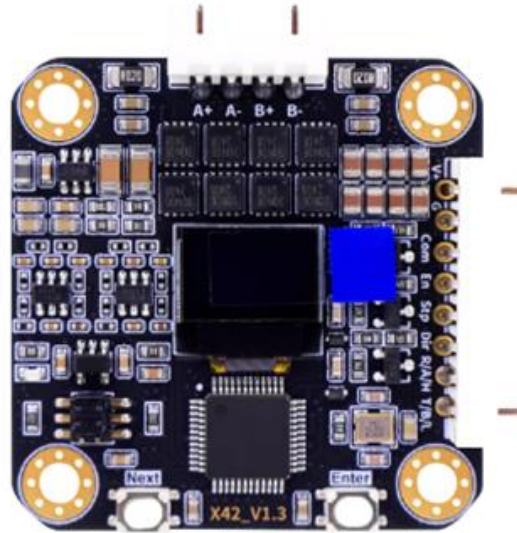


# Newly Upgraded Stepper Motor Closed-Loop Control Module

Emm28/35/42\_V5.0 *The flagship is extraordinarily reborn.*

## Stepper Closed-Loop Driver



Triple-loop control for torque, speed, and position.

Supports CAN, 485, 232, serial port, and pulse control, compatible with Modbus-RTU protocol. Features curve acceleration/deceleration, multi-axis synchronous control, high-speed emergency stop, and speed control as low as 0.1 RPM. Supports single-turn nearest/direction homing, limit-switch-less collision homing, and multi-turn limit switch homing. Equipped with stall protection, in-position output, alarm output, and left/right limit switch inputs. This upgraded module delivers more precise, stable, and powerful motor control performance.

## Product Introduction

The Emm\*\*\_V5.0 closed-loop control module is a newly launched upgrade version by Zhang Datou Closed-Loop Servo, based on the Emm42\_V4.2. It features an upgraded closed-loop algorithm and integrates the ZDT\_X42\_V1.2 software and hardware framework. This enhancement delivers higher rotational speed, faster printing speed, and more powerful functionalities. Additionally, it supports built-in serial port/RS232/RS485/CAN bus modules and motor stall current limiting, offering greater safety and reliability. It meets the needs of a wider range of users and is suitable for applications such as 3D printing, writing machines, engraving machines, PLC control, robotic arms, and car competitions.

## Product Features

1. Emm\*\*\_V5.0 adopts an advanced FOC vector closed-loop control algorithm, achieving triple-loop control (torque, speed, and position).
2. Features an onboard industrial-grade high-precision 16384-line magnetic encoder, onboard precision current sensors, and an onboard dual H-bridge composed of 8 high-quality MOSFETs rated above 30A.
3. Maximum current 3000mA, maximum speed 3000RPM+ (the maximum speed may vary depending on individual motor parameters).
4. Supports pulse control, serial/RS232/RS485/CAN communication control, and hybrid control combining both methods.
5. Supports Modbus-RTU protocol and custom protocols.
6. Supports multi-unit communication and synchronous control, allowing communication and synchronized control for up to 255 addressable motors.
7. Supports speed mode and position mode control, supports S-curve acceleration/deceleration, supports immediate stop. Each position command supports both absolute and relative positioning modes.
8. Open-loop mode also supports communication control, with a maximum speed of 200-400RPM, and also supports S-curve acceleration/deceleration and synchronous control.
9. Supports a speed as low as 0.1RPM, supports storing direction, speed, and acceleration parameters for automatic operation upon power-up, and IO control for start/stop.
10. Supports single-turn shortest-path homing, single-turn directional homing, multi-turn limitless collision homing, and multi-turn finite limit switch homing.
11. Supports communication-controlled in-position output/in-position return command, and

supports pulse control alarm output.

12. Supports left/right limit switch input; motor movement is prohibited beyond the triggered limit direction.

13. Supports real-time display and reading of RPM, phase current (mA), and bus voltage (mV).

14. Features stall protection with configurable detection current, speed, and duration; stall protection can be cleared via command without requiring a power cycle.

