SENUO Electric vehicle

Commercial electric motorcycle“T1”

Service manual

■Function Introduction

This service manual is designed to help dealers gain a thorough understanding of product knowledge and usage methods, including vehicle specifications, adjustment guidelines, and service data.

●Due to vehicle improvements, recorded content and specifications may change without prior notice. Please understand.

●Photos or content may differ from the actual vehicle due to specification changes or other reasons.

●This service manual is intended for individuals with basic knowledge and skills in automotive repair.

●Individuals without basic maintenance knowledge and skills should not attempt inspections, adjustments, disassembly, or assembly based solely on this service manual, as this may lead to repair failures and mechanical damage.

●The electrical circuit of this product should be inspected and maintained by personnel who have received special training under Article 59, Paragraph 3 of the Labor Safety and Health Law.

■Contact way

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■Summary

Service manual

■Summary

Part 1 Summary

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<tr><td>Lateral part</td><td colspan="3">  </td></tr>
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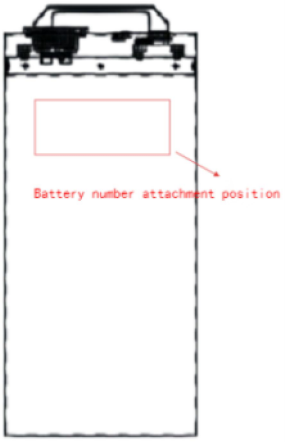
</td><td> 
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■Service data

◆Maintenance specifications (body)

Item	Standard value	Limit of Use
Steering System: Steering bearing type Handle cut angle (left/right)	Steering Stem Tapered Roller Bearing Left: 45° / Right: 45°	
Front fork: Cushion stroke	Φ27mm 75mm	
Saddle Lock Hook Length	Foam Sponge Saddle 48mm	
Front Wheel: Rim size Rim longitudinal sway limit Rim lateral sway limit	Aluminum wheel 16 inches 1mm 1mm	
Rear wheel : Rim size Rim longitudinal sway limit Rim lateral sway limit	Electric motor 12 inches 1mm 1mm	
Disc brake pad	12Cr13 Stainless Steel	
Front Disc Thickness	4mm	
Rear Disc Thickness	4mm	

■Service data

Item	Standard value	Limit of Use
Stator Test Hall Element Signal A Hall Element Signal B Hall Element Signal C	 72V 120° 	
Rotor Magnet Pole Pairs	Rear Wheel Rare Earth Magnet 30 Pole Pairs	
Battery Type Voltage Capacity	Lithium Battery Lithium Iron Phosphate 72V 25AH	
Charger Type	72V15A Lithium Ion Charger	
Converter Type Power	DC72V-DC12V 10A 120W	
Horn Type Max Current	Iron Horn 12V 1.5A	
Flasher Frequency	12V 80-100 times/min	

■Service data

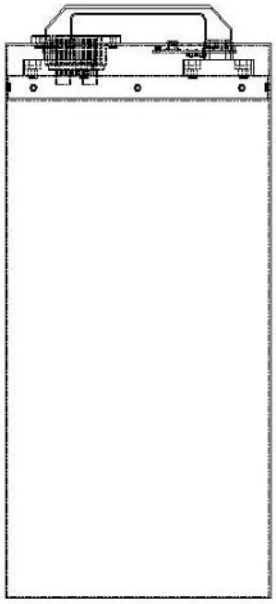
◆Tightening torque (body)

Tightening point	Screw diameter × pitch	Tightening torque
Frame and Fork Axle	M 12 × 235 × 1.25	55（5.5） N
Rear Shock Absorber (Frame Side)	M 10 × 40 ×1.25	35（3.5） N
Rear Shock Absorber (Rear Fork Side)	M 10 × 40 ×1.25	35（3.5） N
Stem and Fork Tube	M 10 × 45 ×1.25	43（4.3） N
Front Fork and Lower Triple Clamp	M 10 × 1. 25	35（3.5） N
Handlebar Fixing Screw	M 8 × 20 ×1.25	23（2.3） N
Front Wheel Axle Nut	M 12 × 1. 25	55（5.5） N
Front Wheel and Disc Brake	M 8 × 1. 25	23（2.3） N
Rear Wheel Axle Nut	M 18 × 1. 5	104（10.4） N
Rear Wheel Axle Nut	M 6 × 1. 25	12（1.2） N
Main Switch and Handlebars	M 6 × 1. 25	12（1.2） N
Foot Pedal	M 6 × 1. 25	10（1.0） N

Part 3 Lithium-ion battery and charger

◆Battery specifications

Type	Lithium-ion Battery
Rated voltage	72v
Rated capacity	30Ah 1unit
Weight	17KG
Charging temperature	-5° C～45° c
Discharge temperature	-5° C～55° c
Standard charging method	Constant Current



◆Characteristics of lithium-ion batteries

The lithium-ion (Li-ion) batteries used in our vehicles have a high energy density and can achieve about three times higher voltage than NiCd and Ni-Mh batteries, making them compact and lightweight. NiCad batteries and nickel-metal hydride batteries require regular refresh charging due to the "memory effect" in which the discharge capacity decreases when shallow discharge and charging are repeated, while lithium-ion batteries do not require refresh charging and can be continuously recharged.

・ Batteries use chemical reactions to charge and discharge. Since this chemical reaction has a characteristic that is greatly affected by temperature, use and storage in a place where the temperature is extremely high or low is avoided.

・ The battery discharges naturally even if it is not used.

・ Performance may not be fully demonstrated when new. Therefore, the mileage may be short when new, but it will recover by using it 2 to 3 times and charging it.

■Lithium-ion battery and charger

・ The battery capacity gradually decreases as it is repeatedly charged and discharged, and the battery needs to be replaced. This is due to the characteristics of the battery, not a failure.

※Please note that the degree of battery deterioration will vary greatly depending on the storage condition!

・ The higher the storage temperature in a state close to full charge, the greater the capacity degradation.

When stored at around 15 °C with a charge amount of 40% or less, the capacity degradation is contained by several% even when left for one year, but in a fully charged storage environment of 45 °C, the capacity degradation may be reduced to about 60% in half a year in some cases.

◆About BMS (Battery Management System)

The BMS is a small computer that manages the voltage, current and temperature of each cell of the battery and issues an alarm when the maximum and minimum values are exceeded. In addition, the system records battery usage status and abnormality contents in real time.

Since the maximum voltage, minimum voltage, etc. of each battery cell is monitored by the BMS, it is possible to prevent malfunctions such as overcharge and overdischarge. In addition, the BMS functions as a window for battery management while communicating information with the charger and the vehicle integrated controller.

