



[Manuals.plus](#) /

› [XYGStudy](#) /

› XYGStudy ST3215-HS Bus Servo Motor User Manual

## XYGStudy ST3215-HS

# XYGStudy ST3215-HS Bus Servo Motor User Manual

Model: ST3215-HS | Brand: XYGStudy

## 1. PRODUCT OVERVIEW

---

The XYGStudy ST3215-HS is a high-performance bus servo motor designed for advanced robotic and automation projects. It features a large torque output of 20kg.cm at 12V, high speed of 106 RPM, and incorporates a 360-degree high-precision magnetic encoder for accurate position feedback. This servo motor supports two-way feedback and is switchable between servo mode and motor mode, offering versatility for various applications.

It is an ideal choice for building wheeled robots, 3D printers, quadruped robots, hexapod walkers, and robotic arms that require precise closed-loop speed control or stepping control.



Figure 1.1: The XYGStudy ST3215-HS Bus Servo Motor. This image displays the compact, black housing of the servo motor with its output shaft and mounting points visible.

## 2. KEY FEATURES

- **High Torque & Speed:** Delivers up to 20kg.cm torque at 12V and a no-load speed of 106 RPM (0.094 sec/60°).
- **360-Degree High Precision Magnetic Encoder:** Provides accurate position sensing with 4096 resolution, enhancing control and extending motor lifetime.
- **Two-Way Feedback:** Offers real-time feedback on position, speed, torque lock, and working mode for advanced closed-loop control.
- **Dual Operating Modes:** Easily switchable between Servo Mode (precise rotation angle control) and Motor Mode (continuous rotation).
- **UART Serial Bus Control:** Capable of controlling up to 253 bus servo motors simultaneously, simplifying complex multi-servo systems.
- **Acceleration Start-Stop Function:** Allows setting speed and acceleration values for smoother motion transitions.
- **Compact Structure Design:** Features a dual shaft and low profile design, optimizing space and appearance.
- **One-Button Calibration:** Simplifies setting the middle position for the servo.
- **Durable Construction:** Utilizes nylon and fiberglass case, high-strength aluminum servo wheels, and high-precision copper and steel gears for reliability.

### 3. SPECIFICATIONS

## 20kg.Cm High Speed Bus Servo Motor

Large Torque | 360° High Precision Magnetic Encoder | 106PRM High Speed



### Specifications

PRODUCT TYPE	ST3215-HS bus servo motor
TORQUE	20kg.cm@12V
ROTATION ANGLE	360° (0~4095)
POSITION SENSOR RESOLUTION	360° / 4096
MECHANISM LIMITED ANGLE	No Limit
OPERATING VOLTAGE	6 ~ 12.6 V
GEAR	high precision metal gear
NO-LOAD SPEED	0.094sec / 60° (106RPM)
ENCODER TYPE	360° Magnetic Encoder

ID RANGE	1 ~ 253
BAUDRATE	38400bps ~ 1Mbps (1Mbps by default)
FEEDBACK	Position, Load, Speed, Input Voltage
NO-LOAD CURRENT	240 mA
LOCKED-ROTOR CURRENT	2.4A
KT	8.3kg.cm/A

Figure 3.1: Detailed specifications of the ST3215-HS Bus Servo Motor.

Parameter	Value
Product Type	ST3215-HS Bus Servo Motor
Torque	20kg.cm @ 12V
Rotation Angle	360° (0-4095)
Position Sensor Resolution	360° / 4096
Mechanism Limited Angle	No Limit
Operating Voltage	6 - 12.6 V
Gear Type	High Precision Metal Gear
No-Load Speed	0.094 sec/60° (106 RPM)
Encoder Type	360° Magnetic Encoder
ID Range	1 - 253
Baud Rate	38400 bps - 1 Mbps (1 Mbps by default)
Feedback	Position, Load, Speed, Input Voltage
No-Load Current	240 mA
Locked-Rotor Current	2.4 A
KT (Torque Constant)	8.3 kg.cm/A
Material	Aluminum (Gear), Nylon & Fiberglass (Case)
UPC	719704484404

## 4. PACKAGE CONTENTS

The standard package for the ST3215-HS Bus Servo Motor includes the following items:

- ST3215-HS Servo Motor x1



Figure 4.1: Contents of the ST3215-HS Servo Motor package. This image shows the servo motor, mounting accessories (screws, servo wheels), and a connection cable.

