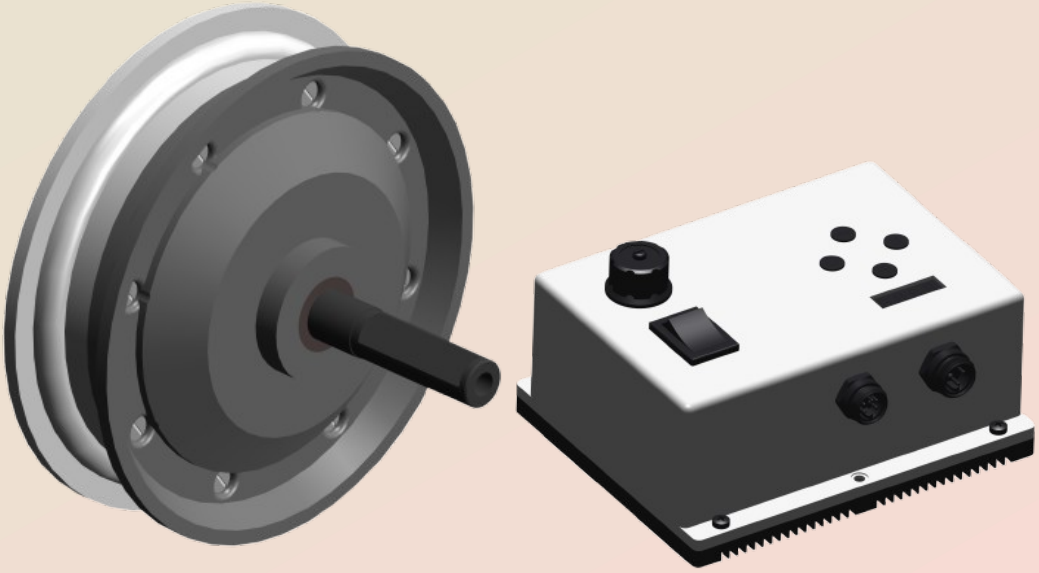
adroitec

XXX 30S Brushless Hub Motor And Servo Motor Controller



Users Manual

Welcome Note

*Thank you for choosing **Adroitec Engineering Solutions Pvt. Ltd.***

*This manual provides essential guidance for the installation, operation, and maintenance of our **Hub Motor** and **Servo Motor** systems. Each product reflects our commitment to precision engineering, performance, and reliability.*

We encourage you to follow the instructions carefully to ensure optimal results and long-term functionality. For any technical assistance, our support team is readily available to assist you.

We appreciate your trust in Adroitec and look forward to supporting your success.

Adroitec Engineering Solutions Pvt. Ltd.
Engineering Innovation. Powering Progress.

📘 About This Manual

🔍 Purpose

This manual is designed to offer comprehensive guidance on the installation, configuration, operation, and troubleshooting of the Adroitec XXX 30S Brushless Hub Motor and its associated Servo Motor Controller. It serves as a reference for understanding essential procedures to ensure optimal performance and reliability of the system.

📐 Scope

This manual includes general safety instructions, system planning guidelines, installation procedures, and operational overviews. It focuses on the Adroitec XXX 30S unit as a whole and does not cover brand-specific details of individual motor or controller components. For specifications and detailed parameters, users should refer to documentation provided by the respective manufacturers.

👥 Intended Audience

This manual is intended for qualified installation professionals such as certified electricians and experienced technicians familiar with electrical systems and safety protocols. While the installation section is technical, the operation section is intended for end users or operators who will interact with the motor system during routine use.

Conventions Used

The following conventions are used in this guide:

WARNING

Warnings identify conditions that could result in personal injury or loss of life.

CAUTION

Cautions identify conditions or practices that could result in damage to the unit or to other equipment.

IMPORTANT: These remarks highlight **critical actions** or **key points** that require your **close attention** to ensure proper operation and safety.

Important Safety Instructions

WARNING

This manual includes essential safety guidelines that must be observed during both the installation and maintenance of this product. It is important that you read carefully, fully understand, and retain these safety instructions for future references.

General Safety Guidelines

All electrical installations must comply with applicable local, national, or international electrical regulations and safety standards.

- **Read all provided instructions and warning labels** before installing or operating this device. This includes labels found on the product itself, the battery system, PV array, and any connected components.
- This equipment is **intended for indoor use only**. Do not expose it to **water, snow, or other liquids**, as doing so may result in damage or safety hazards.
- Always use **insulated tools** when working on the unit or any direct current (DC) power source to minimize the risk of short circuits.
- **Remove any metallic accessories** such as rings, bracelets, or watches before beginning installation or service work. This reduces the risk of **accidental contact with live electrical components**.
- Be aware that this device may include **multiple active circuits** (e.g., batteries and photovoltaic input). Electricity may be present from **more than one power source**.
- The unit does **not contain any components intended for user repair**. Do not attempt to disassemble or service internal parts.

WARNING: Usage Restrictions

This solar charge controller is not designed or approved for use with life support systems or medical devices where equipment failure could result in personal injury or loss of life.

Safety Information

WARNING

Using a battery or external power supply to operate the electric motor may pose several **personal safety risks**, including:

- **Electric shock**
- **Burns** caused by high short-circuit current
- **Fire or explosion** due to released gases

Always follow **appropriate safety measures** when handling or working near batteries or power sources.

Wear appropriate safety gear—always use protective eyewear (such as safety glasses) and avoid wearing jewelry when working with batteries to prevent shock or short-circuits.

1. **Never work alone.** Always have someone nearby during installation or maintenance to assist in case of emergencies.
2. **Handle batteries carefully**—use proper lifting techniques and ensure that **only identical, new, and tested batteries** are installed. Check manufacturing dates and labels for consistency.
3. **Install in a ventilated area.** Batteries should be placed where there is sufficient airflow to avoid gas build-up. Maintain **at least 1 inch of spacing** between units for cooling.
4. **Avoid ignition sources**—never smoke near batteries or generators, and avoid creating sparks by always **connecting the batteries first**, then the inverter/controller.
5. **Use insulated tools** and verify correct voltage and polarity before making connections. **Do not short-circuit** battery cables, as this could cause fire or explosion.
6. In case of **electrolyte contact**, wash the affected area with water. If it gets into the eyes, flush with cold running water for at least 15 minutes and seek **immediate medical attention**.
7. **Recycle used batteries** responsibly. Contact local recycling centers for proper disposal procedures.

Contents

1. INTRODUCTION

1.1 Overview

This manual provides a complete introduction to the features, installation procedures, and maintenance guidelines for the XXX 30S Brushless Hub Motor and its Servo Motor Controllers. It is important to read this manual carefully before operating the controller. For any further assistance or technical support, please contact Adroitec Pvt. Ltd.

The XXX programmable motor controllers are designed to deliver quiet, efficient, and smooth control for electric vehicles and custom applications. These controllers are capable of delivering high starting torque while effectively limiting current draw from the battery. This enables the use of compact battery systems without compromising acceleration or climbing ability.

By utilizing high-efficiency MOSFETs and PWM (Pulse Width Modulation) technology, the system achieves operational efficiency of up to 99%. Advanced microprocessor integration enables precise, intelligent control and also makes it easy for users to configure parameters, perform system tests, and access real-time diagnostics.

2. MAIN FEATURES & SPECIFICATIONS OF MOTOR CONTROLLER

2.1 General Functions

- Integrated fault detection and protection system with LED flashing codes for quick identification of issues during operation.
- Battery voltage is continuously monitored; the controller stops operation when voltage is too high and reduces or halts power if it drops too low. This includes monitoring during regenerative braking, where current is cut back if over voltage is detected.
- Built-in current loop, over current protection, and temperature-based current control safeguard the system: current ramps down above 90°C, shuts off at 100°C, and begins limiting below 0°C.
- Accepts motor temperature input with a configurable protection range and includes thermal overload detection using KYT83-122 silicon sensors to prevent overheating.
- Reverse speed and power can both be limited to 50% of forward values through configuration, offering improved control and safety.
- Fully programmable via RS-232 with support for firmware upgrades, and includes a Windows-based GUI for setup, diagnostics, and parameter testing.
- Provides a regulated 5V output for hall-effect sensors and supports three configurable digital switch inputs (defaulting to throttle, brake, and reverse) and three analog inputs (0–5V) for throttle, brake, and temperature sensing.
- Switch-based functions include optional boost mode (full power output when enabled) and turbo mode (restricted to 50% power), allowing tailored performance control.
- Features advanced regenerative braking, enhanced with a unique ABS-like method for smooth and effective deceleration; supports a 12V brake signal or motor temperature sensor input for added flexibility.
- A single 0–5V joystick throttle can be used for both forward and reverse, simplifying system integration.
- Operates over a broad voltage range of 8V to 30V and is compatible with three hall-position sensors using open-collector inputs with internal pull-up resistors.

CAUTION: Regenerative braking assists with deceleration but **does not replace mechanical brakes** proper braking system is essential, as **regeneration brake may stop to protect the controller, not the user**.

2.2 Features

- Engineered specifically for use in electric vehicle applications.
- Powered by an intelligent microprocessor for advanced control and precision.
- Utilizes synchronous rectification, high-speed PWM, and ultra-low voltage drop technology to ensure exceptional efficiency.
- Supports electronic motor direction reversal without mechanical switching.
- Provides voltage monitoring across all three motor phases, main power bus, and internal supply lines (12V and 5V).
- Measures current across all motor phases with integrated sensing for effective control.
- Includes a closed-loop current control system for stable and responsive operation.
- Built-in hardware-level protection for both over current and over voltage conditions.
- Supports torque, speed, and balanced mode operation, configurable per application.
- Allows separate motor and battery current limits to be defined for optimal power management.
- The battery current limit feature helps protect the system while preserving strong launch performance.
- Optimized for higher initial startup torque and speed, allowing smoother take off.
- Designed with low electromagnetic interference (EMC) for improved system compatibility.
- Built-in LED fault code indicator for easy error diagnosis.
- Offers battery protection through configurable high/low voltage thresholds, with current limiting, warnings, and auto-shutdown when limits are exceeded.
- Housed in a durable aluminium enclosure for excellent heat dissipation and operation in harsh environments.
- Features high-current terminals and aviation-grade signal connectors for rugged and reliable electrical connections.
- Includes thermal protection that automatically reduces current, issues a warning, or shuts down the system when internal temperatures exceed safe levels.
- Compatible with both 60° and 120° hall-effect position sensors.
- Supports motors with any number of poles, offering maximum versatility.

- Standard operation supports up to 40,000 electrical RPM, with optional configurations for 70,000 and 100,000 electrical RPM for high-speed applications. *(Electrical RPM = Mechanical RPM × Pole Pairs)*
- Regenerative braking can be triggered using the brake switch, and the regenerative current can be controlled via a 0–5V brake signal.
- Three regenerative braking modes are available:
    - Brake Switch Activation
    - Throttle Release Activation
    - Variable Regenerative via 0–5V Analog Signal
- Supports high throttle lockout protection to prevent operation if the throttle is active during startup.
- Implements current multiplication, allowing more motor output current while drawing less from the battery, improving efficiency.
- Simple installation process — a standard 3-wire potentiometer is sufficient for setup.
- Includes current meter output for real-time current monitoring.
- Programming can be done using a regular PC or laptop; no specialized hardware is required.
- A user-friendly programming tool is provided free of charge, making configuration easy and accessible for all users.

