Changing the brake disk

1. Turn off the ZOOM by the key switch, then disconnect the batteries.
2. Remove the wheel according to the instructions in section - 6.4.2 "Changing the wheel" steps 2 to 4.
3. Loosen and remove the screws holding the brake disk and remove the disc as in figure 6.4.11. Exchange the old brake disc for the new one, add some drops of LocTite 243 to the threads of the screws and tighten the screws properly.



Figure 6.4.11 Removing the brake disk.

- Now, reattach the wheel to the ZOOM. Make sure that the cable comes out above the wheel axle. Do not forget the washers and tighten the wheel nuts to 66 lb-ft/90 Nm. (If the nuts are hard to tighten to the given torque while off the ground, tighten as well as possible, and then tighten further to the required torque when the ZOOM is back on the ground.) Ensure that the cable is routed free from the screws of the brake disc as in figure 6.4.12. The cable routing is, among others, dependent on the placement of the cable ties. Try to route the cable so that it is as protected as possible when the ZOOM is driven into stones, twigs etc



Figure 6.4.12 Correct routing of motor cable.

- When you reconnect the motor to the ZOOM main harness, make sure that the connecting pins in the male connector are right across the ones in the female connector before pushing them together. The connectors have arrows indicating

the right direction to connect them.

- While the ZOOM is still off the ground, reconnect the batteries and turn on the power by the key switch to make sure that all wheels move as they should. Both forward/backwards and that they stop when either of the brake handles is pulled in slightly. Also, test the cruise control.

6.4.6 Changing brake pads

The procedure for changing brake pads is the same for all wheels.

- Switch off the main power to the ZOOM with the key switch and disconnect the batteries.
- Cut away the two cable ties that are holding the brake hose to the fork.
- Loosen and remove the two M8 Allen bolts holding the brake calliper. See figure 6.4.13.



Figure 6.4.13 Brake calliper fastening bolts.

- Pull the brake calliper straight up, away from the brake disc, until it is free.
- Press the brake pads apart. The brake pads should now be loose to pull straight out of the calliper.
- Repeat the moment backwards and insert the new brake pads. Note that if the brake pads of the new calliper have closed, use a tool to press them open, but be careful not to damage the brake pads surface or the brake cylinder.
- Reinsert the calliper in place and tighten the two Allen bolts to 24 Nm (17.7 ft-lb) after adding some Loctite 242 Medium on the threads.
- Lightly pump with the brake levers a couple of times to get the brake pads in position on the disc.
- Secure the brake hose to the fork again with cable ties, in the same position as before.

10. Reconnect the batteries and switch on the key switch for a slow test drive to ensure the brake is working properly.

6.4.7 Changing brake callipers

The procedure for changing brake callipers is the same for all wheels.

Note: Brake fluid is a very corrosive substance. Even if you are careful while working, you may spill some brake fluid onto your frame or surrounding area. Make sure that you wipe it off immediately with water as it can corrode metal and other unprotected surfaces or discolour the paint.

1. Switch off the main power to the ZOOM with the key switch and disconnect the batteries.
2. Unscrew the bolt connecting the brake hose to the calliper and keep it in an elevated position to minimise spillage of brake fluid. Keep a jar below it to collect any accidental spillage.
3. Loosen and remove the two M8 Allen bolts holding the brake calliper. See figure 6.4.13.
4. Pull the brake calliper straight up, away from the brake disc, until it is free.
5. Insert the new calliper in place and tighten the two Allen bolts to 24 Nm (17.7 ft-lb) after adding some Loctite 243 Medium on the threads. Note that the brake pads of the new calliper might be closed. If that is the case, use a tool to press them open, but be careful not to damage the brake pads surface or the brake cylinder.
6. Reconnect the brake hose to the new brake calliper.

Note: The two copper washers positioned on either side of the brake hose where it is attached to the lever should be replaced, or the connection might leak. See figure 6.4.14.

7. Bleed the brake system by following the instructions in chapter 6.4.10.
8. Reconnect the batteries and switch on the key switch to take a slow test drive to make sure the brake is functioning properly.