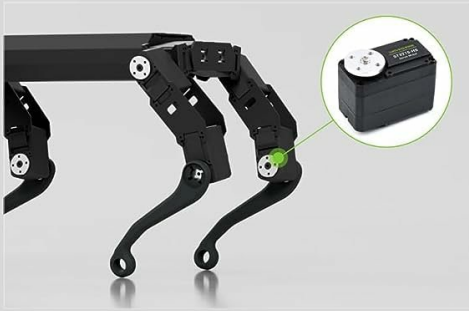
## 5. SETUP AND INSTALLATION

### 5.1 UART Serial Bus Control

The ST3215-HS servo motor supports UART serial bus control, allowing multiple servos to be connected and controlled from a single communication bus. Up to 253 servo motors can be controlled simultaneously.

## Large Torque, High Speed

Up To 20kg.Cm Torque On 12V Voltage, Suitable For Building Quadruped Robots, Hexapod Walkers, Robotic Arms And Other Robotic Projects Requiring Multiple Servo Motors With Large Torque And High Speed Performance



## Supports Installing Flat Key Shaft Flange

With The Flat Key Shaft Flange Designed For The Serial Bus Servo, It Is Possible To Drive Various Transmission Parts



\* for reference only, the [flat key shaft flange](#) and wheels are Not included.

## 360° Magnetic Encoder High Precision, Longer Lifetime

Adopts 12-bit high-precision magnetic encoding angle sensor. Compared with the potentiometer, the angle is enlarged to 360°, and the resolution is increased by 4 times. Since there is a gap and no friction between the magnetic encoder and the radial magnet, the lifetime of the motor is effectively extended.

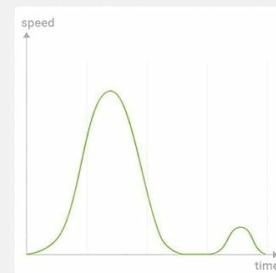


## Acceleration Start-Stop Function

The Speed And Acceleration Values Are Settable To Make The Motion Effect Softer



Actual Effect



Motion Effect Diagram

Figure 5.1: Diagram illustrating UART serial bus control for multiple servo motors. This image shows four servo motors connected in series to a control board, demonstrating the bus communication setup.

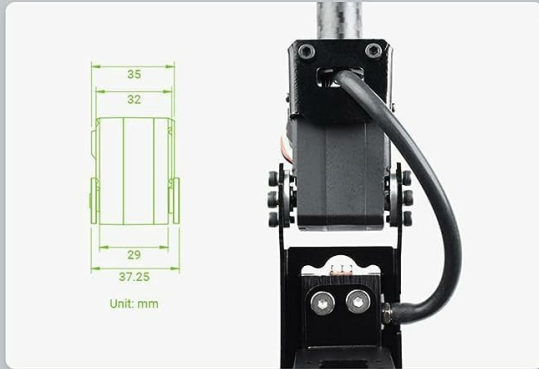
**Note:** While one channel UART can control up to 253 bus servo motors, ensure the power supply is sufficient when using many servo motors due to high power demands. The servo driver board is not included.

## 5.2 Installing Flat Key Shaft Flange

The servo is designed to support the installation of flat key shaft flanges, which allows for easy attachment of various transmission parts like wheels or robotic linkages.

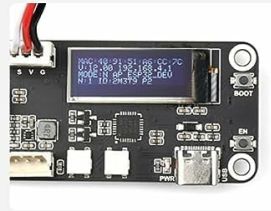
## Compact Structure Design

The case adopts higher intensity engineering plastics, dual shaft and low profile design, shortening the plane spacing of the double-shaft servo wheel, and the overall structure is more compact, which can make the appearance of the product more beautiful.