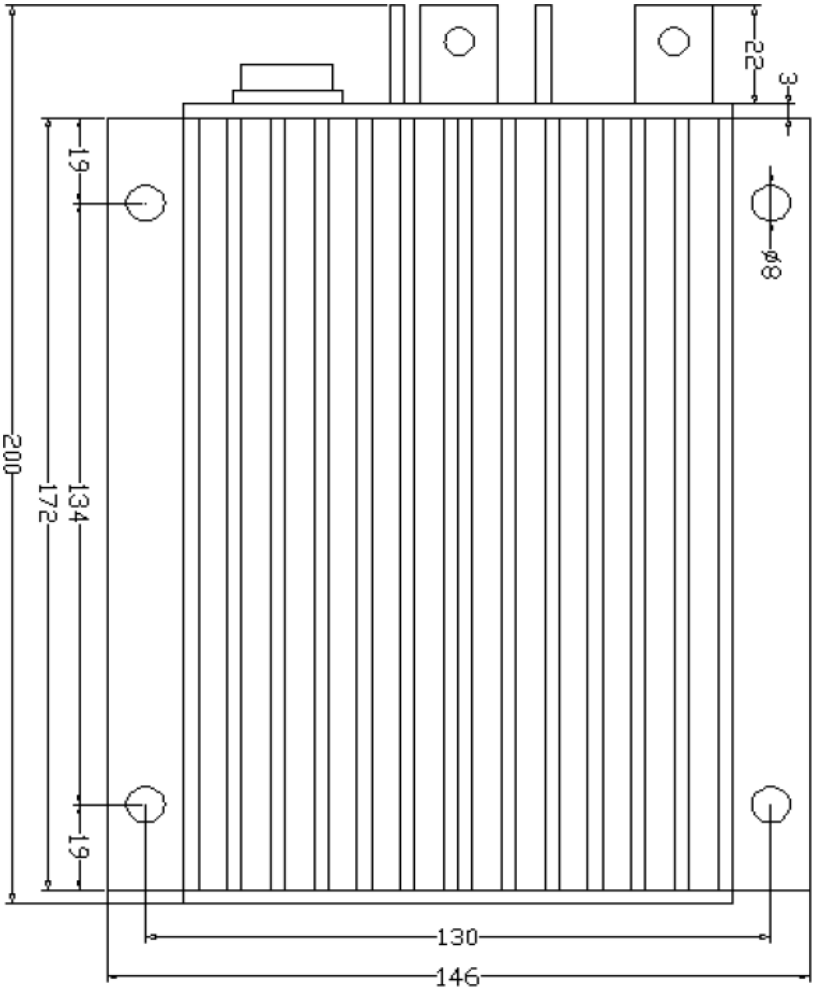
2.3 Specifications

- Operates at a **PWM frequency of 16.6 kHz** for smooth control, drawing less than **0.5 mA** in standby mode to conserve energy.
- Provides a **5V sensor output** (up to 40 mA), accepts a **PWR supply voltage** of **18V to 90V** with typical draw of **150 mA**, and supports a configurable **battery voltage input (B+)** ranging from **18V up to 1.25× Vnom**.
- **Throttle and brake inputs** are **analog (0–5V)**; throttle supports both **3-wire resistive potentiometers (0–5V)** and **active hall-effect types (1–4V)** for flexible control input options.
- Supports **full power output** between **0°C and 50°C case temperature**, operates across **–30°C to 90°C**, and features **automatic shutdown at 100°C** for thermal protection.
- Delivers **peak phase current of 100–350 A (30s)** and **continuous phase current of 50–150 A**, with **user-configurable maximum battery current** for optimized system protection and performance tuning.

3. WIRING & INSTALLATION OF MOTOR CONTROLLER

3.1 Mounting the Controller

The controller may be mounted in any orientation, provided the area is kept clean and dry or protected with a suitable cover to prevent exposure to moisture and contaminants. For optimal performance and to ensure it delivers its full rated power output, the controller should be securely fastened to a flat, clean metal surface using four screws. To enhance thermal conductivity and improve heat dissipation, it is recommended to apply silicone gel or another thermally conductive material at the contact surfaces between the controller and the mounting base. In high-power applications, proper airflow or additional heat sink assemblies should be used to maintain safe operating temperatures. The detailed case outline and mounting hole dimensions can be found in Figure 1



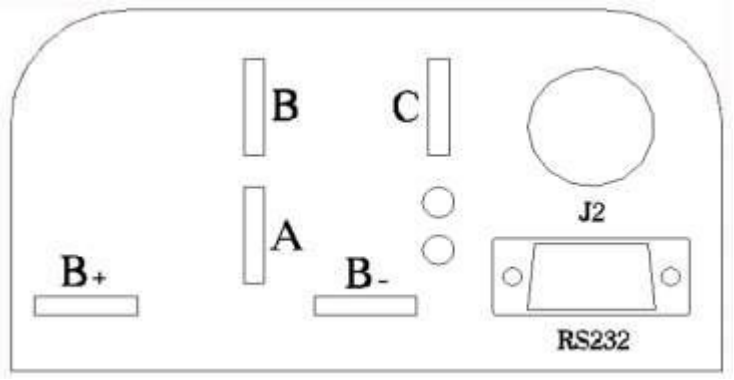
Height – 62mm

Figure 1- Mounting holes' dimensions (dimensions in millimetres)

3.2. Connections

3.2.1. Front Panel of the Controller

Five metal bars and fourteen pinned rugged connector are provided for connection of battery, motor, and control signals in front of the controller as shown in Figure 2. Fourteen pinned rugged connector is given in Figure 3:



B+: Battery Positive

B-: Battery Negative

A: Output U/1/A Phase (Yellow)

B: Output V/2/B Phase (Green)

C: Output W/3/C Phase (Blue)

***Figure 2**: Front Panel of the Controller*

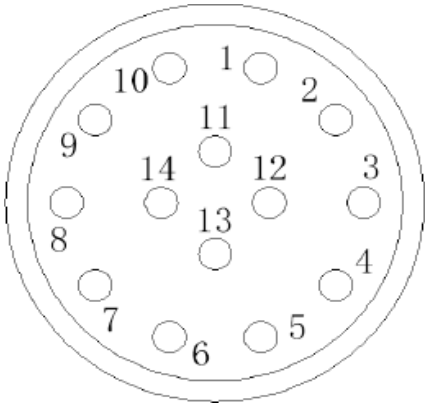


***Figure 3:** Connection Diagram*

1: PWR: Controller Power Supply

2: RTN: Signal Return or Power Supply Ground

3: RTN: Signal Return

4: Motor Temperature Input or 12V Brake Input

5: Analog Throttle Input (0 – 5V)

6: Analog Brake Input (0 – 5V)

7: 5V: 5V Supply Output (<40 mA)

8: Micro_SW: Throttle Switch Input

9: Reverse Switch Input

10: Brake Switch Input

11: Hall Phase C

12: Hall Phase B

13: Hall Phase A

14: RTN: Signal Return

CAUTION

Before powering up, ensure all connections are secure — improper wiring can damage the controller. **Connect B- first**, and place a **contactor or breaker on B+ with a pre-charge resistor**, as failure to do so may cause serious damage.

3.2.2. Communications Port

The controller includes an RS232 port to enable communication with a host computer for configuration and calibration purposes. It is highly recommended that any configuration adjustments be performed under the guidance of Adroitec Engineering Solutions Pvt. Ltd. to ensure proper setup.

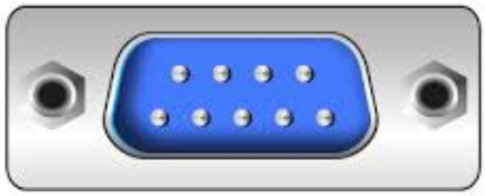


Figure 4: *Standard RS232 Interface*

3.2.3. Standard Wiring of Motor Controller

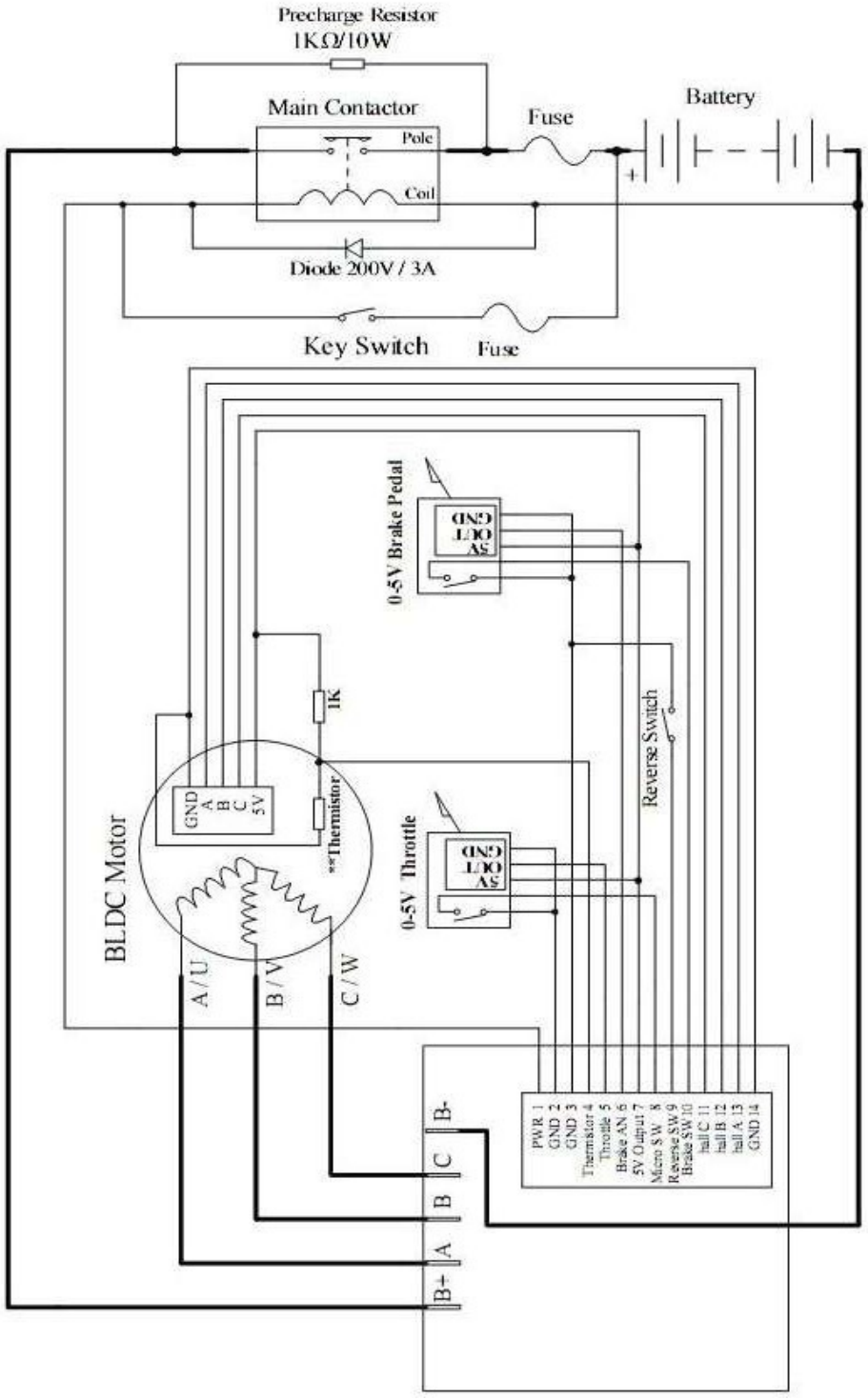


Figure 5: Controller standard wiring (Battery voltage can be used for controller supply)

- **Note: A potentiometer may be used to provide a 0–5V output signal. Always ensure that the B- connection is made first, before connecting any other wires. Never install a contactor breaker on the B- line. The use of a thermistor is optional, and by default, the controller is configured for the KYT83-12 model.**

3.3 Installation Checklist

Before starting the motor or vehicle, ensure that all installation steps have been properly completed by going through the following checklist. Refer to the **LED indicator codes** for status verification. These can be found in **Table 1 and Table 2**.

WARNING:

Regenerative braking can help slow the vehicle, but it does not substitute for a mechanical brake. A proper mechanical braking system is essential to bring the vehicle to a full stop. Regeneration is not designed as a safety feature the controller may disable it to protect itself, regardless of user safety.

WARNING:

Before applying electrical power, ensure that **all connections are properly made**, as incorrect wiring may result in **controller damage**. Always **securely connect the B- terminal first** before powering on. For additional safety, it's recommended to install a **load relay on the B+ line** and use a **pre-charge resistor** with any breaker in the system. Prior to testing, **lift the drive wheels** to prevent unintended movement, and make sure **no one is standing in front of or behind the vehicle**. Confirm that both the **power switch and brake are turned off**, and always use **insulated tools** during setup for personal safety.

Turn on the PWR switch. The LED should blink initially and then remain solid if the controller is operating correctly. If not, check the PWR wiring and controller ground continuity.

- On restart, any fault codes will be automatically detected and displayed by the controller.
- With the brake switch open, select a direction and apply throttle—the motor should spin accordingly. If it doesn't respond or run faster with increased throttle, check the wiring, voltage, fuse, and refer to LED Codes Table 2 to identify and fix any fault.
- Once testing is complete, remove the vehicle from the blocks and test-drive it in an open area. The vehicle should accelerate smoothly and reach its proper top speed.

4. MAINTENANCE OF MOTOR CONTROLLER

If the controller ceases to function, it should be returned to **Adroitec** for servicing. **Do not attempt to open the unit**, as this could cause **irreversible damage**. However, occasional **external cleaning** of the controller may be required.

Since the controller operates as a **high-power device**, it is important to follow **proper safety procedures** when working with battery-powered vehicles. This includes having appropriate training, wearing **eye protection**, avoiding **loose clothing or jewelry**, and using **insulated tools** at all times.

4.1 Cleaning

Although the controller requires **minimal maintenance** once installed correctly, a few steps may be necessary in some applications:

- First, **disconnect the battery** to cut off all power.
- Discharge any internal capacitor energy by briefly connecting a **load** (e.g., a contactor coil or horn) across the **B+ and B- terminals**.
- **Clean any dirt or corrosion** from the bus bar area. Wipe the controller's surface with a **slightly damp cloth**, and ensure it is **completely dry** before reconnecting the power supply.
- Check that all **bus bar connections are firmly tightened**. Use **two insulated wrenches** to avoid twisting or damaging the bus bars during this process.

