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User guide

AQMD2403BLS-M

9V–24V 3AHigh performance brushless DC motor driver/controller

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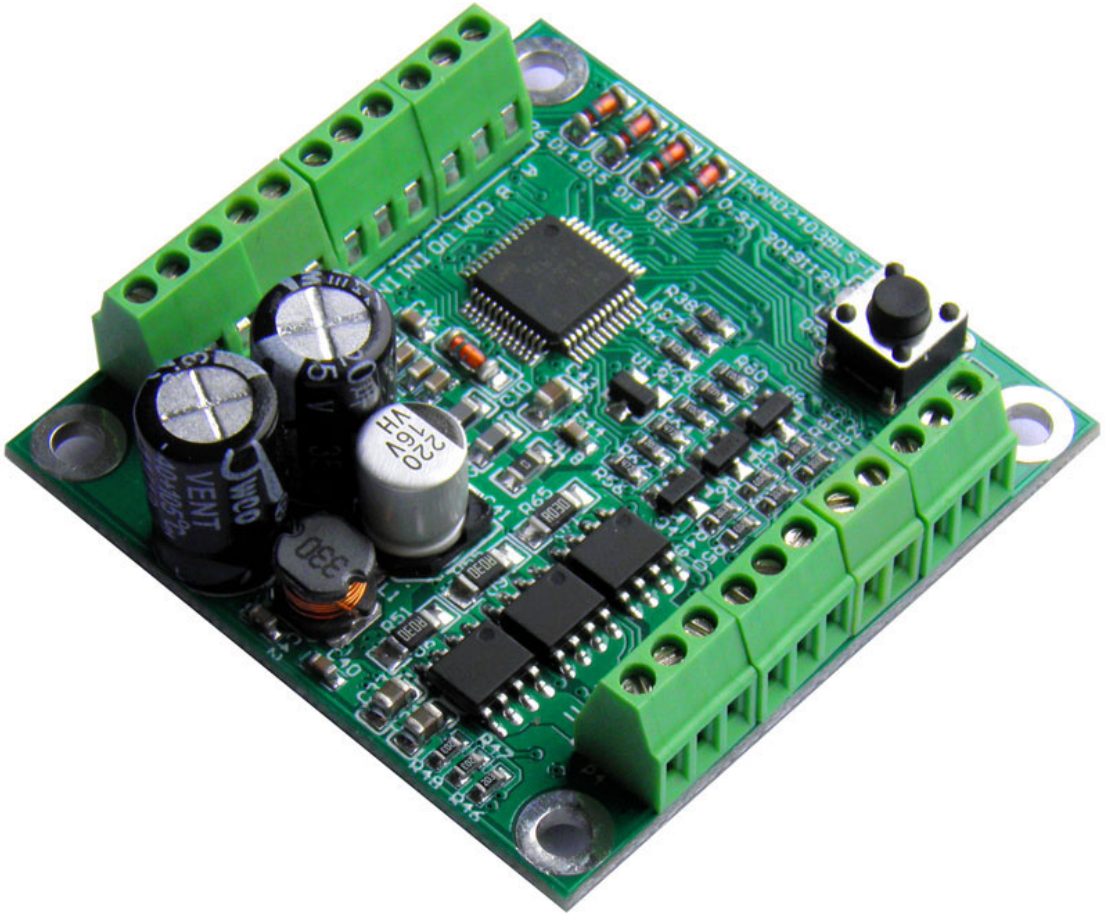
category	content
Keywords	Brushless DC motor, speed regulation, steady speed, position control,RS485
summary	AQMD2403BLS-MUser Manual



Revision History

Version	date	reason
V0.90	2020/03/23	Create documents;

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1. AQMD2403BLS-MDC sensorless brushless motor driver features

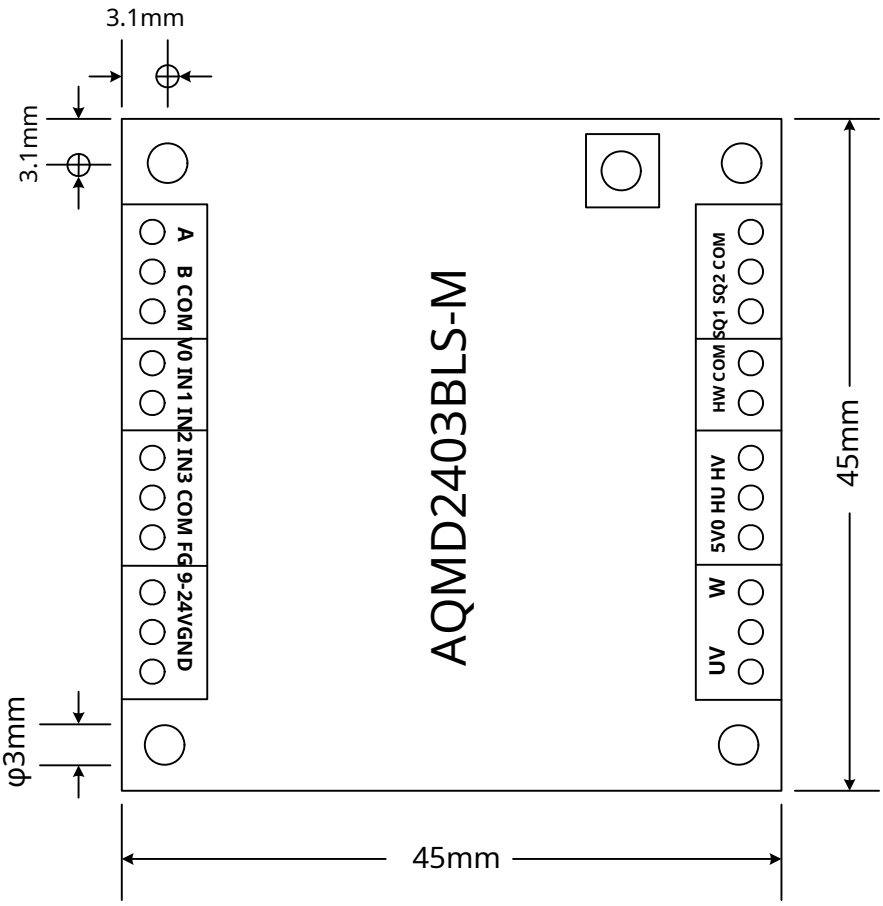
- Support voltage9V~24V; Rated output current3A, Large output current6A Supports multiple speed regulation modes including duty cycle speed regulation
- (voltage regulation), torque control (current stabilization), speed closed-loop control (speed stabilization), and position closed-loop control (angle, distance control).
- Support potentiometer, analog signal, logic level, switch quantity,PWM, frequency, pulse,RS485Various input signals
- Support analog signal voltage range configuration and logic level voltage configuration. Analog signals can support0~3.3VEqual voltage range, logic level can support0/3.3/5VEqual voltage; support analog signal linearity adjustment and logic level threshold configuration
- 485Common mode voltage protection, supportRS485Multi-machine communication, supportMODBUS-RTUCommunication protocol, convenient for various controllers (such as PLC) Communication control, support communication interruption shutdown protection Support acceleration and deceleration buffer time and acceleration and deceleration
- acceleration control, can automatically accelerate and decelerate within the specified stroke and accurately locate the motor currentPIDAdjustable control, maximum starting/
- load current and braking (brake) current can be configured separately, supporting current doubler output

- Supports internal temperature monitoring of the driver, and configurable overheat protection temperature
- Supports driver power supply voltage monitoring, configurable overvoltage/undervoltage shutdown monitoring values Supports motor overload current limiting and stall
- shutdown, as well as instantaneous high current monitoring to prevent overcurrent from damaging the motor or driver Supports one-key motor phase sequence learning;
- supports Hall error protection and fault alarm
- Supports motor forward and reverse limit, can connect two limit switches for forward and reverse
- limit respectively Supports motor speed measurement, supports motor stall detection/stall limit
- stop 18kHzofPWMFrequency, motor speed regulationPWMVery small noisePWMDead zone, only
- 0.5us,PWMEffective Range0.1%~100% useARM Cortex-M3@72MHzprocessor
-

Scope of application

-Scientific research, production, on-site control

1.1Product size



picture1.1Product size definition

Driver dimensions as shown in the figure1.1Dimensions are45mm×45mm×17mmThe mounting hole diameter is3mm, the distance from the center of the mounting hole to the side is3.1mm.

1.2Technical Parameters

surface1.1 AQMD2403BLS-MMotor driver technical parameters

project	parameter	Remark
Power input voltage	DC 9V~24V	Driver connected to user controller without isolation Do not share the same ground when connecting the power supply. For cause analysis, see9.1Festival (When there is a load, the voltage should not exceed24V, no load Do not exceed the voltage27VOtherwise it may be damaged and Difficult to repair)
Large output current	6A(current doubler output) 4A(Non-current doubler output)	Do not short-circuit the motor output interfaceOtherwise it may damage Bad drive
Rated output current	3A	

Large soft braking current	3A	
Hall sensor interface output voltage	5V	
Hall sensor current	10mA	
Supported motor speed	0~100000RPM	Measured high reach140000RPMIf the Hall interface filter capacitor is increased, the supported Speed
Completion/fault signal output voltage	3.3V	
Motor rated current setting range	0.5A~4A	Please configure the rated current parameter of the driver as Consistent with the actual rated current of the motor, otherwise it may This can result in slow response, unstable speed regulation, or damage to the drive. Consequences of actuators
Load current setting range	0.5A~4A, And does not exceed the rated current1.5times	
Current multiplier setting range	1.00~2.00	0Disable current doubler output
Current doubling time setting range	0.1S~99.9S	0Disable current doubler output
Instantaneous overcurrent shutdown current setting range	0~9A	When an abnormally large current appears at the motor interface, the driver The actuator will1msInternal shutdown output; 0Disable the instantaneous high current shutdown function (not recommended)
Temperature effective detection range	- 40℃~125℃	
Temperature detection error	±10℃	Can be corrected by configuring temperature calibration coefficient
Overtemperature shutdown/overtemperature current limiting temperature setting scope	- 40℃~125℃	
Voltage effective detection range	8~30V	
Voltage detection error	5%	Can be corrected by configuring voltage calibration coefficient
Undervoltage/overvoltage shutdown maximum setting value	27V	For non-battery direct power supply, it is recommended to disable overvoltage Turn off, otherwise the reverse electromotive force when the motor brakes An overvoltage shutdown may be triggered.
Motor current detection accuracy	0.2A	
Current measurement resolution	0.03A	
Steady flow control accuracy	0.06A	
Single-ended analog signal input voltage range	0 ~ 3.3V	
Differential analog signal input voltage range	-3.3V ~ +3.3V	The voltage range can be configured, for example -2V~+2V
Logic level voltage range	0V ~ 5V	Configurable high and low level thresholds, support LvTTL,TTLEqual level
PWM/Pulse input interface supports voltage	0V ~ 5V	$V_{IH} \geqslant 2.15V, 0 \leqslant V_{IL} \leqslant 1.15V$
PWMInput signal supported frequency	Support scope100Hz~10kHz, 100Hz~1kHzWhen the resolution0.1%; 1kHz~10kHzWhen the resolution 0.1%~1%	Frequency range below this will not be captured PWMsignal; above this range a capture will occur PWMLow resolution

Frequency input signal support range	0 ~ 10kHz	
5VPower supply high output current	100mA	
OutputPWMfrequency	18kHz	
OutputPWMResolution	1/1000	
OutputPWMSmall effective pulse width	500ns	
OutputPWMEffective Range	0.1% ~ 100.0%	
PWMSpeed regulation modePWMConfigurable scope	- 100.0%~0,0~100.0%	
Speed closed loop control adjustable range	- 3276.8Hz~3276.7 Hz	unitHzis the motor commutation frequency (number of commutations per second), Motor speed = commutation frequency / number of motor poles *20
Position closed loop control adjustable range	speed0.1~3276.7 Hz Location - 2147483648~2147483647	
Real-time speed and best measurement range	10Hz~4000Hz	unitHzis the motor commutation frequency, the motor commutation No measurement value will be shown if the frequency is lower than this range
Real-time speed display range	- 32768Hz~32767Hz	When the commutation frequency is -3276.7Hz~3276.7Hz The resolution is within the range0.1Hz
Motor speed indication range	1~655340RPM	When the commutation frequency is -3276.7Hz~3276.7Hz When the speed is within the range, the resolution is1RPM, exceeding The resolution of this range is10RPM
Stall protection time setting range	0.1s~25.5sor no protection	
When the duty cycle speed regulation mode starts responding between	Rated current and maximum load current3A The response time is about0.1s	Test conditions: Use24V60WThe motor is unloaded. PWMDepend on0%Adjust to100%Time required
Duty cycle speed regulation mode forward and reverse switching Response time	Rated current and maximum load current3A The response time is about0.3s	Test conditions: Use24V60WThe motor is unloaded. existPWMfor100%Status brake and by0Adjust to -100%Time required
Closed-loop speed regulation mode start-up response time	Rated current and maximum load current3A The response time is about0.3s	Test conditions: Use24V60WThe motor is unloaded. Speed by0Reach the set speed90%Time required.PIDThe parameters are configured appropriately, the acceleration 6500Hz/s
Closed-loop speed regulation mode forward and reverse switching Response time	Rated current and maximum load current3A The response time is about0.5s	Test conditions: Use24V60WThe motor is unloaded. The speed switches from forward speed to reverse speed. Constant speed90%Time required.PIDThe parameters are configured appropriately, the acceleration6500Hz/s
Position closed loop control accuracy	Acceleration500Hz/shour,1Within pulse error; Acceleration2000Hz/shour,2Pulse Internal error; errors do not accumulate	Test conditions: Use24V60WThe motor is unloaded. Error occurs without correction mode.PIDParameter configuration suitable

Braking response time	Usually0.1s~0.3s	Test conditions: no load, specific time and motor speed Factors related to kinetic inertia
485Supported baud rates	1200~115200bps	
Signal port withstand voltage	IN1,IN2,IN3,SQ1,SQ2, HU,HV,HW Withstand voltage4.9V~+8.2V; VO Withstand voltage0~+3.6V; 5V0,COM, 485-A/BWithstand voltage ±27V	Driver connected to user controller without isolation Do not share the same ground when connecting the power supply (only485Connection (Except for other reasons), see9.1Festival
Operating temperature	- 30℃~70℃	Note: The actual measurement can reach -40℃~85℃, but extreme ambient temperature will affect the service life of the driver

1.3Principle Overview

This driver uses leading motor current precision detection technology, brushless motor self-speed detection, brushless motor rotation position detection, regenerative current constant current braking (or braking) technology and powerfulPIDThe regulation technology can perfectly control the motor's smooth forward and reverse rotation, commutation and braking, real-time regulation of output current to prevent overcurrent, precise control of motor speed and rotation position, and short motor response time and small recoil force.

1.3.1Motor acceleration and deceleration control

The soft start mode with automatic current adjustment and acceleration control enables the motor to start quickly and smoothly with little recoil. It supports acceleration and deceleration time and acceleration and deceleration configuration.

1.3.2Motor brake control

The energy consumption braking mode with automatic current adjustment can shorten the motor braking time without strong impact and vibration.

Set.

1.3.3Motor commutation control

The process of the motor's forward and reverse switching is controlled internally by the driver, which automatically performs deceleration, soft braking, and soft start control. No matter how frequently the commutation signal changes, it will not cause damage to the driver or motor.

1.3.4Motor speed control

The speed and rotation position are detected by Hall signal.PIDThe closed-loop control is performed by adjusting the algorithm, and supports two steady-speed control algorithms: speed closed-loop control and time-position closed-loop control. The speed closed-loop method has the characteristics of stable rate control and small overshoot at high speed, but the speed control may be unstable at low speed; the time-position closed-loop control method is suitable for the control requirements of multiple drivers controlling multiple motors to rotate the same angle in the same time, and is also suitable for ultra-low speed control.

1.3.5Motor position control

The rotation position is detected by the Hall signal, usingPIDThe adjustment algorithm performs closed-loop position control and uses a brake resistor for deceleration. The motor coil is energized with a certain current to lock the motor's rotation position.

1.3.6Motor torque control

Since the motor torque and current are approximately linearly related, this driver uses a steady-current output control method to achieve motor torque control. The user controls the motor torque by adjusting the output current.

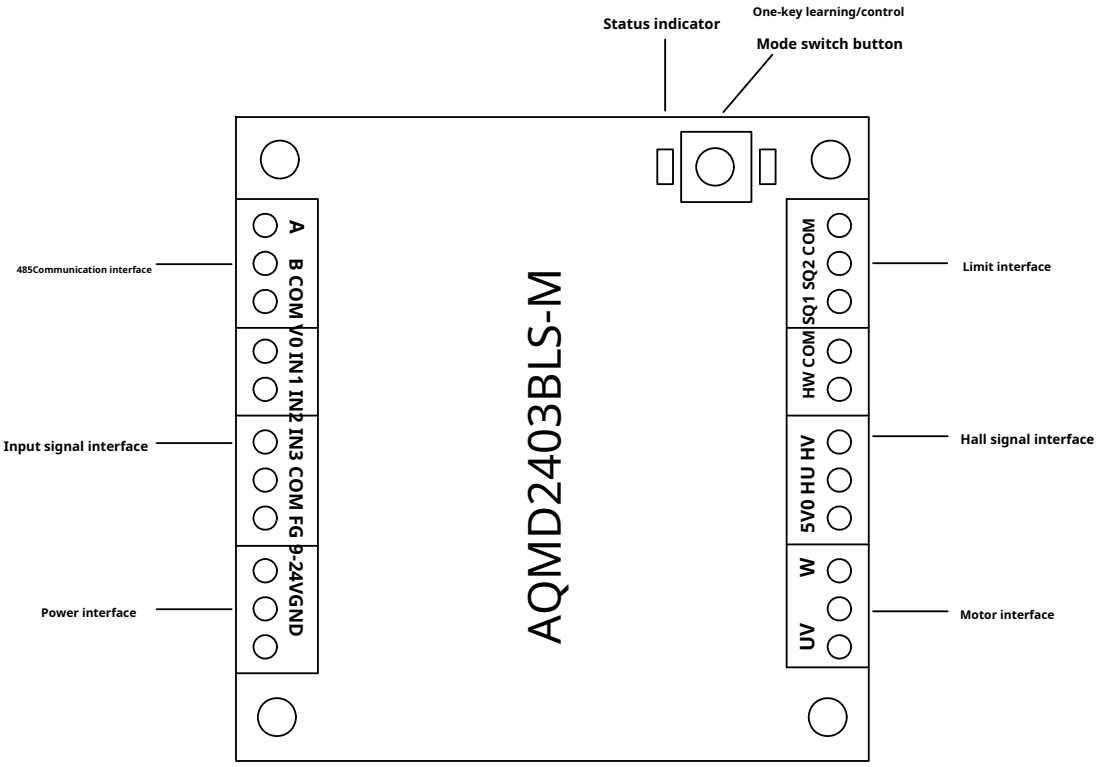
1.3.7Motor overload and stall protection

When the motor is overloaded, the driver will limit the output current to effectively protect the motor; when the motor is stalled, the driver can detect this state and brake the motor.

1.3.8Internal interference suppression

In order to ensure the accuracy of motor loop current measurement, the drive circuit and the control circuit are coupled through interference attenuation and consumption and transient interference suppression, which can effectively ensure that the control circuit is not affected by the interference of the drive circuit.

2.Interface Definition



picture2.1 AQMD2403BLS-MMotor driver interface definition

Note: The power interface and motor interface wiring must not be connected together, nor can they be connected together with the input signal, Hall signal, limit or communication interface, otherwise the driver may be damaged. The power ground or control signal ground should not be connected to the chassis, otherwise the driver may work unstably. If a transformer or switching power supply is used, the chassis should be connected to the ground. If a battery is used, please do not connect the chassis to the ground.

