Title: Repair Plan - 2.0	**Author:** T. Beckmann	**Copyright:** unu GmbH
Version: 1.0	**Language:** EN	**Created:** September 2019

Foreword

This repair manual describes work on the unu Scooter (Model 2019).
The vehicle identification numbers (VIN) of the unu Scooter (Model 2019) begin with "WUNU2S".
The VIN can be found on the frame nameplate which is riveted to the frame on the right side of the frame at the point where it connects to the rear swingarm.
At the time of release of this user manual, the included instructions are valid for every unit of the unu Scooter (Model 2019).
The unu Scooter (Model 2019) will hereafter be called "the scooter".

This manual is written for the use by trained mechanics. If you are not sure about your ability to safely perform the work-steps described in this repair guide, both in terms of safety during the repair as well as a safely reconstructed vehicle at the end of the repair, let a trained mechanic perform the work.
Whether you are a trained mechanic or not, carefully read the safety notes provided in chapter 0 of this repair guide before performing any work on the scooter.

Documentation of changes to this repair guide

This represents the first version (1.0) of the document titled "Repair Plan - 2.0". Should any relevant changes to the scooter itself, a specific repair instruction for one or more of its components, or the structure of this document be made, then these changes will be mentioned in this section.

Content (resumed on following page)

0. Safety notes

Before performing any work-steps on the unu Scooter (Model 2019), familiarize yourself with the following explanations and warnings.

0.1 Explanation of warning labels

The following labels will be used throughout the repair manual to warn you about potential risks caused either by mechanical or electrical sources or negligence in the proper execution of a crucial repair step. Please consider that even in the absence of any of the labels listed below, the proper execution of any repair is relevant to providing a safe environment for the execution of repairs and the driving experience after any repair.

Danger
A dangerous situation which, if not avoided, will undoubtedly result in serious injury or death.

Warning
A hazardous situation which, if not avoided, could result in death or serious injury.

Attention
A dangerous situation which, if not avoided, could result in minor to moderate injury.

Information
Label distinguishes information that does not concern personal injury, e.g. information on damage to property.

0.2 General safety warnings for repair personnel

Before working on the scooter and even when preparing any repair, make sure you understand the basic workshop rules for providing a safe environment for the execution of repairs. Such workshop rules may include wearing proper clothing to prevent the risks posed by sharp objects or heavy equipment or parts necessary for the execution of a repair.

The scooter operates at voltages below 60V and therefore does not fall under the classification of high voltage. However, some precautions need to be made when working on the scooter in order to prevent electrical shock or other types of injury.

- When working on any element usually covered by the body of the scooter, turn off the scooter, detach the battery from the scooter and then turn the scooter back on for at least two seconds to discharge any electricity stored in the electrical components.
- Wear safety gloves when performing any type of work on the scooter to prevent cuts as well as provide additional protection against electrical shock.
- Protect your eyes with proper safety goggles or glasses when performing steps such as drilling, hammering, and polishing.
- Wear a safety mask with an air filter when applying and type of spray, especially when working in an enclosed environment. Generally all types of work involving sprays should be performed in a well-ventilated environment.
- Wear a safety helmet also for short test drives as some unexpected behavior of the scooter after a repair can lead to a loss of control and result in a fall or crash.
- Carefully follow all of the instructions laid out in this repair guide to ensure the proper reassembly of all parts. Pay attention also to applying the proper torque to all screws and bolts, which have been worked on during the repair. A list of all relevant torque values can be found in the according chapter of this repair guide.
- Make sure to use only parts provided by unu to ensure proper quality and fit of the parts. We advise strongly against the use of inferior parts, even if they appear to be fitting with the scooter.

1. Part replacement

The following articles describe the work needed for the detachment of each part from the scooter a group of its parts. For reassembly execute the steps in reverse order, unless otherwise specified. The listed durations describe the time needed for dis- and reassembly combined. The durations do not include the time needed for the preparatory steps.

1.1 Fixtures

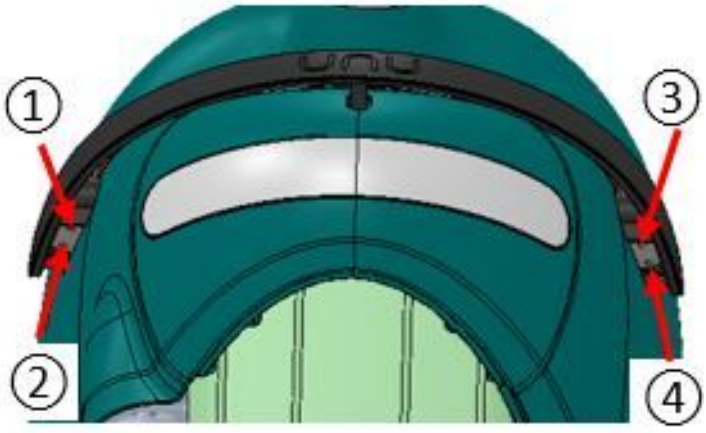
1.1.1 Rear handhold

Duration: 4 minutes

Preparatory steps: None

Work steps

Remove the four screws on the underside of the handhold.



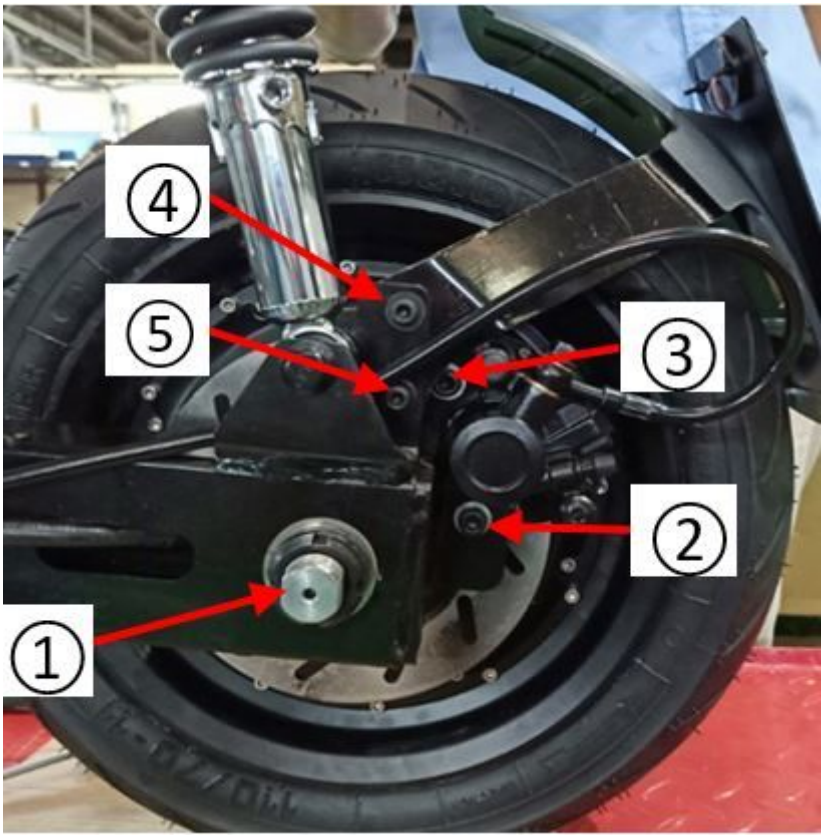
With the screws removed, stretch the ends of the handhold away from the bodykit and pull the handhold towards the rear to remove it. If you can't find the right angle for taking off the handhold, look at the angle at which the middle part of the handhold enters the bodykit. It is only slotted in and does not need to be unscrewed anywhere.

1.1.2 Rear mudguard bracket (with mudguard attached)

Duration	5 mins
Preparatory steps	None

Work steps

Remove screws 4 & 5 shown in the image. Do not remove the bracket abruptly, because the cable for the license plate light is still connected. Disconnect it to remove the rear mudguard bracket.

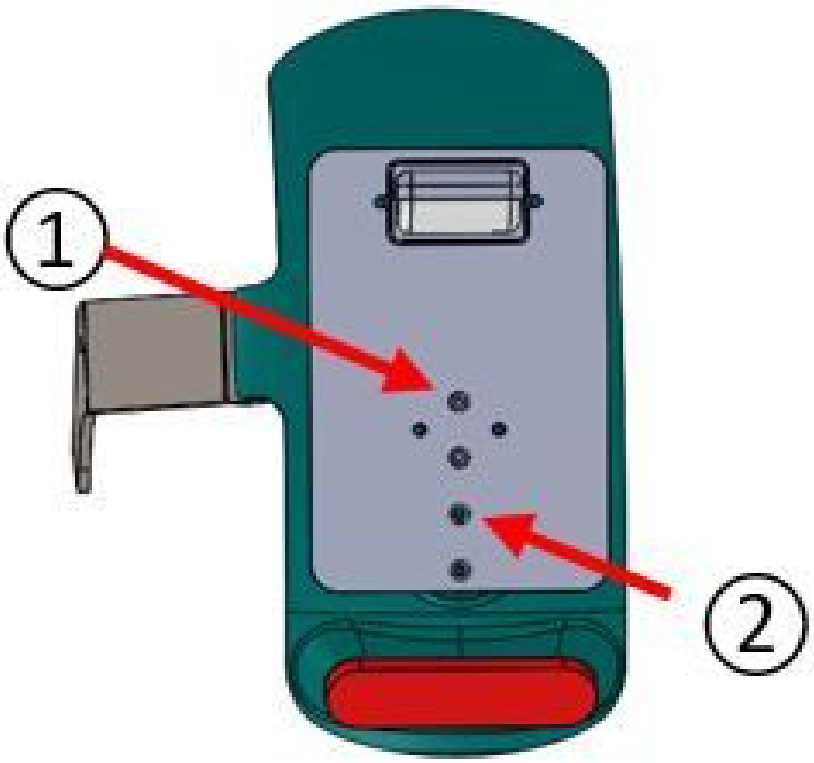


1.1.3 License plate holder

Duration	5 mins
Preparatory steps	1.1.2 Rear mudguard bracket (with mudguard attached)

Work steps

Remove the two cross-head screws to detach the license plate holder from the mudguard.