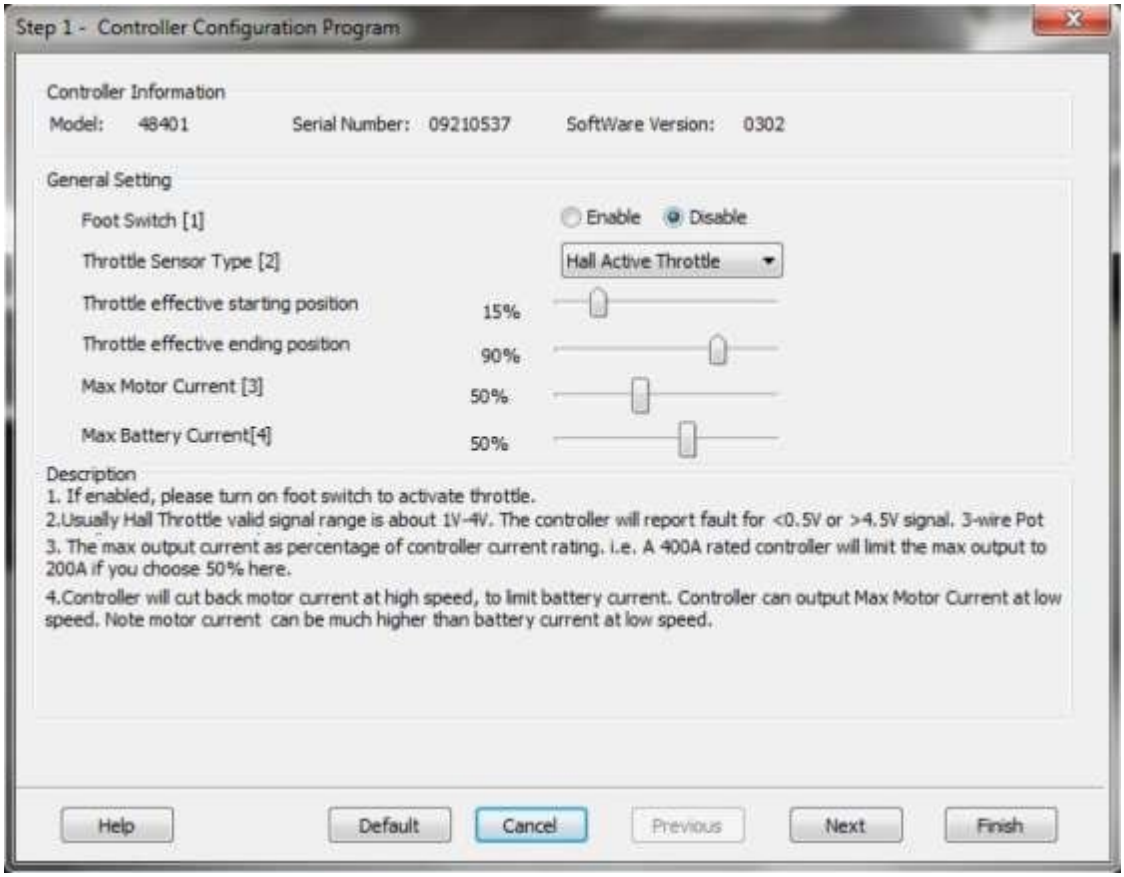
4.2 Configuration

The controller's settings can be adjusted by connecting it to a **host computer** using either an **RS232** or **USB interface**:

- Use a **standard RS232 cable** or an **Adroitec-approved USB-to-RS232 converter** to connect the controller's 9-pin front-panel connector to your computer. Supply **18–90V** power to the **PWR input**, and make sure the **power ground is connected to any RTN pin**.
- There's no need to connect the **B+ line, throttle, or other functional terminals** during configuration. If a **fault code appears**, it can typically be ignored during programming, as it does **not interfere with configuration functions**.

4.3. Motor Controller Software Settings

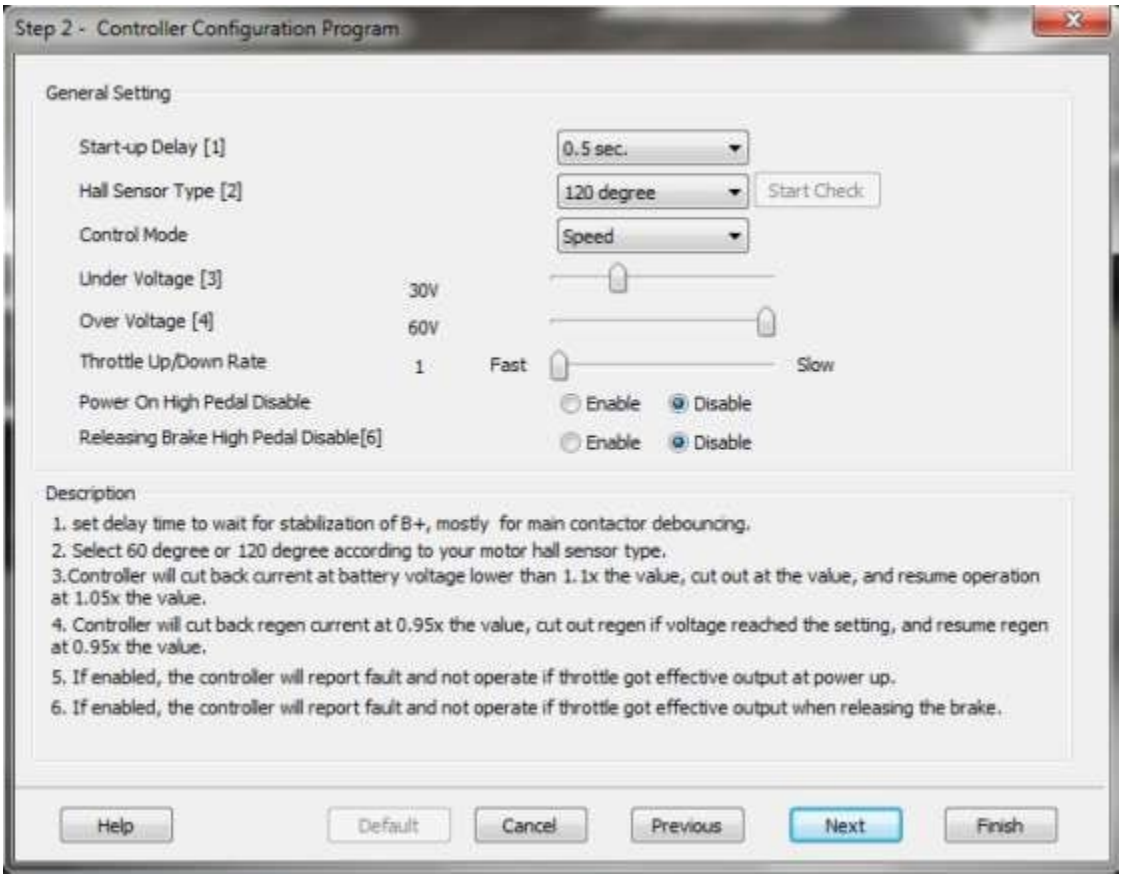
As an example, a **48V 4 kW motor drive** is used to illustrate the configuration settings. The **motor driver software** guides you through the configuration process in **six simple steps**. Additionally, detailed explanations are provided to support proper setup and understanding of the **motor drive configuration**.



Step 1 Description:

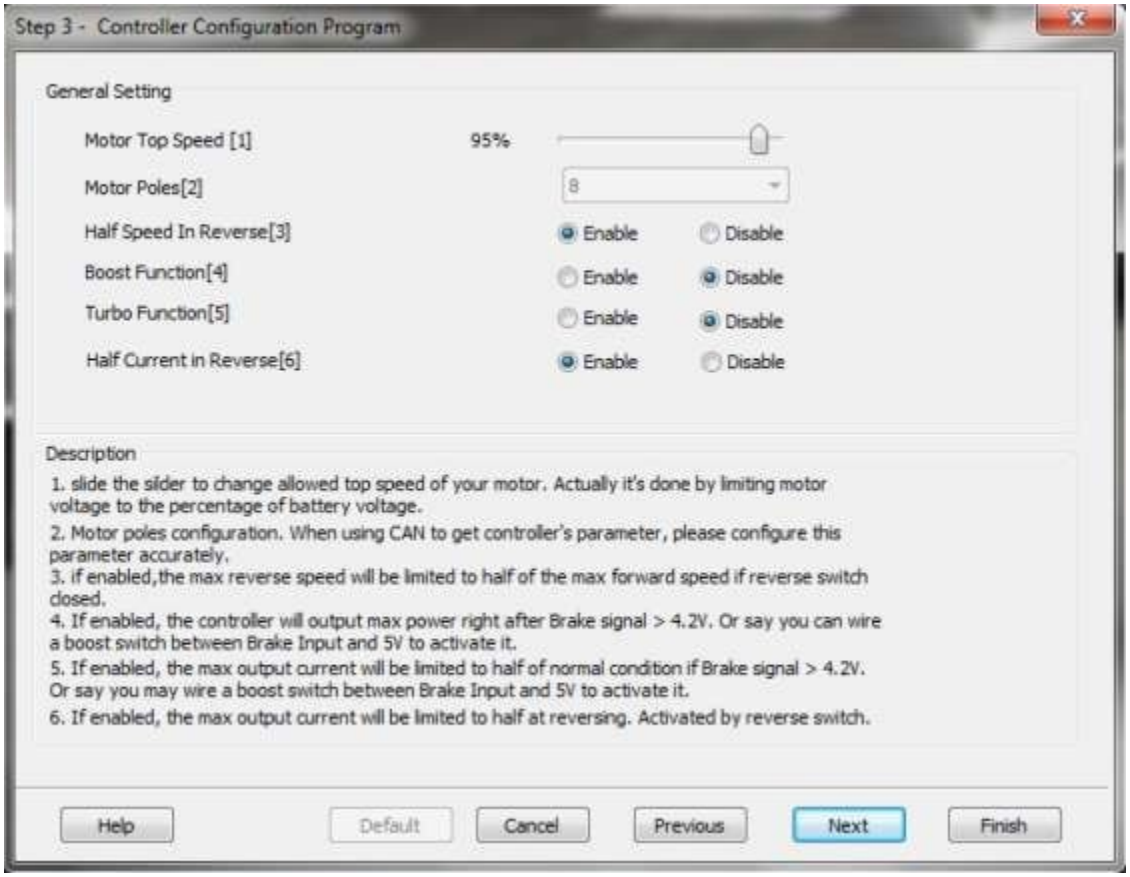
1. Under **General Settings**, the **Foot Switch** is **disabled by default**. If it's enabled, make sure to **activate the foot switch** in order for the throttle to function properly.
2. The valid signal range for a typical **hall-effect throttle** is between **1V and 4V**. If the signal falls **below 0.5V or exceeds 4.5V**, the controller will register a **fault**. This also applies to a standard **3-wire potentiometer**.
3. In the **Max Motor Current** section under General Settings, the value is expressed as a **percentage of the controller's rated current**. For example, if the controller is rated at **400A**, selecting **50%** would limit the maximum motor output to **200A**.
4. The **Max Battery Current** field determines how the controller manages current at different speeds. At **higher speeds**, the controller will **reduce motor current** to prevent excessive battery load. However, at **lower speeds**, the controller can still deliver **maximum motor**

current, which may be **significantly higher than the battery current** due to the nature of electric motor operation.