2.1Button usage, signal source selection and working mode configuration

Before using this driver, you must first learn the motor phase sequence, and configure the rated current, signal source selection, and working mode. The registers can be used to configure the motor's rated current, the signal source and working mode under digital/analog signal control, and485Slave address under communication control mode.

Only by learning the motor phase sequence can the driver drive the motor to rotate normally. For a newly connected motor, when it is used for the first time, the motor phase sequence learning is required. The motor phase sequence learning can be achieved by one-key operation or related register operation (see the motor learning register for details).6.3.9section).

By configuring the rated current of the motor, on the one hand, the maximum load current of the motor is set. When the motor is overloaded or stalled, the driver will stabilize the output current to the rated current to effectively protect the motor; on the other hand, it can make the speed regulation of the motor with the corresponding rated current more stable.0x006aRegisters are used to configure the rated motor current.

By selecting the signal source, it can support different control signals used by users. This driver can support potentiometers, analog signals, switch quantities, logic levels andPWM/Frequency/pulse and other input signals.0x009a Registers can configure the signal source.

By configuring the working mode, you can configure different motor speed regulation modes under digital/analog signal control.

0x009bRegisters can configure the operating mode.

2.1.1Key Usage

Through key operation, we can realize one-key motor phase sequence learning and control mode switching. The functions of the keys in different operation modes are shown in the table.2.1shown.

surface2.1Key usage

How it works	Function	illustrate	Status indicator
Short press	Motor phase sequence learning	Learning success	Yellow and green lights flash alternately6After that, At the same time, long light1s
		Learning Failure	Yellow and green lights flash alternately6After that, The yellow light flashes continuously3Second-rate
Press and hold1sRelease	Switch control mode	Digital/analog signal control	The yellow light is always on, and the green light is0.5or2Hz Frequency flicker
		485Communication control	The yellow light is always off, and the green light is0.5or2Hz Frequency flicker
Long press5sRelease	Default communication parameters	The baud rate is9600bps, verification method The formula is even parity,1Stop bit	

Press the button briefly, the motor enters the learning state, and if the status indicator light flashes green and yellow alternately6After that, both lights will stay on 1s, the learning is successful; if the status indicator light flashes green and yellow alternately6After that, the yellow light flashes continuously.3If it fails, the learning will fail.

Press and hold the button1sAfter release, digital/analog signal control and485When the driver is in digital/analog signal control mode, the status indicator light is always yellow and the green light is always0.5/2HzFrequency flashes; when the drive is in485 In control mode, the yellow status indicator light is off and the green light is on.0.5/2HzFrequency flashes.

Long press the button5sAfter releasing,RS485useModbus-RTUThe communication protocol communicates with the drive, and the default baud rate is9600bps, the verification mode is even parity,1stop bits.

2.1.2Configuration of motor current related parameters

The user can configure the motor related current through the current related registers. The related register configuration description is shown in Table 2.2.

surface2.2Related configuration of motor current parameters

Register Address	Register Name	value (Multiply by0.01Ais the current value)	illustrate
0x006a	Motor rated current	0~400	Usually configured to match the nominal rated current of the motor; Too small rated current may cause unstable speed regulation or even Burn the drive; too large may cause slow response
0x006b	Large load current	0~400	Used to limit the motor starting, overload and stall If there is no special requirement, it can be configured as Consistent with the motor rated current
0x006c	Braking compensation current	0~300	Used to adjust the braking torque, which will affect the motor braking Movement time and stability

0x0078	Normal self-locking current	0~300	Used to adjust the motor to maintain the rotation position after it stops Resistance torque, suitable for time position steady speed algorithm closed loop Speed regulation and position control working mode, recommended configuration value Not more than the rated current of the motor1/2, otherwise it may Causes the motor to heat up severely and shortens its life

Users can also use thePCThe sample program of the machine realizes the configuration of motor related current under digital/analog signal control mode.

Note: The configuration of the motor rated current should be consistent with the actual rated current of the motor, otherwise it may cause unstable speed regulation, slow response, fuse burnout or even more serious consequences. The actual rated current of the motor can be obtained from the motor nameplate label, data manual, etc.

2.1.3Selection of signal source under digital/analog signal control mode

By operating the port input type register (0x009a), the signal source can be selected under the digital/analog signal control mode. The corresponding relationship between the register value and the signal source is shown in Table 2.3.

surface2.3Signal source selection table under digital/analog signal control mode

0x009aRegister Value	Signal Source
1	Potentiometer
2	analog signal
3	Pulse signal
4	Built-in programs

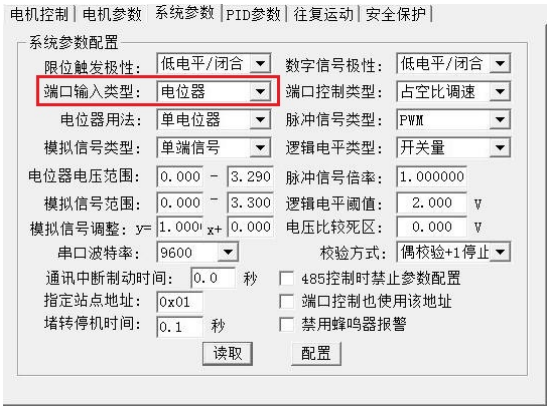
In digital/analog signal control mode, the signal source can be selected as a potentiometer, analog signal, pulse signal or built-in program. When the signal source is a potentiometer, use the potentiometer for speed regulation, torque control or position adjustment within a fixed stroke. It supports single potentiometer, dual potentiometer independent and dual potentiometer coordinated control. For the usage of the potentiometer, see3.1.3Section.

When the signal source is an analog signal, use the analog signal for speed regulation, torque control or position adjustment within a fixed stroke. It supports single-ended analog signal, differential analog signal, dual single-ended analog signal independent and dual single-ended analog signal coordinated control. For the usage of analog signal, see3.1.4Section.

When the signal source is a pulse signal, usePWM/Frequency signals are used for speed regulation, torque control or position adjustment within a fixed stroke, and pulse signals are used for speed, torque increment control or position step control.3.1.5Section.

When the signal source is a built-in program, the working mode can be configured as preset speed and built-in program control.2.1.4 Section.

Users can also use thePCThe sample program of the machine realizes the signal source selection and corresponding signal usage configuration under the digital/analog signal control mode, as shown in the figure2.2shown.



picture2.2Signal source selection under digital/analog signal control mode

2.1.4Configuration of working mode under digital/analog signal control

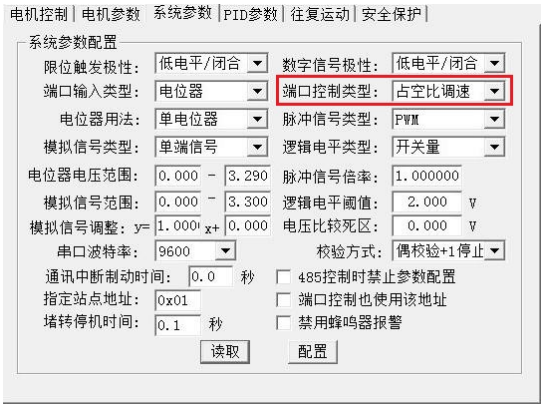
By setting the port control type register (0x009b) can be used to configure the working mode under digital/analog signal control mode. The corresponding relationship between register value and working mode is shown in the table2.4shown.

surface2.4Working mode configuration table under digital/analog signal control mode

Register Value	Working Mode
1	Duty cycle speed regulation
2	Torque control
3	Speed closed loop control
4	Position closed loop control
5	Preset speed control
6	Built-in programs

In digital/analog signal control mode, when the signal source is a potentiometer, analog signal orPWM/When the frequency/pulse signal is used, the working mode can be configured as duty cycle, torque, speed closed loop and position closed loop control.

Users can also use thePCThe sample program of the machine realizes the configuration of the working mode under the digital/analog signal control mode, as shown in the figure2.3shown.



picture2.3Working mode configuration under digital/analog signal control mode

The duty cycle speed regulation method adjusts the motor speed by changing the equivalent output voltage. It has the characteristics of fast response, but the speed changes to a certain extent due to load changes, and the torque during stall is related to the duty cycle.

The torque control mode changes the motor torque by adjusting the output current. The torque control mode supports two modes: torque control only and torque-speed simultaneous control. In the torque control mode, when the load torque is less than the motor torque, the motor speed will be reduced.

In the torque and speed simultaneous control mode, in addition to adjusting the motor torque, the motor's final speed can also be adjusted.

Speed closed loop control methodPIDThe speed regulation algorithm is used to control the motor at a steady speed. The speed regulation algorithm supports speed closed-loop control and time-position closed-loop control. The former directly adjusts the motor speed, and has the characteristics of small overshoot and smooth speed regulation at high speed, but at low speed, uneven speed regulation may occur; the latter controls the motor rotation position by calculating the position that the motor should rotate over time, thereby indirectly controlling the motor at a steady speed. This method can meet the requirements of multiple drives for synchronous control of the rotation positions of multiple motors and the requirements of ultra-low speed steady speed control, but the speed regulation has a certain overshoot.

Position closed loop control usePIDThe adjustment algorithm is used to control the motor rotation position. When the target position is given, the driver will automatically calculate the target real-time speed of the current rotation position during the motor operation and adjust it according to the configured acceleration, deceleration and maximum speed, so that the motor can accurately rotate to the target position according to the configured speed and acceleration parameters.

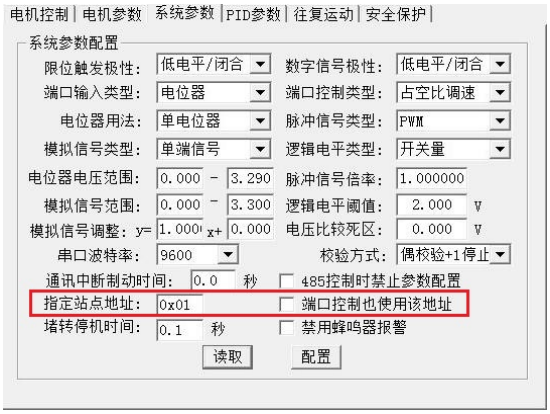
When the signal source is a built-in program, the working mode can be configured as preset speed and built-in program control. The preset speed control mode saves the forward and reverse speeds in the driver and controls the motor start and stop and forward and reverse rotation only through switches or logic levels. This control mode supports duty cycle, torque, speed closed loop, and position closed loop control. For details on the preset speed control mode, see3.1.7Section.

The built-in program control method can control the motor movement process by writing a custom process program through the supporting program. For details, see "MotorProcUser Manual.

2.1.5 485Configuration of communication slave station address

By operating the specified site address register (0x009c) Configurable485The slave address of the drive in communication control mode. If digital/analog signal control mode is used, it is also used.0x009cThe slave address configured by the register can also be used to change the address register (0x009d)Write1.like0x009dThe register value is0, the default communication parameters (baud rate) will be used in digital/analog signal control mode.9600bps, even parity,1Stop bit, slave address0x01) for communication.

Users can also use thePCMachine sample program implementation485The configuration of the communication slave station address is shown in the figure2.4 shown.

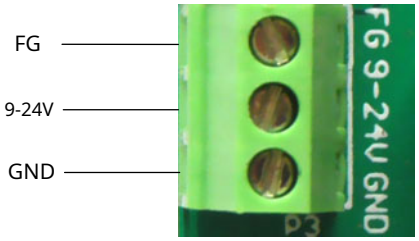


picture2.4 485Communication slave address configuration

485The mode switching between communication control mode and digital/analog signal control mode can be realized by key operation. If the configured slave address and communication parameters are forgotten and the drive cannot communicate, you can also press and hold the key to switch between the communication control mode and the digital/analog signal control mode.5The default communication parameters are switched to communicate in seconds (for details on key operation, see2.1.1section).

2.2Power interface

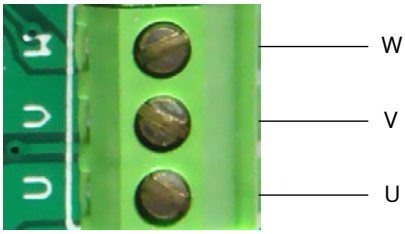
The signal definition of the power interface is as shown in the figure2.5shown.9-24VConnect the positive pole of the power supply.GNDConnect to the negative pole of the power supply or ground.FGConnect to the case, the power interface supports a voltage range ofDC 9V~24V.



picture2.5Power interface signal definition

2.3Motor interface

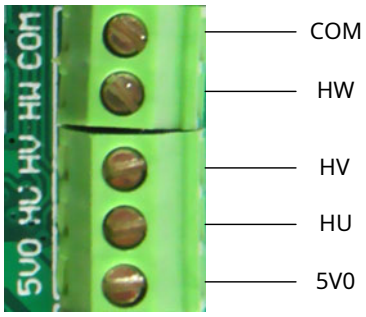
The definition of the motor interface is shown in the figure2.6shown.U,V,WWith motorU,V,WThe phase lines are connected (the connection can be made in any order; when the order of the motor phase lines is changed, the motor needs to be relearned).



picture2.6Motor interface definition

2.4Hall signal interface

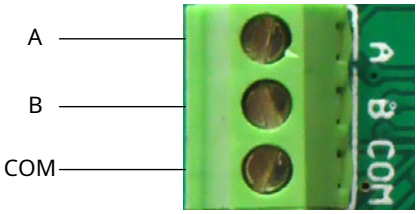
The Hall signal interface definition is as shown in the figure2.7As shown,COMConnect to the negative pole of the Hall sensor.5V0Connect to the positive electrode of the Hall sensor.HW,HV,HUConnect the three Hall signal wires of the Hall sensor respectively (the positive and negative poles of the power supply of the motor Hall sensor must be connected correctly, and the Hall position signalHW,HV,HUThe connections can be made in any order. When the wiring order of the Hall position signal is changed, the motor needs to be relearned).



picture2.7Hall signal interface definition

2.5Communication interface

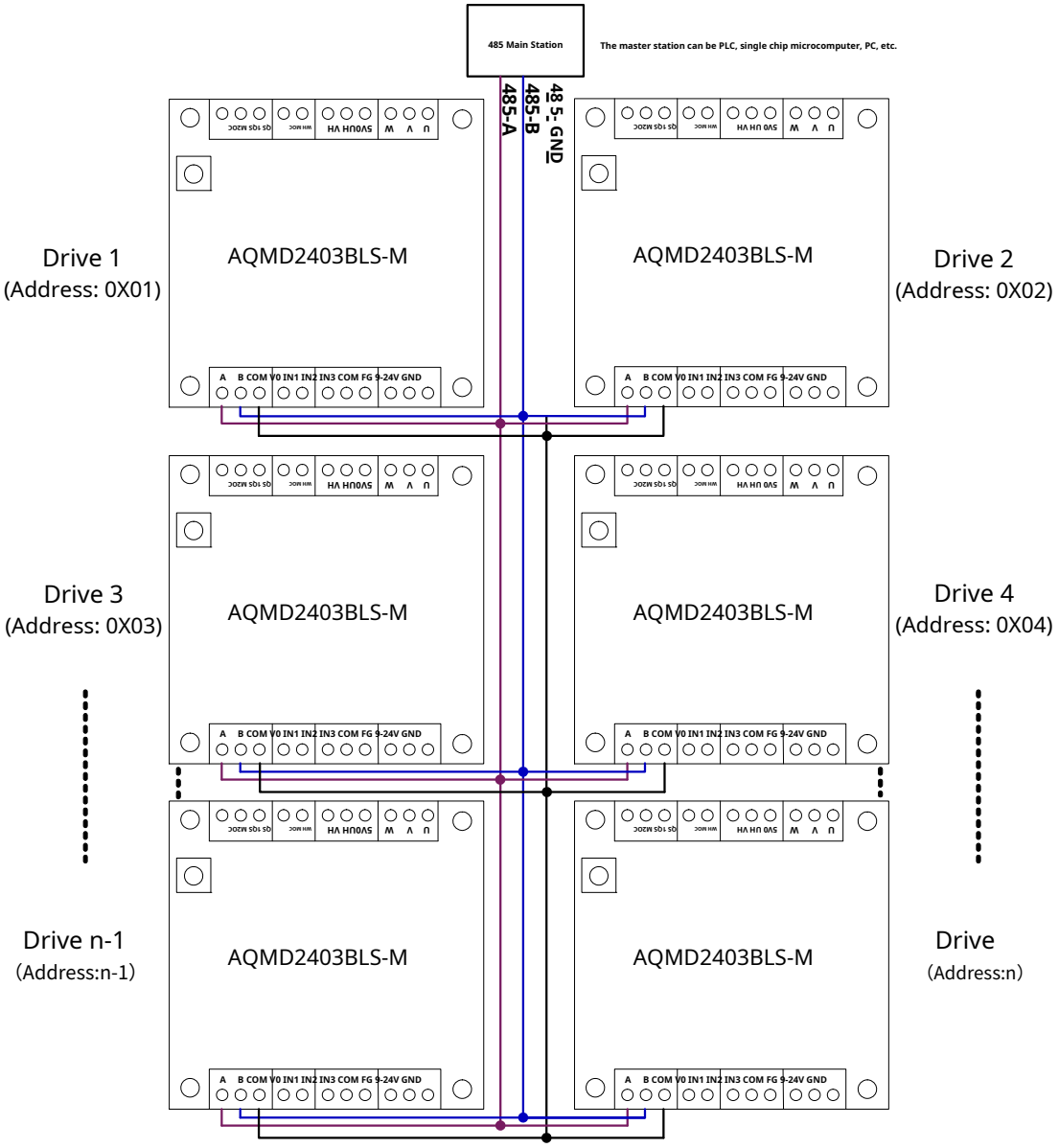
Communication interface supportRS485Communication, signal definition is as shown in the figure2.8shown.A,BForRS485Two differential signalsAandB.COMFor signal ground.Acatch485Signal line of the master stationA,Bcatch485Signal line of the master stationB.



picture2.8 485Communication interface signal definition

This driver supports multi-site communication, that is, multiple drivers485Communication lineAA,BBAfter being connected in parallel with a 485To make the signal more stable, each driverCOMAfter connecting with485The master station can be connected to the signal ground of the master station.PLC, MCU orPCMachine, etc.485The master station operates each drive independently through the different address bit identifications set for each drive.

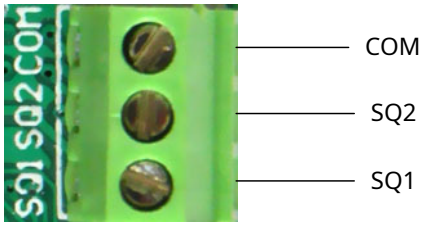
RS485The schematic diagram of multi-site communication is shown in the figure2.9All drives485Signal lineA,BAfter being connected in parallel485Main Station485Signal lineA,BThe address set for each driver connected in parallel should be unique and cannot be the same as other drivers.485The master station specifies which drive to operate through the address byte in the communication frame. Only the drive with the same address as the address specified in the communication frame will respond to the master station's request (see How to configure the slave station address2.1.5If the communication line is long, you can 485Signal lines are connected in parallel120ΩThe terminal resistance is used to eliminate the interference caused by reflection in the communication line.