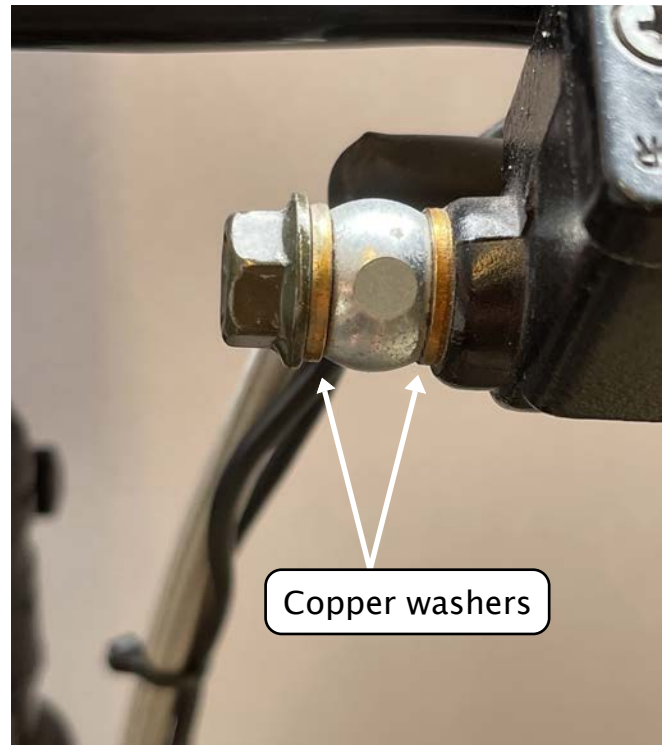


Figure 6.4.14 Brake calliper fastening bolts.

6.4.8 Changing brake handle

The procedure for changing brake handles is the same for both left and right handles.

Note: Brake fluid is a very corrosive substance. Even if you are careful while working, you may spill some brake fluid onto your frame or surrounding area. Make sure that you wipe it off with water immediately as it can eat through metal and other unprotected surfaces or discolour the paint.

1. Switch off the main power to the ZOOM with the key switch and disconnect the batteries.
2. Disconnect the brake signal cables from the microswitch located at the underside of the brake handle.
3. Unscrew the bolt connecting the brake hose to the lever and keep it in an elevated position to minimise spillage of brake fluid. Keep a jar below it to collect any accidental spillage.
4. Loosen the two Allen screws on the back of the handle, clamping the brake lever to the handlebar.
5. Turn the brake handle, so any remaining brake fluid inside it is emptied into the jar. The brake lever can now be removed.
6. Attach the new brake lever in the same position as the old one and reconnect the brake hose to the new lever.

Note: The two copper washers positioned on either side of the brake hose where it is attached to the lever should be replaced, or the connection might leak. See figure 6.4.14.

7. Reattach the two brake signal wires to the microswitch. Note that the positioning of the wires has no impact on the function.
8. Bleed the brake system by following the instructions in chapter 6.4.10.
9. Reconnect the batteries and switch on the ZOOM by the key switch so that the new microswitch on the brake lever is working by taking a slow test drive.

6.4.9 Changing brake hose

The procedure for changing the brake hoses is the same for all hoses.

Note: Brake fluid is a very corrosive substance. Even if you are careful while working, you may spill some brake fluid onto your frame or surrounding area. Make sure that you wipe it off immediately with water as it can eat through metal and other unprotected surfaces or discolour the paint.

It is important to note that the rear brakes are one unit, controlled by the left brake lever, while the front brakes form a system together with the right brake lever. In a few cases, the ZOOM has been delivered with front and rear brakes controlled by one single (left or right) brake lever.

1. Switch off the main power to the ZOOM with the key switch and disconnect the batteries.
2. Remove the driver's seat according to instructions in section 6.4.14.
3. Cut away any cable ties holding the brake hose in place, remembering their location.
4. Unscrew the valve connecting the brake hose to the brake calliper or brake lever and place the end in a jar to minimise spillage of brake fluid.
5. Next, use a fixed wrench to loosen the hose from the T-junction – again, take care of eventual spillage.
6. Screw back the new brake hose in the T-junction, then reconnect the brake hose to the calliper.