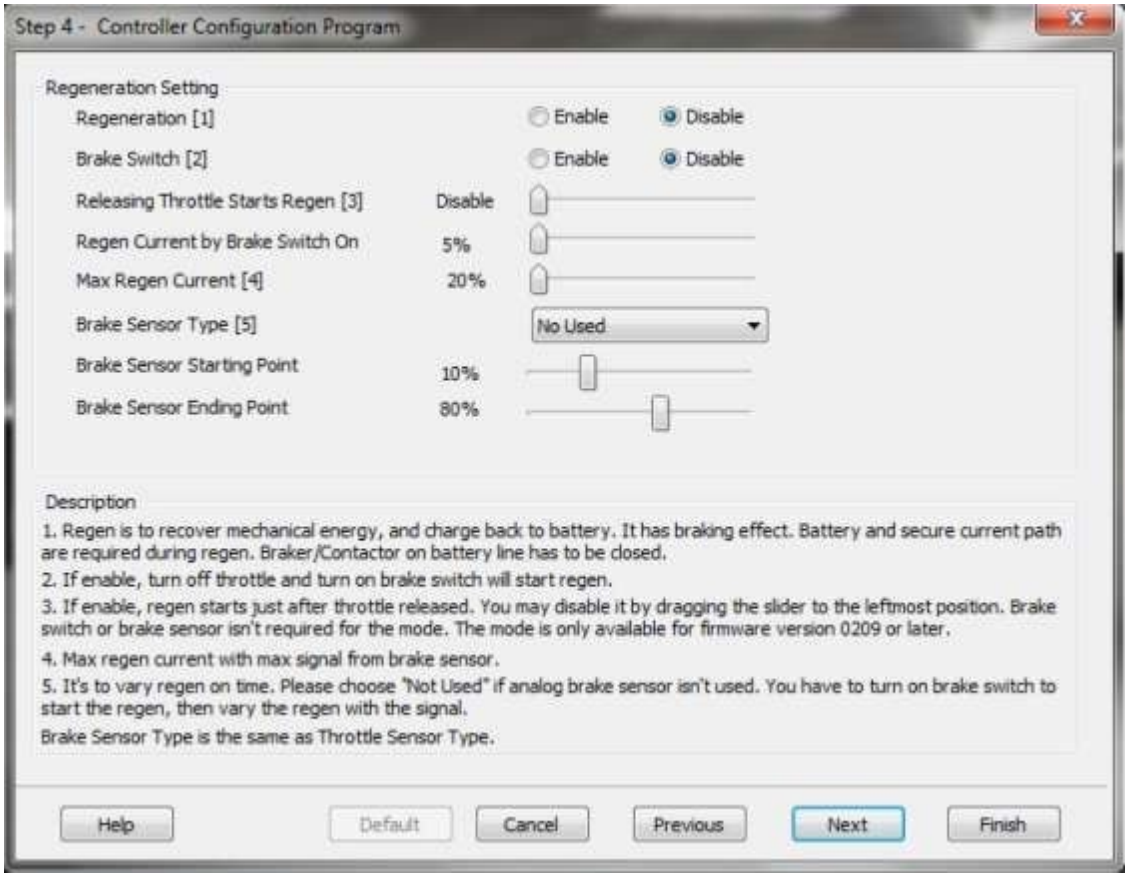
Step 2 Description:

1. In **General Settings**, Step 2 allows you to **set a delay time** to ensure B+ voltage stabilizes—this is mainly used to handle **main contactor debounce** during startup.
2. In this section, you can **select the hall sensor type** for your motor. Choose either **60° or 120°** depending on the motor's hall sensor specification.
3. The controller is programmed to **reduce current** when the battery voltage drops below **1.1× the configured value**, **cut off completely** at the exact value, and **resume operation** once voltage rises to **1.05×** the set point.
4. For regenerative braking, the controller will **begin reducing regen current** when voltage drops to **0.95× the set limit**, will **disable regeneration** if voltage reaches the threshold, and will **re-enable regen** once the voltage returns to **0.95×** of the configured level.
5. When this feature is enabled, the controller will **detect throttle activity at power-up** and trigger a **fault**, preventing operation if **any output is present**.
6. Similarly, if enabled, the controller will report a **fault condition** and refuse to operate if **throttle output is active** at the moment the **brake is released**.



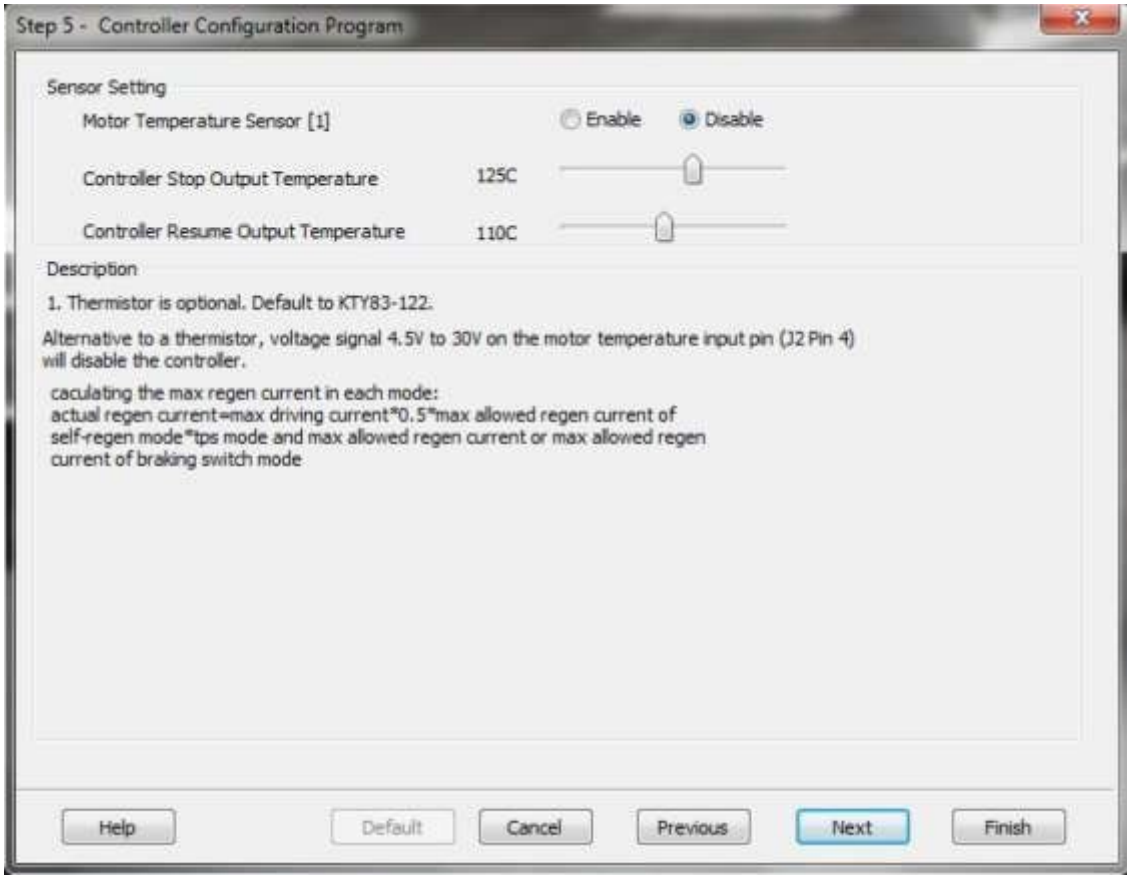
Step 3 Description:

1. Adjust the **slider** to set the **maximum speed** of your motor. This is effectively done by **limiting the motor voltage** as a percentage of the **battery voltage**.
2. Configure the **motor pole count** accurately—this is especially important when using **CAN communication** to retrieve the controller's parameters.
3. When this feature is enabled, if the **reverse switch is engaged**, the **maximum reverse speed** will be limited to **50% of the forward speed**.
4. Enabling this option allows the controller to deliver **maximum power output** as soon as the **brake signal exceeds 4.2V**. This can be activated by wiring a **boost switch** between the **Brake Input and 5V**.
5. If this setting is turned on, the controller will limit the **maximum output current to half** under certain conditions, such as when the **brake signal exceeds 4.2V**. Similar to the boost mode, this can be triggered by connecting a **switch between Brake Input and 5V**.
6. If this option is active, the controller will **limit output current to 50%** while in **reverse mode**, and it will be triggered by the **reverse switch**.



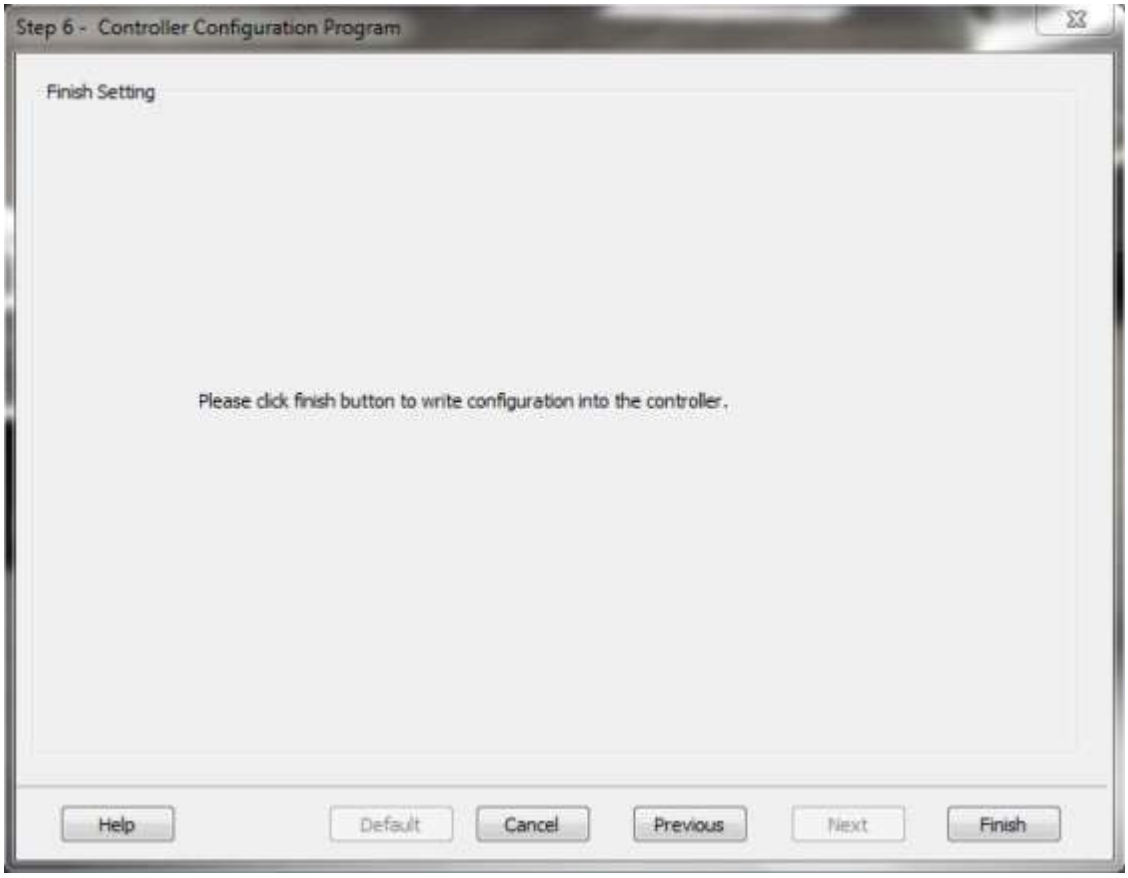
Step 4 Description:

1. The **regeneration settings** in this step allow mechanical energy to be recovered and sent back to the battery. While it offers a **braking effect**, a properly functioning **battery and secure current path** are essential. Ensure that the **breaker or contactor** on the battery line is **closed** during regenerative braking.
2. When enabled, **releasing the throttle** and **activating the brake switch** will initiate the **regeneration process**.
3. If this feature is active, **regeneration will automatically begin** once the **throttle is released**—no brake switch or sensor is needed. To disable this, drag the **slider to the far left**. Note that this function is available **only with firmware version 0209 or later**.
4. This setting defines the **maximum regenerative current**, which is triggered when the **brake sensor sends a full signal**.
5. This option allows you to **adjust the regeneration level based on brake signal timing**. If no **analog brake sensor** is used, set it to **"Not Used."** In this mode, you must first **activate the brake switch** to start regeneration, and then control the regen intensity using the **sensor signal**. The **brake sensor type** must match the **throttle sensor type**.



Step 5 Description:

1. The **thermistor is optional** and by default set to **KTY83-122**. As an alternative to using a thermistor, applying a **voltage signal between 4.5V and 30V** to the **motor temperature input pin (J2 Pin 4)** will result in the **controller being disabled** for safety.
2. The **maximum regenerative current** for each mode is calculated using the following formula:
   Actual regen current = (Max driving current) × 0.5 × (Max allowed regen current in self-regeneration mode) × (TPS mode regen limit or regen limit of brake switch mode).



This last step, click on Finish button. When the click this button the settings process is complete and changes are overwritten new configuration into the controller.

4.4. Led Codes

Table 1: LED Codes

LED CODE	Explanation	Solution
Green Off	No power or no operation	1. Check wiring. 2. Check fuse and power supply.
Green On	Normal operation	That is great! You got solution!
Green-Red On		1. Software is upgrading. 2. Power supply voltage is too low or battery voltage is too high. 3. The controller is damaged, contact Adroitec.

Table 2: Red LED Codes

LED CODE	Explanation	Solution
1.2	Over voltage error	1. The battery voltage exceeds the controller's maximum supported level. Verify the battery's voltage and setup. 2. Excess voltage detected during regenerative braking. The controller will reduce or halt regeneration. 3. Keep in mind, the over-voltage threshold may have a margin of error of up to 2%.
1.3	Low voltage error	1. If the battery voltage stabilizes within normal range, the controller will automatically try to reset the fault code after 5 seconds. 2. Verify the current battery voltage level. 3. Recharge the battery if required.
1.4	Over temperature warning	1. The controller temperature has exceeded 90ºC. In this case, it will reduce current output. Stop operation or lower the load to allow the temperature to decrease. 2. Enhance cooling by improving the heat sink or increasing airflow.
2.1	Motor fails to start	The motor failed to reach 25 electrical RPM within 2 seconds of startup. This is most likely due to an issue with the hall sensor wiring or phase connections.