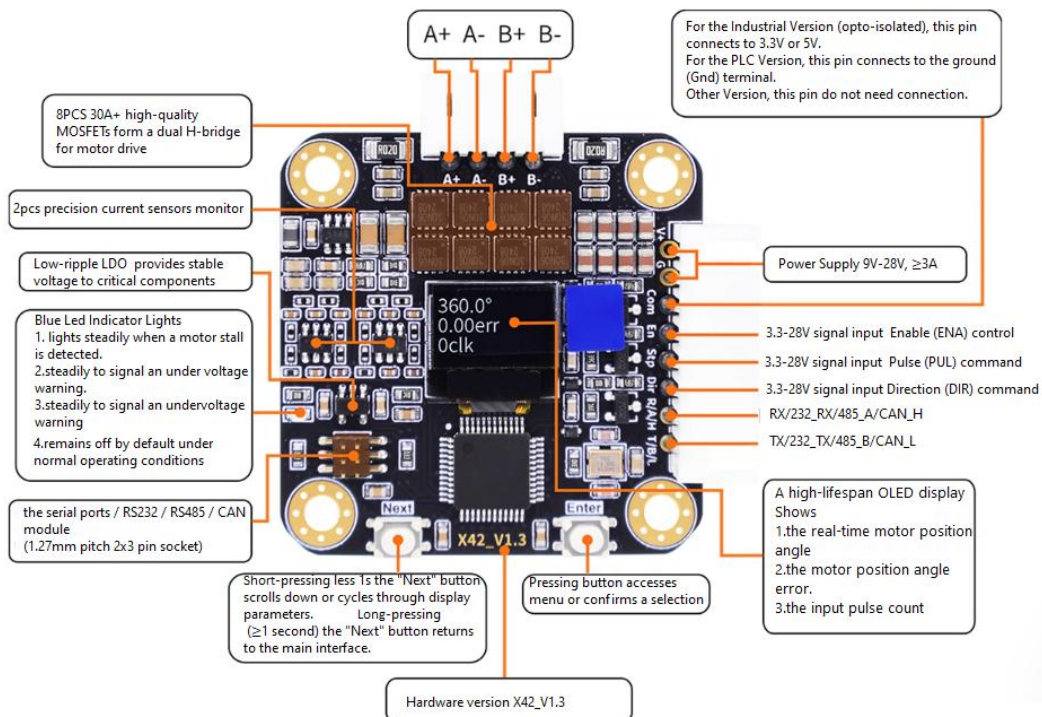
15. Supports both common-anode and common-cathode signal input, compatible with 24V PLC signal input; opto-isolated input is optional.

16. Inherits the ZDT\_X\*\*\_V1.2 hardware platform, supports built-in serial/RS232/RS485/CAN bus modules.

17. Supports 1-256 arbitrary microstepping with interpolation function, enabling smoother and quieter motor operation.

18. Onboard small screen displays system information in real time; onboard keys allow one-touch parameter modification with automatic save and immediate effect.