■Lithium-ion battery and charger

Item	Battery cell	Battery Pack
Overcharge protection voltage	3650mV	±0.050V
Charge recovery voltage	3450mV	±0.050V
Overdischarge protection voltage	2300mV	±0.10V
Discharge recovery voltage	2800mV	±0.10V
Discharge stop temperature	65˚C±3˚C	
Discharge recovery temperature	60˚C±3˚C	
Normal continuous current	--	
Overcurrent protection value (primary)	12A	
Overcurrent protection value (secondary)	20A	

◆BMS → Operation of charger

Output current indication during charging

・Pre-charge instruction according to battery voltage

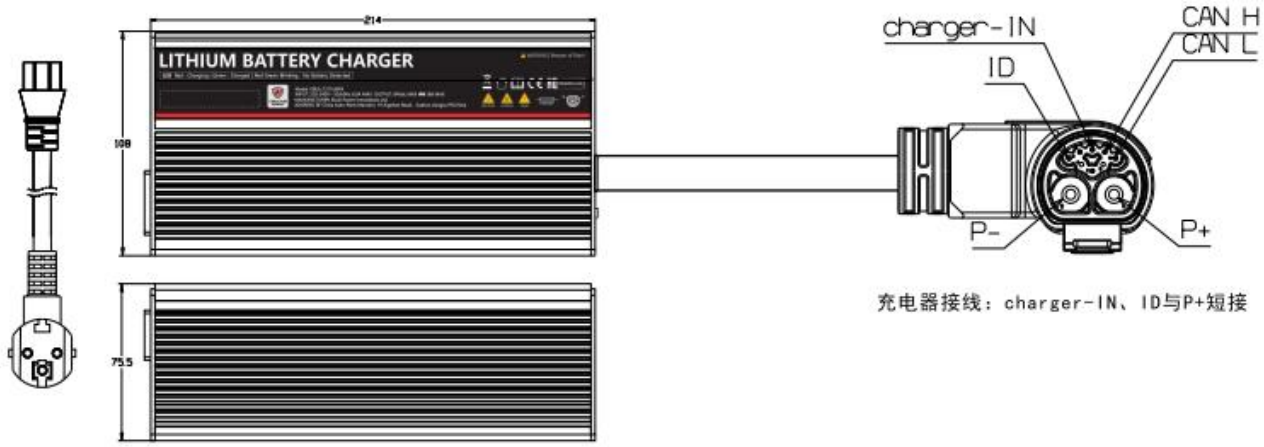
・Charging stop instruction when the battery is low (if it cannot be restored due to preliminary charging)

・ Charging stop instruction when battery temperature is abnormal.

■Lithium-ion battery and charger

Type	Charger
Charging method	Alternating Current (AC)
Rated input voltage	AC 220V
Frequency	50-60HZ
Weight	2Kg
Rated output voltage	72V
Rated charging current	10A
Maximum output	840W
Efficiency	92%
Operating temperature	-20℃--40℃
Storage temperature	-20℃--85℃
Overcurrent protection	Yes
Overvoltage protection	Yes
Short-circuit protection	Yes
Charger minimum input voltage	AC 180V
Authentication	CE

Charger - Exterior and Specifications



Part 4 Motors

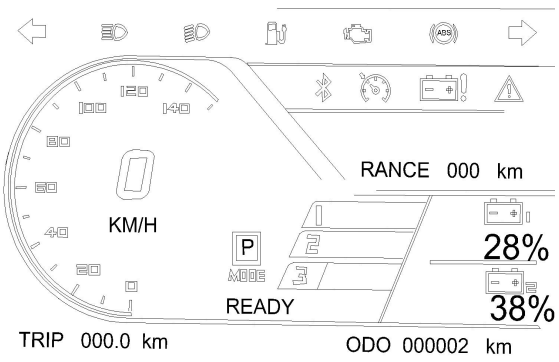
Brushless AC motors detect the rotor position through Hall sensors to enable rotation. The rotor of the motor is made of permanent magnets, while the stator (the armature) consists of three-phase windings, including U-phase, V-phase, and W-phase. The rotor position is detected based on the voltage output from the Hall sensors, and rotational control is achieved by sequentially changing the current direction in the U-phase, V-phase, and W-phase windings.

The advantages of this motor include low electrical and mechanical noise, high reliability, long lifespan, and ease of achieving high speeds.

Part 5 Electrical equipment

Speed/Total Mileage Display

Remaining battery level display (with integrated current) — If there is 1 or 2 item(s), they will be displayed as "1" and "2" respectively.



Light indicators — high beam, low beam, turn signals, etc.

1, 2, 3 gear speed mode display,

Mode display: "P (Park)", "D (Drive)", "R (Reverse)".

How to look at the battery level meter

The remaining capacity of each battery is expressed as a numerical value (%). 0-100%。

* Depending on conditions such as weather, temperature, road surface conditions, and the driver, the distance that can be traveled based on the remaining battery level will vary.

Please instruct customers to charge frequently until they get used to the characteristics of the vehicle.

About remaining capacity display

The remaining capacity display adopts a current integration method, and in this method, a current detection error is also integrated, and a deviation of the remaining capacity may gradually increase when charging and discharging is repeated as it is.

* The remaining capacity display is likely to deviate if you use it repeatedly without charging to full charge with additional charging. Provide appropriate guidance to users on how to charge. Although there are the following methods for correcting the deviation, the user is guided to correct the deviation by detecting full charge.

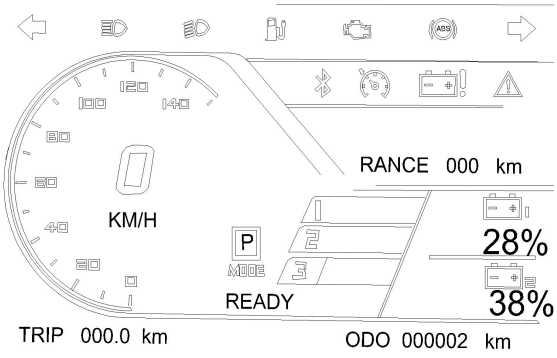
■Electrical equipment

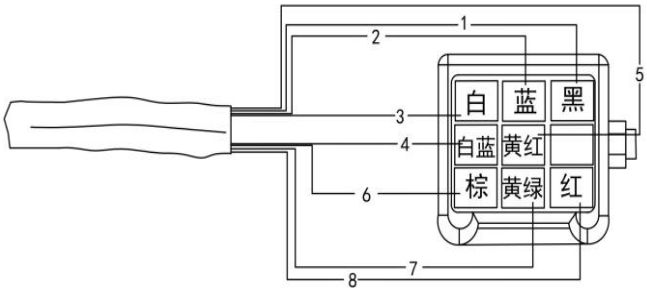
◆Correction by full charge detection

The remaining capacity display program corrects the remaining capacity to the full charge capacity when full charge is detected.

◆Correction by voltage during discharge

Corrected to a default remaining capacity based on the voltage value (65 V) at the end of discharge.





●Wiring description (see numbers in figure)

1 Black: Earth side (-)

2 Blue: CAN H

3 white: CAN L

4 white-blue: high beam

5 Yellow and red: Right turn signal

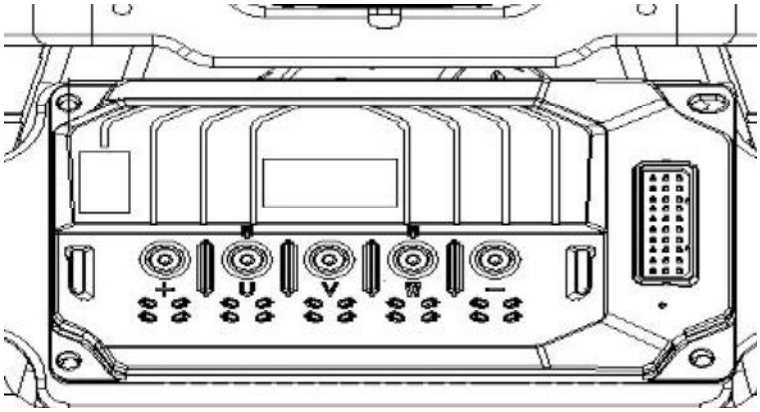
6 Brown: Low beam

7 yellow green: left turn signal

8 Red: 12 V positive electrode

■Electrical equipment

Controller



●Features of multifunction controllers

It is a PWM control system using a field effect transistor (= FET).