2.2	Internal voltage fault	1. Check if the B+ and PWR voltage are correct, refer to B- or RTN. Could be PWR voltage low. 2. Please check load on 5V supply. Could be high load on 5V. Incorrect pot wiring can load it heavily. 3. The controller is damaged. Please contact Adroitec.
2.3	Over temperature warning	1. When controller's temperature is over 100℃. It will stop driving in order to protect itself. 2. Stop driving and wait for temperature fall. The controller will restart if temperature drops <80℃.
2.4	Throttle error at power up	1. The throttle signal is higher than configured dead zone at power-on. 2. The fault will disappear if restarts or releases throttle.
3.1	Frequent reset	The controller may stop driving due to frequent resets, often caused by improper B- or return wiring. Use heavier, cleaner return wires and bond B- lines with a thick cable or copper strip in dual-controller setups. It could also be due to over current protection—try lowering the maximum current limit. Restarting the controller will clear the error, but if the issue persists, please contact Adroitec Engineering Solutions Pvt. Ltd. for further assistance.
3.2	Internal reset	Reset caused by over current, high battery voltage or low supply voltage. It is normal if occurs occasionally.
3.3	Throttle short or open circuit when using 1-4V hall sensor throttle	1. Check whether the throttle is short or open circuit. 2. When the throttle is normal, restart will clear the error.
3.4	Throttle is not zero while trying to change direction	The controller won't change drive direction if throttle isn't zero. Also it won't change direction at high speed. The controller will wait throttle and speed close to zero before changing direction.
4.1	Over voltage at start up or regeneration	The controller won't drive motor if detects over voltage at power up. It will cut back regeneration current or stop regeneration at over voltage. You may set maximum voltage threshold with GUI.
4.2	Hall sensor signal error	1. Most likely caused by incorrect hall wiring (to wrong pin or loose wire). 2. Intermittent or damaged hall sensor. 3. Double check hall angle setting, 60° or 120°

4.3	Motor over temperature	1. The motor temperature is higher than configured maximum temperature. Controller will shut down and wait for motor temperature dropping. 2. Change the temperature setting with configuration program.
4.4	Motor locked rotor	When in locked rotor condition, max output phase current of the motor will be limited to 90% of previous current. Once the locked rotor disappear, the fault codes will disappear and the max output phase current will return to normal.

Note: *The Red LED flashes once at power on, then keeps off for normal operation. "1,2" means it flashed once, then flashes twice after 1 second. The time between two flashes is 0.5 second. The pause time between one error code and another error code is 2 seconds.*

5. TECHNICAL SPECIFICATIONS OF XXX 30S HUB MOTOR SERIES

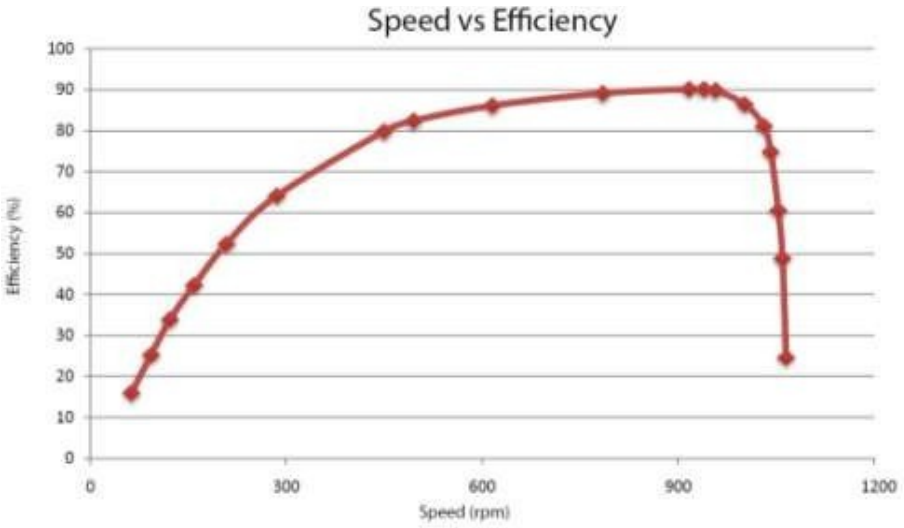
The **XXX 30S series motors** serve as a reliable source of propulsion across a wide range of applications — from industrial automation systems to wind turbines. They are also highly popular for electric vehicle (EV) conversions and experimental EV projects. **In-wheel (hub) motors** offer an efficient propulsion solution for vehicles not originally designed with driven wheels.

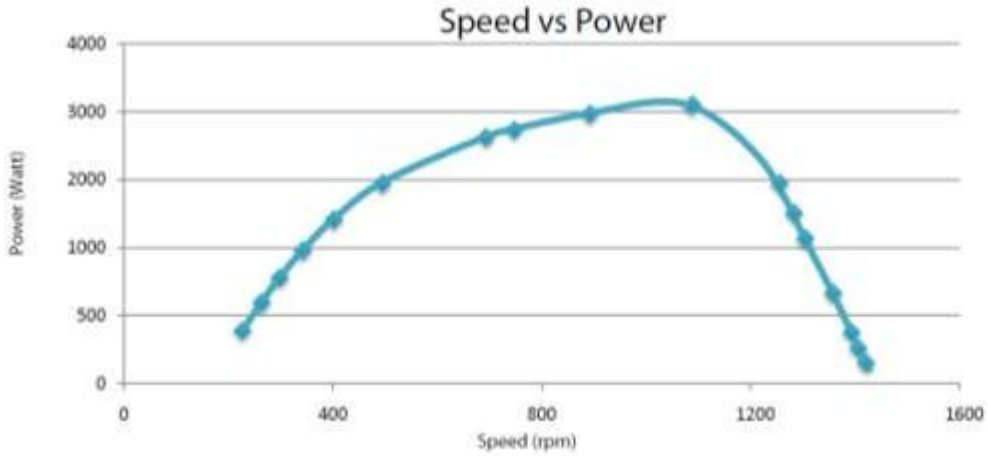
XXX hub motors are modular and compact in design, eliminating the need for external axle support from the vehicle. Their design allows for easy integration into the vehicle's structure. These motors operate by applying electromagnetic fields to stationary windings; the rotor (outer part) responds to these fields, causing the wheel to turn. This operational principle gives hub motors a performance advantage in both **efficiency** and **power output** compared to conventional electric motors. Below is the **technical data sheet** for the XXX 30S hub motor, followed by its **motor characteristic curves**.

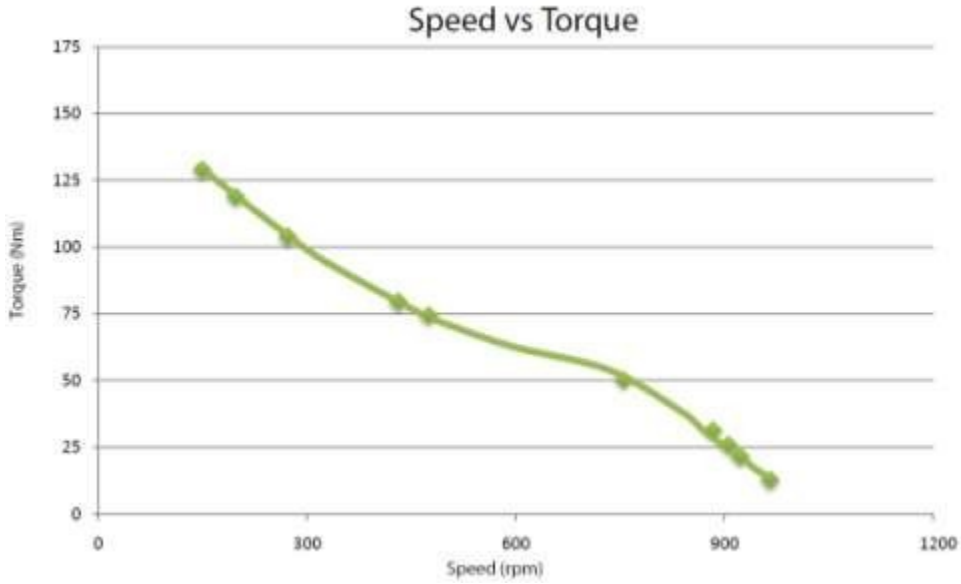
Table 3: Technical Data

XXX30S Hub Motor Technical Data	
Nom.Voltage	60V
Max. Current	65A
Max. Power	3500W
Min. Power	3000W
Speed	940rpm
Torque	41Nm
Efficiency	>92%
Weight	15kg

XXX 30S Motor Characteristics




Speed vs Power
Power (Watt)
4000
3000
2000
1000
500
0
0
400
800
1200
1600
Speed (rpm)


Speed vs Torque
Torque (Nm)
175
150
125
100
75
50
25
0
0
300
600
900
1200
Speed (rpm)

6. ASSEMBLING AND INSTALLING XXX 30S HUB MOTOR SERIES

Introduction

The **XXX 30S Hub Motor Series** is a high-performance, brushless in-wheel motor designed for electric mobility applications such as e-bikes, scooters, and light electric vehicles. Its compact and efficient design integrates the motor directly into the wheel hub, eliminating the need for chains or external drive systems. This not only reduces mechanical complexity but also enhances reliability and energy efficiency.

This section provides a clear, step-by-step guide to the **assembly and installation** of the XXX 30S hub motor system. It includes instructions for mounting the motor onto the vehicle frame, connecting electrical components, and performing safety checks prior to operation. Whether you're an experienced technician or assembling a conversion kit for the first time, following these procedures will ensure a smooth and safe setup.

If you are unsure about any step during assembly or installation, we strongly recommend contacting your **local dealer or a qualified mechanic**. Proper installation is essential to achieving optimal performance and longevity from your hub motor system.

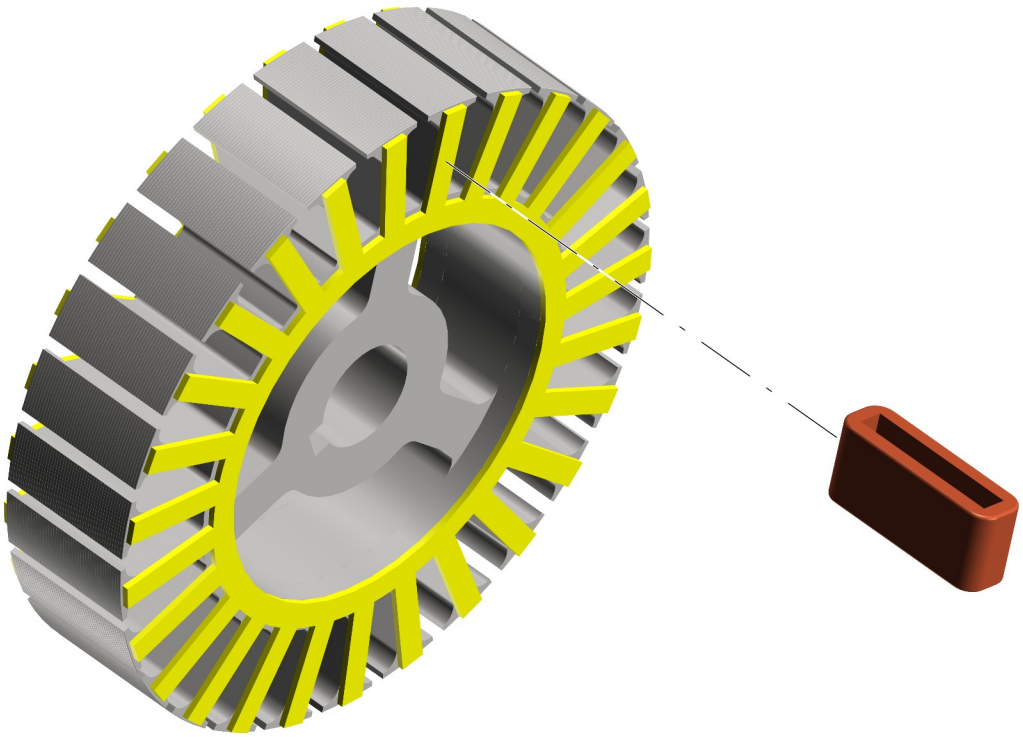
Component Checklist:

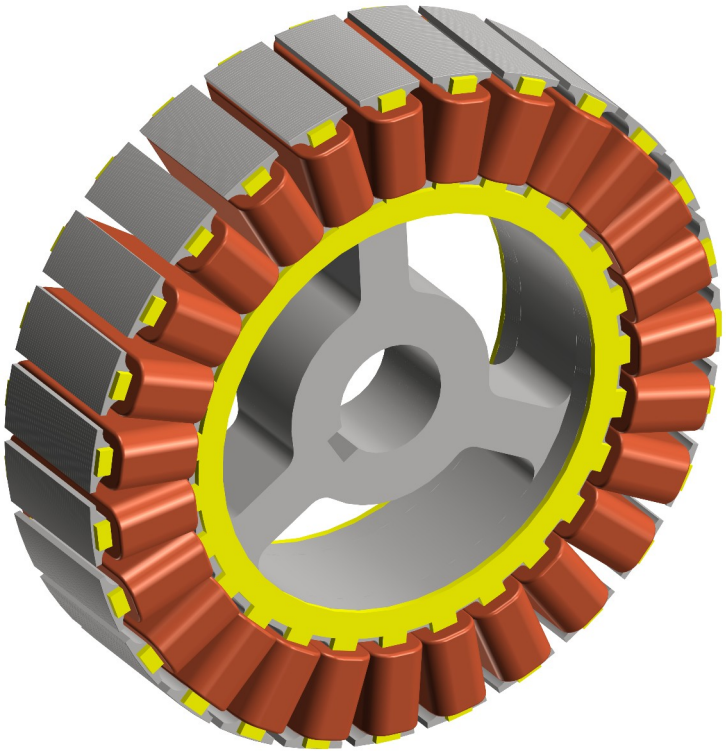
1. Stator Sheet
2. Copper Wire Winding
3. Stator Sheet Lock
4. Shaft
5. Key
6. Rotor Disc (outer drum)
7. Permanent Magnets
8. Seal Ring
9. Rotor Back Lid
10. Tire (mounted on rotor)
11. Bearings (2 pcs)