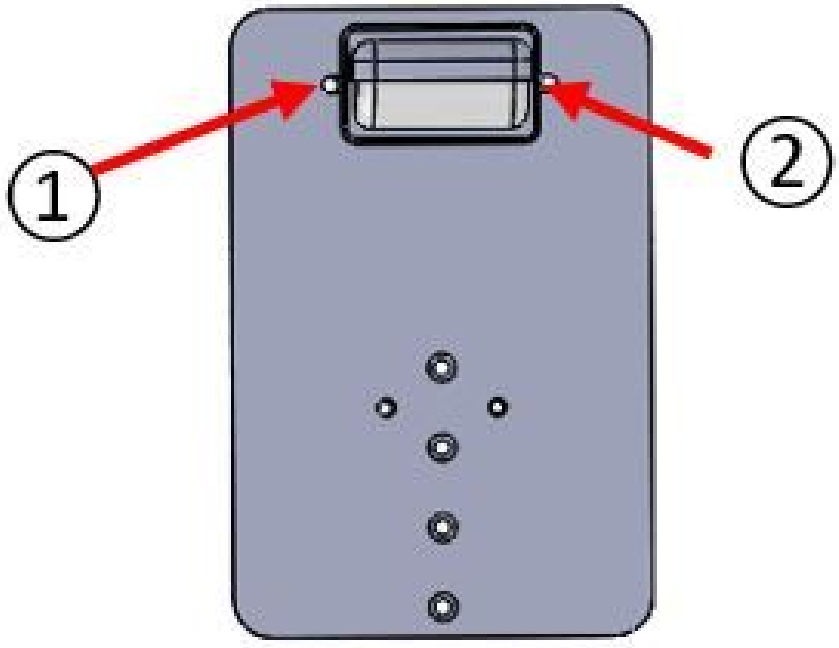
Note: Before replacing the license plate holder, the license plate light will also have to be detached.

1.1.4 License plate light

Duration	4 mins
Preparatory steps	1.1.2 Rear mudguard bracket (with mudguard attached) 1.1.3 License plate holder

Work steps

Unscrew the two screws to detach the license plate light from the license plate holder. If you have not detached the connector on the wires of the license plate light, do so now.



1.1.5 Mirror mounting bracket left

Duration	3 mins
Preparatory steps	Front outer panel Left grip

Work steps

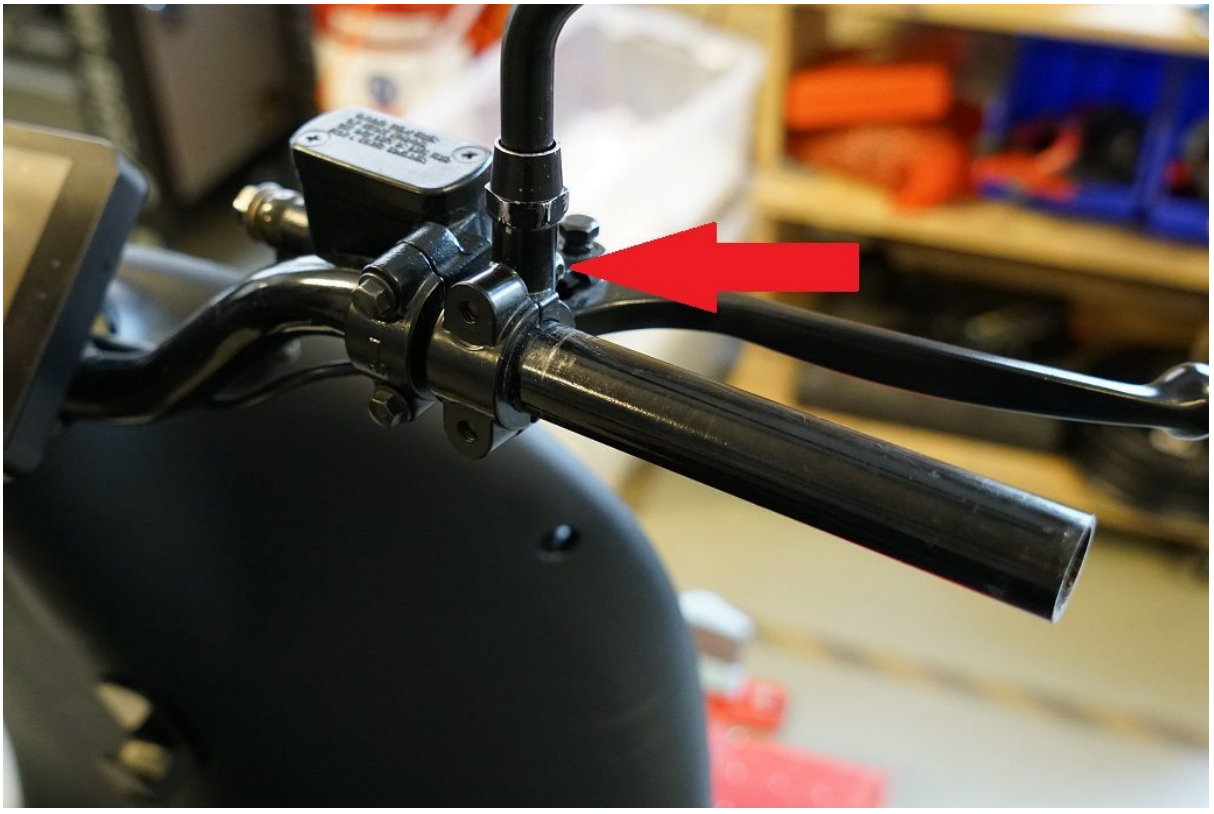
Remove the two hex-head screws on the mounting bracket to remove it.

1.1.6 Mirror mounting bracket right

Duration	3 mins
Preparatory steps	None

Work steps

Because the mounting bracket cannot be removed with the throttle fully in place, first loosen the allen-head screw holding the throttle in place. Move the throttle to the right by 4cm. Remove the two hex-head screws on the mounting bracket to remove it.



1.1.7 Left grip

Duration	3 mins
Preparatory steps	None

Work steps

Unscrew the allen-head screw to detach the left grip from the handlebar.

1.1.8 Throttle

Duration	3 mins
Preparatory steps	Front Outer Panel

Work steps

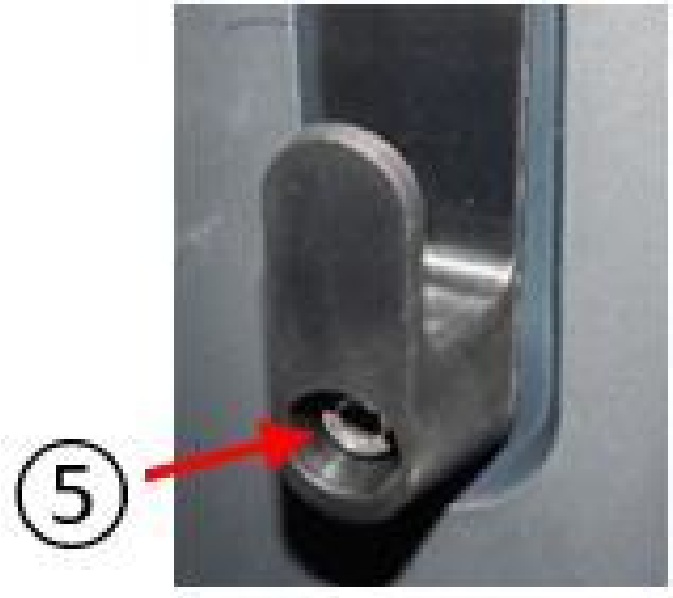
Unscrew the allen-head screw on the underside of the throttle to detach it from the handlebar. Unclip the connector from the harness in order to replace it.

1.1.9 Luggage hook

Duration	2 mins
Preparatory steps	None

Work steps

Unscrew the allen-head screw which connects the hook to the front inner panel.



1.2 Seat and substructure

1.2.1 Seat lock bar

Duration	3 mins
Preparatory steps	None

Work steps

Remove the two allen-head screws in order to detach the seat lock bar from the substructure of the seat.