By adopting a large-capacity power MOSFET, stable large-current control is realized. A circuit with 18 FETs in parallel is also a feature.

●Comprehensive vehicle control

・Activates the power supply with a signal from the main switch

・Receives a conversion operation signal from the "P" button to "D" and switches to driving mode "D"

・Control motor drive according to the throttle signal

・Switches speed mode with the operation signals of the "1", "2" and "3" buttons

・Detects battery voltage and warns of low voltage and overvoltage

・Overdischarge protection (63.0 ± 0. 5V)

・Vehicle state detection

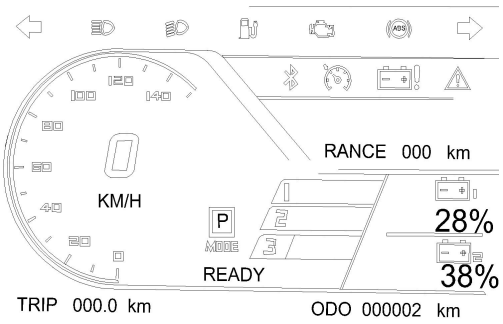
・Low voltage output limit (70.0 V ± 0. 5V)

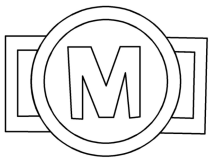
・After the conversion operation signal to "D", the vehicle body retreats by the conversion operation signal to "R"

■Electrical equipment

Vehicle status detection function

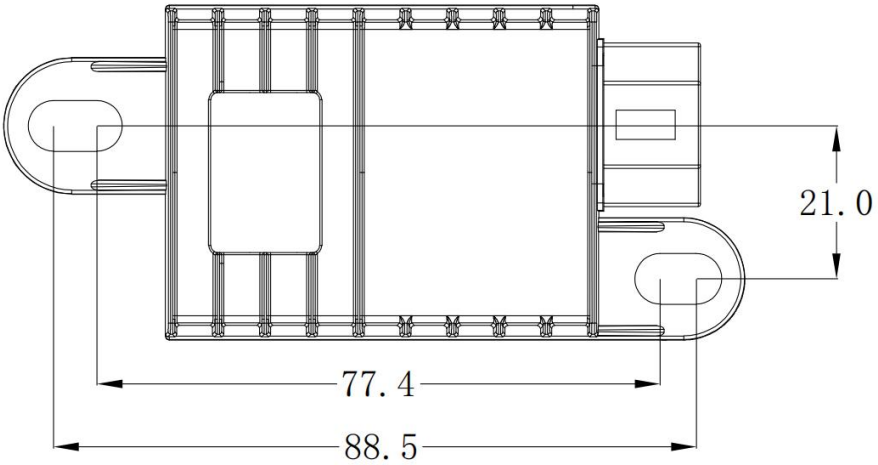
If an abnormality occurs in the vehicle, the fault diagnosis lamp on the display indicates the vehicle's status.

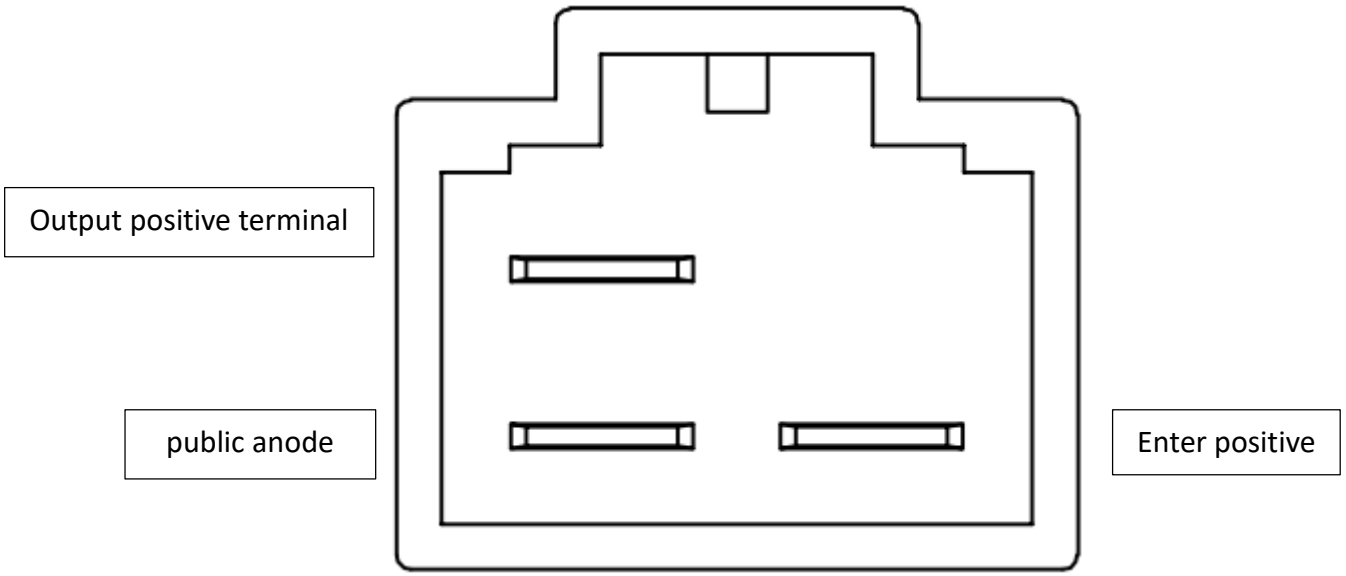


Denote	Vehicle condition	Remarks
The following lamp is not displayed	Normal	
	If you always see Low Battery Warning	Charge the battery because the remaining battery level is low. * Temporarily displayed when starting the vehicle, but after checking the remaining battery level, the light will turn off if there is remaining battery level.
	Communication protocol failure	Check communication system parts
	Warning of motor abnormality	Check the periphery of the controller and motor

■Electrical equipment

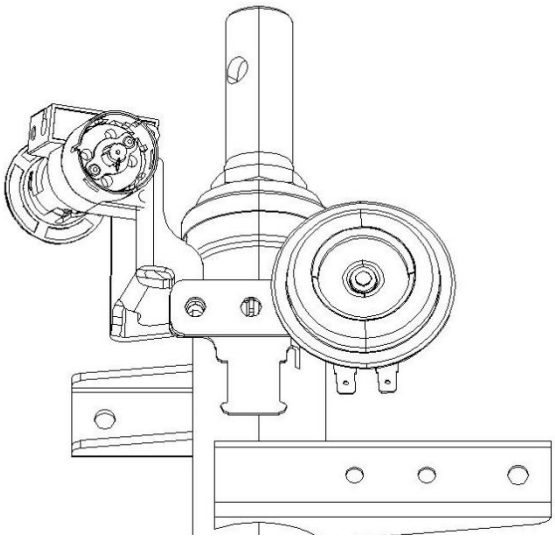
Converter





■Electrical equipment

Horn



Accelerator grip

Part 6 Switch

Main switch

■Switch

◆Brake power-off switch

When the side stand is erected, the power cut switch turns ON and stops the power supply to the motor. If the disconnect switch makes poor contact or fails, the motor will stop spinning. Replace the power-off switch.