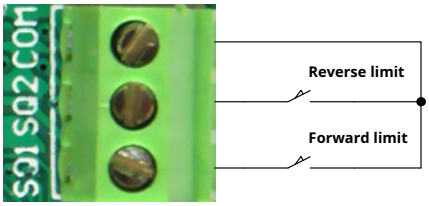
picture2.9 RS485Multi-site communication wiring diagram

2.6Limit interface

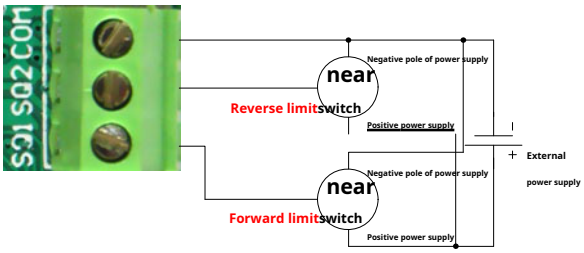
The limit interface signal definition is as shown in the figure2.10The limit interface is used to limit the travel of the mechanical device. Two limit switches can be connected to limit the forward and reverse rotation respectively. The default support is normally open contact limit, which can be485Configured as normally closed contact limit. COMIt is the common terminal of the two limit switches and is connected toSQ1andCOMThe limit switch between the two limits the forward rotation of the motor. SQ2andCOMThe limit switch limits the motor's reverse rotation, as shown in the figure2.11As shown; if using5VPhotoelectric proximity switch or5VMetal proximity switch as limit switch (driver only supports NPNNormally open/normally closed output proximity switch), the positive pole of the proximity switch power supply can be connected to the Hall signal interface5V0The negative pole of the power supply is connected toCOMIf you use more than5V If the proximity switch is used as a limit switch, an external power supply is required to power the proximity switch, as shown in the figure2.12shown.



picture2.10Limit interface signal definition



picture2.11Limit switch connection



picture2.12How to connect the proximity switch as a limit switch

Note: Never connect the driver's V- and COM together, and do not connect a capacitor in series between V+ and COM, otherwise the driver or user equipment may become unstable.

The limit interface trigger level and polarity are configurable (see how to configure the limit interface polarity).6.3.5Sections0x0080Register description), when the trigger mode is level trigger, the motor stops when the limit is triggered, and the motor resumes after the limit is removed; when the trigger mode is edge trigger, the motor stops at the moment of limit trigger, and the motor remains stopped after the limit is removed until the reverse signal is given. The limit interface trigger logic is shown in the table2.5shown.

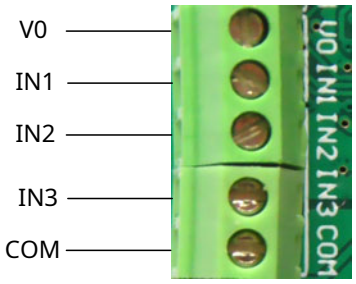
surface2.5Limit interface trigger logic

Limit trigger polarity	Motor rotation direction	SQ1state	SQ2state	Limitation
Low level/closed	Forward	Low level/switch closed	Any	Forward limit stop
		High level/switch off	Any	No Action
		High level → Low level → High level flat/ The switch is closed and then disconnected	Any	The motor pauses for a while. Continue forward
	Reversal	Any	Low level/switch closed	Reverse limit stop
		Any	High level/switch off	No Action
		Any	High level → Low level → High level/ The switch is closed and then disconnected open	The motor pauses for a while. Continue to reverse
High level/disconnect	Forward	Low level/switch closed	Any	No Action
		High level/switch off	Any	Forward limit stop

		Low level → High level → Low level flat / The switch opens and then closes	Any	The motor pauses for a while. Continue forward
	Reversal	Any	Low level/switch closed	No Action
		Any	High level/switch off	Reverse limit stop
		Any	Low level → High level → Low level /After the switch is disconnected closure	The motor pauses for a while. Continue to reverse
Falling edge/closing moment between	Forward	Low level/switch closed	Any	Forward limit stop
		High level/switch off	Any	No Action
		High level → Low level → High level flat / The switch is closed and then disconnected	Any	Forward limit stop and hold hold
	Reversal	Any	Low level/switch closed	Reverse limit stop
		Any	High level/switch off	No Action
		Any	High level → Low level → High level /After the switch is closed disconnect	Reverse limit stop and hold hold
Rising edge/off instant between	Forward	Low level/switch closed	Any	No Action
		High level/switch off	Any	Forward limit stop
		Low level → High level → Low level flat / The switch opens and then closes	Any	Forward limit stop and hold hold
	Reversal	Any	Low level/switch closed	No Action
		Any	High level/switch off	Reverse limit stop
		Any	Low level → High level → Low level /After the switch is disconnected closure	Reverse limit stop and hold hold

2.7Input signal interface

The definition of the input signal interface is shown in the figure2.13As shown in the table, the functions of each signal port are as shown in the table2.6shown.



picture2.13Potentiometer/analog signal interface signal definition

surface2.6Function of each signal port

Speed regulation mode	Function of the port				
	VO	IN1	IN2	IN3	COM
Single potentiometer duty cycle speed control Single potentiometer torque control Single potentiometer closed loop speed regulation	Powering the Potentiometer	Connect the potentiometer to the Machine speed regulation	Control motor positive change	Control motor reverse change	Potentiometer Power Ground
Single potentiometer position control (electric Flat trigger)	Powering the Potentiometer	Connect potentiometer to set Motor rotation position	Signal latch	Emergency Stop	Potentiometer Power Ground
Single potentiometer position control (side Edge Trigger	Powering the Potentiometer	Connect the potentiometer to the Machine speed regulation	Control motor positive change	Control motor reverse change	Potentiometer Power Ground
Dual potentiometers with independent duty cycle Speed Control Dual potentiometer independent closed loop adjustment speed	Powering the Potentiometer	Connect potentiometer1Electric Machine forward speed regulation	Connect potentiometer2right Motor reverse adjustment speed	Control motor side Towards	Potentiometer Power Ground
Dual potentiometer independent torque control system	Powering the Potentiometer	Connect potentiometer1adjust Motor torque	Connect potentiometer2right Motor speed regulation	Control motor side Towards	Potentiometer Power Ground
Dual potentiometer position independent control system	Powering the Potentiometer	Connect potentiometer1set up Motor rotation position	Connect potentiometer2right Motor speed regulation	Emergency Stop	Potentiometer Power Ground
Dual Potentiometer Coordinated Duty Cycle Speed Control Dual potentiometer coordinated torque control system Dual potentiometers for closed-loop regulation speed	Powering the Potentiometer	Connect potentiometer1control Motor direction and rotation speed	Connect potentiometer2set up Center point reference Voltage	Emergency Stop	Potentiometer Power Ground
Dual potentiometer position coordinated control system	Powering the Potentiometer	Connect potentiometer1set up Motor rotation position	Connect potentiometer2set up Center point position	Emergency Stop	Potentiometer Power Ground
Single-ended analog signal duty cycle Speed Control Single-ended analog signal torque control system Single-ended analog signal closed loop modulation speed (Level Trigger)	Fault signal output	Connect analog signal control Braking motor speed	Control motor side Towards	stop	Signal Ground

Single-ended analog signal duty cycle Speed Control Single-ended analog signal torque control system Single-ended analog signal closed loop modulation speed (Edge Triggered)	Fault signal output	Connect analog signal control Braking motor speed	Control motor positive change	Control motor reverse change	Signal Ground
Single-ended analog signal position control system (Level Trigger)	Complete signal output	Control motor rotation Location	Signal latch	Emergency Stop	Signal Ground
Single-ended analog signal position control system (Edge Triggered)	Complete signal output	Control motor rotation Location	Control motor positive change	Control motor reverse change	Signal Ground
Differential analog signal duty cycle Speed Control Differential analog signal torque control system Differential analog signal closed loop modulation speed	Fault signal output	Connect differential analog signal to control motor direction and speed		stop	Signal Ground
Differential analog signal position control system	Complete signal output	Connect differential analog signal to control motor rotation Location		Emergency Stop	Signal Ground
Dual single-ended signals with independent duty Ratio speed regulation Dual single-ended analog signals independent Closed loop speed regulation	Fault signal output	Connect analog signal1 Forward rotation of the motor speed	Connect analog signal2 Reverse the motor Speed Control	Control motor side Towards	Signal Ground
Dual single-ended analog signals independent Torque control	Fault signal output	Connect analog signal1 Control motor torque	Connect analog signal2 Motor speed control	stop	Signal Ground
Dual single-ended analog signals independent Position Control	Complete signal output	Connect analog signal1 Control motor rotation Location	Connect analog signal2 Motor speed control	Emergency Stop	Signal Ground
Dual single-ended signal coordination duty Ratio speed regulation Dual single-ended analog signal coordination Torque control Dual single-ended analog signal coordination Closed loop speed regulation	Fault signal output	Connect analog signal1 Controlling the motor direction and speed	Connect analog signal2 Set midpoint parameter Test voltage	stop	Signal Ground

Dual single-ended analog signal coordination Position Control	Complete signal output	Connect analog signal1 Control motor rotation Location	Connect analog signal2 Set midpoint Place	Emergency Stop	Signal Ground
PWMSignal duty cycle speed regulation PWMSignal torque control PWMSignal closed loop speed regulation (Level Trigger)	Fault signal output	catchPWMSignal Control Braking motor speed	Control motor side Towards	Emergency Stop	Signal Ground
PWMSignal duty cycle speed regulation PWMSignal torque control PWMSignal closed loop speed regulation (Edge Triggered)	Fault signal output	catchPWMSignal Control Braking motor speed	Control motor positive change	Control motor reverse change	Signal Ground
PWMSignal position control	Complete signal output	catchPWMSignal Control Braking motor rotation position Place	Signal latch	Emergency Stop	Signal Ground
Frequency signal duty cycle speed regulation Frequency signal torque control Frequency signal closed loop speed regulation (Level Trigger)	Fault signal output	Frequency signal control Braking motor speed	Control motor side Towards	Emergency Stop	Signal Ground
Frequency signal duty cycle speed regulation Frequency signal torque control Frequency signal closed loop speed regulation (Edge Triggered)	Fault signal output	Frequency signal control Braking motor speed	Control motor positive change	Control motor reverse change	Signal Ground
Frequency signal position control	Complete signal output	Frequency signal control Braking motor rotation position Place	Signal latch	Emergency Stop	Signal Ground
Pulse signal duty cycle speed regulation Pulse signal torque control Pulse signal closed loop speed regulation (Level Trigger)	Fault signal output	Pulse signal control Braking motor speed increase quantity	Control speed increase Quantity direction	Emergency Stop	Signal Ground
Pulse signal duty cycle speed regulation Pulse signal torque control Pulse signal closed loop speed regulation (Edge Triggered)	Fault signal output	Pulse signal control Braking motor speed increase quantity	Control motor increase The direction of the quantity is positive Towards	Control motor increase The direction of the quantity is opposite Towards	Signal Ground

Pulse signal position control	Complete signal output	Pulse signal control Braking motor stepping	Control motor steps Direction	Emergency Stop	Signal Ground
Preset speed control (double key control System method)	Fault/Completion Signal Output	Control motor forward	Control motor reverse change	stop	Signal Ground
Preset speed control (single-touch System method)	Fault/Completion Signal Output	Forward → Reverse → Forward...	Reverse → Forward → Reverse...	stop	Signal Ground

2.8Status indicator

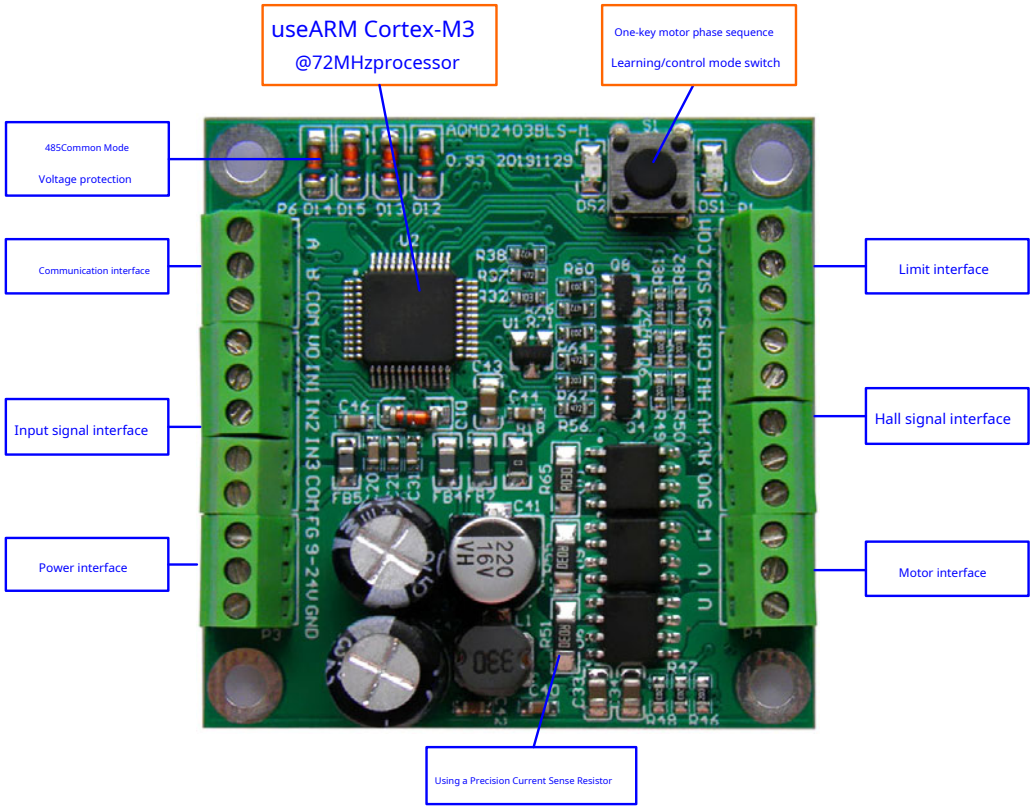
When the green indicator light of the drive0.5HzWhen the green indicator light flashes slowly at a frequency of2HzWhen the yellow indicator light flashes at a faster frequency, it means the driver is in communication status; when the yellow indicator light flashes alone, it means the driver is in fault status. The status indicator light description is as shown in the table.2.7shown.

surface2.7Status Indicator Light Description

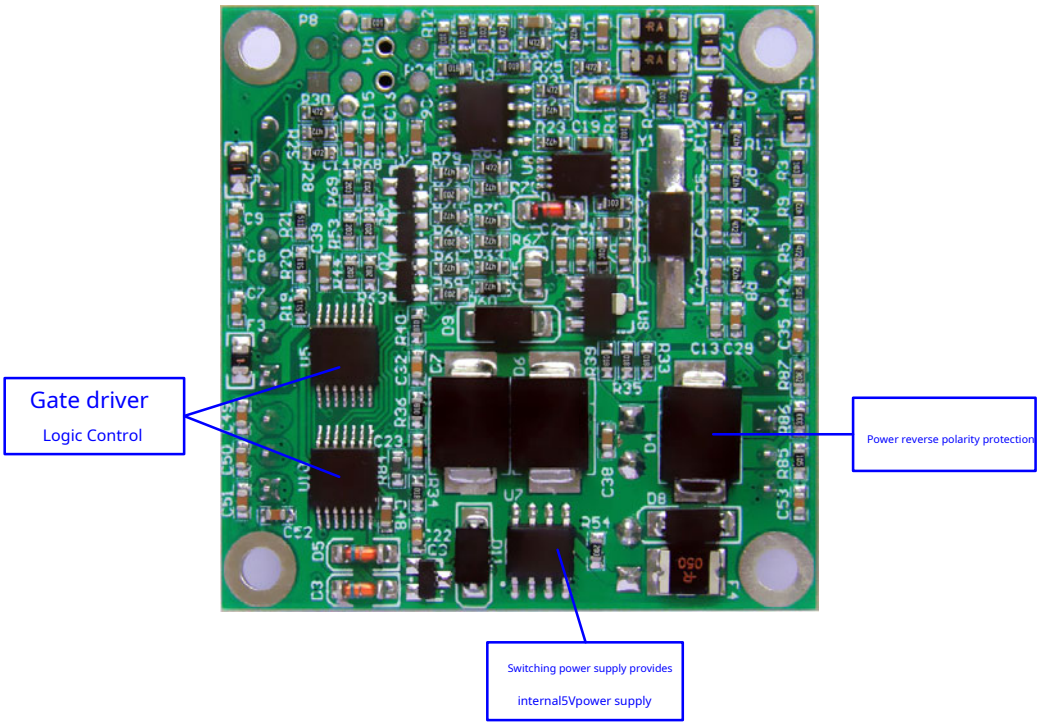
Indicator status		illustrate
Yellow Light	Green Light	
Flashing alternately6After that, both lights will stay on1s		Motor learning success
Flashing alternately6The yellow light flashes continuously after3Second-rate		Motor learning failed
Always on	0.5/2HzFrequency flicker	The drive is in digital/analog signal control mode
Constantly Extinct	0.5/2HzFrequency flicker	The drive is in485Communication control mode
	0.5HzFrequency Slow Flashing	The drive is in normal operation
	2HzFaster flashing frequency	The drive is in communication state
Single flash		The drive is in a failed state

2.9Internal structure of the drive

1. Internal front structure of the drive



2.Internal structure of the drive



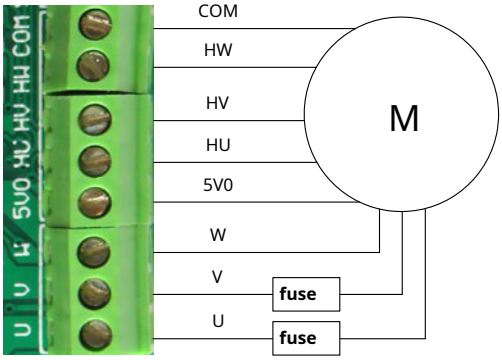
3.How to use

3.1Usage under digital/analog signal control mode

3.1.1Basic operation steps

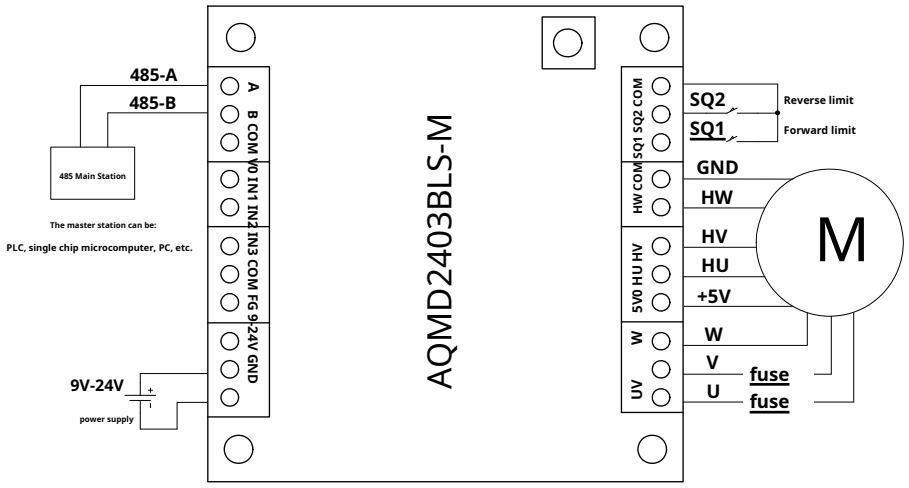
Before using the driver after powering on, you should first configure the rated current parameters of the motor, then connect the motor and power supply. If it is the first time to use the motor, you need to learn the motor before using it. Then configure the relevant parameters according to the parameters required by the corresponding control mode.485Communication configuration parameters should be followed485The corresponding wiring method of the communication control mode is to connect the drive as485After setting the communication control mode, configure the relevant parameters and then configure the registers according to the corresponding control mode requirements. The specific operation steps are as follows.

1)The motorU,V,WThe three-phase power line is connected to the driver motor interfaceU,V,W, connect the positive and negative poles of the motor's Hall sensor power line (usually the positive pole is red and the negative pole is black, refer to the relevant information of the motor for details) to the Hall signal interface of the driver respectively5VOandCOM, the three Hall position signal lines of the Hall sensor are connected to the Hall interface of the driverHU,HV,HW, as shown in the figure3.1shown.



picture3.1Motor wiring diagram

2)Connect the positive and negative poles of the power supply to the driver power interface.V+andV-,485Main StationA,BRespectively with the driver485of A,BConnected (if usingPCThe machine sample program operation can beUSB-485Converter connectionPCMachine and drivePCMachine as485 Master station), as shown in Figure3.2As shown (Note: the voltage of the power supply should be consistent with the rated voltage of the motor, and the current it can provide should be greater than the rated current of the motor).



picture3.2 485Communication power supply and motor wiring diagram

3)Power on, through the register or atPCThe motor rated current is configured to be consistent with or slightly higher than the actual rated current of the motor (see2.1.2The rated motor current can be obtained from the motor nameplate or data sheet. If the rated motor current cannot be determined, it can be estimated by dividing the motor rated power by the rated voltage and then by the motor efficiency.12VMotor, good efficiency50%,for24VAnd above voltage motor, efficiency is desirable70%.