1.2.2 Seat cushion

Duration	3 mins
Preparatory steps	None

Work steps

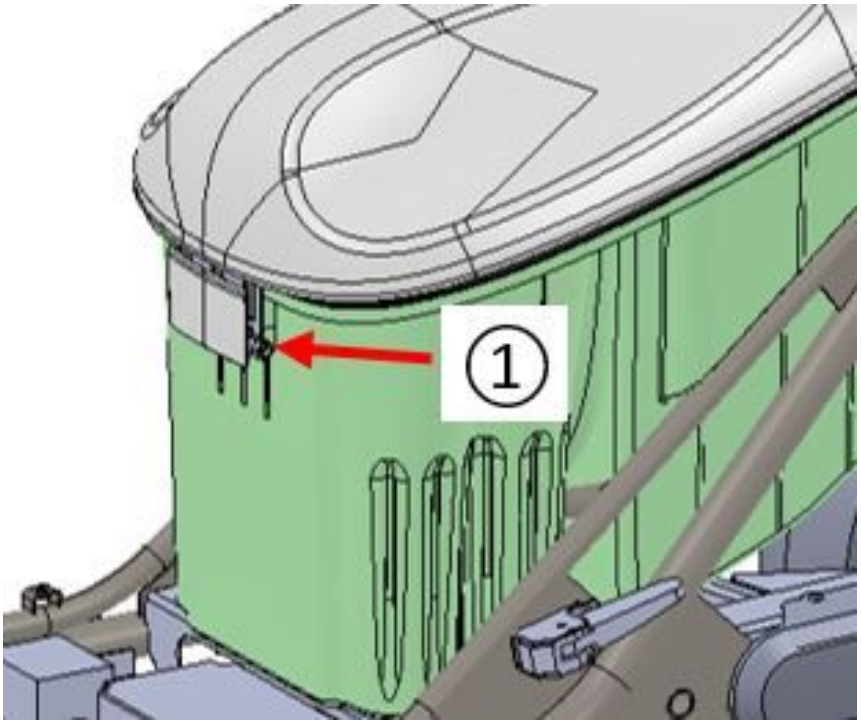
Detach the cushion from the understructure by removing the cross-head screws at the three locations. There are six screws in total.

1.2.3 Seat assembly

Duration	4 mins
Preparatory steps	Rear panel sub-assembly

Work steps

To remove the seat assembly from the seatbox, unscrew the hinge bolt and remove it. The hinge cover panel does not need to be removed for this step.



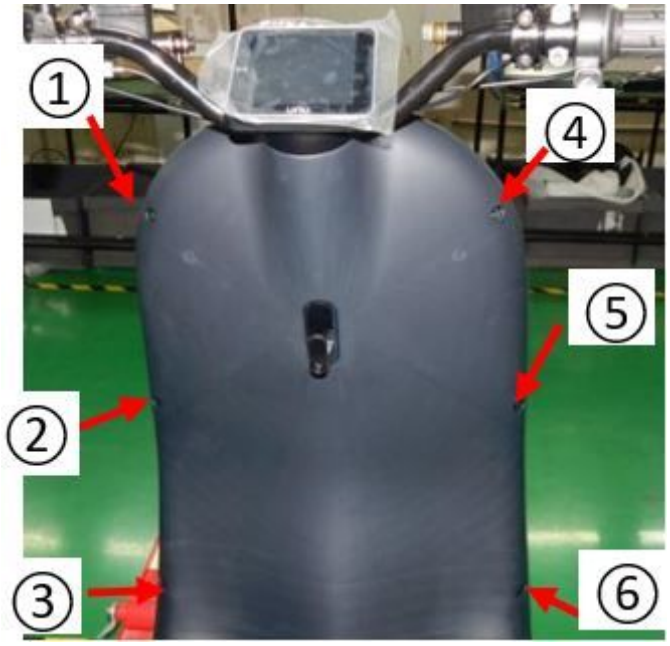
1.3 Painted body panels

1.3.1 Front outer panel

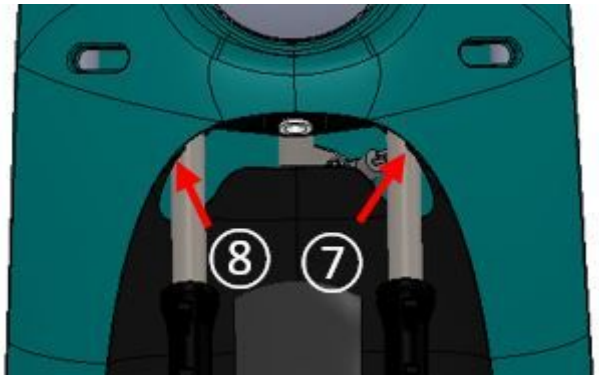
Duration	10 mins
Preparatory steps	None

Work steps

Remove the six cross-head screws which are accessible on the front inner panel.



Next, remove the two cross-head screws which are accessible through the wheel-house.



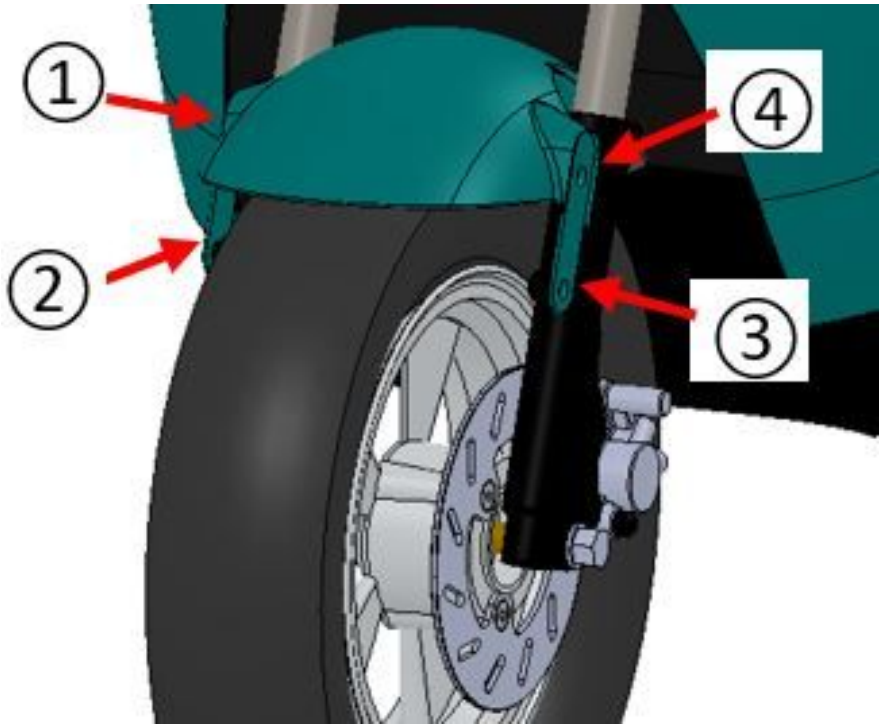
Be careful when taking off the front outer panel and detach all of the light connectors.

1.3.2 Front mudguard

Duration	8 mins
Preparatory steps	None

Work steps

With the two glued reflectors removed, unscrew the four allen-head screws to free the mudguard from the front suspension.

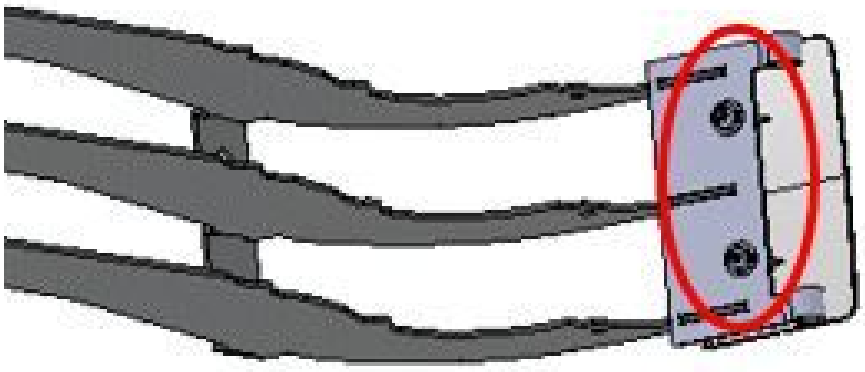


1.3.3 Seat hinge panel

Duration	4 mins
Preparatory steps	None

Work steps

With the seat assembly opened, unscrew the two cross-head screws to remove the seat-hinge panel.

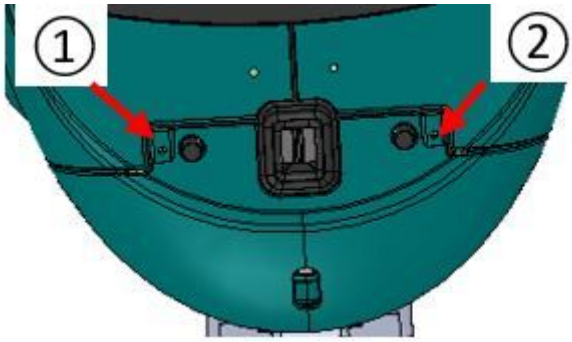


1.3.4 Rear light panel

Duration	4 mins
Preparatory steps	Rear handhold Bottom rear panel

Work steps

Remove the two cross-headed screws on the top of the rear light panel.



Next remove the two cross-headed screws slightly on the inside of the scooter. These screws connect to the rear side panels.