■Switch

◆Right steering wheel switch

●Switch description (see left A in the figure above)

① Gear Shift Switch (toggle between 1st, 2nd, and 3rd gear modes)

② Headlight Switch

③ R (Reverse) Switch

●Wiring explanation (see right B in the figure above)

1: Red..... Power Input (+)

2: Green..... Power Output

3: Black ..... negative electrode(-)

4: Light Blue .....Travel Mode

5: Orange .....Travel Mode

6: Gray..... Polarity

7: Black ..... Polarity

8: Purple .....Retreat (R)

9: Red..... Brake Cut-off Switch

10: Black ..... Brake Cut-off Switch

Part 7 Inspection and maintenance

◆Inspection and maintenance

Inspection and maintenance items			Time			Standard
Inspection location	Inspection item		Routine inspection	6-month inspection	12-month inspection	
Steering System	Handlebar	Usage Condition				Good
	Front Fork	Damage				None
		Installation Status				Good
		Abnormal Noise				None
Braking System	Front Brake	Clearance				3mm
	Rear Brake	Gap				3mm
	Brake Disc	Wear				2mm
	Brake Lever	Working Stroke				55mm
	Brake Caliper Bracket	Deformation				None
	Power Cut-off Switch	Looseness				None
Travel System	Wheel	Air Pressure				250Kpa
		Cracks				None
		Wear				None
		Bolt Looseness				None
		Bearings				Good
		Oil Seal				Good
Shock Absorber	Suspension Wall	Looseness				None
	Shock Absorber	Oil Leakage				None

Part 8 Vehicle trouble inspection and repair

◆Dealing with common problems

* Be sure to turn OFF the breaker before performing all work.

* For problems that cannot be resolved in this list, please check the vehicle's symptoms and possible causes in as much detail as possible and report them to our company.

Motor turns on its own, accelerator grip does not return.

Accelerator grip abnormality	→ Accelerator grip replacement

Turn signal does not light

* If all front and rear turn signals do not light up	
Relay failure	→ Relay replacement
* If there is something that does not light up	
① Bulb (light bulb) broken	→ Replace the bulb (light bulb)
② Poor handle switch contact	→ Replace lever holder L

Lighting (12V) system does not work

Converter abnormality	→ Converter replacement

Power won't turn on, power off while driving

① Out of charge	⇒ Voltage measurement	→ Charging
②BMS Breaker failure	⇒CANCAN box detection	→Troubleshoot communication fault
③Connector missing	⇒ Visual confirmation	→Reinsert
④Main switch contact fault	⇒Abnormal clicking sound when turning the key	→Replace main switch

Do not change mode from "P" to "D"

① Switch lead wire broken	→ Lead wire repair
② Failure of the switch body	→ Replace lever holder L
Controller failure	→ Controller replacement

■Vehicle trouble inspection and repair

Meter abnormality

* If the meter and lighting system do not light up	
Converter failure	→ Converter replacement
* If only the meter does not light up	
Meter failure	→ Meter replacement

Error display

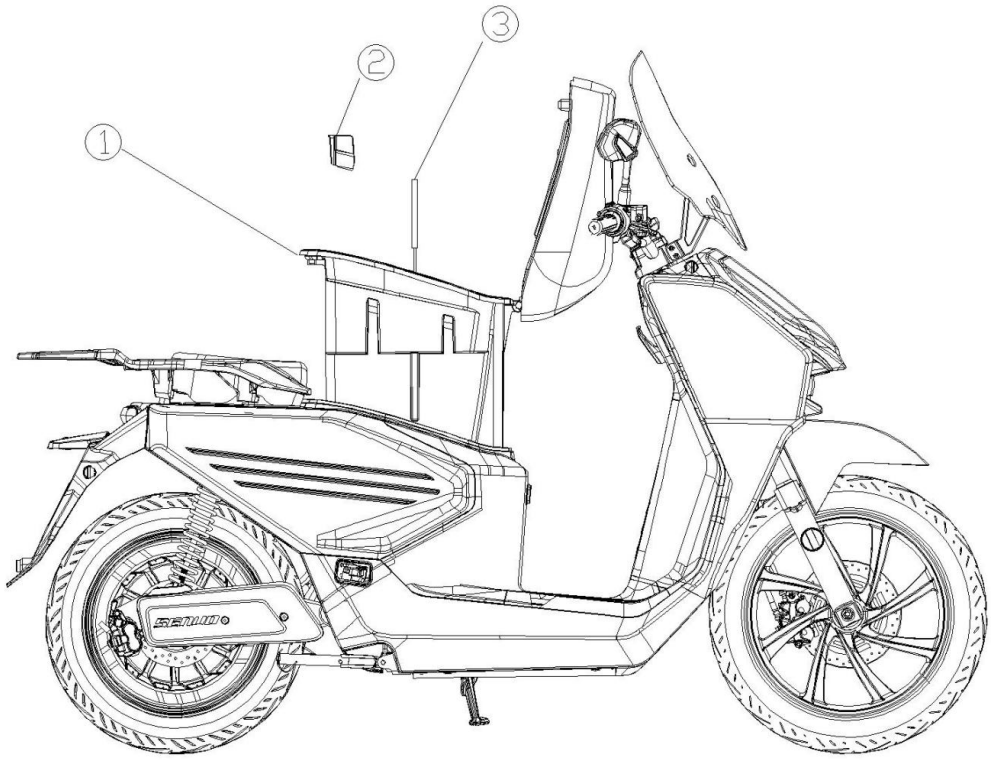
Denote	Vehicle condition	Remarks
The following lamp is not displayed	Normal	
	If you always see Low Battery Warning	Charge the battery because the remaining battery level is low. * Temporarily displayed when starting the vehicle, but after checking the remaining battery level, the light will turn off if there is remaining battery level.
	Communication protocol failure	Check communication system parts
	Warning of motor abnormality	Check the periphery of the controller and motor

Motor abnormality

* If the motor does not turn even if the start switch is turned on.	
① Brake switch abnormality	→ Brake switch replacement
② Accelerator grip abnormality	→ Accelerator grip replacement
③ Controller abnormality	→ Controller replacement
④ Motor connector or motor abnormality	→ Connector or motor replacement
* If the motor becomes heavy and becomes locked.	
Controller abnormality	→ Controller replacement
* If the motor becomes powerless and unable to balance.	
Motor connector or motor malfunction	→ Connector or motor replacement