4)Learn the motor phase sequence. For details on the motor phase sequence learning method, see3.1.2Section Steps3).

5)After the motor learning is completed, turn off the driver power supply and connect the wiring according to the wiring method required by the corresponding control mode (see the wiring method of various control modes for details).4Then turn on the power and use the relevant registers to reconfigure the required parameters and working mode, and the driver can work.

6)If necessary,485Communication configuration parameters, first turn off the drive power supply, according to485Wiring method required by communication control mode Wiring (see4.5Then turn on the power, hold down the button1sThen release to configure the drive as485 Communication method (For details on key usage, see2.1.1subsection), in485Configure the required parameters in the communication mode (see the parameter configuration requirements of various control modes for details).4Chapter), use the relevant registers again to configure the required parameters of the working mode, the driver can work.

3.1.2Motor Learning

Before using a newly connected motor for the first time, or after the motor phase line or Hall signal line wiring sequence is changed, the motor phase sequence needs to be learned before use. The steps for motor phase sequence learning are as follows:

1)Cut off the power supply of the driver and put the motor in a no-load state;

2)according to3.1.1Section Steps1)~3)Connect the driver and motor by the method, turn on the driver power supply, and configure the motor rated current;

3)Press the button briefly to enter the learning state. If the status indicator flashes green and yellow alternately6After that, both lights will stay on1s, it means the learning is successful; if the status indicator light flashes green and yellow alternately6After that, the yellow light flashes continuously.3If the motor is connected correctly, it means that the learning has failed. Please check whether the motor wiring is correct and connected firmly, or whether the motor is the type supported by the driver.

4)After successful learning, disconnect the power supply of the driver, reconnect as needed and use the relevant registers to configure the required working parameters. For the wiring and configuration methods under various control modes, refer to the first section of this document.4chapter.

3.1.3How to use potentiometer

The usage of the potentiometer can be configured as single potentiometer speed control, dual potentiometer independent speed control and dual potentiometer coordinated speed control (see how to select the signal source as the potentiometer2.1.3For instructions on how to configure the potentiometer, see6.3.5Sections0x0082register description).

Single potentiometer speed control uses a single potentiometer to adjust the motor speed, controls the motor direction and start and stop through switches or logic levels, and limits the forward and reverse rotation through limit switches. For the wiring and configuration methods of single potentiometer speed control, see4.1.1Section.

Single potentiometer position control uses a single potentiometer to adjust the motor rotation position, latches the position signal and controls the motor emergency stop through switches or logic levels, and limits the forward and reverse rotation through limit switches. For the wiring and configuration methods of single potentiometer position control, see4.1.2Section.

Dual potentiometer independent speed control uses two potentiometers to adjust the speed of the motor's forward and reverse rotation separately (torque and speed are controlled separately in torque control mode), controls the motor start and stop and direction through switches or logic levels, and limits the forward and reverse rotation through limit switches. The wiring and configuration methods of dual potentiometer independent speed control are shown in4.1.4Section.

The dual potentiometer independent position control uses one potentiometer to adjust the rotational position of the motor, and the other potentiometer to adjust the motor speed. The motor emergency stop is controlled by a switch or logic level, and the forward and reverse limit is set by the limit switch. The wiring and configuration method of the dual potentiometer independent position control is shown in4.1.5Section.

The dual potentiometer coordinated speed regulation uses two potentiometers to control the speed and direction of the motor, and the limit switch is used to limit the forward and reverse rotation. The wiring and configuration method of the dual potentiometer coordinated speed regulation can be found in4.1.6Section.

The dual potentiometer coordinated position control uses one potentiometer to set the midpoint of the stroke, and the other potentiometer to adjust the motor rotation position. The motor emergency stop is controlled by a switch or logic level, and the forward and reverse limit is set by the limit switch. The wiring and configuration method of the dual potentiometer coordinated position control is shown in4.1.7Section.

3.1.4Usage of analog signals

The type and usage of analog signals can be configured as single-ended analog signal speed control, differential analog signal speed control, dual single-ended analog signal independent speed control, and dual single-ended analog signal coordinated speed control (see How to select the signal source as analog signal2.1.3For details on how to configure the analog signal type, see6.3.5Sections0x0084register description).

Single-ended analog signal speed control uses a single-ended analog signal to control the motor speed, controls the motor direction and stop through switch quantity or logic level, and limits the forward and reverse rotation through limit switches. For the wiring and configuration methods of single-ended analog signal speed control, see4.2.1Section.

Single-ended analog signal position control uses a single-ended analog signal to adjust the motor rotation position, latches the position signal and controls the motor emergency stop through switches or logic levels, and limits the forward and reverse rotation through limit switches. For the wiring and configuration methods of single-ended analog signal position control, see4.2.3Section.

Differential analog signal speed control uses differential analog signals to control the direction and speed of the motor, controls the emergency stop of the motor through switch quantity or logic level, and limits the forward and reverse rotation through limit switches. 4.2.5Section.

Differential analog signal position control uses differential analog signals to control the direction and speed of the motor, controls emergency stop through switch quantity or logic level, and limits forward and reverse rotation through limit switches.4.2.6 Section.

Dual single-ended analog signal independent speed control uses two single-ended analog signals to control the forward and reverse speed of the motor separately (torque and speed are controlled separately in torque control mode), controls the start and stop and direction of the motor through switch quantity or logic level, and limits the forward and reverse rotation through limit switches. The wiring and configuration methods of dual single-ended analog signal independent speed control are shown in4.2.9Section.

Dual single-ended analog signal independent position control uses one analog signal to adjust the rotation position of the motor, and the other analog signal to adjust the motor speed. The motor emergency stop is controlled by a switch or logic level, and the forward and reverse limit is set by the limit switch. The wiring and configuration method of dual single-ended analog signal independent position control is shown in4.2.10Section.

Dual single-ended analog signal coordinated speed regulation uses two single-ended analog signals to control the speed and direction of the motor.

The limit switch quantity is used to limit the forward and reverse rotation. The wiring and configuration method of the dual single-ended analog signal coordinated speed regulation can be found in4.2.7Section.

The dual single-ended analog signal coordinated position control uses one analog signal to set the midpoint of the stroke, and the other analog signal to adjust the motor rotation position. The motor emergency stop is controlled by a switch or logic level, and the forward and reverse limit is set by the limit switch. The wiring and configuration method of the dual single-ended analog signal coordinated position control is shown in4.2.8Section.

3.1.5Pulse signal usage

The type and usage of the pulse signal can be configured asPWMSignal speed regulation, frequency signal speed regulation and pulse signal (counting mode) speed regulation (how to select the signal source as pulse signal, see2.1.3For details on how to configure the pulse signal type, see6.3.5Sections 0x0083 register description).

PWMSignal speed regulation adjusts the speed of the motor by changing the duty cycle of the input pulse signal, controls the direction of the motor and emergency stop through switch quantity or logic level, and limits the forward and reverse rotation through limit switches.PWMFor the wiring and configuration of signal speed regulation, see4.3.1Section.

Frequency signal speed regulation adjusts the motor speed by changing the frequency of the input pulse signal, controls the motor direction and emergency stop through switch quantity or logic level, and limits the forward and reverse rotation through limit switches.
4.3.4Section.

Pulse signal speed control controls the speed and direction of the motor by combining the number of pulses generated with the switch value or logic level, and limits the forward and reverse rotation through the limit switch (see the wiring and configuration method of pulse signal speed control for details).4.3.7section).

3.1.6Study Tour

When using potentiometers, analog signals,PWMWhen the signal or frequency signal adjusts the rotation position of the motor within a specified stroke, we can measure the total stroke of the motor through motor stroke learning. The steps of stroke learning are as follows:

1)Make sure the power supply, motor and driver are connected correctly, and the driver has successfully learned the motor;

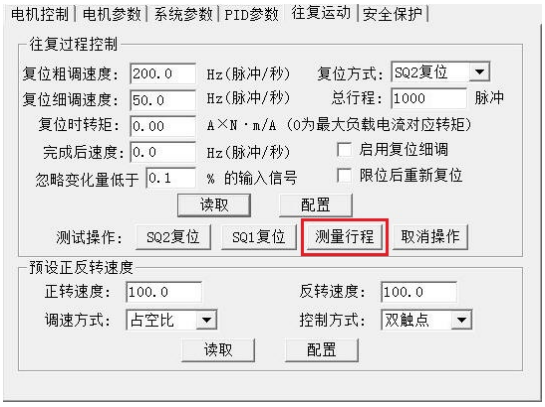
2)Disconnect the power supply of the drive;

3)Connect a limit switch to the driveSQ1andCOM(If it is a proximity switch, please refer to the figure for the connection method.2.12) is installed in the forward direction of the motor, and the other limit switch is connected to the driverSQ2andCOMThe timer is installed in the reverse direction of the motor;

4)Will485Converters and drivers485Interface according toAA,BBConnect the motor in the same way as above and turn on the power supply (Note: the voltage of the power supply should be consistent with the rated voltage of the motor, and the current it can provide should be greater than the rated current of the motor).

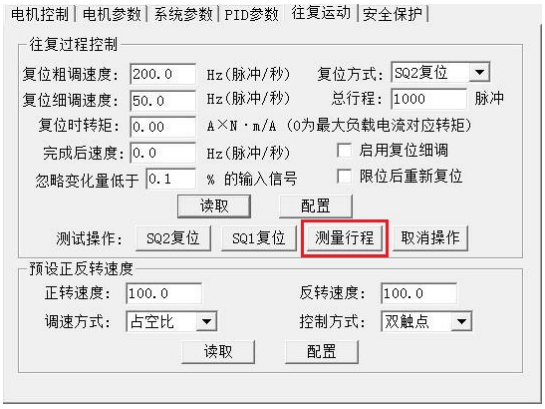
5)Operate the buttons to configure the drive as485Communication control mode, the yellow indicator light is always off, the green indicator light is 0.5/2HzFrequency flashing (For key operation, see2.1.1section).

Make sure the computer has the converter driver installedCH340,connect485Converter, double-click to open the driver packagePC machine sample program, find the correct serial port number, set the baud rate and verification method (the default baud rate is9600bps, the verification mode is even parity,1Click "Measure Stroke" in the reciprocating motion tab of the sample program.



Buttons, such as

6)picture3.3As shown, wait for the driver to complete learning. During learning, the working indicator light and the fault indicator light will flash alternately; the device driven by the motor will first move toward the limit switchSQ2Move in the direction when the limit switchSQ2Once triggered, the driver determines the starting point of the stroke, and then the device driven by the motor moves toward the limit switch.SQ1Move in the direction when the limit switchSQ1Once triggered, the drive determines the end position of the travel. The travel value is automatically written to Modbusof0x00A2-0x00A3Registers (For other registers related to stroke control, see6.3.6), the motor will stop rotating and the stroke learning is completed;



picture3.3Study Tour

7)Disconnect the power supply of the drive, rewire as needed and use the DIP switches to configure the required working parameters.

3.1.7Preset speed control

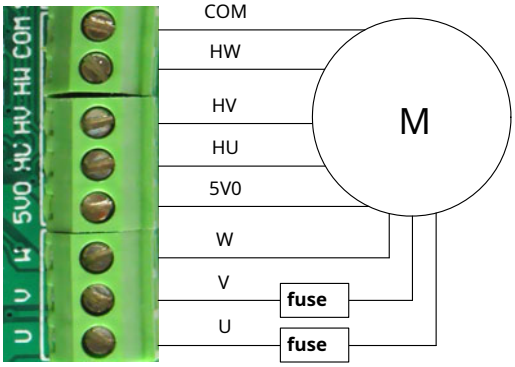
When the motor speed does not need to be adjusted and the motor start/stop and forward/reverse rotation are controlled only by switches or logic levels, we can use the preset speed mode (see how to configure the working mode to the preset speed control mode).2.1.4By presetting the speed register (see 6.3.7Section)0x00B2and0x00B3Configure the forward and reverse speeds separately, by0x00B0Register configuration speed control mode (configurable as duty cycle speed control, torque control, speed closed-loop control, position closed-loop control), through0x00B1 Configure the operation mode, whether it is a single button (or a single control signal) to control forward and reverse or two buttons (or two control signals) to control forward and reverse respectively. See the wiring and configuration method of the preset speed control mode.4.4chapter.

3.2 485How to use in communication control mode

Before using the driver, you should first configure the rated current parameters of the motor. If it is the first time to use the motor, you need to learn the motor first, and then configure the relevant parameters according to the parameters required by the corresponding control method. The specific steps are as follows:

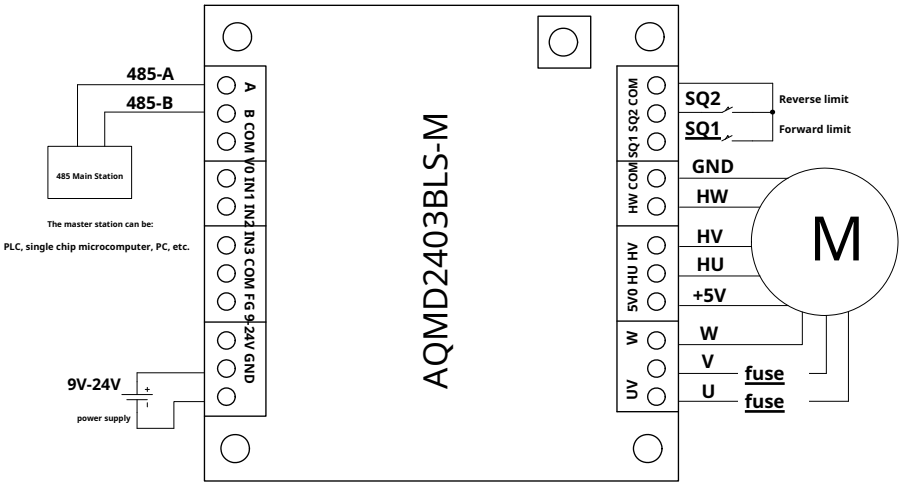
1)Disconnect the power supply to the drive.U,V,WThe three-phase power line is connected to the driver motor interfaceU,V,

W, connect the positive and negative poles of the motor's Hall signal sensor power line (usually the positive pole is red and the negative pole is black, refer to the relevant information of the motor for details) to the Hall signal interface of the driver respectively5VOandCOMThe three Hall position signal lines of the Hall signal sensor are connected to the Hall interface of the driver.HU,HV,HW, as shown in the figure3.4shown.



picture3.4Motor wiring diagram

2)Connect the positive and negative poles of the power supply to the driver power interface.V+andV-,485Master and drive485Interface according toAA,BB(In order to make the signal more stable, the driverCOMConnected to the signal ground of the master station), as shown in the figure3.5As shown, turn on the power supply (Note: the voltage of the power supply should be consistent with the rated voltage of the motor, and the current it can provide should be greater than the rated current of the motor).



picture3.5 485Communication power supply and motor wiring diagram

3)Operate the buttons to configure the drive as485Communication control mode, the yellow indicator light is always off, the green indicator light is 0.5/2HzFrequency flashing (For key operation, see2.1.1section).

4)Long press the button5sAfter releasing,RS485useModbus-RTUThe communication protocol communicates with the drive, and the default baud rate is9600bps, the verification mode is even parity,1If the communication parameters have been reconfigured, please use the newly configured communication parameters for communication.

5)pass0x006aand0x006bRegister (see6.3.4The motor rated current and maximum load current are configured in the following sections. The configured motor rated current should be consistent with or slightly higher than the actual rated current of the motor. The maximum load current can be used to configure the motor's maximum load/locking torque. If there is no requirement, it is usually configured the same as the rated current (see the motor current configuration for details). 2.1.2The rated current of the motor can be obtained from the nameplate or data sheet of the motor. If the rated current of the motor cannot be determined, it can be estimated by dividing the rated power of the motor by the rated voltage and then by the motor efficiency.

At12VMotor, good efficiency50%,for24VAnd above voltage motor, efficiency is desirable70%.

6)For the first use of the motor, or when the motor phase line or Hall signal line wiring sequence is changed, the motor should be learned first. Press the button briefly, the motor enters the learning state, and if the status indicator light flashes green and yellow alternately6After that, both lights will stay on1s, the learning is successful; if the status indicator light flashes green and yellow alternately6After that, the yellow light flashes continuously. 3If the motor is not connected correctly, the learning fails. Please check whether the motor wiring is correct and whether the motor is the type supported by the drive.

7)pass0x0050~0x0053Register (see6.3.3The speed control register description can temporarily change the duty cycle speed control mode. PWMThe rise and fall buffer time and the acceleration and deceleration in the speed closed loop and position closed loop mode. 0x0060~0x0067Register (see6.3.4The motor control parameter configuration register description can be configured to set the default duty cycle speed control mode after power-on.PWMThe rise and fall buffer time and the acceleration and deceleration in the speed closed loop and position closed loop mode, as well as the large acceleration and deceleration and large commutation frequency.

8)By writing0x0042The register sets the output duty cycle for duty cycle speed regulation; by writing0x0043The register sets the commutation frequency (corresponding to the speed) of the motor for closed-loop speed regulation;0x0044Set the commutation frequency of position control (corresponding to the speed),0x0045The register sets the position control mode to absolute position or relative position. 0x0046and0x0047Two registers are written with four-byte integer target position values to perform position closed-loop control.0x0046and0x0047Register or in0x0046Register Write0After operation0x0047 Registers to control the position.0x0040The register brakes the motor.0x0040~0x0047 For a detailed description of the registers, see6.3.3Section.

9)The closed-loop speed control algorithm can be0x0070The register configuration is speed closed-loop control or time-position closed-loop control. The former has the characteristics of small overshoot and smooth speed regulation at high speed, but the speed regulation may be uneven at low speed; the latter can realize the synchronous control of multiple motor rotation angles by multiple drivers, and the speed regulation is also smooth at low speed, which can meet the requirements of extremely low speed control, but there is a certain overshoot in the speed regulation process.

10)When the closed-loop speed regulation algorithm is speed closed-loop control, pass0x00c0~0x00c5Register configuration of closed loop speed regulationPID Parameters; when the closed-loop speed control algorithm is time-position closed-loop control,0x00c6~0x00cbRegister configuration closed loop speed control motor rotationPIDParameters, through0x00ba~0x00bfRegister configuration closed loop speed control motor self-lockingPID Parameters; when it is position closed loop control, it is also0x00c6~0x00cbRegister configuration position closed loop control motor rotationPID parameter,0x00ba~0x00bfWhen configuring the motor self-lockingPIDparameter.PIDIf the configuration of each parameter is too large, it may cause serious overshoot of speed or position control or even oscillation.PIDIf the parameters are configured too small, it may lead to slow adjustment and poor follow-up. They should be configured reasonablyPIDParameters to achieve the best adjustment effect.PIDFor details on parameter configuration related registers, see6.3.8Section introduction.

11)pass0x0080~0x0099Register (see6.3.5Section Description of System Parameter Configuration Registers) Configurable 485Limit switch trigger polarity, communication parameters, communication interruption protection time and stall stop time under communication control mode.

Note: You can also use thePCThe machine sample program is used to perform parameter configuration and speed control operations.

3.3Characteristics of various speed regulation methods

This driver can support duty cycle speed regulation, torque control, speed closed loop control and position closed loop control (see how to configure the speed regulation mode2.1.4The characteristics of various speed control methods are as follows.

3.3.1Duty cycle speed regulation

The duty cycle speed regulation method adjusts the motor speed by changing the equivalent output voltage. Duty cycle speed regulation has the characteristics of fast response, but the speed changes to a certain extent due to load changes. When the stall current does not exceed the configured large load current, the stall torque is approximately proportional to the duty cycle, which can be manifested as a small motor torque when the motor is adjusted to a low speed. This driver also supports the duty cycle rise/fall buffer time configuration to make the motor start/stop process smooth.