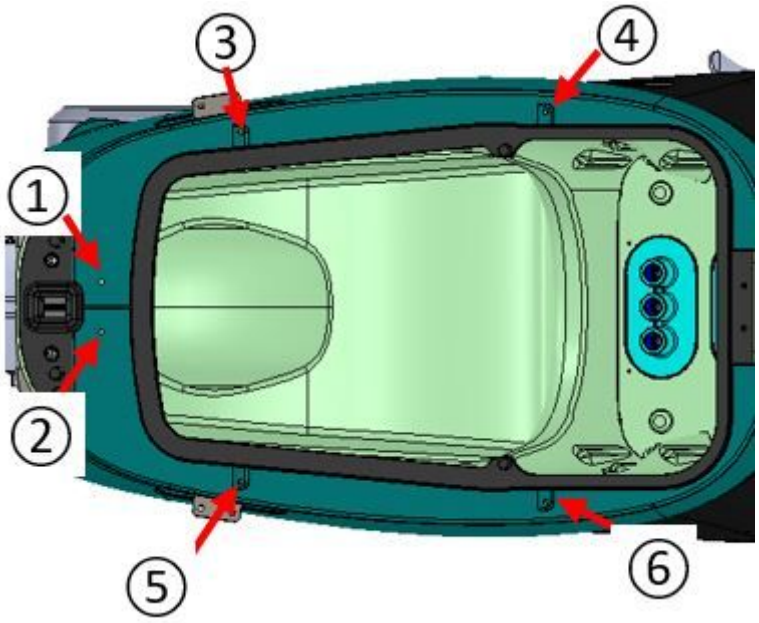
Careful when removing the rear light panel from the scooter. Make sure to unplug the connector of the rear light.

1.3.5 Rear panel assembly

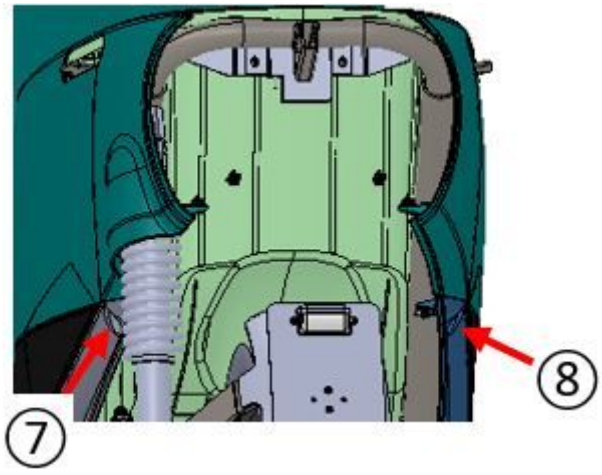
Duration	10 mins
Preparatory steps	Rear handhold Bottom rear panel Rear light panel

Work steps

Remove the six cross-head screws on the top rim of the rear panel assembly.



Next remove the two cross-head screws attaching the rear panels to the bottom sides.



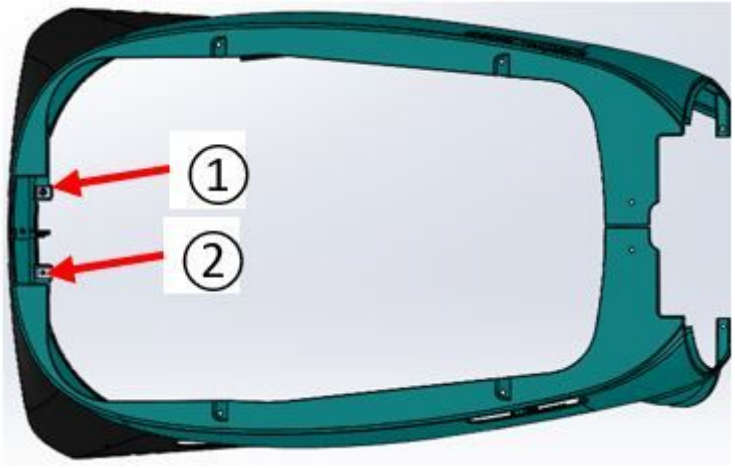
To remove the rear panel assembly, close the seat, bend the rear ends of the assembly to the side for about 20cm and slide the entire assembly forward.

1.3.6 Rear side panel left

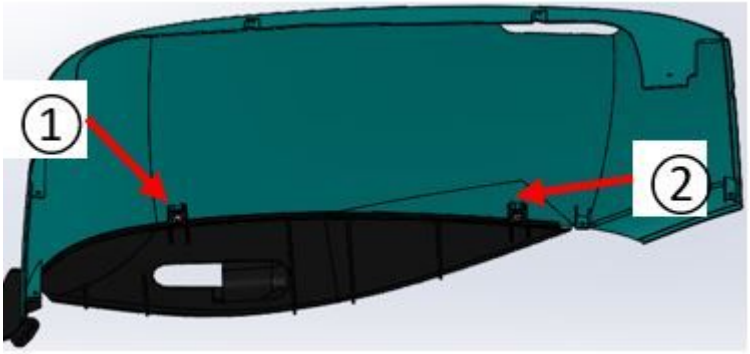
Duration	7 mins
Preparatory steps	Rear handhold Bottom rear panel Rear light panel Rear panel assembly

Work steps

Remove the two cable-ties or cross-head screws in the front of the assembly.



For removing each side panel, also remove the two cross-head screws.

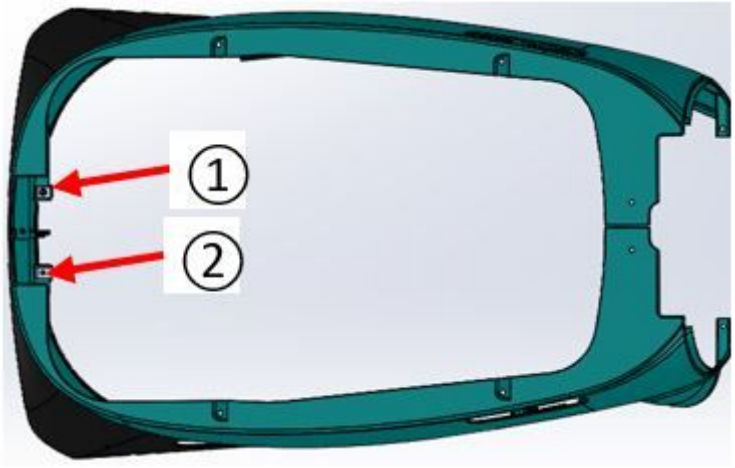


1.3.7 Rear side panel right

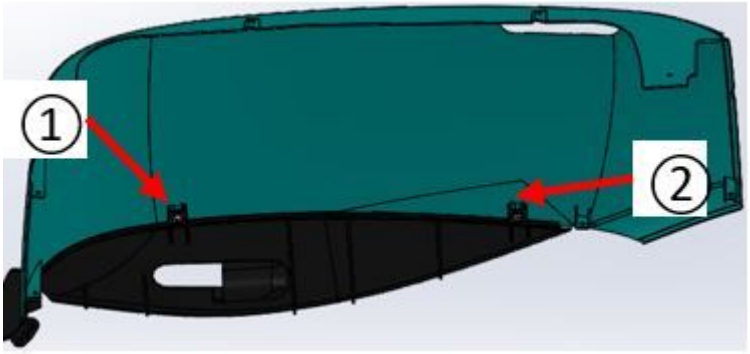
Duration	7 mins
Preparatory steps	Rear handhold Bottom rear panel Rear light panel Rear panel assembly

Work steps

Remove the two cable-ties or cross-head screws in the front of the assembly.



For removing each side panel, also remove the two cross-head screws.



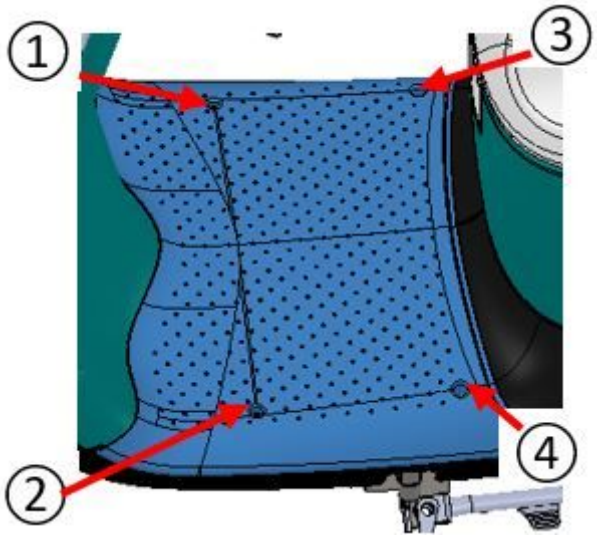
1.4 Unpainted body panels

1.4.1 Footrest panel

Duration	6 mins
Preparatory steps	None

Work steps

Remove the four allen-key screws in order to remove the foot rest panel from the scooter.