Part 9 Attaching and detaching covers and vehicle bodies

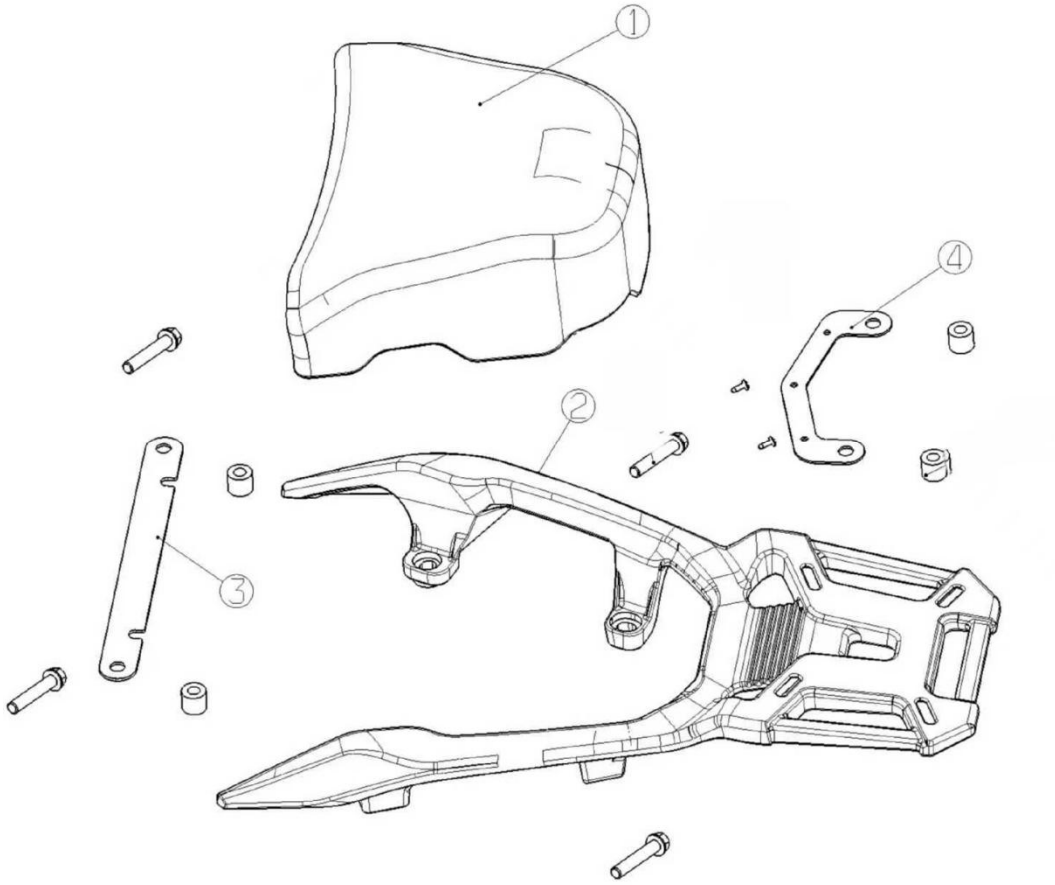
◆Underseat Storage



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Seat Compartment	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Underseat Storage Small Cover	1	
(3)	Underseat Storage Divider	1	

■Attaching and detaching covers and vehicle bodies

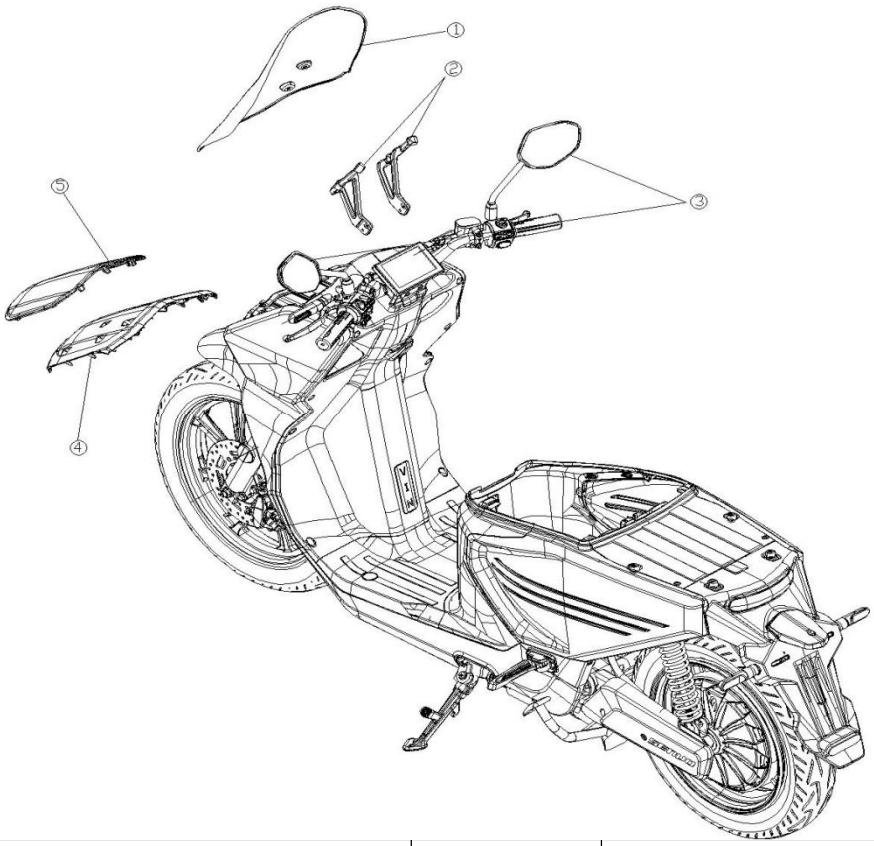
◆Rear seat cushion, front and rear seat cushion supports, rear shelf



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Rear Seat Cushion	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Rear Luggage Rack	1	
(3)	Seat Front Bracket	1	
(4)	Seat Rear Bracket	1	