## One Button To Calibrate The Middle Position

360° Installation At Any Position, One Button To Set The Current Position As Middle Position. Easy To Install



1. In the default program, a hotspot will be created automatically after the servo driver board is turned on. Use your mobile phone to connect to this hotspot, open the browser, and enter the IP address to enter the control interface.



2. Click Release to unlock, then turn the servo motor to the middle position where you need to set



3. Click Set Middle Position then confirm.



4. Turn the servo motor to any angle, then click Middle, and the servo motor will automatically return to the middle position initially set.

## Two-Way Feedback

The Servo Motor Will Provide Various Feedback Like Position, Load, Speed, And Input Voltage In Real Time



\* images here are for reference ONLY

Figure 5.2: Illustration of the flat key shaft flange and compatible parts. This image shows the servo motor with an attached flat key shaft flange, alongside examples of wheels and other components that can be mounted.

**Note:** The flat key shaft flange and wheels are not included with the servo motor.

## 6. OPERATING INSTRUCTIONS

### 6.1 Dual Modes: Servo or Motor

The ST3215-HS servo motor can operate in two distinct modes:

- **Servo Mode:** Provides precise control over the rotation angle, typically within a defined range.
- **Motor Mode:** Enables continuous rotation, suitable for applications requiring constant movement.

# Outline Dimensions

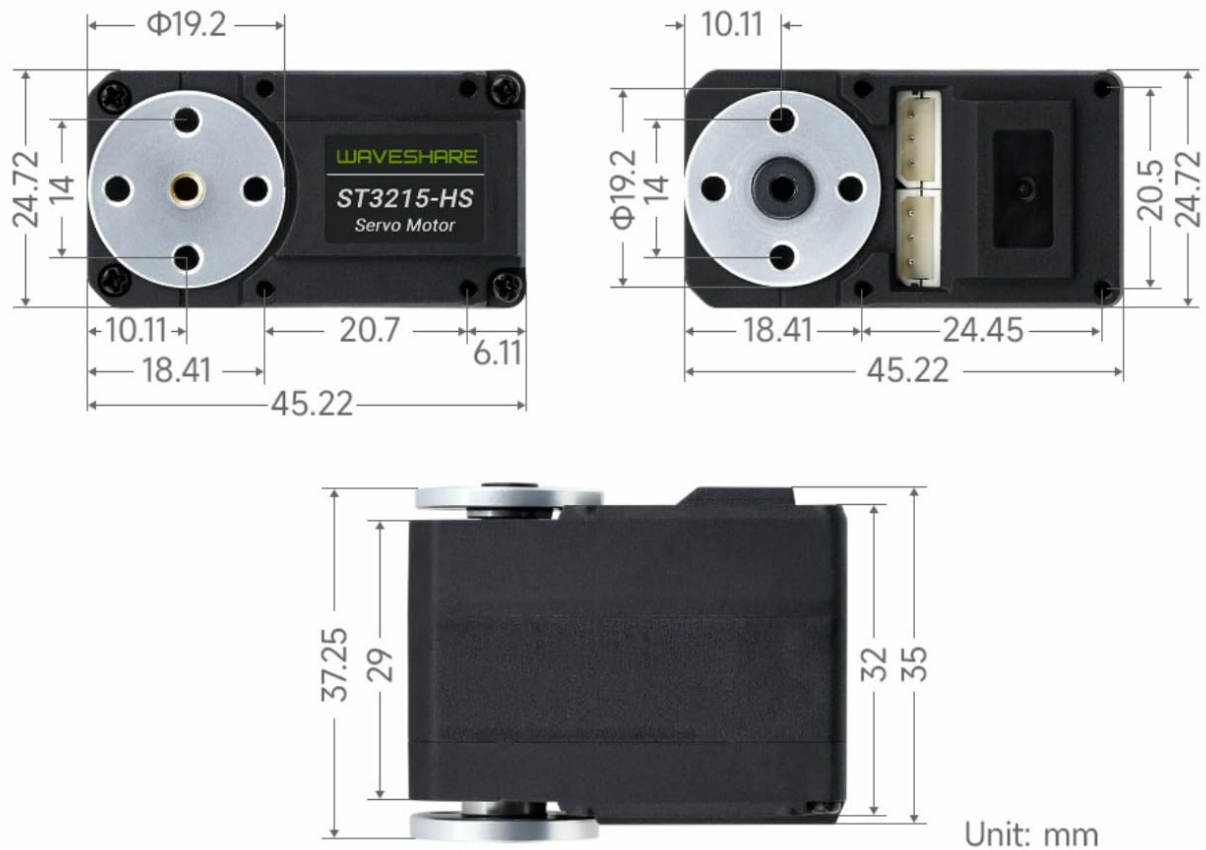


Figure 6.1: Visual representation of the servo operating in precise rotation angle control (Servo Mode) and continuous rotation (Motor Mode). This image shows a mobile phone interface controlling the servo in both modes.

## 6.2 One-Button Middle Position Calibration

To calibrate the middle position of the servo motor, follow these steps:

1. In the default program, a hotspot will be created automatically after the servo driver board is turned on. Use your mobile phone to connect to this hotspot, open the browser, and enter the IP address to access the control interface.
2. Click 'Release' to unlock the servo, then turn the servo motor to the desired middle position.
3. Click 'Set Middle Position' and confirm.
4. To verify, turn the servo motor to any angle, then click 'Middle'. The servo motor should automatically return to the initially set middle position.

## Dual Modes: Servo Or Motor



**Precise Rotation Angle Control On Servo Mode**



**Continuous Rotation On Motor Mode**

\* images here are for reference ONLY