Step 1: Assemble the Stator

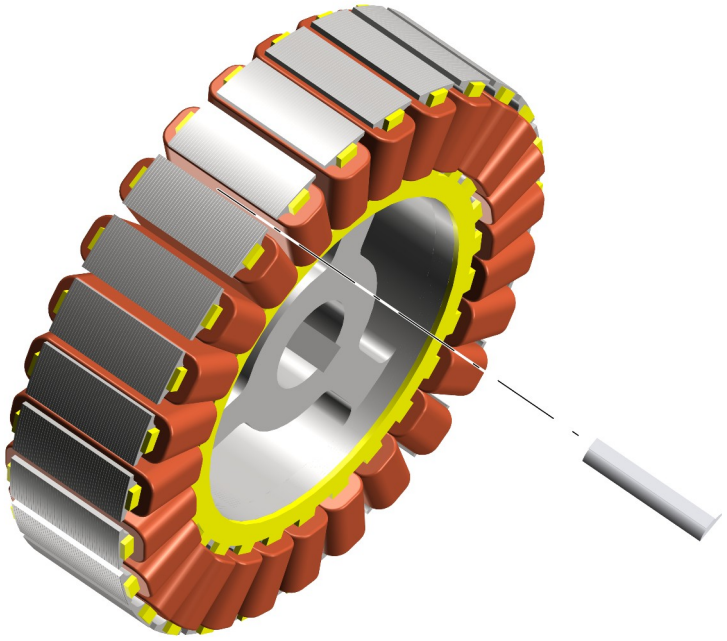
1. Wrap or insert the **copper wire windings** into the stator slots (if not pre-wound).
2. Secure the windings using the **stator sheet lock**.
3. Ensure the windings are evenly distributed and tightly held in position.
4. Place the **stator sheet** onto the central shaft.

Note: *Handle copper wires carefully to avoid insulation damage.*



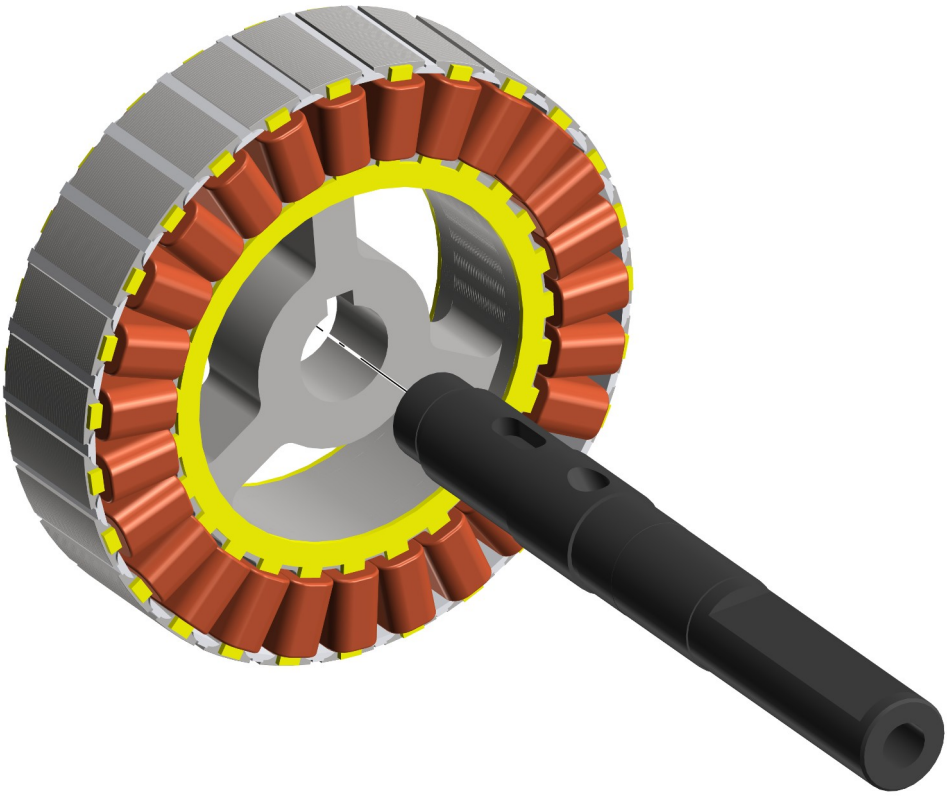


- **Position the stator sheet lock over the wound copper coils**, aligning it with the slots or guide points on the stator to ensure a firm hold without damaging the insulation.
- **Gently press or fasten the stator sheet lock into place** to secure the windings evenly, ensuring they remain tight and do not shift during rotor installation or motor operation.



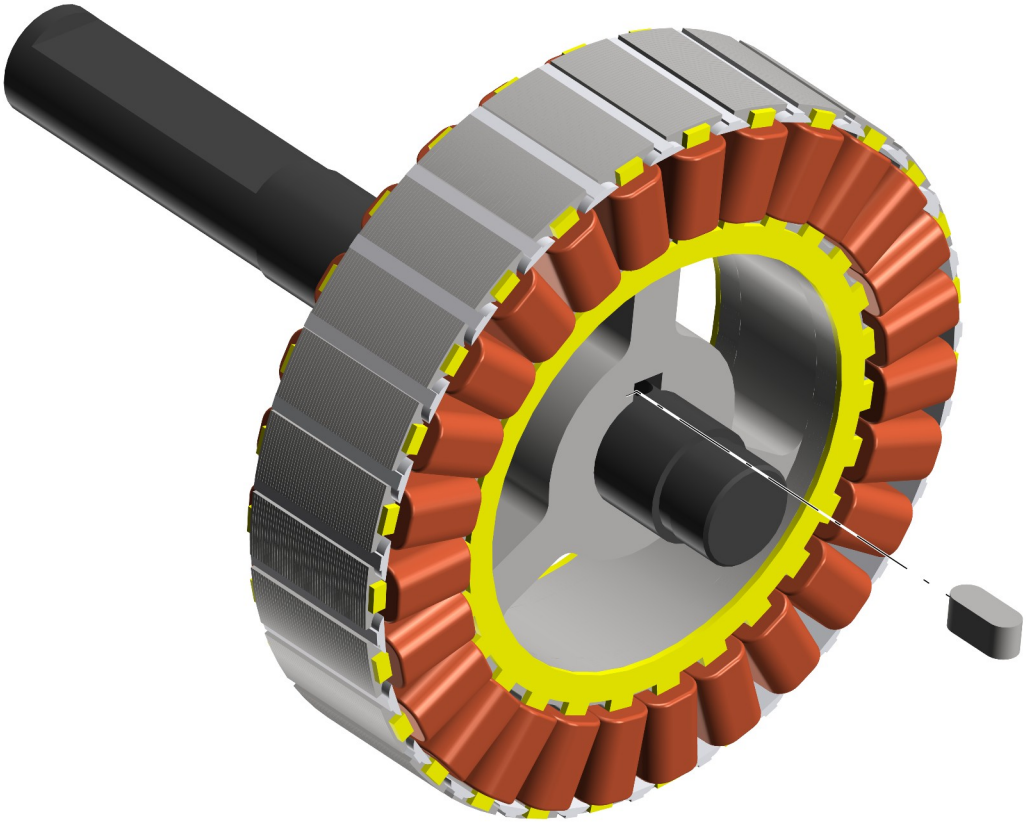
Step 2-Placing the Stator Sheet onto the Central Shaft

1. **Inspect the stator sheet and shaft** for any debris or damage before assembly to ensure a smooth fit.
2. **Align the center hole of the stator sheet with the shaft**, making sure any keyways or guide slots are properly positioned.
3. **Gently slide the stator sheet onto the central shaft** until it reaches the mounting location. Do not force it — the fit should be snug but smooth.
4. **Ensure the stator is seated flat and aligned**, with no tilting or angular gaps, to maintain proper motor balance and performance.



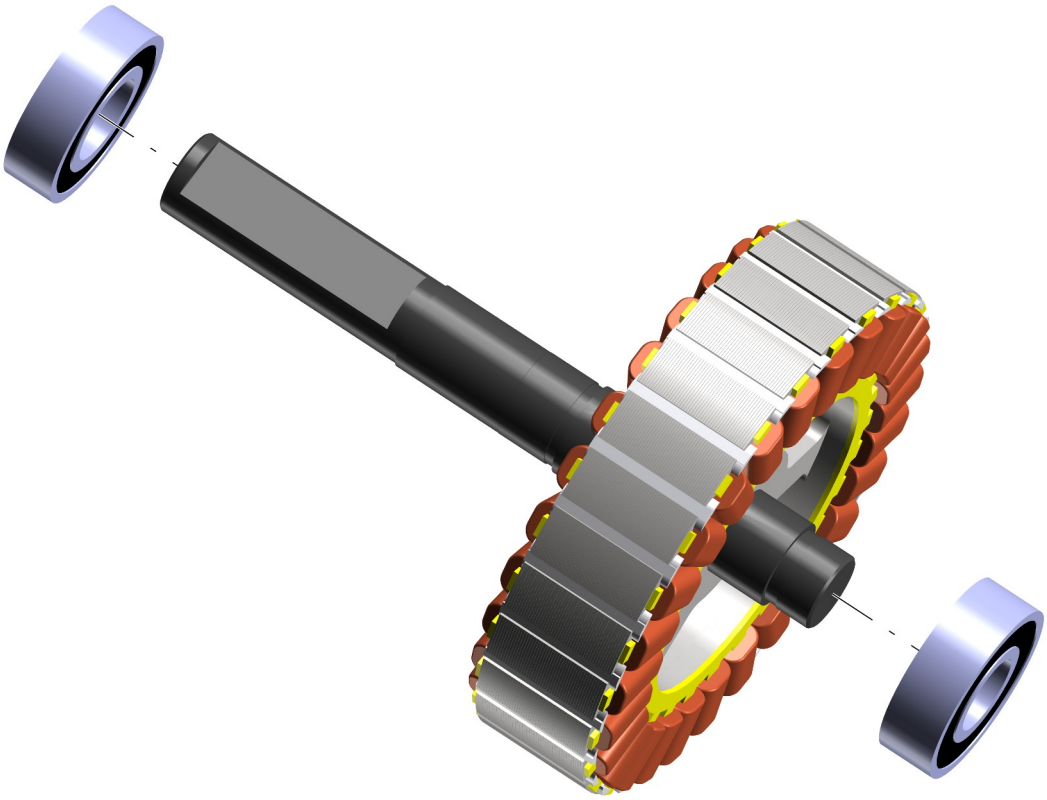
Step 3: Insert the Key

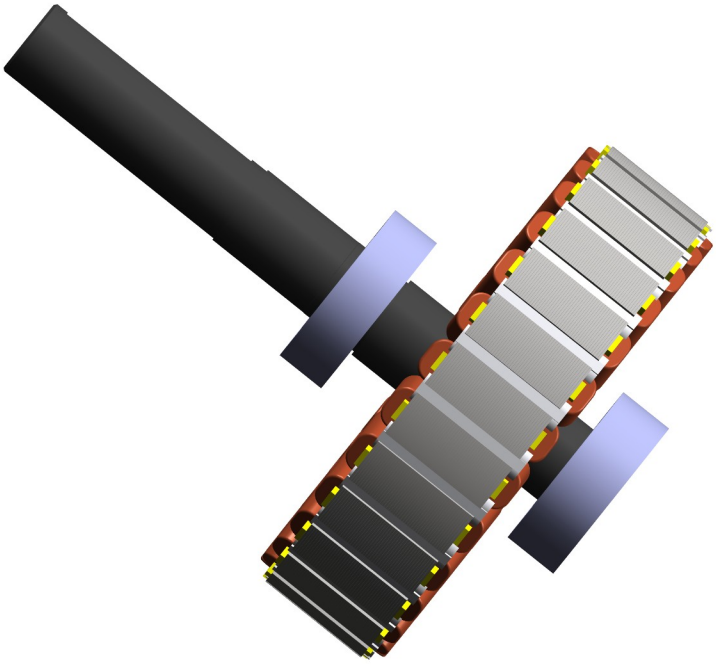
- Insert the **key** into the **slot on the shaft**.
- This prevents rotational slipping between the shaft and rotor during operation.