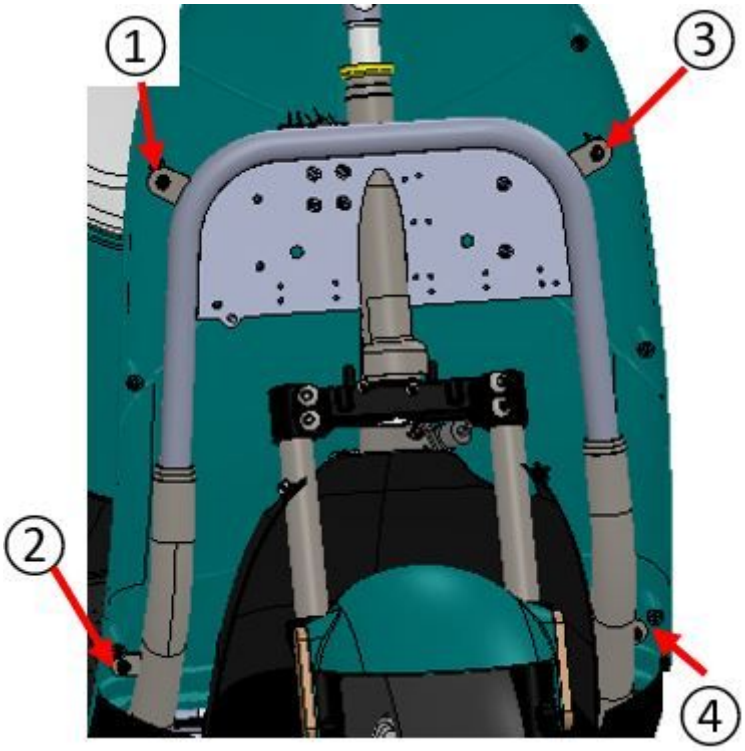
Lift up the front of the footrest panel and slide the panel towards the front by two centimeters.

1.4.2 Front inner panel

Duration	8 min
Preparatory steps	Front outer panel Luggage hook Dashboard Left brake upper part Right brake upper part Throttle

Work steps

Remove the four screws in order to detach the front inner panel from the frame.

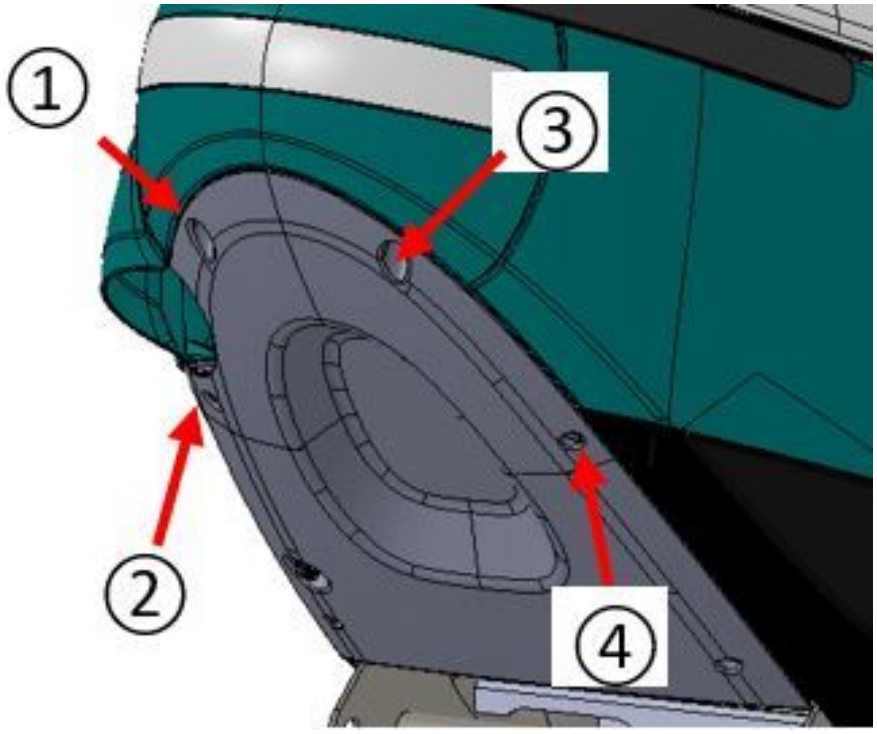


1.4.3 Bottom rear panel

Duration	6 min
Preparatory steps	None

Work steps

Remove the four upward facing cross-head screws.



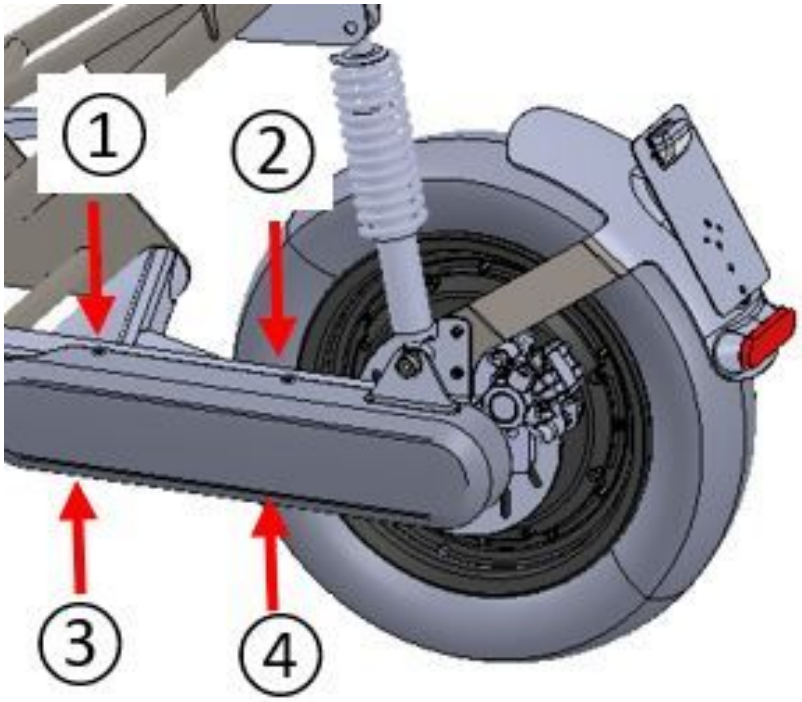
Next, let the rear panel come down a few centimeters. Careful, before removing the panel, unplug the connector of the rear charging port.

1.4.4 Swingarm cover panel

Duration	6 min
Preparatory steps	None

Work steps

Remove the four allen-head screws holding the swingarm cover onto the swingarm.



Remove the panel by pulling it outwards to the left.

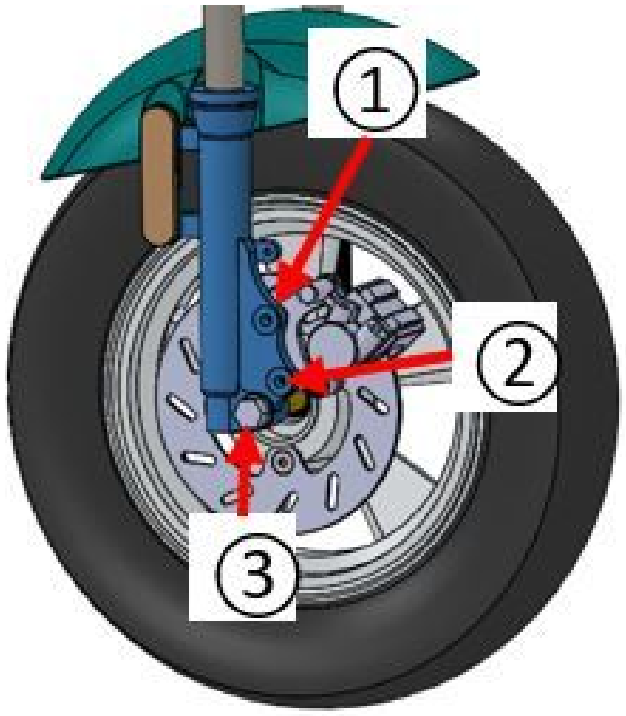
1.5 Frame & Chassis

1.5.1 Front wheel

Duration	5 min
Preparatory steps	None

Work steps

To remove the front wheel, remove the front wheel axle by holding the hex-head end of the axle in place with a wrench and loosed the hex-head nut on the other end of the axle with another wrench.



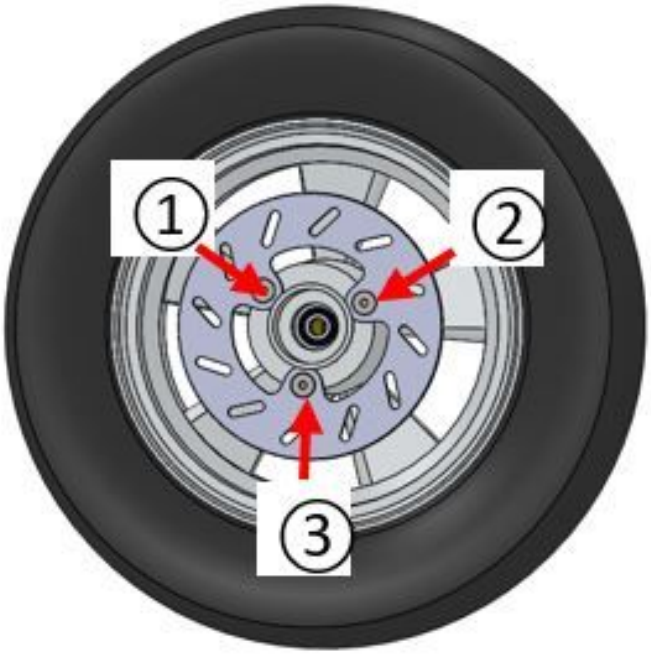
Before removing the front axle, make sure to have the scooter on a solid stand so that removing the axle will not result in a sudden loss of balance of the scooter. A loss of balance of the scooter could mean that it falls onto you or somebody around you.