Note: The two copper washers positioned on either side of the brake hose where it is attached to the calliper or brake lever should be replaced, or the connection might leak. See figure 6.4.14.

7. Repeat the process for each brake hose to be exchanged.
8. Again, secure the hoses with new cable ties to the frame.
9. Bleed the brake system by following the instructions in chapter 6.4.10.
10. Reassemble the driver's seat.
11. Reconnect the batteries, turn on the key switch and take a slow test drive to ensure the brakes are working properly.

6.4.10 Bleeding the brake system

If air enters the ZOOM's hydraulic system, the brake will feel soft or spongy, greatly reducing braking pressure. When this happens, the system must be bled to remove the air. Air can enter the system if there is a leak in the hydraulic system, a component has been replaced, or the brake fluid has been replaced.

Note: Brake fluid is a very corrosive substance. Even if you are careful while working, you may spill some brake fluid onto your frame or surrounding area. Make sure that you wipe it off immediately as it can eat through metal and other unprotected surfaces or discolour the paint.

Bleeding the brake manually (alternate method)

When bleeding the brake manually, a clean jar, a suitable length of clear hose, two 60 ml syringes and an open-ended spanner will be required.

Note: Before bleeding the brake, check that all brake hoses and lines are tight and not leaking.

1. Flip off the dust cap from the brake bleeder valve on the left calliper.
2. First, fit the spanner on the bleed valve. Connect a length of clear tubing to the bleeder valve on the calliper. Then connect the tubing to a 60 ml syringe filled with DOT4 brake fluid.
3. Clean the top of the master cylinder on the brake handle of all dirt and foreign matter.
4. Remove the screws securing the master cylinder top cover and remove the cover and rubber diaphragm.
5. Use the second syringe to suck out the brake fluid from the master cylinder.

Note: Be careful not to remove so much brake fluid that the cylinder gets empty and air bubbles are introduced in the system.

6. Loosen the bleed valve on the calliper, ca ½ turn.

WARNING: Do not intermix brake fluid. DOT4 brake fluid was originally installed at the time of manufacture. Do not install DOT3 or DOT5 brake fluid as it can lead to brake system failure.

7. Slowly press the brake fluid from the syringe into the calliper while keeping an eye on the fluid level and the bubbles coming out in the master reservoir.
8. When there are no more bubbles coming out in the master cylinder, the bleeding process is finished. The total volume to exchange is ca. 40 ml.

Note: During this procedure, it is important to check the fluid level in the master reservoir often. If the reservoir fills up, you will need to suck out the fluid again to avoid spillage. Be careful not to remove so much brake fluid that the cylinder gets empty and air bubbles are introduced in the system.

9. Tighten the valve on the calliper and remove the hose.
10. Repeat steps 1 to 9 above, but this time with the right calliper.

Note: Do not reuse the brake fluid that was forced into the jar. It could be contaminated or dirty.

11. If necessary, add fluid to correct the level in the master cylinder reservoir. When topping up the front master cylinder, turn the handlebar until it's level with the reservoir gasket surface. The mas-

ter cylinder should be filled until the level visible in the small window is 50%. See figure 6.4.15.

12. Install the top cover and diaphragm of the master cylinder and tighten the screws securely.
13. Test the feel of the brake lever. It should be firm and should offer the same resistance each time it is operated. If it feels spongy, it is likely that there is still air in the system, and it must be bled again. When the air has been bled from the system, and the fluid level is correct in the reservoir, double-check for leaks and tighten all fittings and connections.

WARNING: Before riding the ZOOM, make certain that the brake is operating correctly by operating the lever several times.

14. Test ride the ZOOM at a slow speed at first to make sure that the brakes are operating properly.

Bleeding the brake manually (traditional method)

This is the traditional method of bleeding a brake system which might be somewhat complicated with the ZOOM's one lever – two brakes system.

Note: Before bleeding the brake, check that all brake hoses and lines are tight and not leaking.