Step 4: Mount Bearings on the Shaft

- Press-fit the bearings onto both ends of the shaft, ensuring they are seated firmly at the designated bearing shoulders or stops on the shaft.
- Ensure a snug fit; the bearings should rotate freely but have no lateral play.





Step 5: Position the Rotor Disc

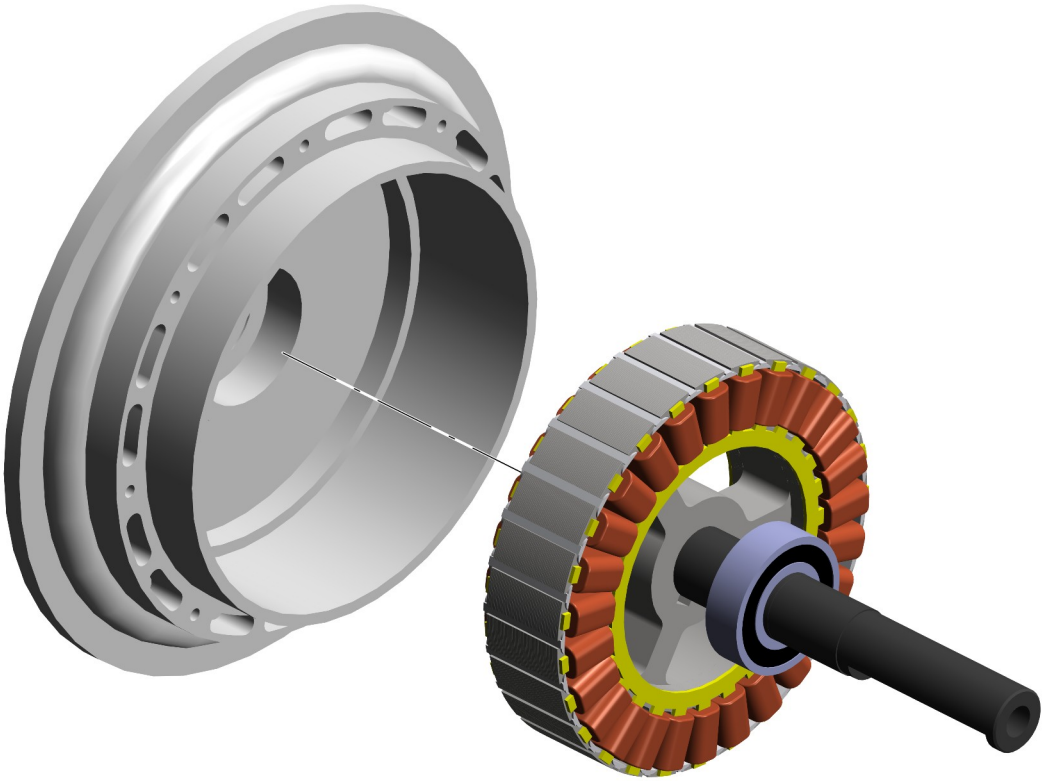
1. Place the **magnets** evenly around the **inner face of the rotor disc** (if not pre-installed).
2. Carefully slide the **rotor disc** over the stator.
    - Magnets will strongly attract — align slowly and avoid snapping.

Warning: *Use a rotor insertion guide if available. Always support the stator and rotor evenly to avoid misalignment.*

➢ Sliding the Rotor Disc Over the Stator

1. **Align the central hole of the rotor disc with the stator assembly** and gently begin to slide the rotor over the stator without applying excessive force.
2. **Ensure smooth movement and proper alignment**, allowing the rotor to seat fully over the stator without touching or scraping the windings.

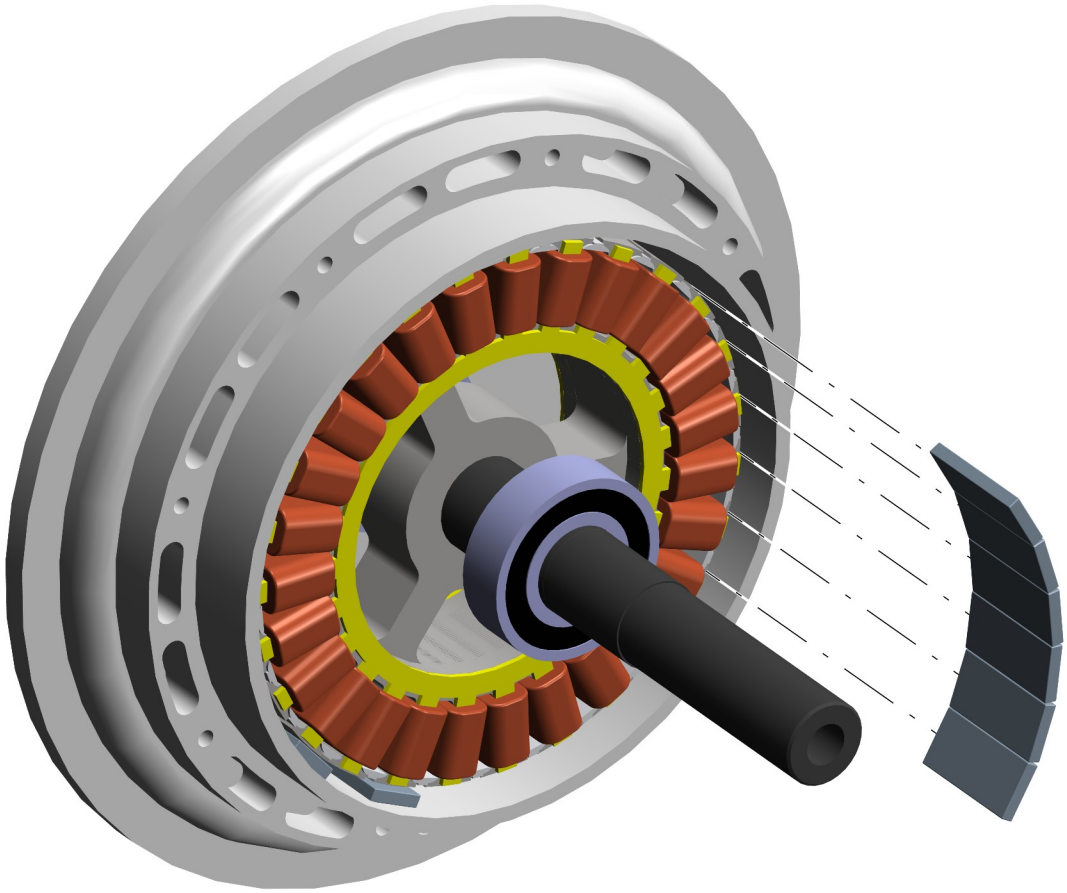
Tip: *Support both parts firmly during this step to prevent misalignment or accidental damage.*

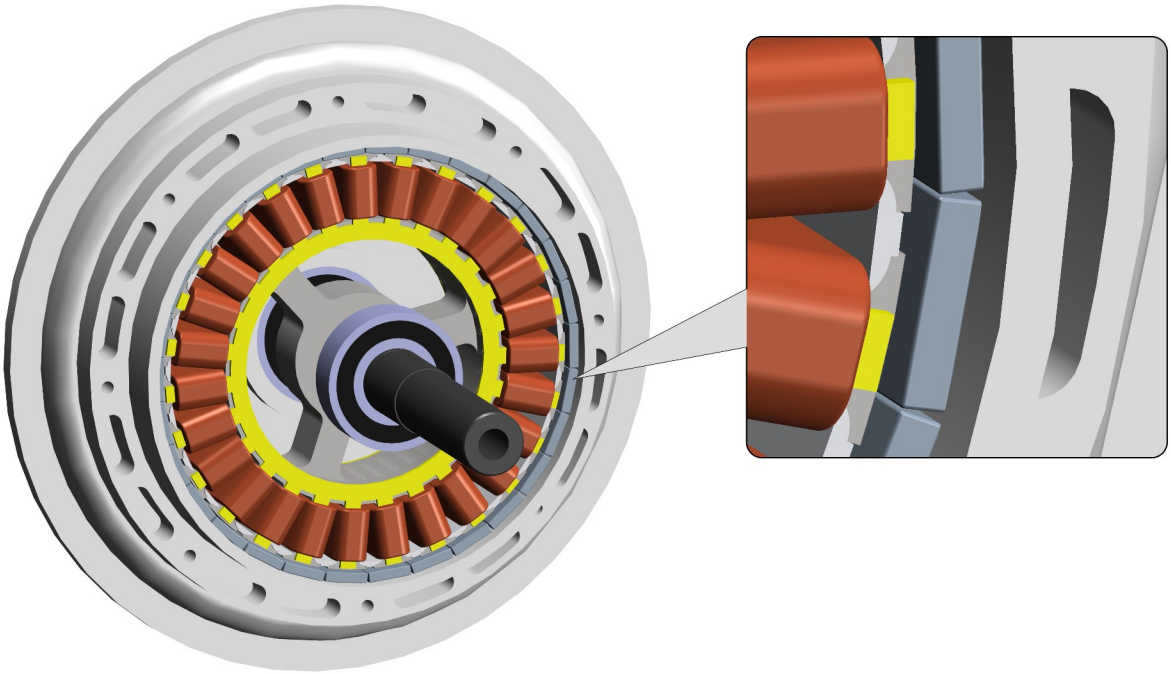


Step 6: Placing the Magnets on the Rotor Disc

1. **Position each magnet evenly around the inner circumference** of the rotor disc, following the designated polarity pattern (e.g., N-S-N-S).
2. **Ensure equal spacing and secure alignment**, so that all magnets sit flush against the rotor surface without gaps or tilting.

Tip: *Use a spacer or template for consistent magnet gaps. Always handle magnets with care — they can snap together forcefully.*



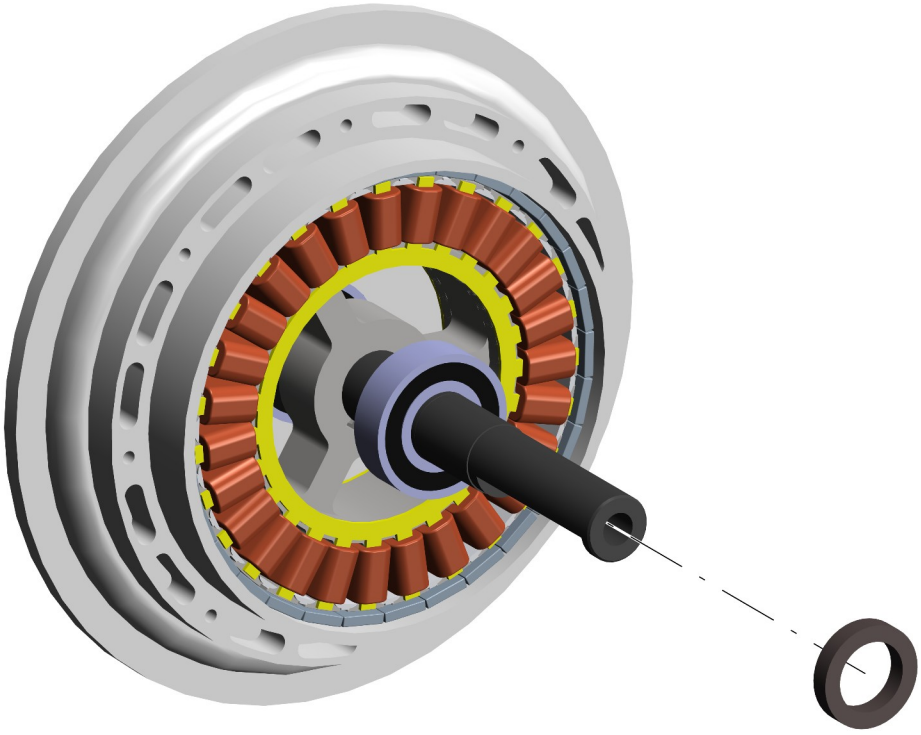


Step 7: Install the Seal Ring

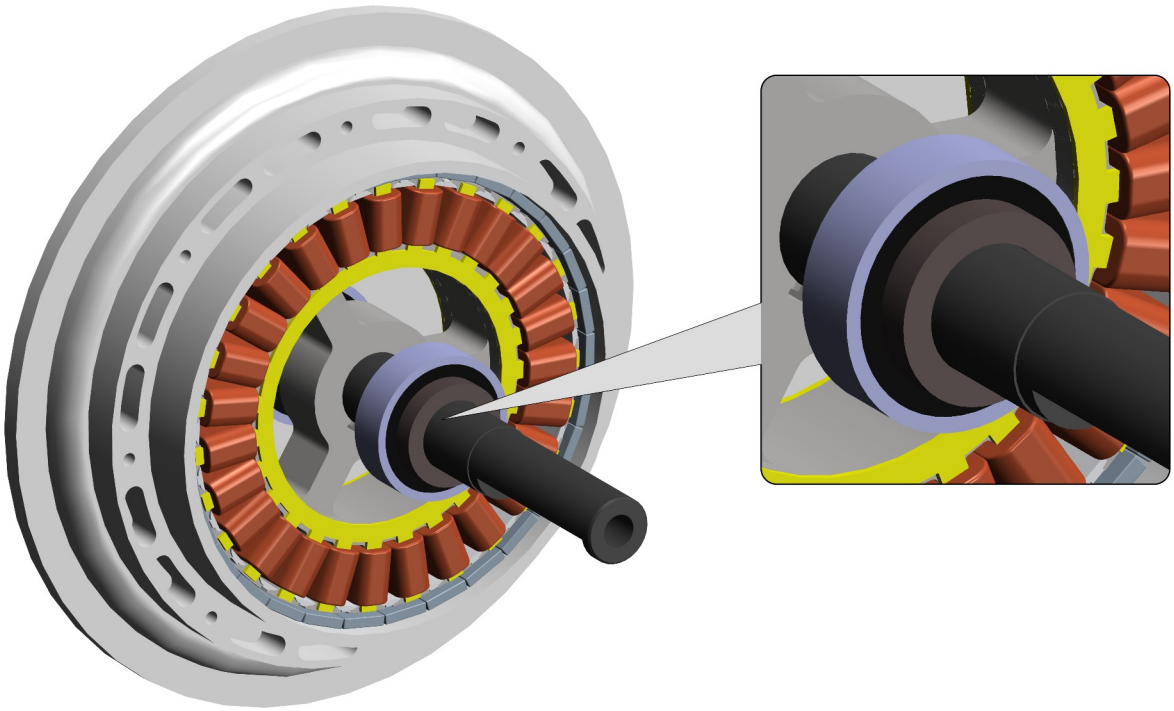
- Fit the **seal ring** into the groove between the rotor and stator interface.
- This helps prevent moisture or dust from entering the motor chamber.