1.5.2 Front brake disc

Duration	8 min
Preparatory steps	Front wheel

Work steps

Rest the front wheel onto the opposite side of the brake disc. Make sure not to rest the front wheel on the brake disc in order to avoid it from getting bent. Remove the three allen-head screws which hold the brake disc onto the rim.

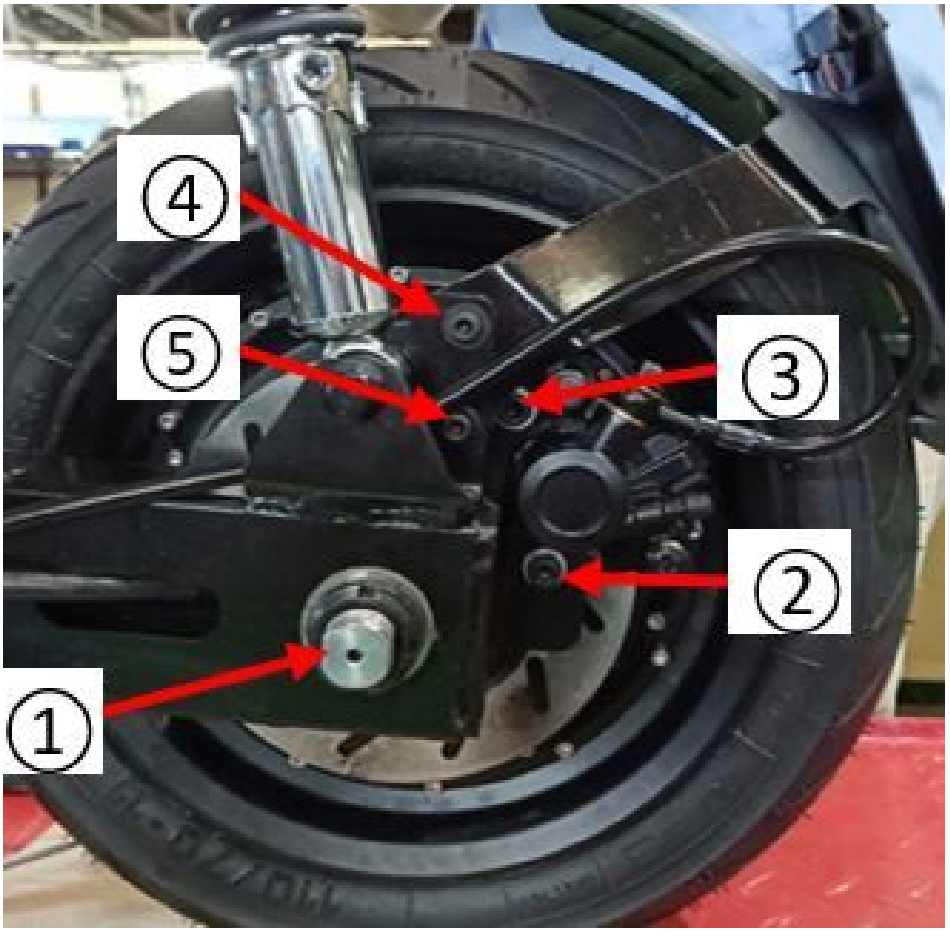


1.5.3 Motor (removal from swingarm)

Duration	15
Preparatory steps	Footrest panel Rear brake disc lower part Swingarm cover

Work steps

In order to take the motor off the swingarm, unscrew the main motor nut (1). Notice that this nut is a left-rotating nut, meaning it is screwed onto the vehicle in a counter-clockwise direction. To unscrew it, you therefore have to move it in a clockwise direction.
Because of the relatively high torque of 90 Nm, a longer wrench than on other positions on the scooter will be necessary.



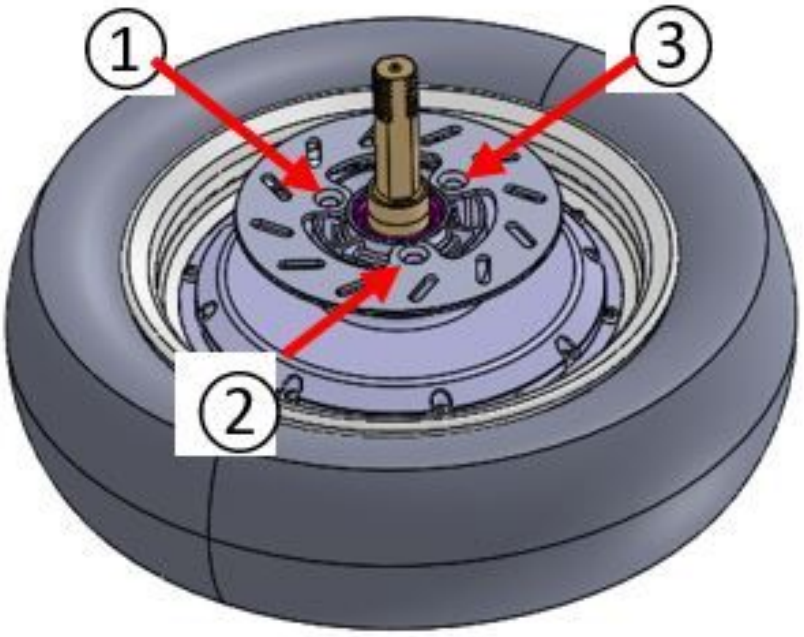
Before removing the motor, make sure to have the scooter on a solid stand so that removing the axle will not result in a sudden loss of balance of the scooter. A loss of balance of the scooter could mean that it falls onto you or somebody around you.

1.5.4 Rear brake disc

Duration	8 min
Preparatory steps	Footrest panel Motor Rear brake disc lower part

Work steps

Rest the motor onto the opposite side of the brake disc. Make sure not to rest the motor on the brake disc in order to avoid it from getting bent. Also make sure not to scratch the painted surface on the opposite side of the motor. Ideally rest the motor on a soft and clean surface. Remove the three allen-head screws which hold the brake disc onto the rim. Slot the rear brake disc all the way over the motor cable.

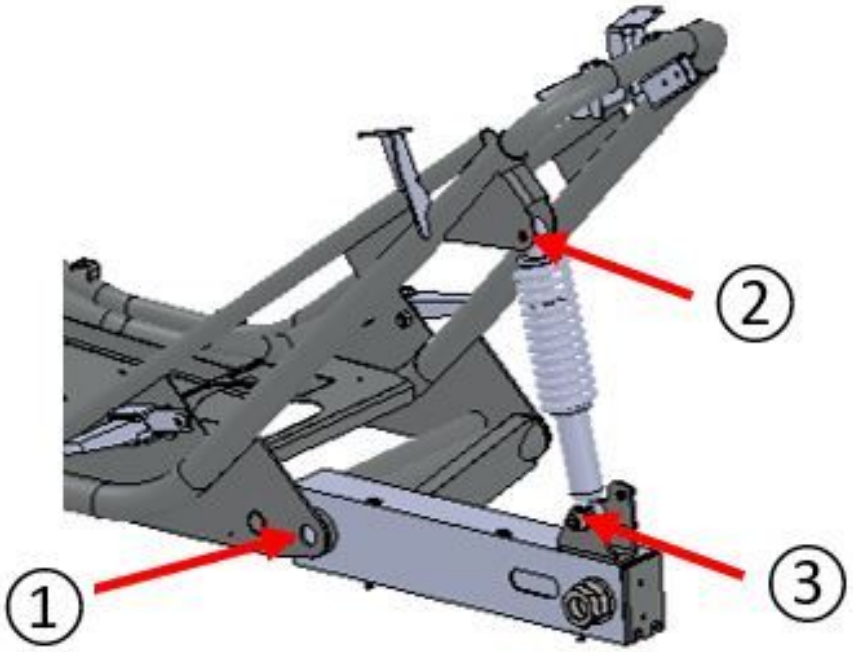


1.5.5 Rear swingarm

Duration	8 min
Preparatory steps	Rear suspension lower bolt Swingarm cover Rear mudguard bracket Motor

Work steps

With the motor removed, unscrew the bolt connecting the swingarm from the frame.



Before removing the rear swingarm, make sure to have the scooter on a solid stand so that removing the axle will not result in a sudden loss of balance of the scooter. A loss of balance of the scooter could mean that it falls onto you or somebody around you.