1. Flip off the dust cap from the brake bleeder valve.
2. Connect a length of clear tubing with inner diameter ca 5mm to the bleeder valve on the calliper. Place the other end of the tube into a



Figure 6.4.15 Master cylinder at 50% level.



Figure 6.4.16 Clear tubing connected to the bleeder valve of the brake caliper.

clean container. Fill the container with enough fresh DOT4 brake fluid to keep the end submerged. The tube should be long enough so that a loop can be made higher than the bleeder valve to prevent air from being drawn into the calliper during bleeding. See figure 6.4.16.

Clean the top of the master cylinder on the brake handle of all dirt and foreign matter.

3. Remove the screws securing the master cylinder top cover and remove the cover and rubber diaphragm.
4. Fill the reservoir almost to the top with DOT4 brake fluid and reinstall the diaphragm, and cover (without screws). Leave the cover in place during this procedure to prevent any entry of dirt.

WARNING: Do not intermix brake fluid. DOT4 brake fluid was originally installed at the time of manufacture. Do not install DOT3 or DOT5 brake fluid as it can lead to brake system failure.

Note: During this procedure, it is important to check the fluid level in the master reservoir often. If the reservoir runs dry, you will introduce more air into the system, which will require starting over.

5. Slowly apply the brake lever several times. Hold the lever in the applied position and open the bleeder valve about $\frac{1}{2}$ turn. Allow the lever to travel to its limit. When this limit is reached, tighten the bleeder screw. As the brake fluid enters the system, the level will drop in the master cylinder reservoir. Maintain the level of brake fluid by looking through the window on the brake fluid container to prevent air from being drawn into the system.
6. Continue to pump the lever and fill the reservoir until the fluid emerging from the hose is clean.

Repeat steps 5 and 6 above until there are no longer any air bubbles visible in the hose and the brake lever feels firm when pressed.

Note: If bleeding is difficult, it might be necessary to allow the fluid to stabilize for a few hours. Repeat the bleeding procedure when the tiny bubbles in the system settle out.

Hold the lever in the applied position and tighten the bleeder valve. Remove the bleeder tube and install the bleeder valve dust cap.

Note: Do not reuse the brake fluid that was forced into the jar. It could be contaminated or dirty.

7. If necessary, add fluid to correct the level in the master cylinder reservoir. When topping up the front master cylinder, turn the handlebar until it's level with the reservoir gasket surface. The master cylinder should be filled until the level visible in the small window is 50%. See figure 6.4.15.
8. Install the cap and diaphragm and tighten the screws securely.
9. Test the feel of the brake lever. It should be firm and should offer the same resistance each time it is operated. If it feels spongy, it is likely that there is still air in the system, and it must be bled again. When the air has been bled from the system, and the fluid level is correct in the reservoir, double-check for leaks and tighten all fittings and connections.

WARNING: Before riding the ZOOM, make certain that the brake is operating correctly by operating the lever several times.

10. Test ride the ZOOM at a slow speed at first to make sure that the brakes are operating properly.

Bleeding the brake with a brake bleeder

This procedure uses a commercial brake bleeder that is available from motorcycle or automotive supply stores.

Note: Before bleeding the brake, check that all brake hoses and lines are tight.

1. Flip off the dust cap from the brake bleeder valve.
2. Connect the brake bleeder to the bleed valve on the calliper assembly. See picture.
3. Clean the lid of the master cylinder on the brake handle of all dirt and foreign matter.
4. Remove the screws securing the master cylinder top cover and remove the cover and rubber diaphragm.
5. Fill the reservoir almost to the top with DOT4 brake fluid and reinstall the diaphragm, and cover. Leave the cover in place during this procedure to prevent any entry of dirt.

WARNING: Do not intermix brake fluid. DOT4 brake fluid was originally installed at the time of manufacture. Do not install DOT3 or DOT5 brake fluid as it can lead to brake system failure.

- Pump the pump handle 10-15 times to create a vacuum, and then open the bleed valve until brake fluid begins to enter the jar. Allow approximately 1 in./25 mm to enter the jar, and then close the bleed valve. As the fluid enters the system and exits the jar, the level will drop in the reservoir. Maintain the level to just about the top of the reservoir to prevent air from being drawn into the system.