■Attaching and detaching covers and vehicle bodies

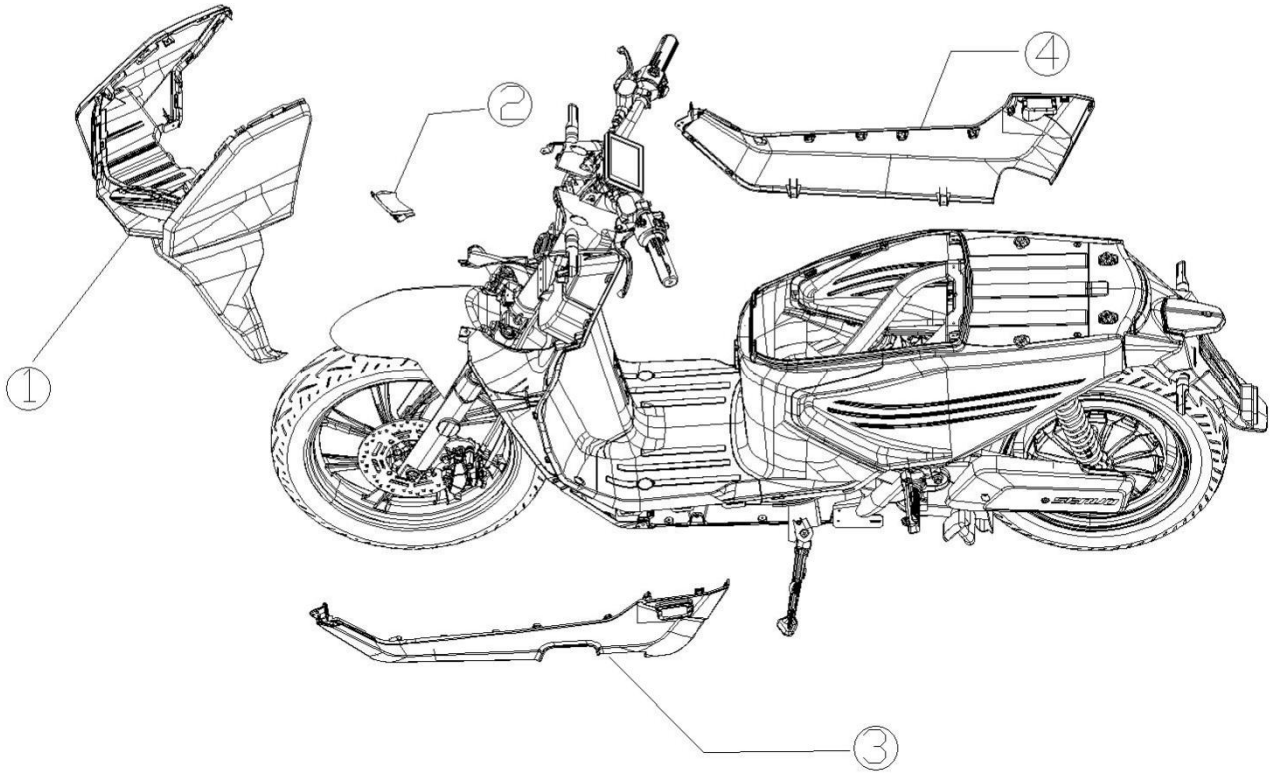
◆Windshield，Windshield Mount，Mirror，Front Panel



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Windshield	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Windshield Mount	1	
(3)	Mirror	1	
(4)	Front Panel	1	
(5)	Front Cowl Decorative Trim	1	

■Attaching and detaching covers and vehicle bodies

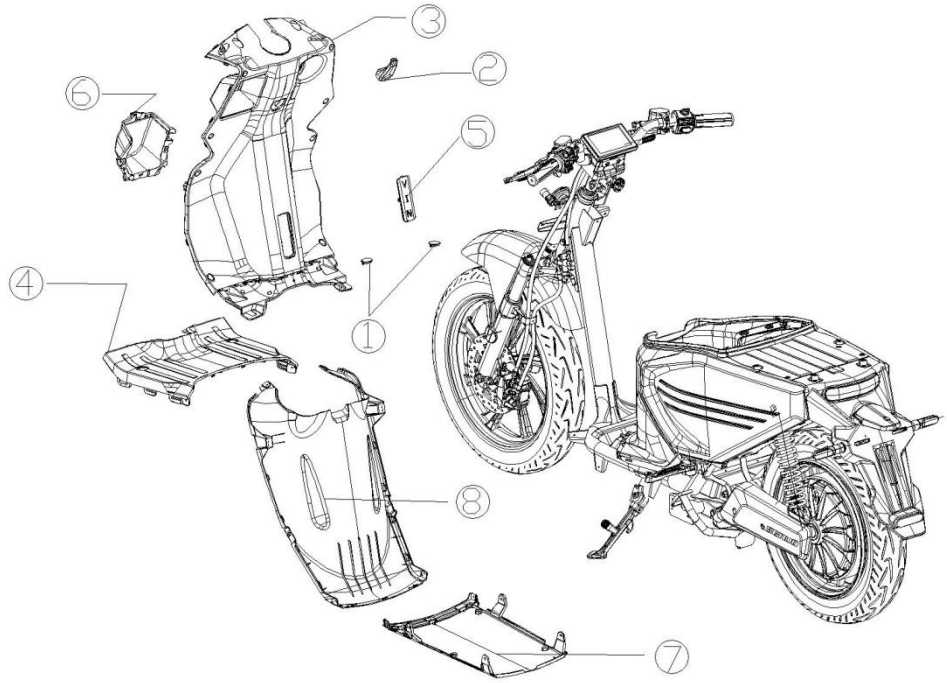
◆Front Assembly



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Front Assembly	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Tool Box Connecting Part	1	
(3)	Left Side Cover	1	
(4)	Right Side Cover	1	

■Attaching and detaching covers and vehicle bodies

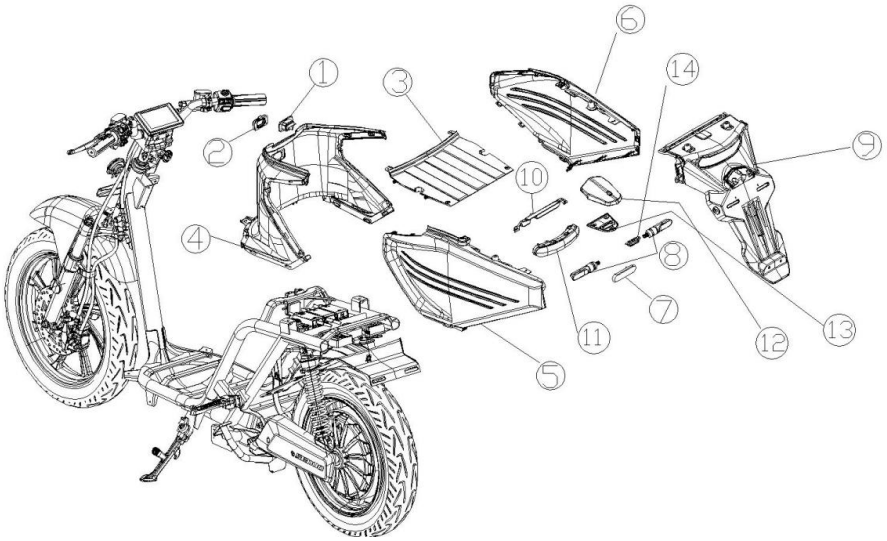
◆Tool Box，Front Inner Fender Assembly



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Footrest Plug	2	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Windshield Hook	1	
(3)	Main Beam Cover	1	
(4)	Footpeg	1	
(5)	Number Plate Cover	1	
(6)	Glove Box	1	
(7)	Frame Base Plate	1	
(8)	Front Mudguard	1	