## Details Introduction



**Nylon and fiberglass case**

Improved heat-resistance, size stability, rigidity, and mechanical performance



**High strength aluminum servo wheels**

Using T6061 aluminum alloy, good corrosion-resistance



**High precision copper and steel gears**

Ingenuous combination of the two, lower operating noise, better stability and mechanical performance

## Open Source Control Program

We provide the open-source web control demo of the servo driver board and a secondary development tutorial, which can be directly used for remote setting and remote control of the servo motor. At the same time, we also provide a 3D model for you to build your own project quickly



Figure 6.2: Step-by-step guide for calibrating the servo's middle position using a mobile interface. This image illustrates the process from connecting to the hotspot to setting and verifying the middle position.

### 6.3 Two-Way Feedback

The ST3215-HS servo motor provides real-time two-way feedback, allowing users to monitor critical parameters such as position, load, speed, and input voltage. This feature is essential for advanced closed-loop control systems.

### 6.4 Open Source Control Program

An open-source web control demo of the servo driver board and a secondary development tutorial are available. These resources can be used for remote setting and control of the servo motor, and to quickly build custom projects. A 3D model is also provided.

## 7. APPLICATION EXAMPLES

The ST3215-HS servo motor is suitable for a wide range of applications requiring accurate closed-loop speed control or stepping control. Examples include:

- **Wheeled Robots:** For precise steering and movement.

- **3D Printers:** For accurate axis control.
- **Quadruped and Hexapod Robots:** For complex leg movements and balance.
- **Robotic Arms:** For multi-joint articulation and precise manipulation.

## Application Examples

- Servo motor will provide various feedback like position, speed, torque lock, working mode (servo mode, servo motor mode, etc.) for advanced projects requiring closed-loop automatic control.
- Ideal choice for building wheeled robots, 3D printers, etc. that require accurate closed-loop speed control or stepping control; it can also be used for building quadruped robots, hexapod walkers, robotic arms and other robotic projects requiring multiple servo motors. (This product provides the open source model of the quadruped robots as shown in the picture below.)