19. Motor speed and position are updated in real time (even when not enabled), and can be cleared via command.

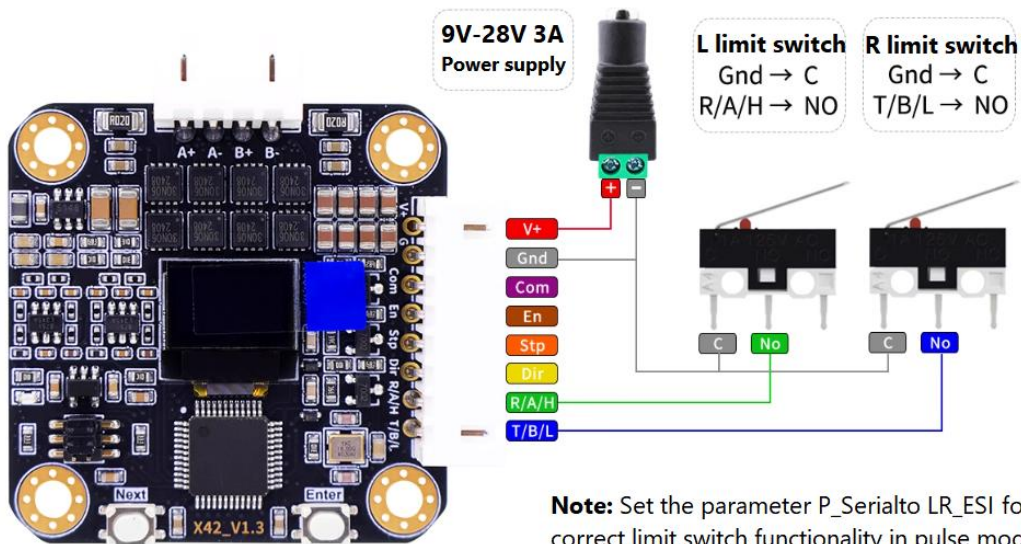


## Product Parameters

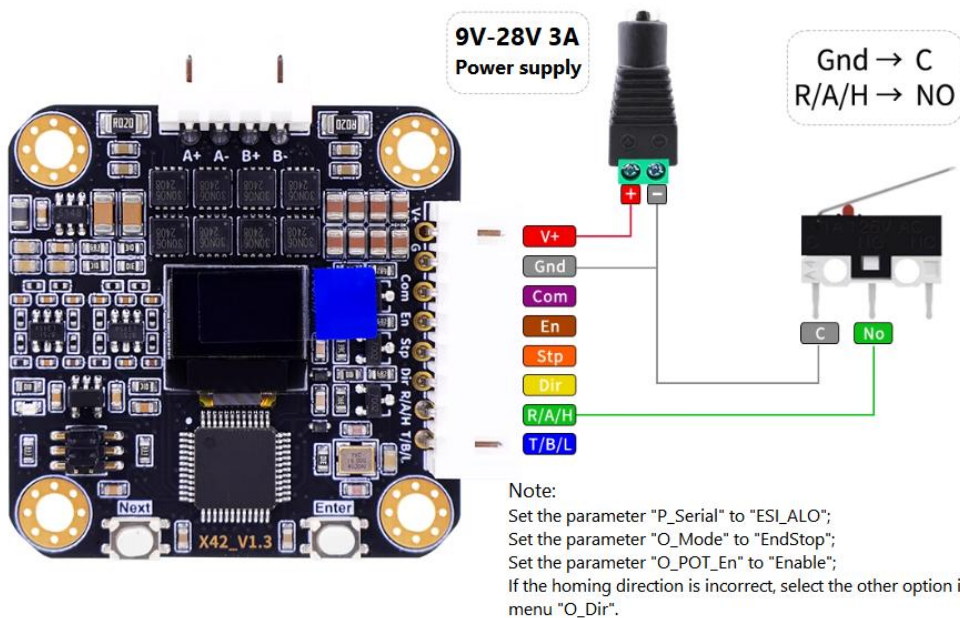
<b>Mainboard Model:</b>	Emm28/35/42 _V5.0
<b>Main Control Chip:</b>	Cortex-M4F core, 120MHz main frequency
<b>Drive Circuit:</b>	Dual H-bridge drive composed of 8 high-quality MOSFETs rated above 30A
<b>Sensors:</b>	Industrial-grade high-precision 16384-line magnetic encoder, precision current sensors
<b>Power Supply Voltage:</b>	9-28V
<b>Operating Current:</b>	0-3000mA, adjustable to any value
<b>Signal Input:</b>	3.3-28V, supports common anode/cathode input; compatible with 24V NPN/PNP PLC signal input
<b>Closed-Loop Feedback Fr</b>	Torque loop 20KHz+, Speed loop 20KHz+, Position loop 20KHz+
<b>Maximum Pulse Frequenc</b>	160KHz and above
<b>Maximum Speed:</b>	0.1RPM - 3000RPM+ (may vary depending on individual motor parameters)
<b>Control Accuracy:</b>	Less than 0.08°
<b>Microstepping Support:</b>	1-256 arbitrary microstepping, supports interpolation function
<b>Control Modes:</b>	Supports pulse control, serial/RS232/RS485/CAN bus multi-unit communication and synchronous control
<b>Communication Control:</b>	Supports speed mode and position mode control, supports S-curve acceleration/deceleration, supports immediate stop
<b>Protection Features:</b>	Includes stall protection, undervoltage warning, and other functions
<b>Noise/Vibration:</b>	Ultra-quiet and ultra-low vibration at low speeds; stable, non-shaking operation at high speeds
<b>Other Functions:</b>	Encoder self-calibration, motor wire sequence error identification, automatic screen-off, factory reset, etc.
<b>Braking/Direction Revers</b>	Supports immediate stop and immediate direction switching at speeds up to 3000RPM+
<b>Homing Mode Support:</b>	Single-turn shortest-path/directional homing, multi-turn limit switch homing, limitless homing (not supported for 3D printing)
<b>Output Type Support:</b>	Supports communication-controlled in-position output/in-position return command, supports pulse control alarm output