■Attaching and detaching covers and vehicle bodies

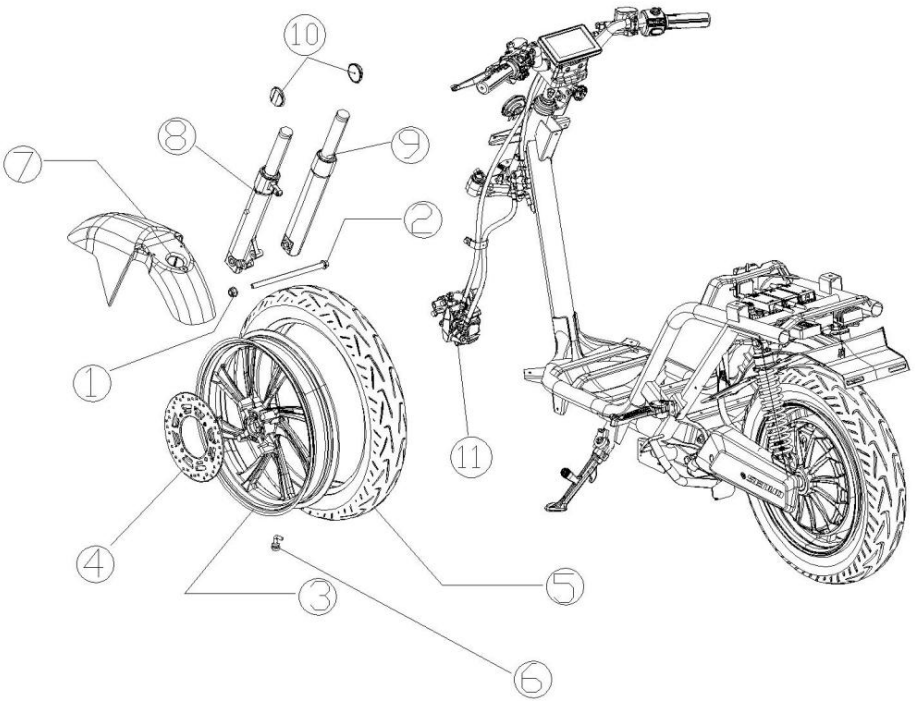
◆Rear Body Assembly



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Vehicle Body Charging Port	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Charging Port Waterproof Cover	1	
(3)	Rear Center Cover	1	
(4)	Center Cover	1	
(5)	Left Side Panel	1	
(6)	Right Side Panel	1	
(7)	Rear Reflector	1	
(8)	Left/Right Turn Signal Lights	1	
(9)	Rear Mudguard	1	
(10)	Taillight Bracket	1	
(11)	Rear Taillight	1	
(12)	License Plate Light Upper Cover	1	
(13)	License Plate Light Lower Cover	1	
(14)	牌照灯	1	

■Attaching and detaching covers and vehicle bodies

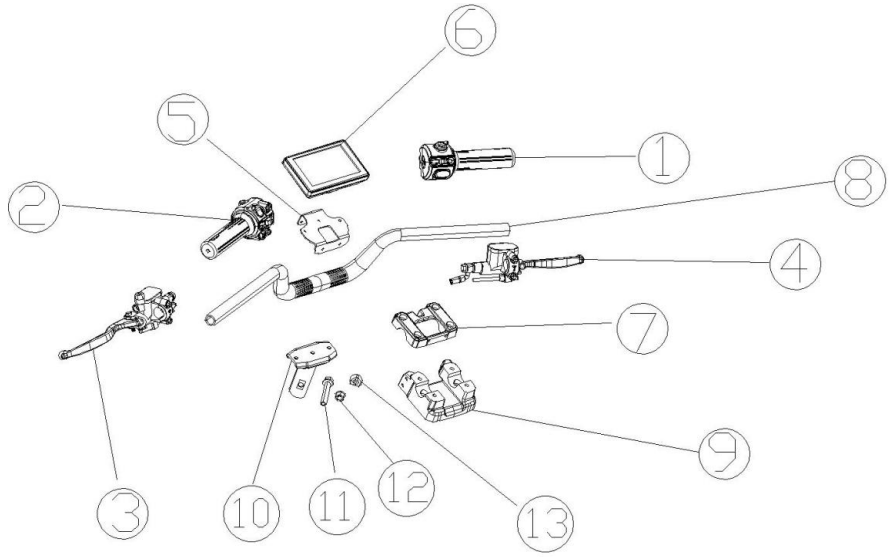
◆Front Wheel，Front Disc Brake



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Front Wheel Axle Lock Nut	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Front Wheel Axle	1	
(3)	Front Wheel	1	
(4)	Front Brake Disc	1	
(5)	Front Tire	1	
(6)	Tire Valve	1	
(7)	Front Mudguard	1	
(8)	Left Front Shock Absorber	1	
(9)	Right Front Shock Absorber	1	
(10)	Left/Right Reflector	1	
(11)	Front Brake Caliper (Lower)	1	

■Attaching and detaching covers and vehicle bodies

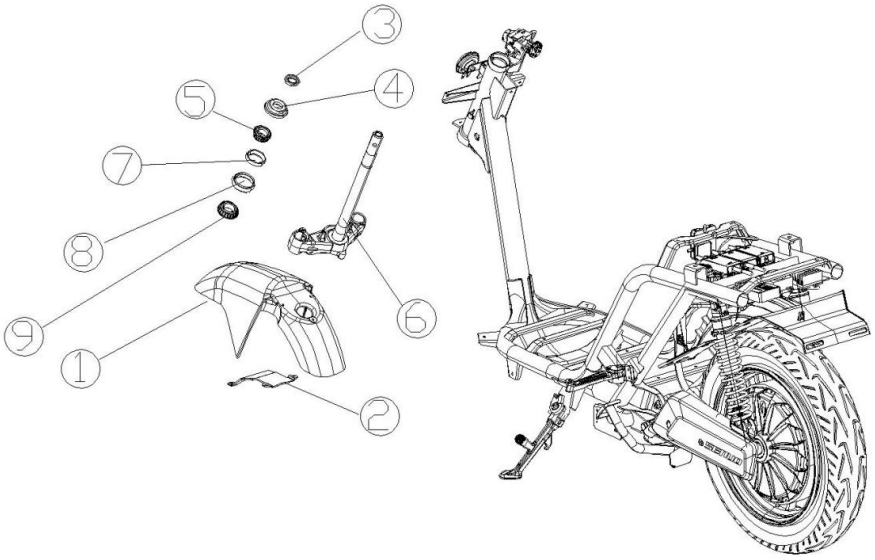
◆Handlebar Assembly



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Throttle Grip	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Left Switch & Grip	1	
(3)	Disc Brake Master Cylinder (Left)	1	
(4)	Disc Brake Master Cylinder (Right)	1	
(5)	Instrument Panel Bracket	1	
(6)	Instrument Panel	1	
(7)	Handlebar Upper Clamp	1	
(8)	Handlebar	1	
(9)	Handlebar Lower Clamp	1	
(10)	Fork Stem	1	
(11)	Handlebar Mounting Screw	1	
(12)	Handlebar Mounting Nut	1	
(13)	Handlebar Mounting Clamp	1	