Note: Do not allow the master cylinder reservoir to empty during the bleeding operation, or more air will enter the system. If this occurs, the entire process must be repeated.

Note: If air is entering the brake bleeder hose from around the bleed valve, apply several layers of Teflon tape to the bleed valve. This should make a good seal between the bleed valve and the brake bleeder hose. Teflon tape can be purchased at hardware and plumbing supply stores.

- If the fluid emerging from the hose into the jar is completely free of bubbles, the system should be properly bled. If there are signs of bubbles being withdrawn with the brake fluid, the air is still trapped in the line. Repeat step 6, making sure to refill the master cylinder to prevent air from being drawn into the system.
- When the brake fluid is free of bubbles, tighten the bleed valve and remove the brake bleeder assembly. Reinstall the bleed valve dust cap.

Note: Do not reuse the brake fluid that was forced into the jar. It could be contaminated or dirty.

- If necessary, add fluid to correct the level in the master cylinder reservoir. When topping up the front master cylinder, turn the handlebar until it's level with the reservoir gasket surface. The master cylinder should be filled until the level visible in the small window is 50%. See figure 6.4.14.
- Install the cap and diaphragm and tighten the screws securely.
- Test the feel of the brake lever. It should be firm and should offer the same resistance each time it is operated. If it feels spongy, it is likely that there is still air in the system, and it must be bled again. When the air has been bled from the system, and the fluid level is correct in the reservoir, double-check for leaks and tighten all fittings and connections.

WARNING: Before riding the ZOOM, make certain that the brake is operating correctly by operating the lever several times.

- Test ride the ZOOM at a slow speed at first to make sure that the brakes are operating properly.

6.4.11 Adjusting the play in the steering column bearings

- If the steering starts to show some play in the bearings, this can be adjusted as follows. Most commonly, it can be noticed by the bottom bearing. See the figure 6.4.16.

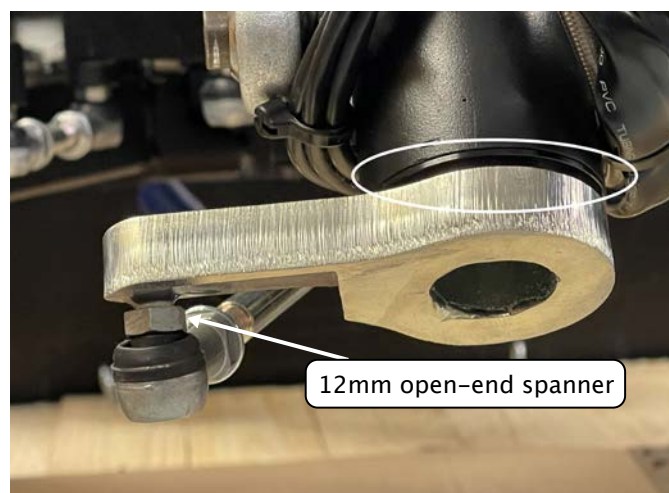


Figure 6.4.16 Bottom bearing play.

- It is easy to discover the play by holding some fingers against the place where the black steering housing and the blank lever (red ring on the picture above) and simultaneously turning the handlebar a bit.
- To correct this, fold up the handlebar so that the steering column is vertical. Then lift the lower lever by raising it with, for example, a (hydraulic) jack that is then raised so that one of the front wheels just leaves the ground.
- This way, the inner column in the steering column is pushed upwards, and the play is reduced. After that, loosen the locking lever for the handlebar height adjustment and press the handlebar down as far as possible. Then loosen the 5 mm Allen screw right below the lever, enough so that the clamp holding the handlebar in place is loosened. (Keep the handlebar in place so it is not twisted to the left or right.)
- Use a rubber mallet to carefully tap the steering downwards. The upper bearing will then move down and tighten up the play.
- When this is done, re-tighten the 5 mm Allen

screw below the lever, but not so hard that the threads in the aluminium clamp get damaged. (max. 7 Nm/5.2 lb-ft).