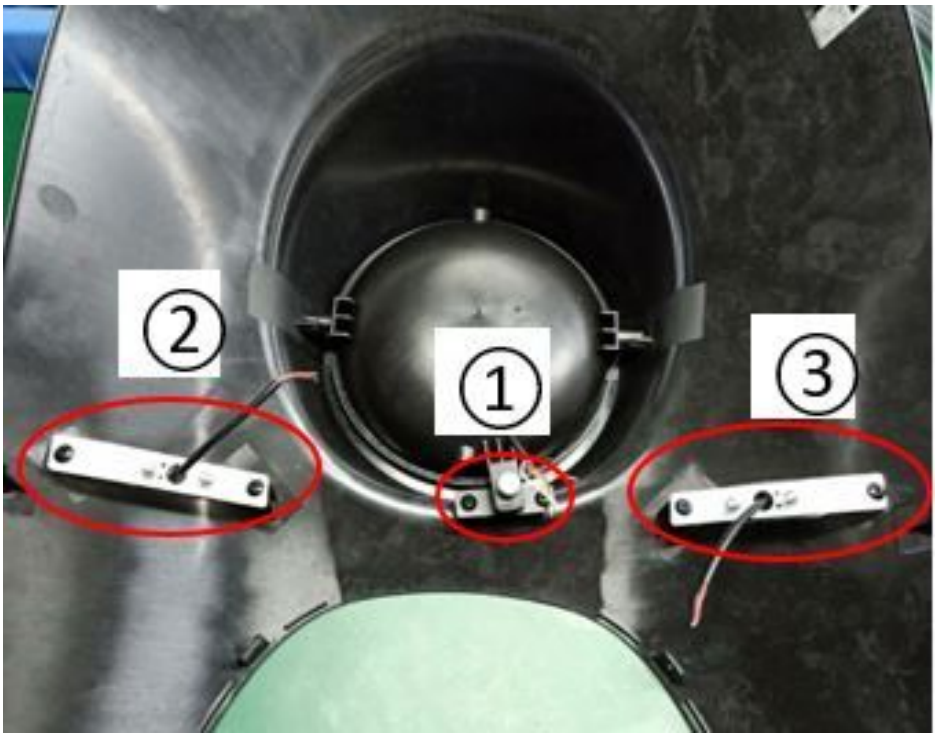
1.6 Lights & Electronics

1.6.1 Front light

Duration	8 min
Preparatory steps	Front outer panel

Work steps

Remove the two cross-head screws highlighted in position 1. Next, take the right pivoting pin out of its slot in the front panel. After that, move the front light slightly to the right to make it possible to take the left pivoting point out of its socket.

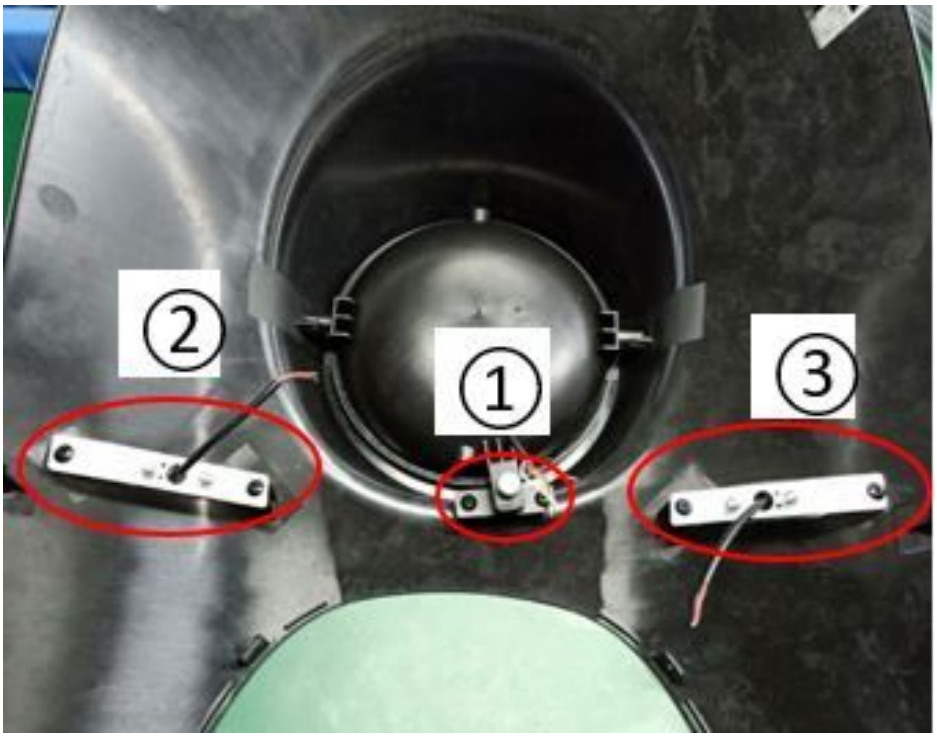


1.6.2 Front indicator left

Duration	3 min
Preparatory steps	Front outer panel

Work steps

Remove the two cross-head screws highlighted in position 2.

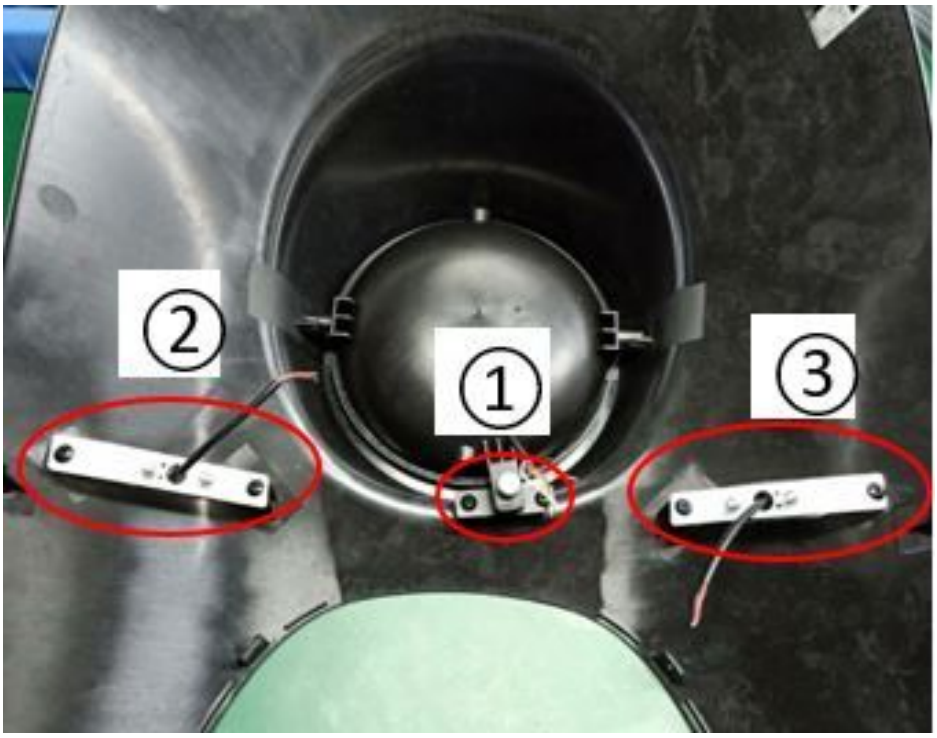


1.6.3 Front indicator right

Duration	3 min
Preparatory steps	Front outer panel

Work steps

Remove the two cross-head screws highlighted in position 3.

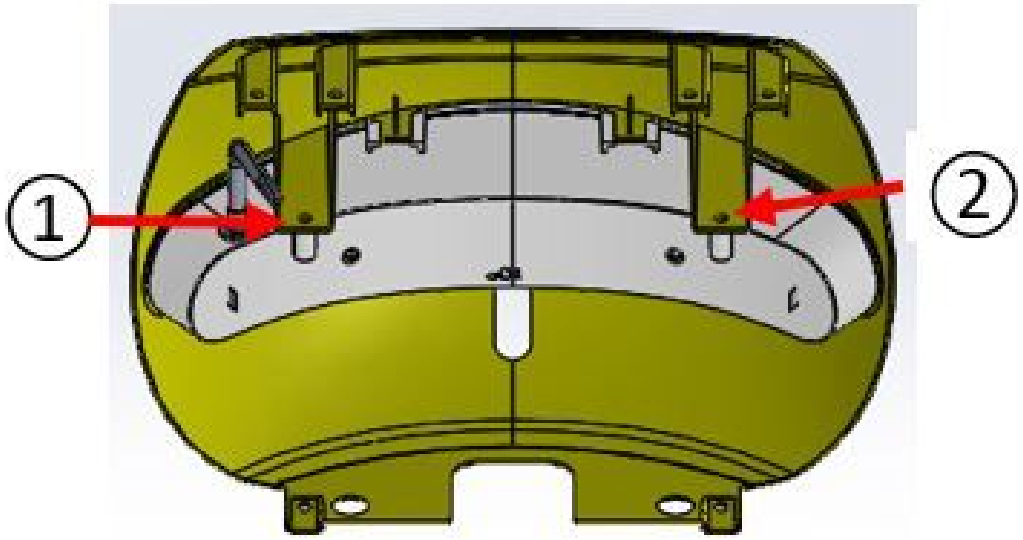


1.6.4 Rear light

Duration	4 min
Preparatory steps	Rear light panel

Work steps

Turn the rear light panel upside down and remove the two cross-head screws, which connect the rear light to the rear light panel.