# Introduction to Pulse Wiring

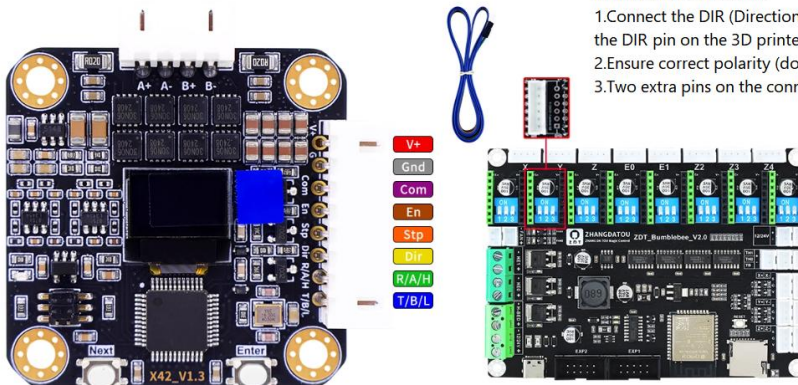
## Pulse Mode Control - Left/Right Limit Switch Wiring Schematic Diagram



## Pulse Control - Power-on Auto Home Limit Switch Wiring Diagram



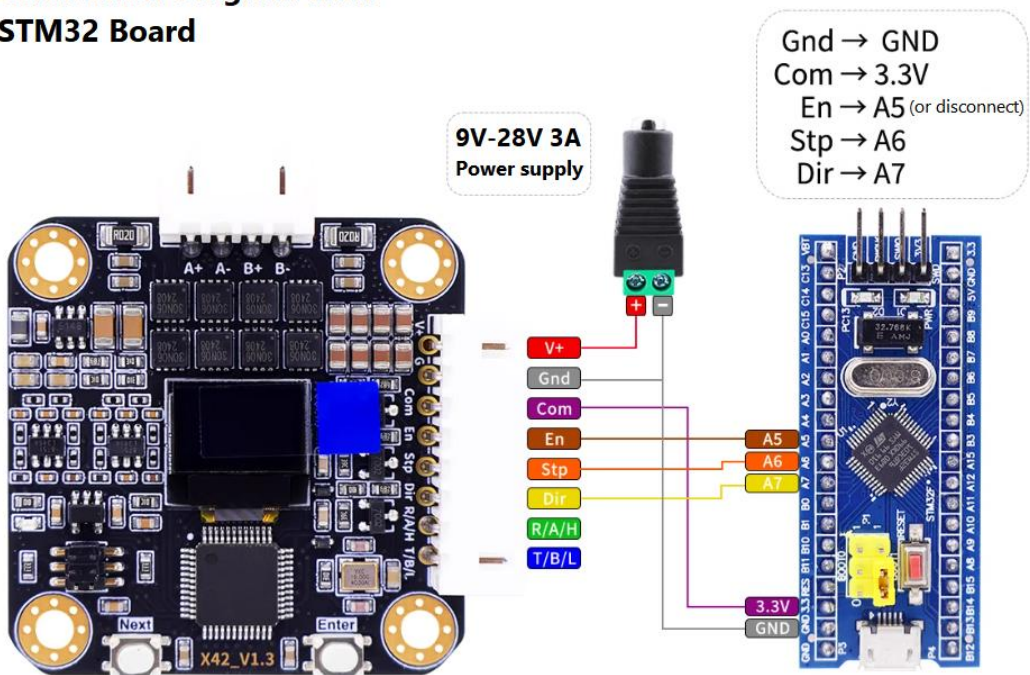
## Connection Diagram with Bumblebee 3D Printer Mainboard