3.3.2Torque control

The torque control method changes the torque of the motor by adjusting the output current. The motor usually works in a stalled state. The output current of the torque control method can be adjusted arbitrarily within the configured maximum load current range.

3.3.3Speed closed loop control

Speed closed loop control methodPIDThe speed regulation algorithm is used to control the motor at a steady speed. The speed regulation algorithm supports speed closed-loop control and time-position closed-loop control. The former directly adjusts the motor speed, and has the characteristics of small overshoot and smooth speed regulation at high speed, but at low speed, uneven speed regulation may occur; the latter controls the motor rotation position by calculating the position that the motor should rotate over time, thereby indirectly controlling the motor at a steady speed. This method can meet the requirements of multiple drivers for synchronous control of the rotation positions of multiple motors and the requirements of ultra-low speed steady speed control, but the speed regulation has a certain overshoot. This driver supports closed-loop speed regulation acceleration configuration. For the use of speed closed-loop control algorithm, the acceleration configuration can be larger to make the steady speed response faster; for the use of time-position closed-loop control algorithm, too large acceleration configuration may cause serious overshoot or uneven switching of the motor rotation direction.

3.3.4Position closed loop control

Position closed loop control usePIDThe adjustment algorithm is used to control the rotation position of the motor. When the target position is given, the driver will automatically calculate the target real-time speed of the current rotation position of the motor during operation and adjust it according to the configured acceleration, deceleration and maximum speed, so that the motor can accurately rotate to the target position according to the configured speed and acceleration parameters. In the process of adjusting the motor position, the driver can also estimate the time required for the motor to rotate to the target position. Note that if the acceleration is configured too large or the braking current is configured too small, the driver may not be able to provide the required acceleration and cause overshoot in the position control. Therefore, the acceleration should be configured reasonably.

In the digital/analog signal control mode, the driver can adjust the motor rotation position within a fixed stroke and use pulse signals to perform step control on the motor;485Under the communication control mode, the absolute rotation position and relative rotation position of the motor can be controlled.

4.Connection and configuration of various control methods

4.1Connection and configuration of potentiometer speed control

The usage of the potentiometer can be configured as single potentiometer speed/position control, dual potentiometer independent speed/position control and dual potentiometer coordinated speed/position control (for how to configure the usage of the potentiometer, see6.3.5Festival0x0082The wiring and configuration methods of the potentiometer for various usages are as follows.

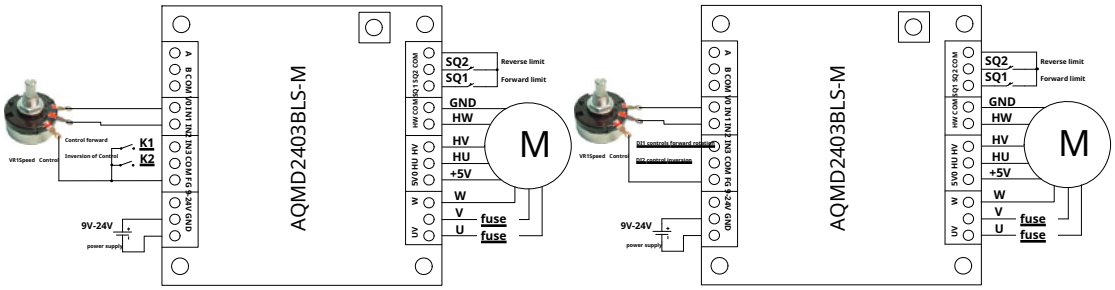
4.1.1Single potentiometer speed control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write0Select the potentiometer usage as single potentiometer,0x009bRegister Write 1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve single potentiometer speed control (you can also use this driver to match PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table 4.1shown.

surface4.1Related configuration required for single potentiometer speed control usage

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x01：Potentiometer	0x00：Single Potentiometer	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This usage uses a potentiometer to adjust the motor speed, and uses switch quantity/logic level to control the motor forward and reverse and start and stop. The connection method of single potentiometer speed control is shown in the figure4.1PotentiometerVR1Two fixed terminationsVOandCOM, dynamic terminationIN1, when the potentiometer moving end isCOMSlideVODuring the process, the motor speed changes from low to high. When the switch quantity is used to control the forward and reverse rotation and start and stop of the motor, the switchK1catchIN2andCOMControl the motor to rotate forward; switchK2catchIN3andCOMWhen using logic level to control the motor forward and reverse rotation and start and stop,IN2Connect to logic levelDI1, control the motor to rotate forward;IN3Connect to logic levelDI2, control the motor to reverse. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.1Connection method of single potentiometer speed control switch (left picture)/logic level (right picture) control method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of potentiometer, switch value and logic level. The control logic is shown in the table4.2shown.

surface4.2Single potentiometer speed control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default	Speed Control	PotentiometerVR1Speed Control	Jog

	recognize)	Forward	K1closure,K2disconnect	
		Reversal	K1disconnect,K2closure	
		stop	K1,K2All disconnected	
	High level/disconnect	Speed Control	PotentiometerVR1Speed Control	
		Forward	K1disconnect,K2closure	
		Reversal	K1closure,K2disconnect	
		stop	K1,K2All closed	
	Falling edge/closing moment	Speed Control	PotentiometerVR1Speed Control	Self-insurance
		Forward	K1After closing, open.K2Always disconnected	
		Reversal	K2After closing, open.K1Always disconnected	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	PotentiometerVR1Speed Control	
		Forward	K1After opening, close.K2Always closed	
		Reversal	K2After opening, close.K1Always closed	
		stop	Limit or speed adjustment0Stop	
Logic Level	Low level/closed (default recognize)	Speed Control	PotentiometerVR1Speed Control	Jog
		Forward	DI1Low level,DI2High level	
		Reversal	DI1High level,DI2Low level	
		stop	DI1,DI2Both are high level	
	High level/disconnect	Speed Control	PotentiometerVR1Speed Control	
		Forward	DI1High level,DI2Low level	
		Reversal	DI1Low level,DI2High level	
		stop	DI1,DI2Both are low level	
	Falling edge/closing moment	Speed Control	PotentiometerVR1Speed Control	Self-insurance
		Forward	DI1From high level to low level, DI2Always high	
		Reversal	DI2From high level to low level, DI1Always high	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	PotentiometerVR1Speed Control	
		Forward	DI1From low level to high level, DI2Always low	
		Reversal	DI2From low level to high level, DI1Always low	
		stop	Limit or speed adjustment0Stop	

In the single potentiometer speed control mode, the reference configuration of the relevant registers is shown in the table4.3shown.

surface4.3Configuration of registers related to single potentiometer speed control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger

			2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1,2,3	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger
0x0082	Potentiometer Usage	0	Single potentiometer (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

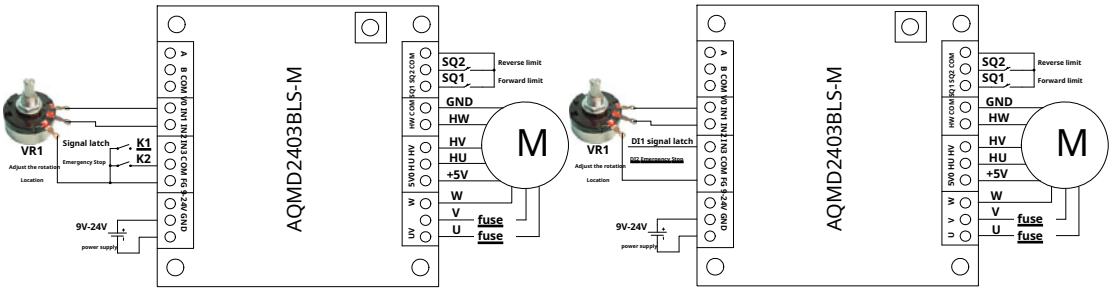
4.1.2Single potentiometer position control (level triggered)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write0Select the potentiometer usage as single potentiometer,0x009bRegister Write 4Configure the speed control mode as position closed loop control.0x0081Register Write0,1Configure the digital signal polarity to low level/closed, high level/open, and you can achieve single potentiometer position control (level trigger) usage (you can also use this driver to matchPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.4 shown.

surface4.4Single potentiometer position control (level trigger) usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x01：Potentiometer	0x00：Single Potentiometer	0x04: Position closed loop control	0x00：Low level/closed 0x01: High level/disconnect

This usage uses a potentiometer to adjust the motor rotation position, and uses the switch value/logic level to latch the motor signal and perform emergency stop. The connection method of single potentiometer position control (level trigger mode) is shown in the figure4.2 PotentiometerVR1Two fixed terminationsVOandCOM, dynamic terminationIN1, when the potentiometer moving end isCOMSlideVODuring the process, the motor rotation position changes from the starting point of the stroke to the maximum position of the stroke (the total stroke can be 0x00a2and0x00a3Registers to configure, see6.3.6(section "Reciprocating Position Control Parameter Register"). When using switch control, the switch K1catchIN2andCOMTime, used for signal latch, switchK2catchIN3andCOMWhen the motor is controlled by logic level,IN2Connect to logic levelDI1, latch the motor signal,IN3Connect to logic levelDI2, control the motor to stop urgently. Limit switchSQ1andSQ2Set limits on the forward and reverse rotation of the motor respectively.



picture4.2Connection of single potentiometer position control (level trigger) switch (left)/logic level (right)

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating the potentiometer, logic level and switch quantity in different ways. The control logic is shown in the table4.5shown.

surface4.5Control logic for single potentiometer position control (level trigger)

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	PotentiometerVR1adjust	
		Signal latch	K1closure,K2disconnect	
		Emergency Stop	K2closure	
	High level/disconnect	Adjust position	PotentiometerVR1adjust	
		Signal latch	K1disconnect,K2closure	
		Emergency Stop	K2disconnect	
Logic Level	Low level/closed (default)	Adjust position	PotentiometerVR1adjust	
		Signal latch	DI1Low level,DI2High level	
		Emergency Stop	DI2Low level	
	High level/disconnect	Adjust position	PotentiometerVR1adjust	
		Signal latch	DI1High level,DI2Low level	
		Emergency Stop	DI2High level	

In single potentiometer position control (level trigger) mode, the reference configuration of related registers is shown in Table4.6shown.

surface4.6Configuration of registers related to single potentiometer position control (level trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0082	Potentiometer Usage	0	Single potentiometer (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)

0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following potentiometer output voltage fluctuations (default) are used for filtering to eliminate interference signals that cause motor jitter
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.1.3Single Potentiometer Position Control (Edge Triggered)

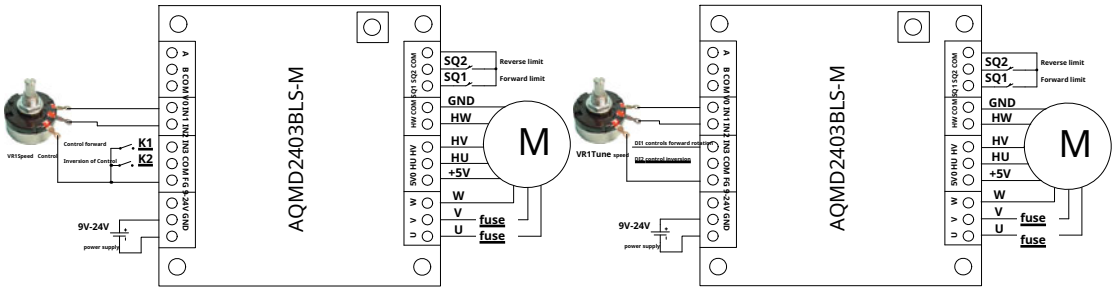
Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write0Select the potentiometer usage as single potentiometer,0x009bRegister Write 4Configure the speed control mode as position closed loop control.0x0081Register Write2,3Configuring the polarity of the digital signal to be falling edge/closing moment, rising edge/opening moment, can achieve single potentiometer position control (edge trigger) usage (can also be used with this driver)PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.7shown.

surface4.7Single potentiometer position control (edge trigger) usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x01：Potentiometer	0x00：Single Potentiometer	0x04: Position closed loop control	0x02: Falling edge/Closed moment
				0x03: Rising edge/disconnection moment

This usage uses a potentiometer to adjust the motor speed, and controls the motor to move to the starting point or maximum stroke position through a switch/logic level. The connection method of single potentiometer position control (edge trigger) is shown in the figure4.3As shown. Among them, the potentiometerVR1Adjust the motor speed and control the motor forward and reverse rotation through switch quantity/logic level.VR1Two fixed terminationsVOandCOM,move

TerminationIN1, when the potentiometer moving end isCOMSlideVODuring the process, the motor speed changes from low to high. When using switch control, the switchK1catchIN2andCOMDuring this time, the control motor is turned to the maximum stroke position (the total stroke can be0x00a2and0x00a3 Registers to configure, see6.3.6Section reciprocating position control parameter register), switchK2catchIN3andCOMWhen the logic level is used for control, the motor is controlled to reverse to the starting point of the stroke.IN2Connect to logic levelDI1, control the motor to move to the maximum stroke position,IN3Connect to logic levelDI2, control the motor to reverse to the starting point of the stroke. Limit switchSQ1andSQ2Set limits on the forward and reverse rotation of the motor respectively.



picture4.3Connection of single potentiometer position control (edge triggered) switch (left)/logic level (right)

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating the potentiometer, logic level and switch quantity in different ways. The control logic is shown in the table4.8shown.

surface4.8Control logic for single potentiometer position control (edge triggered)

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Falling edge/closing moment	Adjust speed	PotentiometerVR1adjust	Self-insurance
		Forward to maximum travel	K1After closing, open.K2Always disconnected	
		Reverse to the starting point of the trip	K2After closing, open.K1Always disconnected	
		stop	Stop when the movement reaches the end point or limit position end	
	Rising edge/disconnection moment	Adjust speed	PotentiometerVR1adjust	
		Forward to maximum travel	K1After opening, close.K2Always closed	
		Reverse to the starting point of the trip	K2After opening, close.K1Always closed	
		stop	Stop when the movement reaches the end point or limit position end	
Logic Level	Falling edge/closing moment	Adjust speed	PotentiometerVR1adjust	edge
		Forward to maximum travel	DI1From high level to low level, DI2Always high	
		Reverse to the starting point of the trip	DI2From high level to low level, DI1Always high	
		stop	Stop when the movement reaches the end point or limit position end	
	Rising edge/disconnection moment	Adjust speed	PotentiometerVR1adjust	
		Forward to maximum travel	DI1From low level to high level, DI2Always low	
		Reverse to the starting point of the trip	DI2From low level to high level, DI1Always low	

		stop	Stop when the movement reaches the end point or limit position end	

In single potentiometer position control (edge trigger) mode, the reference configuration of related registers is shown in Table4.9shown.

surface4.9Configuration of registers related to single potentiometer position control (edge trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	2,3	2: Falling edge trigger 3: Rising edge trigger
0x0082	Potentiometer Usage	0	Single potentiometer (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total stroke can be obtained through stroke learning, or it can be directly configured
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following potentiometer output voltage fluctuations (default) are used for filtering to eliminate interference signals that cause motor jitter
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

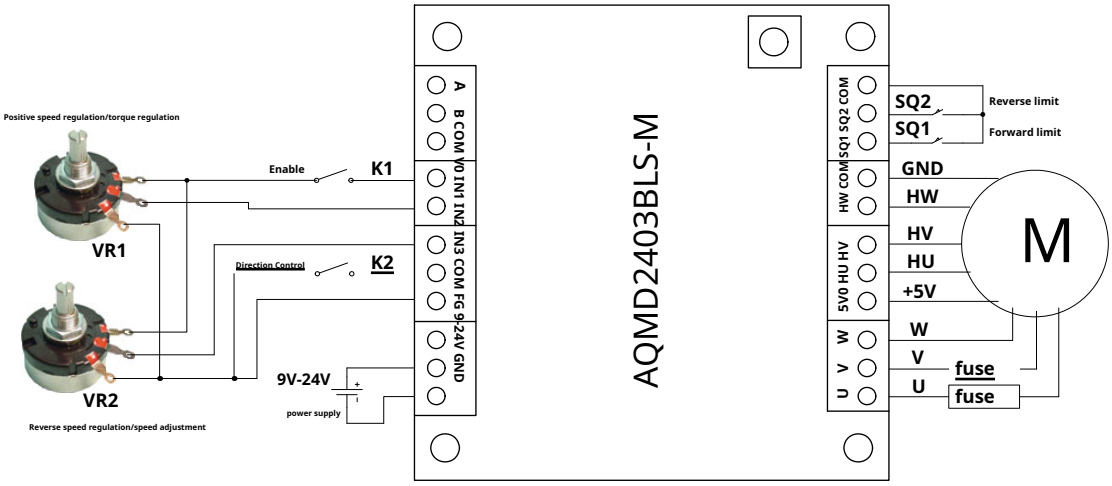
4.1.4Dual potentiometer independent speed regulation

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write1Select the potentiometer usage as dual potentiometer independent,0x009bRegister Write1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve dual potentiometer independent speed control (can also use this driver to matchPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_Demo User Manual) and related configurations are shown in the table4.10shown.

surface4.10Related configuration required for dual potentiometer independent speed regulation usage

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x01：Potentiometer	0x01: Dual potentiometers independent	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This usage uses two potentiometers to adjust the speed of the motor forward and reverse or control the torque and speed respectively, and uses a switch to control the forward and reverse rotation and start and stop of the motor. The connection method of dual potentiometer independent speed regulation is shown in the figure4.4PotentiometerVR1One fixed end and the potentiometerVR2Then connect it to the fixed end of the switchK1One end is connected,K1The other end is connected toVOPort; PotentiometerVR1 The other fixed end ofVR2The other fixed end is connected toCOMend;VR1Dynamic TerminationIN1,VR2 Dynamic TerminationIN2,switchK2catchIN3andCOMWhen the speed regulation mode is duty cycle speed regulation or closed loop speed regulation, the potentiometerVR1Adjust the motor forward speed, potentiometerVR2Adjust the motor reverse speed.COMSlideVODuring the process, the motor speed changes from low to high; when the speed control mode is torque control, the potentiometerVR1Adjusting torque, potentiometerVR2Adjust speed, potentiometerVR1 The moving end isCOMSlideVODuring this process, the motor torque is0Change to the torque corresponding to the configured large load current, potentiometerVR2 The moving end isCOMSlideVODuring this process, the motor speed changes from low to high.K1Control motor start and stop; switchK2 Control the direction of motor rotation. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.4Connection method of dual potentiometer independent speed regulation

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start, stop and forward and reverse control of the motor by different operation methods of potentiometer, switch value and logic level. The control logic is shown in the table4.11shown.

surface4.11Dual potentiometer independent speed control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	Under duty cycle speed regulation and closed loop mode, PotentiometerVR1Adjust the forward speed, PotentiometerVR2Adjust the reverse speed.	
			In torque control mode, PotentiometerVR1Adjustment torque, PotentiometerVR2Adjust the speed.	
		Forward	K1closure,K2disconnect	
		Reversal	K1closure,K2closure	
		stop	K1disconnect	
	High level/disconnect	Speed Control	Under duty cycle speed regulation and closed loop mode, PotentiometerVR1Forward speed regulation, PotentiometerVR2Reverse speed regulation.	
			In torque control mode, PotentiometerVR1Adjustment torque, PotentiometerVR2Adjust the speed.	
		Forward	K1closure,K2closure	
		Reversal	K1closure,K2disconnect	
		stop	K1disconnect	

In the dual potentiometer independent speed control mode, the reference configuration of the relevant registers is shown in the table4.12shown.

surface4.12Configuration of related registers of dual potentiometer independent speed regulation mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0082	Potentiometer Usage	1	Dual potentiometer independent
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation

			2: Torque control 3: Speed closed loop control

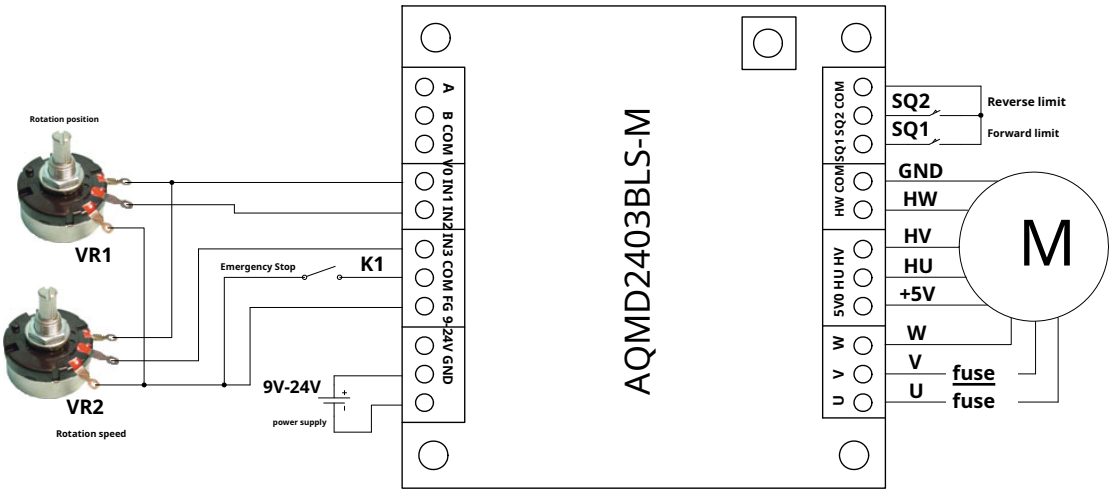
4.1.5Dual potentiometer independent position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write1Select the potentiometer usage as dual potentiometer independent,0x009bRegister Write4Configure the speed control mode as position closed-loop control to achieve dual potentiometer independent position control usage (this driver can also be used as a supportingPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.13shown.

surface4.13Dual potentiometer independent position control usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x01：Potentiometer	0x01: Dual potentiometers independent	0x04: Position closed loop control

This usage uses one potentiometer to adjust the motor rotation position, another potentiometer to adjust the motor speed, and the switch quantity to control the motor forward and reverse rotation and start and stop. The connection method of dual potentiometer position independent control is shown in the figure4.5PotentiometerVR1Two fixed terminationsVOandCOM, dynamic terminationIN1, used to set the motor rotation position, when the potentiometer moves COMSlideVODuring the process, the motor rotation position changes from the starting point of the stroke to the maximum stroke position (the total stroke can be0x00a2and0x00a3 Registers to configure, see6.3.6Section Reciprocating Position Control Parameter Register); PotentiometerVR2Two fixed terminationsVOand COM, dynamic terminationIN2, used to adjust the motor speed, when the potentiometer movesCOMSlideVODuring this process, the motor speed changes from low to high.K1catchCOMandIN3The motor is controlled to stop urgently.SQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.5Connection method of dual potentiometer position independent control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating the potentiometer, logic level and switch quantity in different ways. The control logic is shown in the table4.14shown.

surface4.14Control logic for independent position control of dual potentiometers

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	PotentiometerVR1adjust	
		Adjust speed	PotentiometerVR2adjust	
		Emergency Stop	K1closure	
	High level/disconnect	Adjust position	PotentiometerVR1adjust	
		Adjust speed	PotentiometerVR2adjust	
		Emergency Stop	K1disconnect	

In the dual potentiometer independent position control mode, the reference configuration of the relevant registers is shown in the table4.15shown.

surface4.15Configuration of related registers of dual potentiometer independent position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0082	Potentiometer Usage	1	Dual potentiometer independent
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following potentiometer output voltage fluctuations (default) are used for filtering to eliminate interference signals that cause motor jitter
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set

			Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

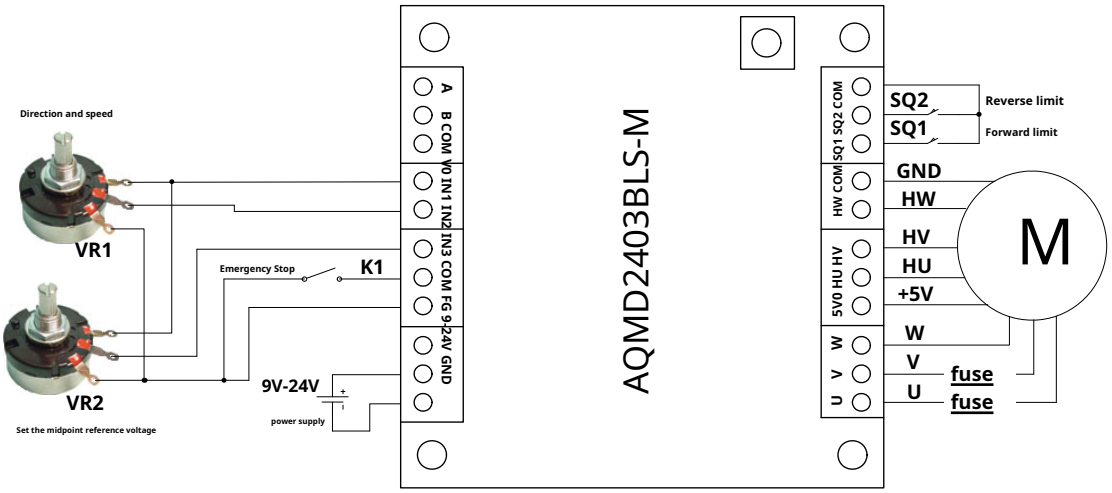
4.1.6Dual potentiometer coordinated speed regulation

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write2Select the potentiometer usage as dual potentiometer coordination,0x009bRegister Write1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve the use of dual potentiometer coordinated speed control (you can also use this driver to matchPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_Demo User Manual) and related configurations are shown in the table4.16shown.

surface4.16Related configuration required for the use of dual potentiometer coordinated speed regulation

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x01：Potentiometer	0x02：Dual potentiometer synergy	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This usage uses one potentiometer to set the midpoint reference voltage, another potentiometer to control the motor speed and direction, and the switch quantity to control the motor emergency stop. The connection method of the dual potentiometer coordinated speed regulation is shown in the figure4.6PotentiometerVR2Two fixed terminationsVOandCOM, dynamic terminationIN2, used to set the midpoint reference voltage; potentiometerVR1Two fixed terminationsVOandCOM, Dynamic TerminationIN1, used to control the motor speed and direction, input signal interface IN1,IN2,VOandCOMThe voltages of the ports are recorded asV_{VR1}.V_{VR2},VandV_{COM}.whenV_{VR1}> V_{VR2}The motor rotates forward whenV_{VR1}Depend onV_{VR2} Gradually increase toV During this process, the motor speed will be0Gradually increase to full forward speed; whenV_{VR1}< V_{VR2}When the motor reverses,V_{VR1}Depend onV_{VR2}Gradually decrease toV_{COM}During this process, the motor speed will be0Gradually increase to full reverse speed; whenV_{VR1} = V_{VR2}When the motor brakes.K1catchCOMandIN3The motor is controlled to stop urgently.SQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.6Connection method of dual potentiometer coordinated speed regulation

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of potentiometer, switch value and logic level. The control logic is shown in the table4.17shown.

surface4.17Dual potentiometer coordinated speed control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	Speed by potentiometerVR1Output VoltageVVR1With potentiometerVR2 Output voltageVVR2The difference is Determined, that is, by abs (VVR1-VVR2)Decide	
		Forward	VVR1>VVR2,K1disconnect	
		Reversal	VVR1< VVR2,K1disconnect	
		stop	K1closure	
	High level/disconnect	Speed Control	Speed by potentiometerVR1Output VoltageVVR1With potentiometerVR2 Output voltageVVR2The difference is Determined, that is, by abs (VVR1-VVR2)Decide	
		Forward	VVR1>VVR2,K1closure	
		Reversal	VVR1< VVR2,K1closure	
		stop	K1disconnect	

In the dual potentiometer coordinated speed control mode, the reference configuration of the relevant registers is shown in the table4.18shown.

surface4.18Configuration of related registers of dual potentiometer coordinated speed regulation mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1,2,3	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger
0x0082	Potentiometer Usage	2	Dual potentiometer synergy
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as

			2000mV(Default), other logic levels are configured separately
0x008b	Voltage comparison dead zone	0	default value0, the unit ismV; Used to create a dead zone near the midpoint of the potentiometer and keep the motor stopped
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

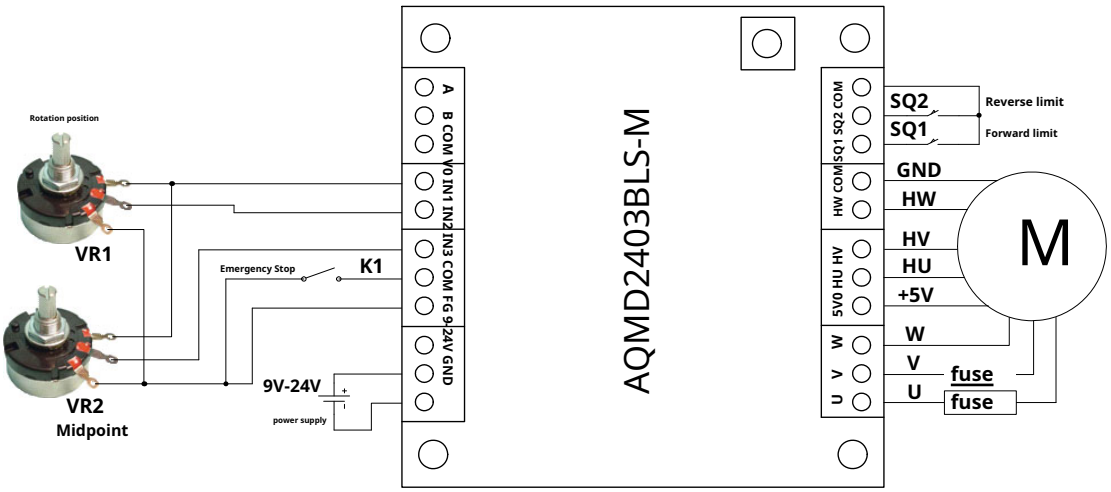
4.1.7Dual potentiometer coordinated position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write2Select the potentiometer usage as dual potentiometer coordination,0x009bRegister Write4Configure the speed control mode as position closed-loop control to achieve dual potentiometer coordinated position control (this driver can also be used as a supportingPC The machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table 4.19shown.

surface4.19Related configuration required for dual potentiometer coordinated position control usage

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x01：Potentiometer	0x02：Dual potentiometer synergy	0x04: Position closed loop control

This usage uses one potentiometer to set the midpoint position, another potentiometer to adjust the rotation position, and the switch quantity to control the motor emergency stop. The connection method of the dual potentiometer position cooperative control is shown in the figure4.7PotentiometerVR2Two fixed terminationsVO andCOM, dynamic terminationIN2, used to set the midpoint position; potentiometerVR1Two fixed terminationsVOandCOM, dynamic termination IN1, used to adjust the motor rotation position. Input signal interfaceIN1,IN2,VOandCOMThe voltages of the ports are recorded asV_{VR1}, V_{VR2},VandVCOM.whenV_{VR1}Depend onV_{VR2}Gradually increase toVDuring the process, the motor rotates from the midpoint to the maximum stroke position (the total stroke can be0x00a2and0x00a3Registers to configure, see6.3.6Section reciprocating position control parameter register); whenV_{VR1}Depend onV_{VR2}Gradually decrease toV_{COM}During the process, the motor rotation position changes from the midpoint position to the starting point of the stroke; whenV_{VR1}= V_{VR2}When the switchK1catchCOMandIN3The motor is controlled to stop urgently.SQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.7Connection method of dual potentiometer position cooperative control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating the potentiometer, logic level and switch quantity in different ways. The control logic is shown in the table4.20shown.

surface4.20Control logic of dual potentiometer position cooperative control

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Set midpoint	PotentiometerVR2adjust	
		Adjust position	PotentiometerVR1adjust	
		Emergency Stop	K1closure	
	High level/disconnect	Set midpoint	PotentiometerVR2adjust	
		Adjust position	PotentiometerVR1adjust	
		Emergency Stop	K1disconnect	

In the dual potentiometer coordinated position control mode, the reference configuration of the relevant registers is shown in the table4.21shown.

surface4.21Configuration of related registers of dual potentiometer coordinated position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0082	Potentiometer Usage	2	Dual potentiometer synergy
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following potentiometer output voltage fluctuations (default) are used for filtering to eliminate interference signals that cause motor jitter
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the system parameter configuration is used.

			Load current; used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008b	Voltage comparison dead zone	0	default value0, the unit ismV; Used to create a dead zone near the midpoint of the potentiometer, and the motor maintains the midpoint position
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.2Connection and configuration of analog signal speed regulation

The usage of analog signals can be configured as single-ended analog signal speed/position control, differential analog signal speed/position control, dual single-ended analog signal independent speed/position control, and dual single-ended analog signal coordinated speed/position control (for how to configure the usage of analog signals, see6.3.5Festival0x0084The wiring and configuration methods of analog signals for various usages are as follows.

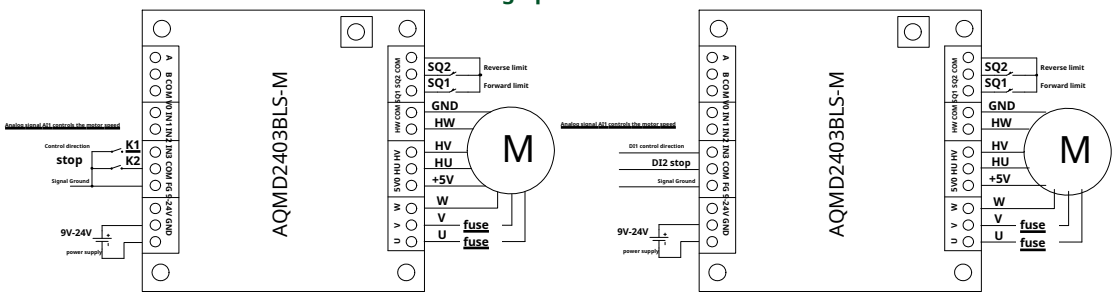
4.2.1Single-ended analog signal speed regulation (level trigger)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write0Select the analog signal type usage as single-ended signal,0x009b Register Write1~3Configure the speed control mode to duty cycle speed control, torque control or speed closed loop control.0x0081Register Write 0,1Configuring the polarity of the digital signal to be low level/closed, high level/disconnected, can achieve single-ended analog signal speed regulation (level trigger) usage (can also be used with this driver)PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_Demo User Manual) and related configurations are shown in the table4.22 shown.

surface4.22Single-ended analog signal speed control (level trigger) usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x02:analog signal	0x00: Single-ended signal	0x01: Duty cycle speed regulation	0x00：Low level/closed
			0x02: Torque control	
			0x03: Speed closed loop control	0x01: High level/disconnect

This usage uses a single-ended analog signal to adjust the motor speed (level trigger), and uses the switch value/logic level to control the motor's rotation direction and start and stop. The connection method of single-ended analog signal speed control is shown in the figure4.8shown.IN1Connect analog signalAI1, used for motor speed control. When using switch quantity to control the motor forward and reverse rotation and start and stop, the switchK1catchIN2 andCOMTime, control the direction of the motor, switchK2catchIN3andCOMWhen the logic level is used to control the motor forward and reverse rotation and start and stop,IN2Connect to logic levelDI1, control the motor direction,IN3Connect to logic levelDI2, control the start and stop of the motor.COMConnect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.8Connection method of single-ended analog signal speed regulation (level trigger) switch quantity (left picture)/logic level (right picture) control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor through different operation methods of analog signals, switch quantities and logic levels. The control logic is shown in the table4.23shown.

surface4.23Single-ended analog signal speed control (level trigger) control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	analog signalAI1Adjust speed	switch
		Forward	K1disconnect,K2disconnect	
		Reversal	K1closure,K2disconnect	
		stop	K2closure	
	High level/disconnect	Speed Control	analog signalAI1Adjust speed	
		Forward	K1closure,K2closure	
		Reversal	K1disconnect,K2closure	
		stop	K2disconnect	
Logic Level	Low level/closed (default)	Speed Control	analog signalAI1Adjust speed	Level
		Forward	DI1High level,DI2High level	
		Reversal	DI1Low level,DI2High level	
		stop	DI2Low level	
	High level/disconnect	Speed Control	analog signalAI1Adjust speed	
		Forward	DI1Low level,DI2Low level	
		Reversal	DI1High level,DI2Low level	
		stop	DI2High level	

In the single-ended analog signal speed control mode, the reference configuration of the relevant registers is shown in the table4.24shown.

surface4.24Configuration of registers related to single-ended analog signal speed regulation (level trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	0	Single-ended analog signal (default)

0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum analog range is3300mV(Default), can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0, used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

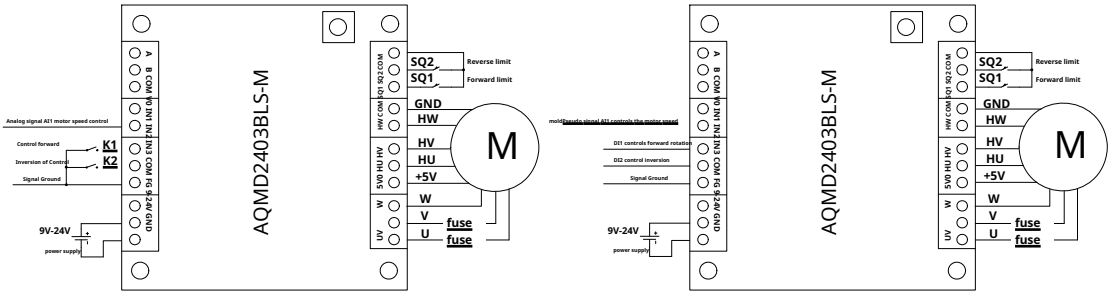
4.2.2Single-ended analog signal speed regulation (edge triggered)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write0Select the analog signal type usage as single-ended signal,0x009b Register Write1~3Configure the speed control mode to duty cycle speed control, torque control or speed closed loop control.0x0081Register Write 2,3Configuring the polarity of the digital signal to be the falling edge/closing moment, the rising edge/breaking moment, can realize the single-ended analog signal speed regulation (edge trigger) usage (can also be used with this driverPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.25shown.

surface4.25Single-ended analog signal speed control (edge trigger) usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x02:analog signal	0x00: Single-ended signal	0x01: Duty cycle speed regulation	0x02: Falling edge/Closed moment
			0x02: Torque control	0x03: Rising edge/disconnection moment
			0x03: Speed closed loop control	

This usage uses a single-ended analog signal to adjust the motor speed (edge trigger), and uses the switch value/logic level to control the motor rotation direction and start and stop. The connection method of single-ended analog signal speed control is shown in the figure4.9shown.IN1Connect analog signalAI1, used for motor speed control. When using switch quantity to control the forward and reverse rotation of the motor, the switchK1catchIN2andCOMControl the motor to rotate forward, switchK2 catchIN3andCOMWhen the logic level is used to control the forward and reverse rotation of the motor,IN2Connect to logic level DI1, control the motor to rotate forward,IN3Connect to logic levelDI2, control the motor to reverse.COMConnect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.9Connection method of single-ended analog signal speed control switch quantity (edge trigger) (left picture)/logic level (right picture) control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor through different operation methods of analog signals, switch quantities and logic levels. The control logic is shown in the table4.26shown.