1.6.5 Electronics under footrest

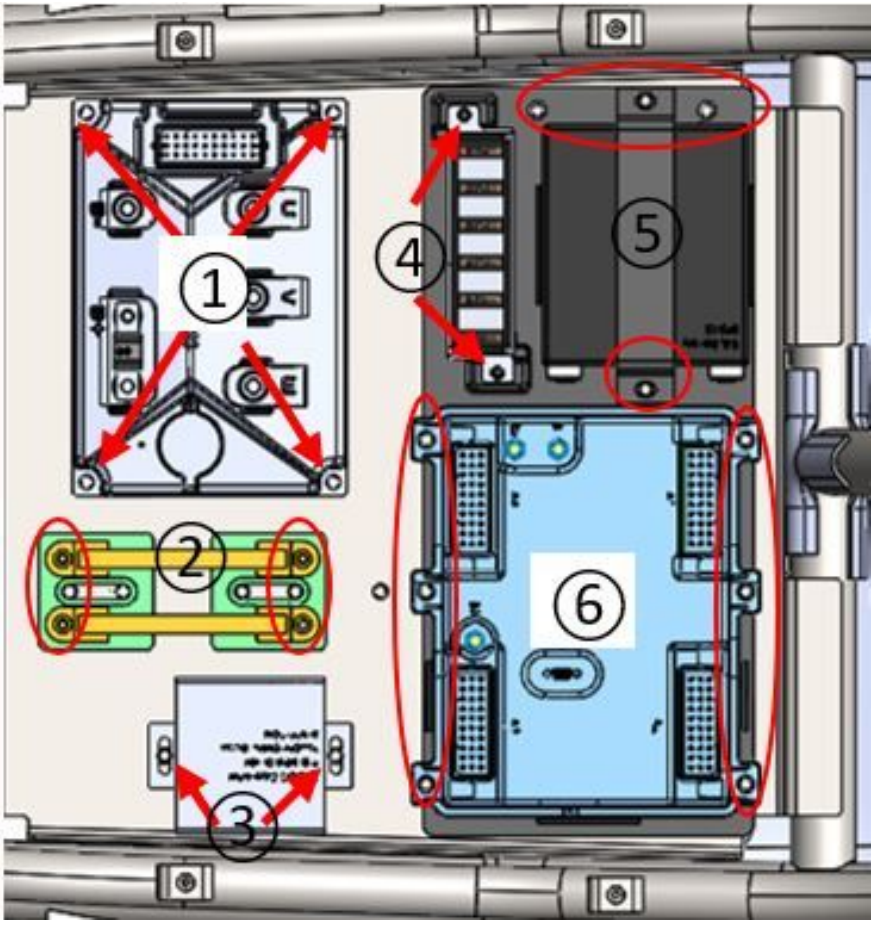
Duration	10 min
Preparatory steps	Footrest panel

Work steps

Before performing any work within the electronics section of the scooter, remove the main battery and turn the scooter back on and off in order to discharge any remaining capacity in the 48V-circuit. Failure to do so can result in electrical shock, even if the scooter does not run on a high-voltage setup.

Next, if the component you want to replace is connected to any other component or the harness, disconnect the cables between those units either by unscrewing or unclipping..

To remove a component from the electronics section, remove the screws holding it onto the bottom plate.

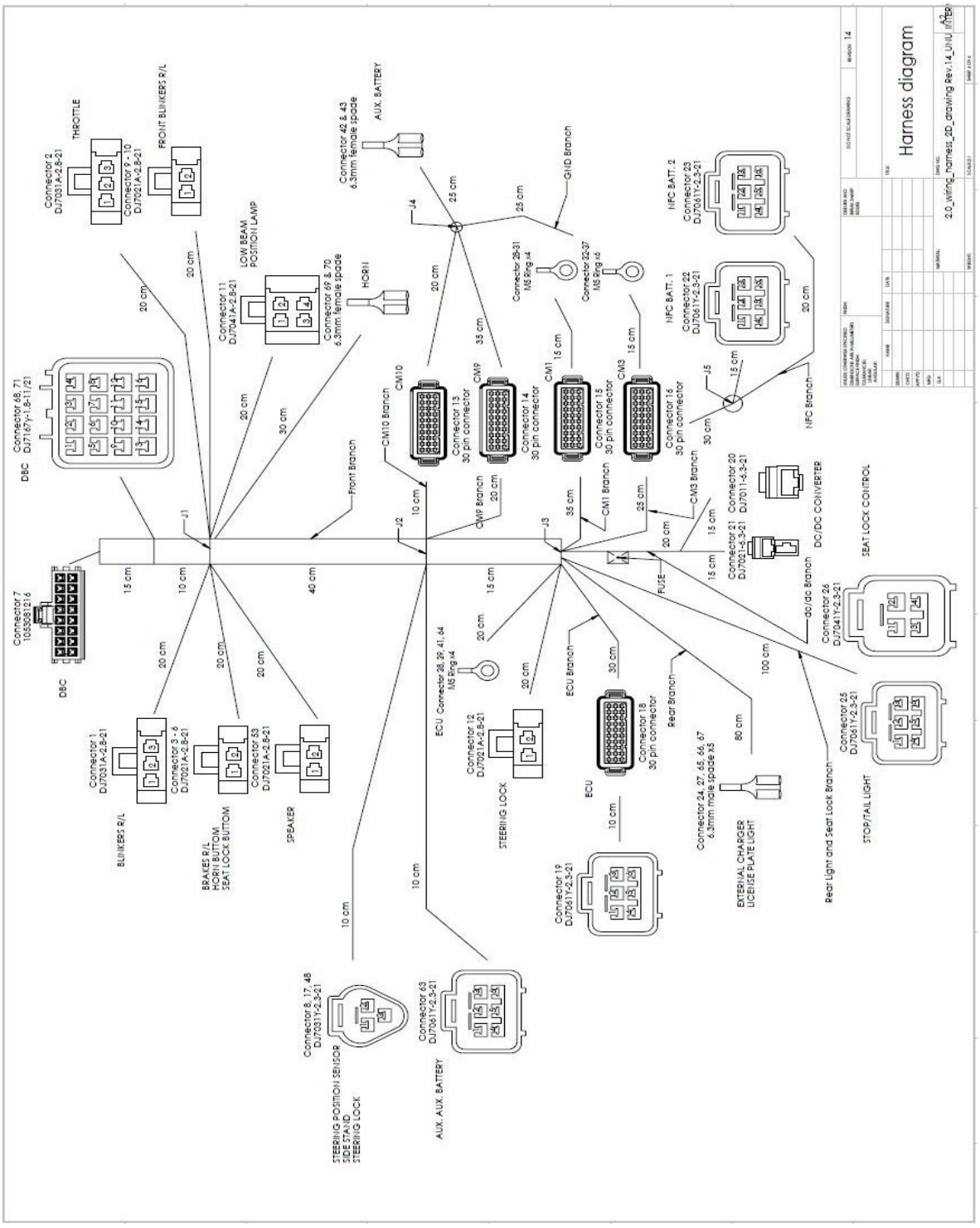


2. Repairs without part replacement

At the moment of the creation of this document, every types of repair which can be expected to become relevant involve part replacement.
Previous models of unu scooters have shown that several technical issues in the field can be fixed without part replacement, which is why this chapter is already planned for in the repair manual.
The chapter will be filled with content as soon as technical issues, which can be fixed without part replacement, become known to the manufacturer.

3. Wiring diagram

Despite the presence of this wiring plan, if possible, contact unu before performing a diagnosis or repair taking more than 20 minutes of time.



4. Relevant Torque values

When reassembling the scooter, adhere to the torque values as listed below to avoid damage to the parts assembled. An overly tight assembly can list to damage of individual parts or the scooter in general. An overly loose assembly can lead to an unwanted further loosening of the screws when the scooter is being driven or transported, which in turn can lead to damage to the parts or the scooter as well as a loss of function if a component is falling out of place. Only use screws supplied by unu or screws of the same size and shape with a steel class of 8.8.

Type of screw and/or position of screw	**Torque in Newtonmeters [Nm]**
All crosshead screws	Unless specified below: 3±1 Nm
All hex-head or allen-head screws with M6 thread	Unless specified below: 8±1 Nm
All hex-head or allen-head screws with M8 thread	Unless specified below: 20±2 Nm
Dashboard onto handlebar	2,5±0,5 Nm
Side stand, hex-head M10	30±3 Nm
Front wheel axle, hex-head M12	30±3 Nm
Brake discs front and rear, allen-head M8	20±2 Nm
Brake calipers front and rear, hex-head M8	20±2 Nm
Steering head bearing, M24	Main nut: 6±1 Nm / Counter nut: 40±4 Nm
Swingarm axle, hex-head M20	70±5 Nm
Bolts for attachment of rear suspension to frame and rear swingarm, hex-head M10	40±4 Nm
Motor axle, hex-head M24	90±5 Nm
Handlebar onto steering column, hex-head M10	40±4 Nm
Reat hinge axle, M8	15±2 Nm
Rear handhold, allen-head M5	5±1 Nm
Front foot panel, allen-head M5	5±1 Nm
Front mudguard, allen-head M6	5±1 Nm

5. ECU error codes for self-diagnosis

Error	Description	LED Blinking time
Over-Voltage Protection	Battery Voltage is higher than default value	1
Under-Voltage Protection	Battery Voltage is lower than default value	2
Motor Over-Current Protection	Motor phase is short-circuit or phase to ground is short-circuit	3
Stalling Protection	Motor stalling time is over default value	4
Hall Sensor Protection	Hall sensor input is abnormal	5
Mosfet Protection	MOSFET self-checking is abnormal	6
Phase winding disconnect protection	One of the motor phase is disconnected	7
Self-Checking Error Protection	System internal power-on self-checking is abnormal	10
Controller Over-Heat Protection	When controller operation temperature is higher than default value	11
Throttle Protection	Throttle input is abnormal	12
Motor Over-Heat Protection	Motor Temperature is higher than the value of configuration	13
Governor Handle Idle Protection - Braking Indication	Prohibit Governor Handle Operating when System Power On	14
Braking Indication	Indicating Braking Mode	15