7. Rise the handlebar to your preferred driving position again and tighten the locking lever on the speed lift. Let the ZOOM down and make sure that the play now is gone.



Figure 6.4.17 Steering column adjustment points.

8. Also, control that the balls of the link arm to the steering brace with links, which leads in under the ZOOM to the steering's link arm system, are properly tightened. If not, tighten it hard with a 12 mm fixed wrench.
9. Also, make sure that the remaining links marked with rings in figure 6.4.18, as well as the locking nuts (dotted rings) to the link arms, are secure and tight.
10. If the handlebar has ended up off-centre, adjust it by loosening the two top screws on the stem, turning it into place and then tightening the screws again.

6.4.12 Exchanging the steering braces and double link

The ZOOM's steering system consists of four different steering braces with rod ends:

- Double link, pos. 88
- Steering brace 80 mm, pos. 89
- Steering brace 180 mm, pos. 97
- Steering brace 460 mm, pos. 98



Figure 6.4.18 Location of ZOOM steering link nuts.

Changing the double link, pos. 88

1. Unscrew the double link with a 12 mm open-end spanner.
2. Add a few drops LocTite 243 Medium on the two threads on the new double link, assemble the link and tighten hard with the spanner.
3. After assembly, turn the handlebar and make sure the steering works properly.

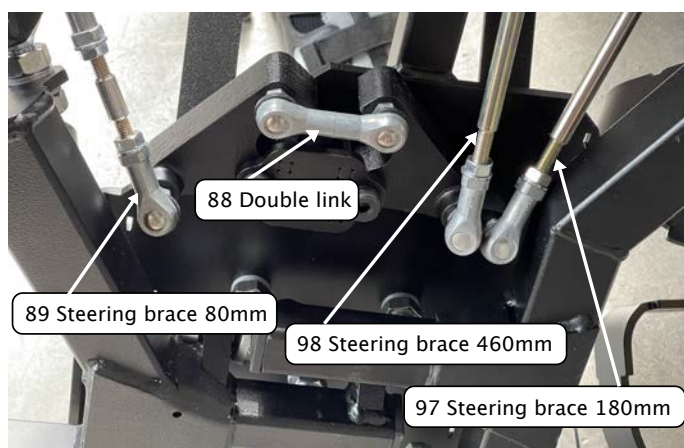


Figure 6.4.19 Location of ZOOM steering link system parts.

Changing the steering brace 80 mm, pos. 89

1. Unscrew the steering brace with a 12 mm open-end spanner.
2. Add a few drops LocTite 243 Medium on the two threads on the new steering brace, assemble the link and tighten hard with the spanner.

Note: The threads of the ball joints marked with an “L” are left-handed, and must be mounted directed towards the centre of the chassis, according to figure 6.4.19.

3. Now check the steering. Place a level with the flat side against the left brake discs (front and back), and make sure that the wheels are aligned.
4. Without moving the steering, now place the level against the right rear brake disc. If the lever shows that the wheels are not aligned straight, adjust the alignment by loosening the locking nuts on the steering brace you just replaced and turning the rod until the wheels are aligned.
5. Tighten the locking nuts hard.
6. If the handlebar is not centered, adjust it by loosening the two top screws on the stem, turning it into place and then tightening the screws again.
7. After assembly, turn the handlebar and make sure the steering works properly.

Changing the steering brace 185 mm, pos. 97

1. Unscrew the steering brace with a 12 mm open-end spanner.
2. Add a few drops LocTite 243 Medium on the two threads on the new steering brace, assemble the link and tighten hard with the spanner.

Note: The threads of the ball joints marked with an “L” are left-handed, and must be mounted directed towards the centre of the chassis, according to figure 6.4.19.