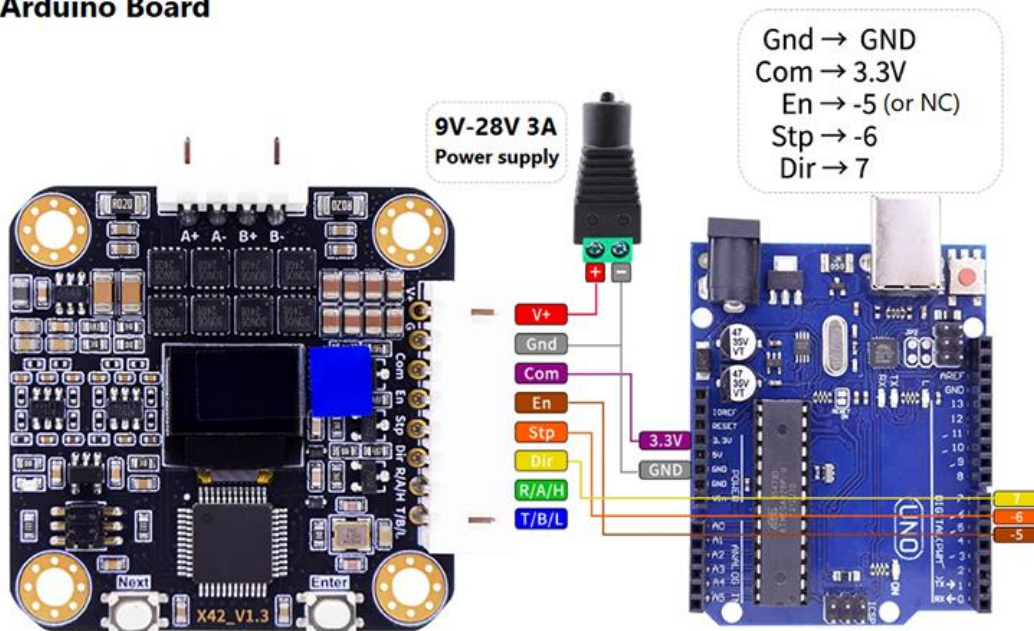
Mainboard Connection:

1. Connect the DIR (Direction) signal on the adapter board to the DIR pin on the 3D printer motherboard.
2. Ensure correct polarity (do not reverse the connection).
3. Two extra pins on the connector are not used.