surface4.26Single-ended analog signal speed control (edge-triggered) control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Falling edge/closing moment	Speed Control	analog signalAI1Adjust speed	Self-insurance
		Forward	K1After closing, open.K2Always disconnected	
		Reversal	K2After closing, open.K1Always disconnected	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	analog signalAI1Adjust speed	
		Forward	K1After opening, close.K2Always closed	
		Reversal	K2After opening, close.K1Always closed	
		stop	Limit or speed adjustment0Stop	
Logic Level	Falling edge/closing moment	Speed Control	analog signalAI1Adjust speed	edge
		Forward	DI1From high level to low level, DI2Always high	
		Reversal	DI2From high level to low level, DI1Always high	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	analog signalAI1Adjust speed	
		Forward	DI1From low level to high level, DI2Always low	
		Reversal	DI2From low level to high level, DI1Always low	
		stop	Limit or speed adjustment0Stop	

In the single-ended analog signal speed control mode, the reference configuration of the relevant registers is shown in the table4.27shown.

surface4.27Configuration of registers related to single-ended analog signal speed regulation (edge triggering)

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger

			2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	2,3	2: Falling edge trigger 3: Rising edge trigger
0x0084	Analog signal type	0	Single-ended analog signal (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum analog range is3300mV(Default), can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0, used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

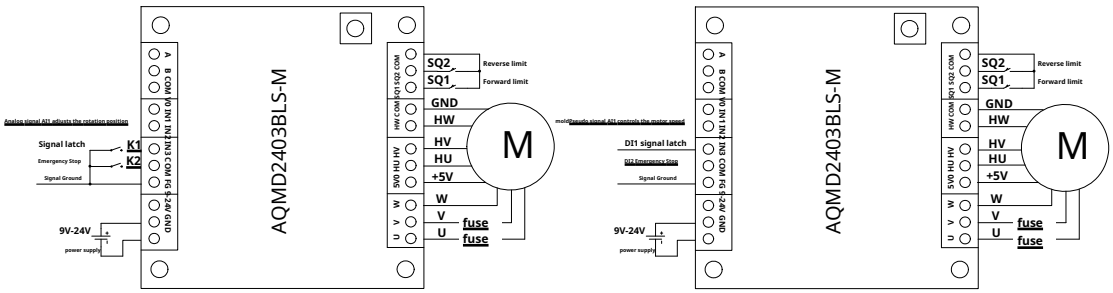
4.2.3Single-ended analog signal position control (level triggered)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write0Select the analog signal type usage as single-ended signal,0x009b Register Write4Configure the speed control mode as position closed loop control.0x0081Register Write0,1Configuring the digital signal polarity to be low level/closed, high level/open, can achieve single-ended analog signal position control (level trigger) usage (can also be used with this driver)PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.28shown.

surface4.28Required configuration for single-ended analog signal position control (level trigger) usage

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x02:analog signal	0x00: Single-ended signal	0x04: Position closed loop control	0x00：Low level/closed
				0x01: High level/disconnect

This usage uses a single-ended analog signal to adjust the motor rotation position (level trigger), and uses logic level/switch quantity to control the position given signal latch and motor emergency stop. The connection method of single-ended analog signal position control is shown in the figure4.10shown.IN1Connect analog signalAI1, used to adjust the motor rotation position. When using switch control, the switchK1catchIN2andCOMFor position signal latch, switchK2catchIN3andCOMWhen using logic level control, IN2 Connect to logic levelDI1, used for position signal latching,IN3Connect to logic levelDI2, control the motor to stop urgently.VOOutput completion signal,COMConnect to signal ground. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.10Wiring for single-ended analog signal position (level trigger) switch quantity (left)/logic level (right) control method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating analog signals, logic levels and switch quantities in different ways. The control logic is shown in the table4.29shown.

surface4.29Single-ended analog signal position control (level triggered)

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	analog signalAI1Adjust position	switch
		Signal latch	K1closure,K2disconnect	
		Emergency Stop	K2closure	
	High level/disconnect	Adjust position	analog signalAI1Adjust position	
		Signal latch	K1disconnect,K2closure	
		Emergency Stop	K2disconnect	
Logic Level	Low level/closed (default)	Adjust position	analog signalAI1Adjust position	Level
		Signal latch	DI1Low level,DI2High level	
		Emergency Stop	DI2Low level	
	High level/disconnect	Adjust position	analog signalAI1Adjust position	
		Signal latch	DI1High level,DI2Low level	
		Emergency Stop	DI2High level	

In the single-ended analog signal position control (level trigger) mode, the reference configuration of the relevant registers is shown in the table4.30shown.

surface4.30Configuration of registers related to single-ended analog signal position control (level trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	0	Single-ended analog signal (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V

0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum analog range is3300mV(Default), can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0; Used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following input analog signal voltage fluctuations (default) Used for filtering to eliminate motor jitter caused by interference signals
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.2.4Single-ended analog signal position control (edge triggered)

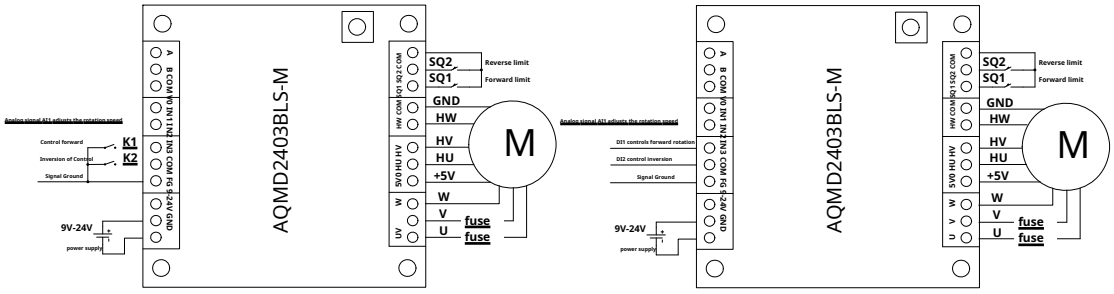
Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write0Select the analog signal type usage as single-ended signal,0x009b Register Write4Configure the speed control mode as position closed loop control.0x0081Register Write2,3Configuring the polarity of the digital signal to be the falling edge/closing moment, the rising edge/breaking moment, can achieve the single-ended analog signal position control (edge trigger) usage (can also be used with this driverPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.31shown.

surface4.31Single-ended analog signal position control (edge trigger) usage related configuration

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal	0x02:analog signal	0x00: Single-ended signal	0x04: Position closed loop control	0x02: Falling edge/Closed

Number control mode				moment 0x03: Rising edge/disconnection moment

This usage uses a single-ended analog signal to adjust the motor speed (edge trigger), and uses the logic level/switch quantity to control the starting point or maximum stroke position of the stroke. The connection method of single-ended analog signal position control is shown in the figure4.11shown.IN1 Connect analog signalAI1, used to adjust the motor speed. When using switch control, the switchK1catchIN2andCOMDuring this time, the control motor turns to Large travel position, switchK2catchIN3andCOMWhen using logic level control,IN2Connect to logic levelDI1, control the motor to rotate forward,IN3Connect to logic levelDI2, control the motor to reverse.VOOutput completion signal,COMConnect to signal ground. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.11Wiring for single-ended analog signal position (edge triggered) switch quantity (left)/logic level (right) control method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating analog signals, logic levels and switch quantities in different ways. The control logic is shown in the table4.32shown.

surface4.32Single-ended analog signal position control (edge triggered)

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Falling edge/closing moment	Adjust speed	analog signalAI1Adjust speed	Self-insurance
		Turning to long stroke	K1After closing, open. K2Always disconnected	
		Reverse to the starting point of the trip	K2After closing, open. K1Always disconnected	
		stop	Limit or stop when moving to the end point	
	Rising edge/disconnection moment	Adjust speed	analog signalAI1Adjust speed	
		Turning to long stroke	K1After opening, close. K2Always closed	
		Reverse to the starting point of the trip	K2After opening, close. K1Always closed	
		stop	Limit or stop when moving to the end point	
Logic Level	Falling edge/closing moment	Adjust speed	analog signalAI1Adjust speed	edge
		Turning to long stroke	DI1From high level to low level, DI2Always high	
		Reverse to the starting point of the trip	DI2From high level to low level, DI1Always high	
		stop	Limit or stop when moving to the end point	

	Rising edge/disconnection moment	Adjust speed	analog signalAI1Adjust speed	
		Turning to long stroke	DI1From low level to high level, DI2Always low	
		Reverse to the starting point of the trip	DI2From low level to high level, DI1Always low	
		stop	When limiting or moving to the end position stop	

In the single-ended analog signal position control (edge trigger) mode, the reference configuration of the relevant registers is shown in the table4.33shown.

surface4.33Configuration of registers related to single-ended analog signal position control (edge trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	2,3	2: Falling edge trigger 3: Rising edge trigger
0x0084	Analog signal type	0	Single-ended analog signal (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum value of the analog range is3300mV(Default), can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0; Used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following input analog signal voltage fluctuations (default) Used for filtering to eliminate motor jitter caused by interference signals
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the system parameter configuration is used.

			Load current; used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

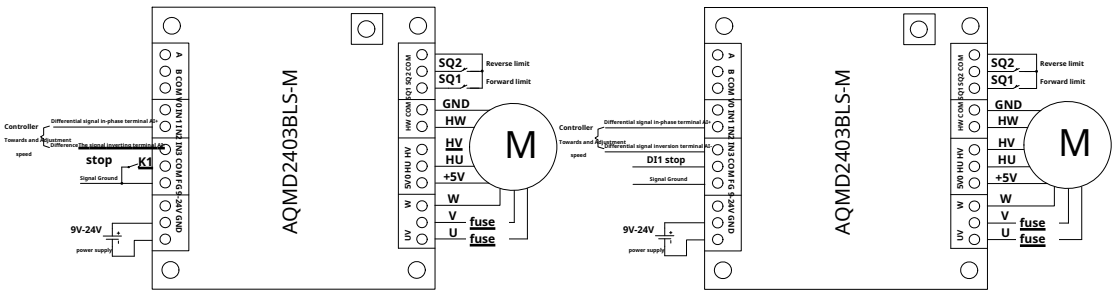
4.2.5Differential analog signal speed control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write1Select the analog signal type as differential signal,0x009bRegister Write1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve differential analog signal speed control (you can also use this driver to match PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_Demo User Manual) and related configurations are shown in the table4.34shown.

surface4.34Related configuration required for differential analog signal speed regulation usage

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x02:analog signal	0x01: Differential signal	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This usage uses differential signals to control the motor speed and direction, and uses switches or logic levels to control the motor to stop. The connection method of differential analog signal speed control is shown in the figure4.12As shown. Among them,IN1Connect to the common-phase terminal of differential analog signalAI+,IN2Connect to the inverting terminal of the differential analog signalAI-, the differential analog signal voltage is recorded asV_{DM}The motor rotation direction is determined byV_{DM}The positive or negative value ofV_{DM} > 0The motor rotates forward whenV_{DM}< 0When the motor reverses,V_{DM}= 0The motor brakes when the motor speed is proportional to the absolute value of the differential signal voltage; whenV_{DM}When the analog signal is greater than or equal to the maximum value of the set range, the motor rotates at full speed;V_{DM}When the analog signal is less than or equal to the minimum value of the set range, the motor stops.0x0086and 0x0087Configure the analog range (see6.3.5When using logic level to control the motor to stop,IN3Connect to logic level DI1; When using switch quantity to control the motor to stop,IN3andCOMIndirect switchK1; COMConnect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.12Wiring diagram of differential analog signal speed control with switch quantity (left)/logic level (right) control mode

By configuring the different types and polarities of digital signals (see6.3.5Section system

Parameter configuration register0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor through different operation methods of analog signals, switch quantities and logic levels. The control logic is shown in the table4.35shown.

surface4.35Differential analog signal speed control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	The voltage of the analog signal is differentially V_{DM}Amplitude adjustment	difference
		Forward	V_{DM}>0,K1disconnect	
		Reversal	V_{DM}<0,K1disconnect	
		stop	K1closure	
	High level/disconnect	Speed Control	The voltage of the analog signal is differentially V_{DM}Amplitude adjustment	
		Forward	V_{DM}>0,K1closure	
		Reversal	V_{DM}<0,K1closure	
		stop	K1disconnect	
Logic Level	Low level/closed (default)	Speed Control	The voltage of the analog signal is differentially V_{DM}Amplitude adjustment	difference
		Forward	V_{DM}>0,DI1High level	
		Reversal	V_{DM}<0,DI1High level	
		stop	DI1Low level	
	High level/disconnect	Speed Control	The voltage of the analog signal is differentially V_{DM}Amplitude adjustment	
		Forward	V_{DM}>0,DI1Low level	
		Reversal	V_{DM}<0,DI1Low level	
		stop	DI1High level	

In the differential analog signal speed control mode, the reference configuration of the relevant registers is shown in the table4.36shown.

surface4.36Configuration of registers related to differential analog signal speed regulation

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	1	Differential analog signal
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum differential analog range is3300mV, or according to needs

			Request configuration to other values
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x008b	Voltage comparison dead zone	0	default value0, the unit ismV; Used to make the differential signal0A dead zone is generated near the voltage, and the motor remains stopped
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0, used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

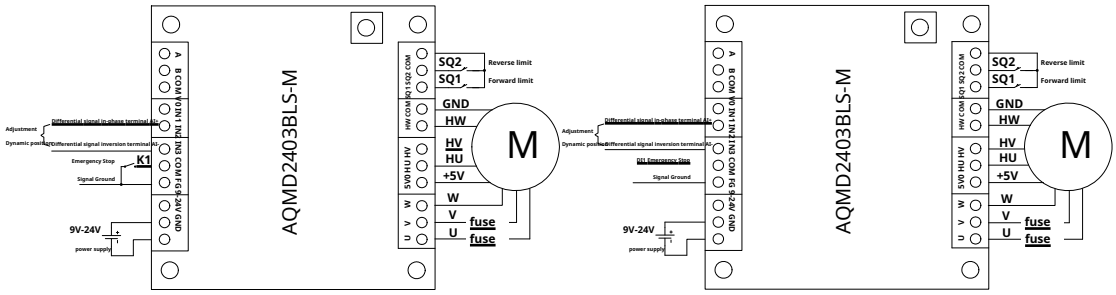
4.2.6Differential analog signal position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write1Select the analog signal type as differential signal,0x009bRegister Write4Configure the speed control mode as position closed-loop control to achieve differential analog signal position control usage (this driver can also be used as a supportingPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.37shown.

surface4.37Related configuration required for differential analog signal position control usage

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x02:analog signal	0x01: Differential signal	0x04: Position closed loop control

This usage uses differential analog signals to adjust the motor rotation position and controls the emergency stop through switch quantity/logic level. The connection method of differential analog signal position control is shown in the figure4.13As shown. Among them,IN1Connect to the common-phase terminal of differential analog signalAI+,IN2 Connect to the inverting terminal of the differential analog signalAI-, the voltage of the differential analog signal is recorded asV_{DM}, the rotation position is determined byV_{DM}WhenV_{DM}When it is equal to the maximum value of the set analog signal range, the motor rotates to the maximum stroke position; whenV_{DM}When it is equal to the minimum value of the set analog signal range, the motor rotates to the starting point of the stroke;V_{DM}equal0When the motor rotates to the midpoint of the stroke, we can configure the range of the analog quantity by operating the register (see how to configure6.3.5Section System Parameter Configuration Register0x0086and0x0087). When using logic level control for emergency stop,IN3Connect to logic levelDI1; When using switch quantity to control the motor emergency stop, the switchK1catchIN3andCOMbetween.VOOutput completion signal,COMConnect to signal ground. Limit switchSQ1 andSQ2Set limits for forward and reverse rotation respectively.



picture4.13Connection method of differential analog control signal position control

By configuring the different types and polarities of digital signals (see6.3.5Section system

Parameter configuration register0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating analog signals, logic levels and switch quantities in different ways. The control logic is shown in the table4.38shown.

surface4.38Differential analog control signal position control

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	The voltage of the analog signal is differentially V_{DM}Make adjustments	
		Emergency Stop	K1closure	
	High level/disconnect	Adjust position	The voltage of the analog signal is differentially V_{DM}Make adjustments	
		Emergency Stop	K1disconnect	
Logic Level	Low level/closed (default)	Adjust position	The voltage of the analog signal is differentially V_{DM}Make adjustments	
		Emergency Stop	DI1Low level	
	High level/disconnect	Adjust position	The voltage of the analog signal is differentially V_{DM}Make adjustments	
		Emergency Stop	DI1High level	

Reference configuration table of related registers under differential analog signal position control mode4.39shown.

surface4.39Configuration of registers related to differential analog signal position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	1	Differential analog signal
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum differential analog range is3300mV, can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x008b	Voltage comparison dead zone	0	default value0, the unit ismV; Used to make the differential signal0 A dead zone is generated near the voltage, and the motor maintains the midpoint position
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0; Used to correct the analog signal dead zone

0x009a	Port input type	2	analog signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following input analog signal voltage fluctuations (default) Used for filtering to eliminate motor jitter caused by interference signals
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.2.7Dual single-ended analog signal coordinated speed regulation

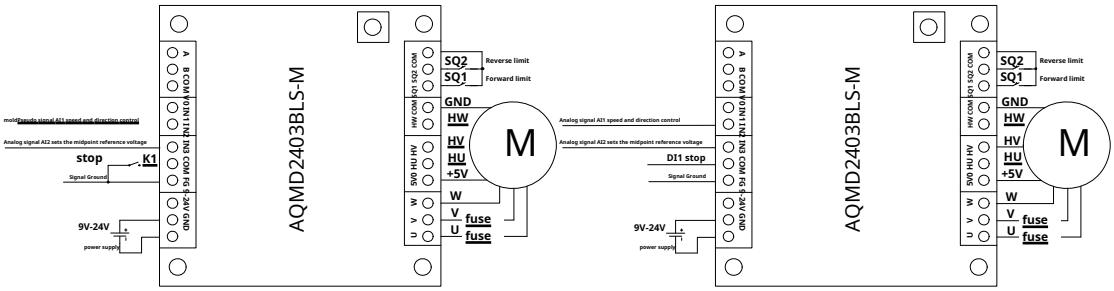
Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write3Select the analog signal type as dual single-ended collaboration.0x009bRegister Write1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve the use of dual single-ended analog signal coordinated speed control (you can also use this driver to matchPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.40shown.

surface4.40Related configuration required for dual single-ended analog signal coordinated speed regulation usage

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x02:analog signal	0x03: Dual-ended collaboration	0x00: Duty cycle speed regulation
			0x01: Torque control
			0x02: Speed closed loop control

This usage uses one analog signal to set the midpoint voltage, and the other analog signal to control the motor speed and direction. The connection method of dual single-ended analog signals for coordinated speed regulation is shown in the figure4.14As shown. Among them,IN2 Connect analog signalAI2, used to set as the midpoint reference voltage;IN1Connect analog signalAI1, used to control the motor speed and direction. Analog signalAI1andAI2The voltages are recorded asV_{IN1}andV_{IN2}The maximum and minimum values of the configured analog signal range are recorded asV_{MAX}andV_{MIN}(We can use register0x0086and0x0087Configure the analog range, see6.3.5section System Parameter Configuration Registers).V_{IN1}Depend onV_{IN2}Gradually increase toV_{MAX}During this process, the motor speed will be0Change to positive, whenV_{IN1} big; whenV_{IN1}Gradually decrease toV_{MIN}During this process, the motor speed will be0Change to reversal big; whenV_{IN1}equalV_{IN2}When the motor

When the logic level is used to control the motor to stop,IN3Connect to logic levelDI1; When using switch quantity to control the motor to stop,IN3 Connect the switchK1.COMConnect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.14Connection diagram of dual single-ended analog signal coordinated speed regulation switch quantity (left) / logic level (right) control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of analog signals, switch quantities and logic levels. The control logic is shown in the table4.41shown.

surface4.41Control logic of dual single-ended analog signal coordinated speed regulation

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	Through the single-ended analog signalAI1of VoltageVIN1Make adjustments	
		Forward	$V_{IN1}>V_{IN2}$	
		Reversal	$V_{IN1}<V_{IN2}$	
		stop	$V_{IN1}=V_{IN2}$orK1closure	
	High level/disconnect	Speed Control	Through the single-ended analog signalAI1of VoltageVIN1Make adjustments	
		Forward	$V_{IN1}>V_{IN2}$	
		Reversal	$V_{IN1}<V_{IN2}$	
		stop	$V_{IN1}=V_{IN2}$orK1disconnect	
Logic Level	Low level/closed (default)	Speed Control	Through the single-ended analog signalAI1of VoltageVIN1Make adjustments	
		Forward	$V_{IN1}>V_{IN2}$	
		Reversal	$V_{IN1}<V_{IN2}$	
		stop	$V_{IN1}=V_{IN2}$orDI1Low level	
	High level/disconnect	Speed Control	Through the single-ended analog signalAI1of VoltageVIN1Make adjustments	
		Forward	$V_{IN1}>V_{IN2}$	
		Reversal	$V_{IN1}<V_{IN2}$	
		stop	$V_{IN1}=V_{IN2}$orDI1High level	

In the dual single-ended analog signal coordinated speed regulation mode, the reference configuration of the relevant registers is shown in the table4.42shown.

surface4.42Configuration of related registers of dual single-ended analog signal coordinated speed regulation mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger

			2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	3	Dual single-ended analog signal coordination
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum analog range is3300mV(Default), can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x008b	Voltage comparison dead zone	0	default value0, the unit ismV; Used to create a dead zone near the midpoint voltage of the analog signal, and keep the motor stopped
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0; Used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	1~3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

4.2.8Dual single-ended analog signal coordinated position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write3Select the analog signal type as dual single-ended collaboration.0x009bRegister Write4Configure the speed control mode as position closed-loop control to achieve dual single-ended analog signal coordinated position control usage (this driver can also be used as a supportingPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.43shown.