3. Now check the steering. Place a level with the flat side against the right brake discs (front and back), and make sure that the wheels are aligned.
4. Without moving the steering, now place the level against the left rear brake disc. If the lever shows that the wheels are not aligned straight, adjust the alignment by loosening the locking nuts on the steering brace you just replaced and turning the rod until the wheels are aligned.
5. Tighten the locking nuts hard.
6. If the handlebar is not centered, adjust it by loosening the two top screws on the stem, turning it into place and then tightening the screws again.
7. After assembly, turn the handlebar and make sure the steering works properly.

Changing the steering brace 460 mm, pos. 98

1. Unscrew the steering brace with a 12 mm open-end spanner.
2. Add a few drops LocTite 243 Medium on the two threads on the new steering brace, assemble the link and tighten hard with the spanner.

Note: The threads of the ball joints marked with an “L” are left-handed, and must be mounted directed towards the centre of the chassis, according to figure 6.4.19.

3. If the handlebar is not centered, adjust it by loosening the two top screws on the stem, turning it into place and then tightening the screws again.
4. After assembly, turn the handlebar and make sure the steering works properly.

Changing the steering brace 460 mm, without links, pos. 98

1. Unscrew the steering brace with a 12 mm open-end spanner.
2. Measure and take note of the steering brace.
3. Loosen the locking nuts for the ball joints and disassemble the steering brace.
4. Attach the ball joints to the new steering rod.
5. Adjust the new steering rod so that its length matches the length of the old steering brace.
6. Make sure the joints are parallel and tighten the locking nuts.
7. Add a few drops LocTite 243 Medium on the threads on the joints, assemble the link and tighten hard with the spanner.

Note: The threads of the ball joints marked with an “L” are left-handed, and must be mounted directed towards the centre of the chassis, according to figure 6.4.19.

8. If the handlebar has ended up off-centre, adjust it by loosening the two top screws on the stem, turning it into place and then tightening the screws again.
9. After assembly, turn the handlebar and make sure the steering works properly.

6.4.13 Adjusting the steering

1. Place a level with the flat side against the right brake discs (front and back), and make sure that the wheels are aligned.
2. Without moving the steering, now place the level against the left rear brake disc. If the lever shows that the wheels are not aligned straight, adjust the alignment by loosening the locking nuts on the 185 mm steering brace and turning the rod until the wheels are aligned.
3. Tighten the locking nuts hard. If the handlebar has ended up off-centre, adjust it by loosening the two top screws on the stem, turning it into place and then tightening the screws again.

6.4.14 Changing the driver's seat

Note that there are two types of seats for the ZOOM, one regular, fixed model and one swivel seat, which can be turned ca 90 degrees to the left and to the right to enable easy entry of the ZOOM. The procedure for changing the seat is the same for both types.

1. To remove the old seat, loosen all four screws on the seat, their location is marked in figure 6.4.20.



Figure 6.4.20 Location of the driver's seat fastening screws.

2. Remove the old seat, and put the new seat in place, fastening again with the nuts, washers and rubber distances. Secure with LocTite 243 Medium and tighten.

Note: The front dampers of the fixed seat are higher than the dampers for the swivel seat and should not be interchanged.

6.4.15 Mudguard installation / securing

1. Pull the cable ties through the slots in the mudguards as in the picture above. The holes are spaced to match the fastening points in the forks.
2. Cut away the two old upper (see picture 6.4.22) cable ties on each fork without damaging the cables
3. Clean the forks where the mudguard will be attached so that the mudguard can be securely fastened.



Figure 6.4.21 Installed rear mudguard.

4. While keeping the cable ties down so they can pass under the fork, push the mudguards into place. The front mudguard should be inserted with the rounded side towards the rear. The cable ties position will then correspond to the fastenings in the fork.



Figure 6.4.22 Detail of mudguard zip ties.

5. Adjust the mudguards so that the fork fits in between the fastenings.
6. Lightly tighten the cable ties while making sure that cables and connectors are well secured. When you are satisfied that the positioning is correct, tighten the cable ties securely and ensure that the mudguards do not move and rattle when you drive.
7. Last, cut off the loose ends of the cable ties (but leave ca 5 mm free)

This page has intentionally been left blank for user's notes.



[zoom]ability

Local Zoom Representative:

Part nr: 710012 Rev: 1.0 (2023-03-28)