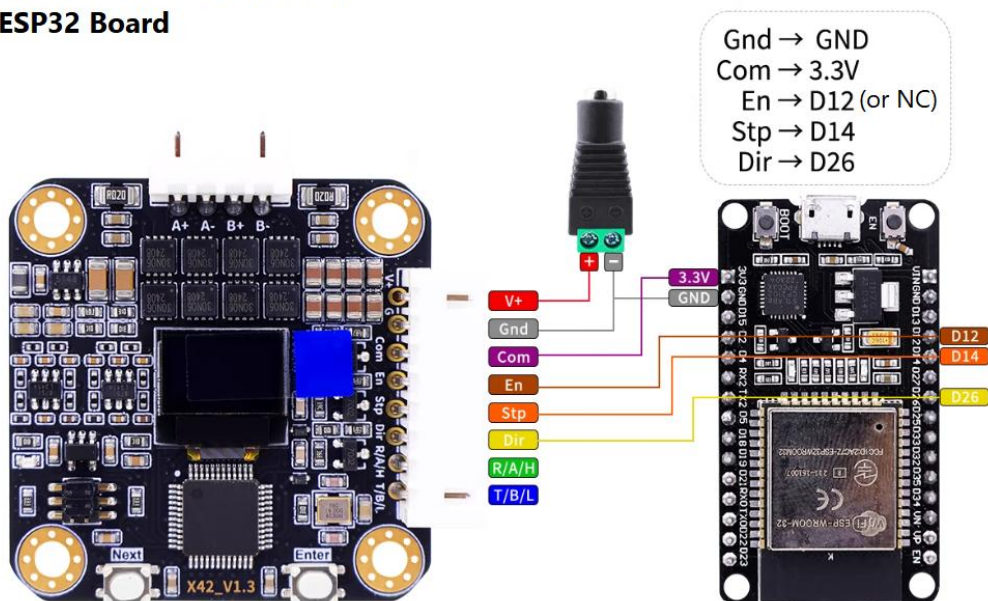
## Connection Diagram with STM32 Board



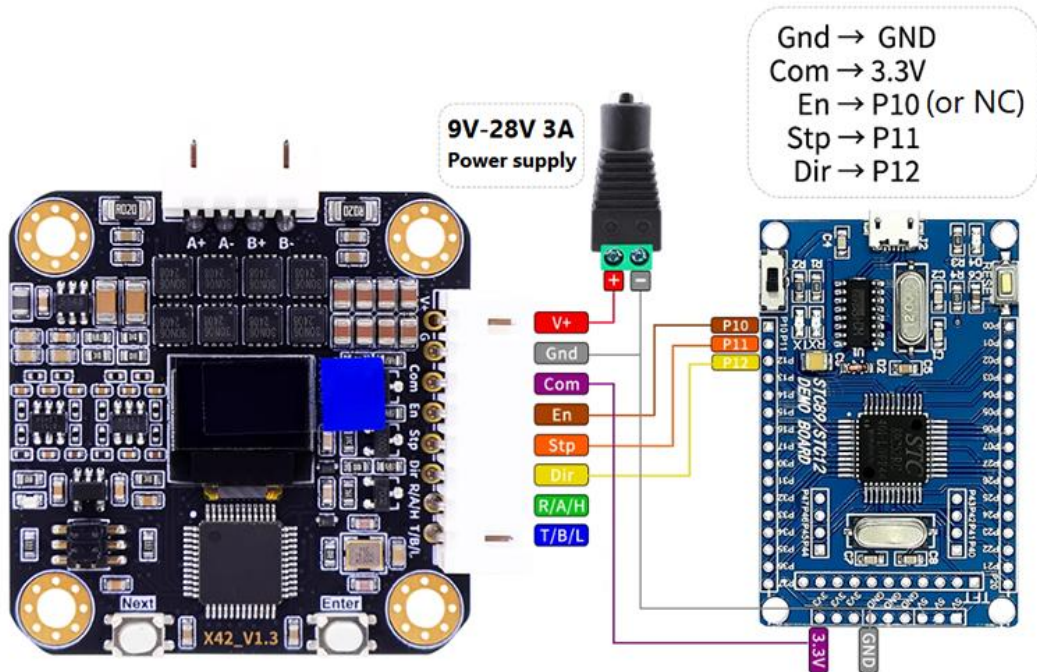
## Connection Diagram with Arduino Board



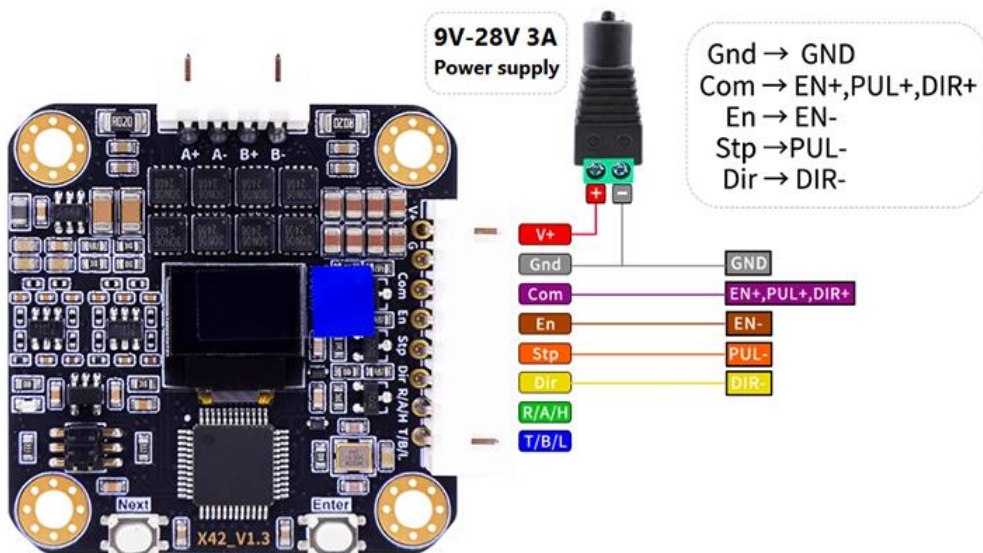
## Connection Diagram with ESP32 Board



## Connection Diagram with 51 Microcontroller



## EN+ / EN- / PUL+ / PUL- / DIR+ / DIR- Differential Pulse Control Wiring



## Connection Diagram with PLC Board