\* images here are for reference ONLY

## UART Serial Bus Control

Allows Controlling Up To 253 Bus Servo Motors At The Same Time



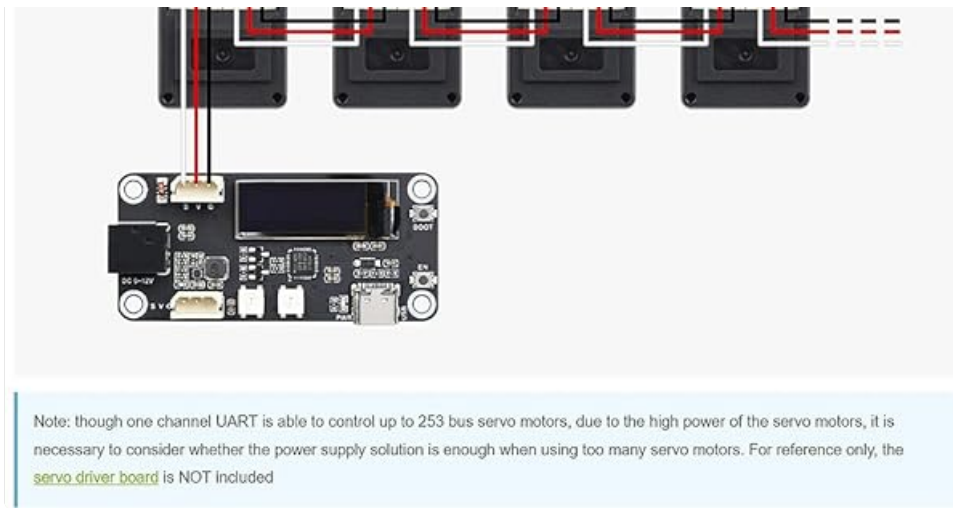


Figure 7.1: Examples of robotic applications utilizing the ST3215-HS servo motor. This image displays an open-source quadruped robot model and robotic arm configurations, demonstrating the servo's versatility.

## 8. MAINTENANCE

---

To ensure the longevity and optimal performance of your ST3215-HS Bus Servo Motor, consider the following general maintenance guidelines:

- **Keep Clean:** Regularly clean the exterior of the servo to prevent dust and debris accumulation, especially around moving parts and ventilation openings.
- **Avoid Overload:** Do not exceed the specified torque and voltage limits to prevent damage to the motor and gears.
- **Proper Storage:** Store the servo in a dry, cool environment away from direct sunlight and extreme temperatures.
- **Inspect Connections:** Periodically check all electrical connections for secure fit and signs of wear or corrosion.
- **Lubrication:** The internal gears are pre-lubricated. Avoid disassembling the servo unless necessary, as this may void any warranty and affect performance.

## 9. TROUBLESHOOTING

---

If you encounter issues with your ST3215-HS Bus Servo Motor, consider the following troubleshooting steps:

- **No Movement:**
  - Check power supply voltage and current. Ensure it meets the 6-12.6V requirement and can provide sufficient current (e.g., 2.4A locked-rotor current).
  - Verify all wiring connections are correct and secure.
  - Confirm the servo ID is correctly set and matches the control command.
  - Ensure the control signal (UART) is being sent correctly and at the appropriate baud rate.
- **Erratic Movement or Incorrect Position:**
  - Recalibrate the middle position as described in Section 6.2.
  - Check for mechanical obstructions or excessive load on the servo shaft.
  - Inspect the magnetic encoder for any physical damage or interference.
  - Ensure the control commands are within the servo's operational range.

- **Overheating:**

- Reduce the load on the servo.
- Ensure adequate ventilation around the servo.
- Check for continuous stalled conditions or rapid, high-frequency movements that can generate excessive heat.

For persistent issues, refer to the open-source development tutorial or contact XYGStudy customer support.

## 10. DIMENSIONS

The physical dimensions of the ST3215-HS Bus Servo Motor are provided below for integration into your projects.



Figure 10.1: Outline dimensions of the ST3215-HS Bus Servo Motor in millimeters. This image provides detailed measurements for the servo's length, width, height, and mounting hole positions.

## 11. WARRANTY AND SUPPORT

For warranty information, technical support, or additional resources (such as detailed datasheets or programming guides), please contact XYGStudy directly through your purchase platform or their official website. Please have your product model (ST3215-HS) and purchase details ready when contacting support.