■Attaching and detaching covers and vehicle bodies

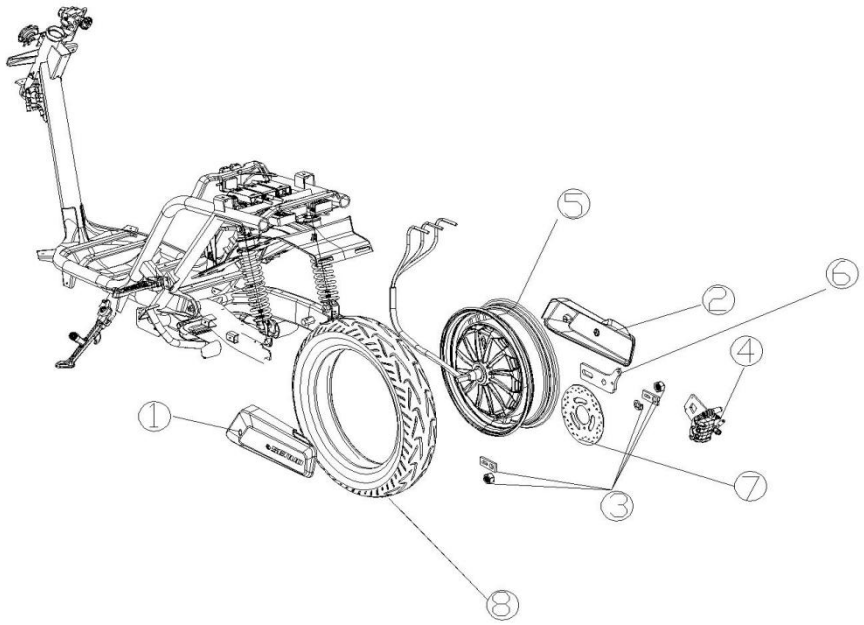
◆Front Fork



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Front Mudguard	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Front Mudguard Bracket	1	
(3)	Front Fork Locking Small Nut	1	
(4)	Front Fork Locking Large Nut	1	
(5)	Upper Bearing	1	
(6)	Lower Triple Clamp	1	
(7)	Upper Head Bearing Race	1	
(8)	Lower Head Bearing Race	1	
(9)	Lower Bearing	1	

■Attaching and detaching covers and vehicle bodies

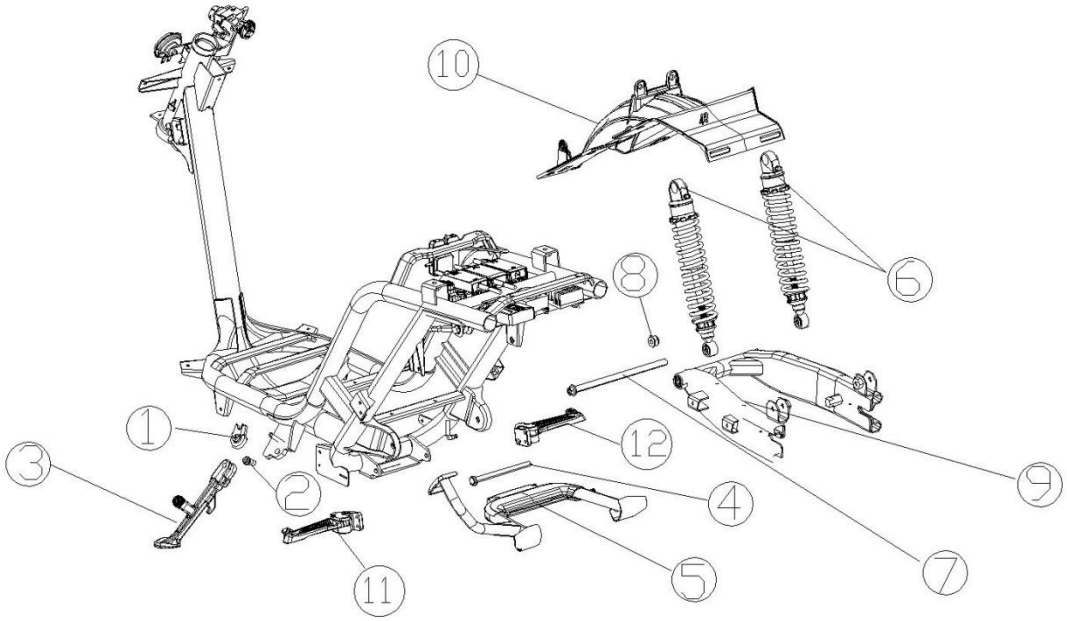
◆Motor



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Left Swing Arm Cover	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Right Swing Arm Cover	1	
(3)	Motor Accessories	1	
(4)	Rear Brake Caliper	1	
(5)	Motor	1	
(6)	Brake Caliper Mount	1	
(7)	Rear Brake Disc	1	
(8)	Rear Tire	1	

■Attaching and detaching covers and vehicle bodies

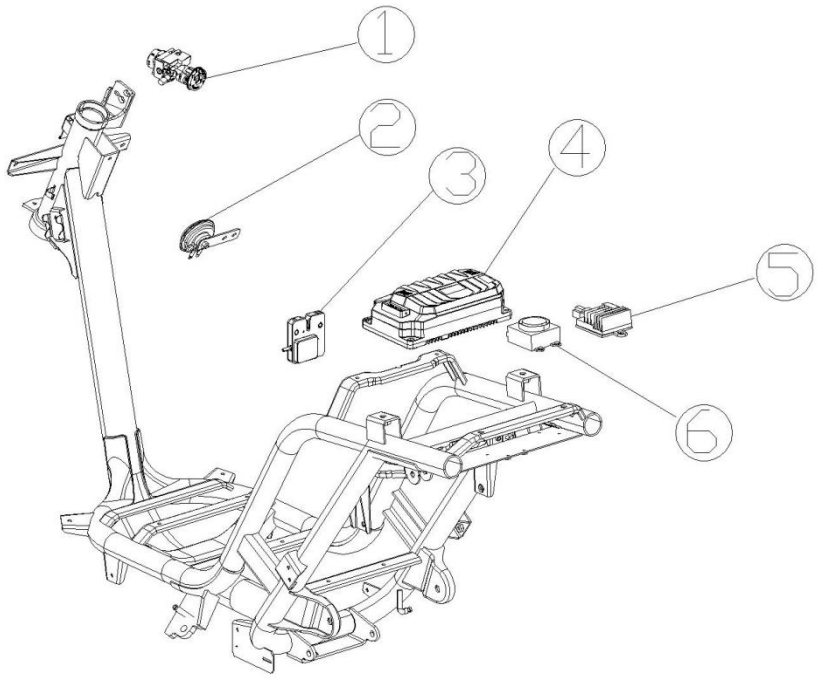
◆Side Stand, Center Stand, Rear Swing Arm, Rear Shock Absorber



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Side Stand Cut-off Switch	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Side Stand Mounting Screw	1	
(3)	Side Stand	1	
(4)	Center Stand Mounting Pivot Pin	1	
(5)	Center Stand	1	
(6)	Rear Shock Absorber	1	
(7)	Rear Swing Arm Pivot Axle	1	
(8)	M12 Self-locking Nut	1	
(9)	Rear Swing Arm	1	
(10)	Rear Inner Fender	1	
(11)	Left Footpeg	1	
(12)	Right Footpeg	1	

■Appendix

◆Electrical Assembly



Procedure	Work/Parts	Number of pieces	Maintenance information
(1)	Ignition Switch	1	・ Removal should be carried out according to the work procedures. ・ Installation is performed in the reverse procedure of removal.
(2)	Horn	1	
(3)	Electronic Lock Panel	1	
(4)	Controller	1	
(5)	Converter	1	
(6)	Anti-theft Device	1	