Here are the **two major points** to include in your manual:

- **Provides a tight seal between rotor and stator** to prevent dust, moisture, and contaminants from entering.
- **Ensures mechanical protection and reliability** by maintaining proper insulation and minimizing wear.



- **Maintains internal pressure stability** essential for efficient motor performance.
- **Helps reduce noise and vibration** by cushioning the interface between rotor and stator.



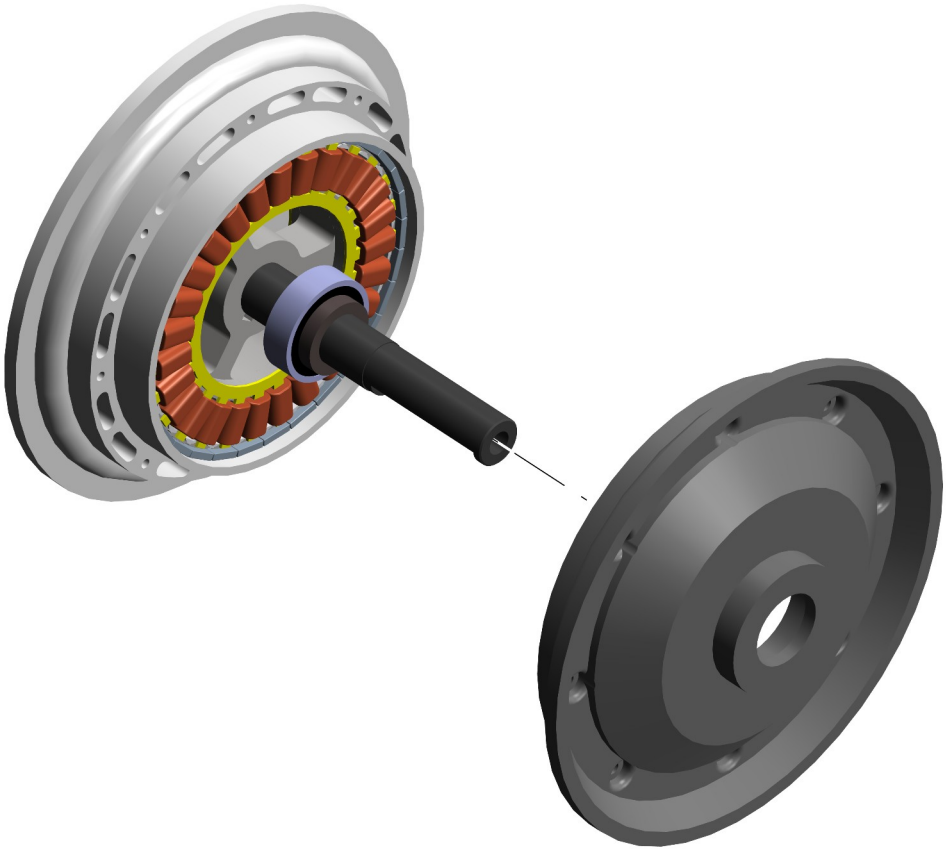
Step 8: Attach the Rotor Back Lid

- Align and secure the **rotor back lid** with screws to the rear side of the rotor.
- This closes the motor casing and helps hold internal parts in place.

Note: *Use thread-locking compound if vibration resistance is needed.*

Here are **two major points** for that step:

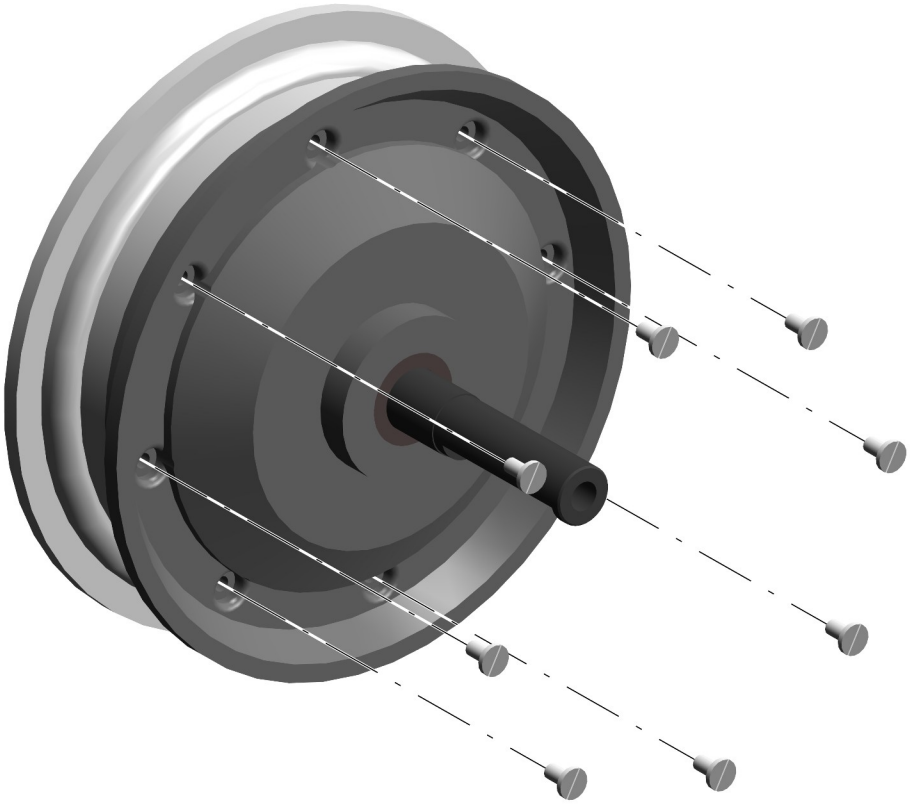
- **Ensures proper alignment and structural integrity** of the rotor assembly.
- **Prevents internal components from shifting** during motor operation, enhancing durability.



- **Seals the motor casing** to protect internal components from external elements.
- **Secures and stabilizes internal assemblies**, ensuring consistent motor performance.

Here are two major points for packing the rotor back lid with bolts:

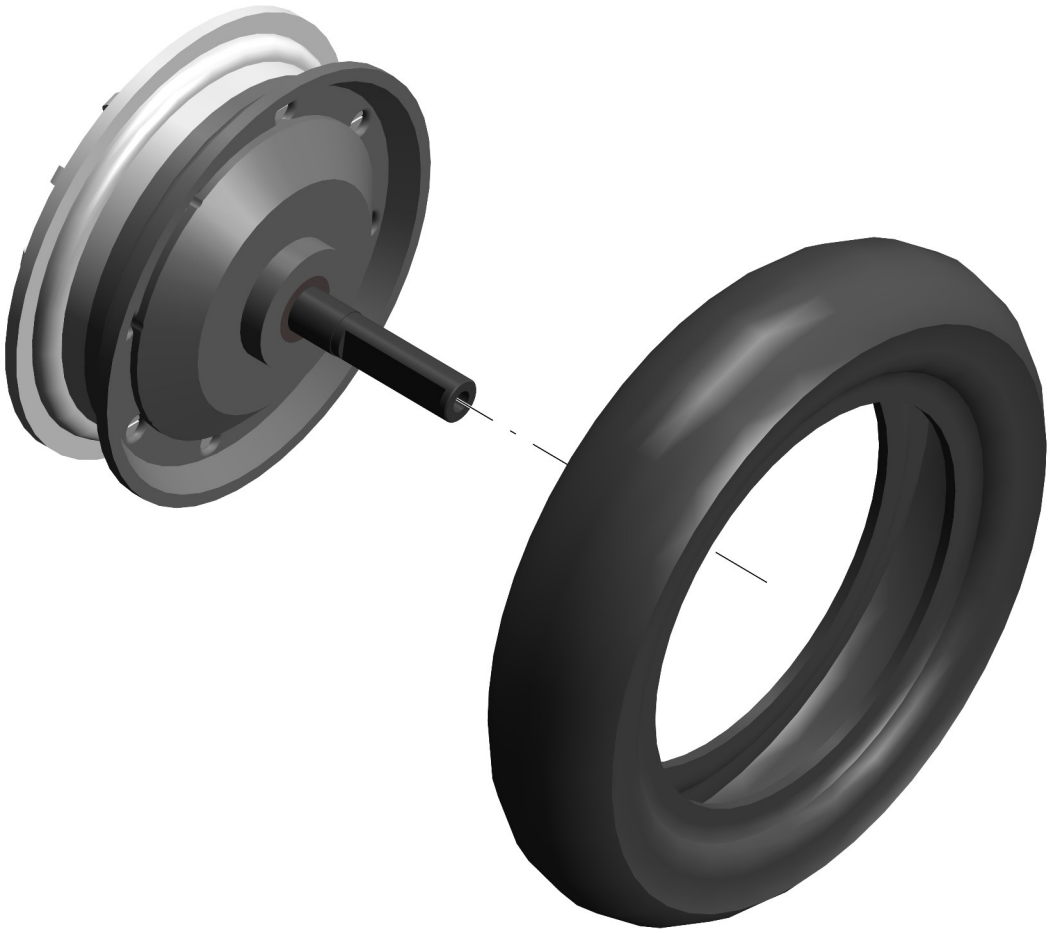
- **Ensures a tight and secure fit**, preventing loosening during operation.
- **Maintains alignment and structural rigidity** of the entire motor assembly.



Step 9: Mount the Tire

- Place the **tire** onto the outer rim of the **rotor disc**.
- Secure it using the designated locking rings or lugs.

Note: *If it's a tubeless tire, make sure it's inflated and seated properly.*



Step 10: Final Inspection and Testing

- Ensure the **rotor spins freely** without grinding or obstruction.
- Double-check all fasteners are torqued correctly.
- Make sure wire exits and seals are properly routed and protected.
- Verify there is **no axial or radial play** in the bearings.

Safety Tips

- Always wear gloves when handling sharp stator laminations or magnets.
- Keep the area clean to avoid iron particles sticking to magnets.
- Avoid applying power until the motor is fully assembled and mounted.

7. WARRANTY INFORMATION

Adroitec Engineering Solutions Pvt. Ltd. warrants that its products are free from manufacturing defects for a period of **24 months** from the date of dispatch.

The product will meet the technical specifications outlined in the **Product Data sheet** as of the dispatch date. Any deviation from these specifications entitles the customer to either a replacement or refund, at their discretion. However, Adroitec is not obligated to provide technical support beyond what is specified in the documentation.

To maintain warranty validity, the product **must be installed and operated strictly in accordance with the guidelines** provided in this manual and the Product Data sheet. Damage resulting from improper installation, misuse, or non-compliance with specifications is not covered.

The warranty does **not apply to damages caused by**:

- Water exposure, condensation, or moisture-related issues
- Electrical surges, including lightning
- Negligence by the customer or their agents
- Use outside the intended purpose described in the manual
- Failure to follow prescribed installation and operating procedures

Adroitec shall not be liable for indirect, special, or consequential damages, including but not limited to **loss of profits, personal injury, property damage**, or costs of substitute equipment.

If any clause in this warranty is deemed invalid, the remaining provisions will continue to be fully enforceable.

8. CONTACT INFORMATION

For technical support, service inquiries, or further assistance, please contact:

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Plot No. 6, Block B, Sector 4, Noida, Uttar Pradesh – 201301, India

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