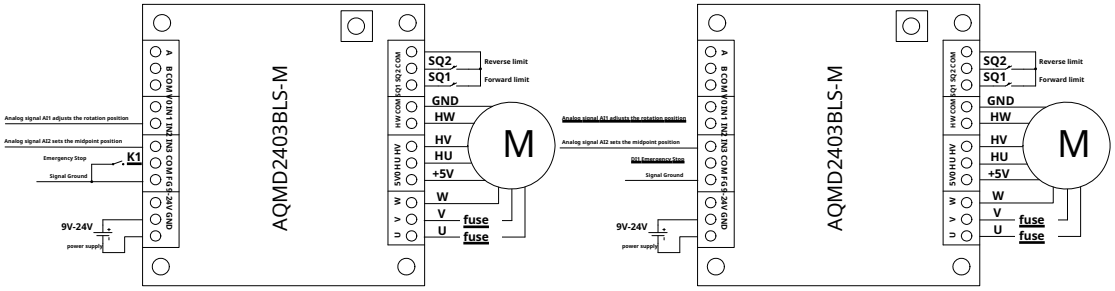
surface4.43Related configuration required for dual single-ended analog signal coordinated position control usage

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x02:analog signal	0x03: Dual-ended collaboration	0x04: Position closed loop control

This usage uses one single-ended analog signal to set the midpoint position, and another single-ended analog signal to adjust the motor rotation position. The connection method of dual single-ended analog signals for coordinated position control is shown in the figure4.15As shown. Among them,IN2Connect analog signalAI2, used to set the midpoint position;IN1Connect analog signalAI1, adjust the motor rotation position. Analog signalAI1andAI2We denote the voltagesV_{IN1} andV_{IN2}The maximum and minimum values of the configured analog signal range are recorded asV_{MAX}andV_{MIN}(We can use register0x0086and0x0087Configure the analog range, see6.3.5section System Parameter Configuration Registers).V_{IN1}Depend onV_{MIN}Gradually increase toV_{IN2}During the process, the motor rotation position will change from the starting point of the stroke to the midpoint of the stroke; whenV_{IN1}Depend onV_{IN2}Gradually increase toV_{MAX}During the process, the motor rotation position will change from the mid-point position to the maximum position.

Program position;V_{IN1}equalV_{IN2}When the motor is stopped, the motor will rotate to the mid-point of the stroke.

When stopped, switchK1catchIN3andCOMWhen using logic level to control the motor emergency stop,IN3Connect to logic levelDI1. COMConnect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.15Connection method of dual single-ended analog signals for coordinated position control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating analog signals, logic levels and switch quantities in different ways. The control logic is shown in the table4.44shown.

surface4.44Control logic of dual single-ended analog signals coordinated position control

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	passAI1Adjust the rotation position	
		Set midpoint	passAI2Set midpoint position	
		Emergency Stop	K1closure	
	High level/disconnect	Adjust position	passAI1Adjust the rotation position	
		Set midpoint	passAI2Set midpoint position	
		Emergency Stop	K1disconnect	
Logic Level	Low level/closed (default)	Adjust position	passAI1Adjust the rotation position	
		Set midpoint	passAI2Set midpoint position	
		Emergency Stop	DI1Low level	
	High level/disconnect	Adjust position	passAI1Adjust the rotation position	
		Set midpoint	passAI2Set midpoint position	
		Emergency Stop	DI1High level	

In the dual single-ended analog signal coordinated position control mode, the reference configuration of the relevant registers is shown in the table4.45shown.

surface4.45Configuration of registers related to dual single-ended analog signal coordinated position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	3	Dual single-ended analog signal coordination
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V

			2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The maximum analog range is3300mV(Default), can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x008b	Voltage comparison dead zone	0	default value0, the unit ismV; Used to make the analog signal produce a dead zone near the midpoint voltage, and the motor maintains the midpoint position
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0; Used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following input analog signal voltage fluctuations (default) Used for filtering to eliminate motor jitter caused by interference signals
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.2.9Dual single-ended analog signal independent speed regulation

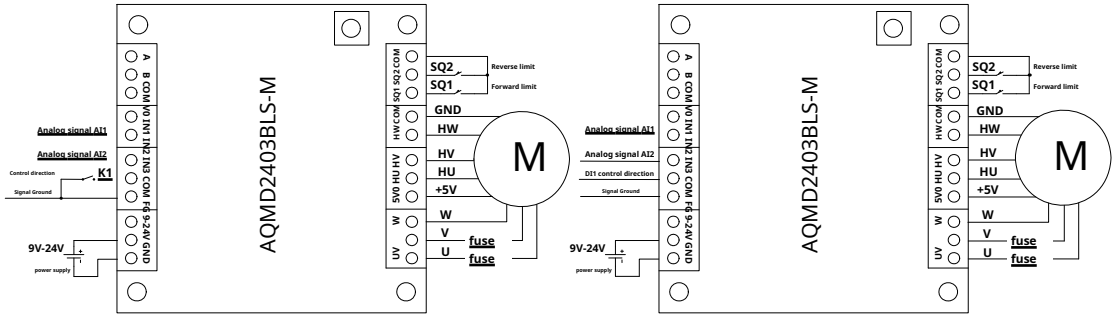
Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write2Select the analog signal type as dual single-ended independent.0x009bRegister Write1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve dual single-ended analog signal independent speed control usage (can also use this driver matchingPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.46shown.

surface4.46Related configuration required for dual single-ended analog signal independent speed regulation usage

Control method	Port input type	Analog signal type	Port Control Type

(Button switch)	(0x009aregister)	(0x0084register)	(0x009bregister)
Digital/analog signal control method	0x02:analog signal	0x02: Dual single-ended independent	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This usage uses one single-ended analog signal to adjust the forward speed (torque for torque control mode) and another single-ended analog signal to adjust the reverse speed (speed for torque control mode). The connection method of dual single-ended analog signals for independent speed regulation is shown in the figure.4.16As shown. Among them,IN1Connect analog signalAI1,IN2Connect analog signalAI2, use logic level/switch quantity to control the motor direction. When the working mode is duty cycle speed regulation or closed loop speed regulation, the analog signalAI1Adjust the motor forward speed, analog signalAI2Adjust the motor reverse speed; when the working mode is torque control, the analog signalAI1 Adjust motor torque, analog signalAI2Adjust the motor speed. When using switch quantity to control the motor direction, the switchK1catchIN3 andCOMWhen using logic level to control the motor direction,IN3Connect to logic levelDI1.COMConnect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.16Connection method of switch quantity (left picture)/logic level (right picture) of dual single-ended analog signal independent speed regulation

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor through different operation methods of analog signals, switch quantities and logic levels. The control logic is shown in the table4.47shown.

surface4.47Dual single-ended analog signal independent speed control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	Duty cycle speed regulation or closed loop speed regulation In operation mode, analog signalAI1Adjust positive speed Degrees, analog signalAI2Adjustment Reversal speed	
			In torque control working mode, analog signalAI1Adjustment torque, analog signalAI2Adjust speed	
		Forward	K1disconnect	
		Reversal	K1closure	
		stop	Limit or speed adjustment0Stop	
	High level/disconnect	Speed Control	Duty cycle speed regulation or closed loop speed regulation In operation mode, analog signalAI1Adjust positive speed Degrees, analog signalAI2Adjustment Reversal speed	

			In torque control working mode, analog signalAI1Adjustment torque, analog signalAI2Adjust speed	
		Forward	K1closure	
		Reversal	K1disconnect	
			Limit or speed adjustment0Stop	
Logic Level	Low level/closed (default)	Speed Control	Duty cycle speed regulation or closed loop speed regulation In operation mode, analog signalAI1Adjust positive speed Degrees, analog signalAI2Adjustment Reversal speed	
			In torque control working mode, analog signalAI1Adjustment torque, analog signalAI2Adjust speed	
		Forward	DI1High level	
		Reversal	DI1Low level	
		stop	Limit or speed adjustment0Stop	
	High level/disconnect	Speed Control	Duty cycle speed regulation or closed loop speed regulation In operation mode, analog signalAI1Adjust positive speed Degrees, analog signalAI2Adjustment Reversal speed	
			In torque control working mode, analog signalAI1Adjustment torque, analog signalAI2Adjust speed	
		Forward	DI1Low level	
		Reversal	DI1High level	
		stop	Limit or speed adjustment0Stop	

In the dual single-ended analog signal independent speed control mode, the reference configuration of the relevant registers is shown in the table4.48shown.

surface4.48Configuration of related registers of dual single-ended analog signal independent speed regulation mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	2	Dual single-ended analog signals independent
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V

			2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The analog range maximum value is configured here as3300mV, can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0; Used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

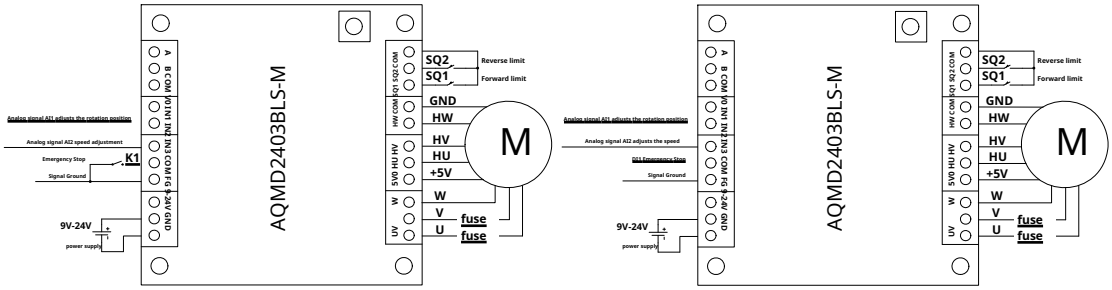
4.2.10Dual single-ended analog signal independent position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write2Select the analog signal type as dual single-ended independent.0x009bRegister Write4Configure the speed control mode as position closed-loop control to achieve dual single-ended analog signal independent position control usage (this driver can also be used as a supportingPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.49shown.

surface4.49Dual single-ended analog signal independent position control usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x02:analog signal	0x02: Dual single-ended independent	0x04: Position closed loop control

This usage uses one single-ended analog signal to adjust the motor rotation position, and another single-ended analog signal to adjust the motor speed. The connection method of dual single-ended analog signal position control is shown in the figure4.17As shown. Among them,IN1Connect analog signalAI1, used to adjust the rotation position of the motor;IN2Connect analog signalAI2, used to adjust the rotation speed of the motor; when using logic level to control the motor emergency stop,IN3Connect to logic levelDI1; When using switch quantity to control the motor emergency stop, the switchK1catchIN3andCOM between.VO Output completion signal,COMConnect to signal ground. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.17Connection method of dual single-ended analog signal independent position control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating analog signals, logic levels and switch quantities in different ways. The control logic is shown in the table4.50shown.

surface4.50Control logic for independent position control with dual single-ended analog signals

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	analog signalAI1Adjust position	
		Adjust speed	analog signalAI2Adjust speed	
		Emergency Stop	K1closure	
	High level/disconnect	Adjust position	analog signalAI1Adjust position	
		Adjust speed	analog signalAI2Adjust speed	
		Emergency Stop	K1disconnect	
Logic Level	Low level/closed (default)	Adjust position	analog signalAI1Adjust position	
		Adjust speed	analog signalAI2Adjust speed	
		Emergency Stop	DI1Low level	
	High level/disconnect	Adjust position	analog signalAI1Adjust position	
		Adjust speed	analog signalAI2Adjust speed	
		Emergency Stop	DI1High level	

In the dual single-ended analog signal independent position control mode, the reference configuration of the relevant registers is shown in the table4.51shown.

surface4.51Configuration of related registers of dual single-ended analog signal independent position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	2	Dual single-ended analog signals independent
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)
0x0089	Analog range maximum value	0x0CE4	The analog range maximum value is configured here as3300mV, can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0; Used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune

0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following input analog signal fluctuations (default) are used for filtering to eliminate interference signals that cause motor jitter
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.3 PWM/Connection and configuration of frequency/pulse signal speed regulation

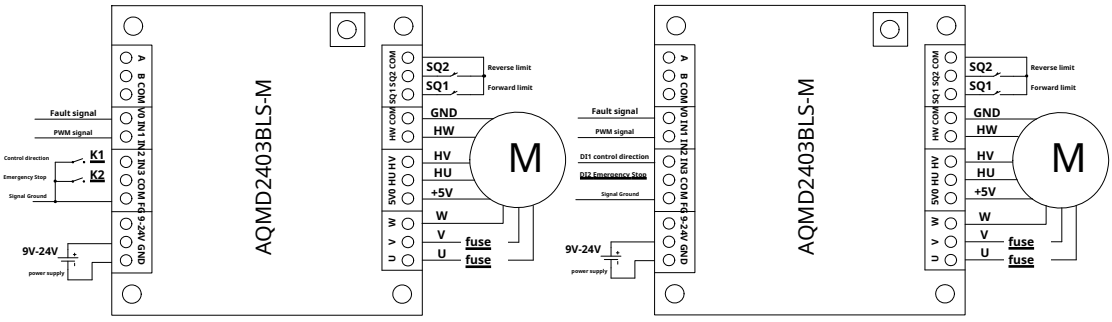
4.3.1 PWMSignal speed regulation (level trigger)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write0Select the pulse signal type asPWM,Towards0x009bRegister Write1~3 Configure the speed control mode to duty cycle speed control, torque control or speed closed loop control.0x0081Register Write0,1 Configure the digital signal polarity to low level/closed, high level/open, and you can achievePWMSignal speed regulation (level trigger) usage (can also be used with this driverPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.52shown.

surface4.52 PWMRelated configuration required for signal speed regulation (level trigger) usage

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x03: Pulse signal	0x00:PWM	0x01: Duty cycle speed regulation	0x00：Low level/closed
			0x02: Torque control	0x01: High level/disconnect
			0x03: Speed closed loop control	

This usage is done through externalPWMThe signal regulates the motor speed, controls the motor direction and emergency stop through switch quantity/logic level.PWMThe connection method of signal speed regulation (level trigger) is shown in the figure4.18As shown. Among them,IN1catchPWMInput signal, used to adjust the motor speed. The motor speed increases with the duty cycle.100% When the switch is used to control the motor direction and emergency stop, the switchK1catchIN2andCOMTo control the direction of motor rotation; switchK2catchIN3andCOMWhen using logic levels to control motor direction and emergency stop, IN2Connect to logic levelDI1, used to control the direction of motor rotation;IN3Connect to logic levelDI2, control the motor to stop urgently.COM Connect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.18 PWMSignal speed regulation (level trigger) Switch quantity (left picture)/logic level (right picture) control mode wiring method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we canPWMDifferent operation methods of signals, switch quantities and logic levels can realize the start, stop and forward and reverse control of the motor. The control logic is shown in the table4.53shown.

surface4.53 PWMSignal speed regulation (level trigger) control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	PWMSignal speed regulation	
		Forward	K1disconnect,K2disconnect	
		Reversal	K1closure,K2disconnect	
		Emergency Stop	K2closure	
	High level/disconnect	Speed Control	PWMSignal speed regulation	
		Forward	K1closure,K2closure	
		Reversal	K1disconnect,K2closure	
		Emergency Stop	K2disconnect	
Logic Level	Low level/closed (default)	Speed Control	PWMSignal speed regulation	
		Forward	DI1High level,DI2High level	
		Reversal	DI1Low level,DI2High level	
		Emergency Stop	DI2Low level	
	High level/disconnect	Speed Control	PWMSignal speed regulation	
		Forward	DI1Low level,DI2Low level	
		Reversal	DI1High level,DI2Low level	
		Emergency Stop	DI2High level	

PWMIn the signal speed regulation (level trigger) mode, the reference configuration of the relevant registers is shown in the table4.54shown.

surface4.54 PWMConfiguration of registers related to signal speed regulation (level trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger

0x0083	Pulse signal type	0	PWM(default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

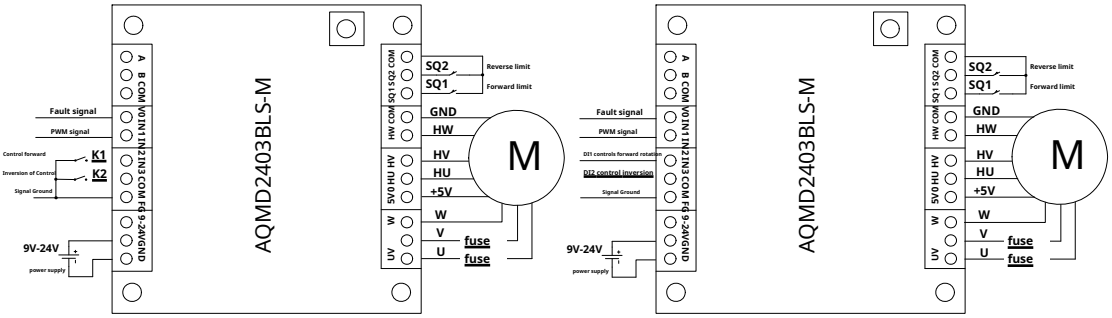
4.3.2 PWMSignal speed regulation (edge triggered)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write0Select the pulse signal type asPWM,Towards0x009bRegister Write1~3 Configure the speed control mode to duty cycle speed control, torque control or speed closed loop control.0x0081Register Write2,3 Configure the digital signal polarity to falling edge/closed, rising edge/open, and you can achievePWMSignal speed regulation (edge trigger) usage (can also be used with this driverPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.55shown.

surface4.55 PWMRelated configuration required for signal speed regulation (edge triggering) usage

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x03: Pulse signal	0x00:PWM	0x01: Duty cycle speed regulation	0x02: Falling edge/Closed moment
			0x02: Torque control	0x03: Rising edge/disconnection moment
			0x03: Speed closed loop control	

This usage is done through externalPWMSignal speed regulation, controlling forward and reverse rotation respectively through two switch quantity/logic level edge triggering methods.PWMThe connection method of signal speed regulation (edge trigger) is shown in the figure4.19As shown. Among them,IN1catchPWMSignal is used to adjust the motor speed. The motor speed increases with the duty cycle.100%When the switch quantity is used to control the forward and reverse rotation, the switchK1catchIN2andCOMBetween, control the motor forward; switchK2catchIN3and COM When the logic level is used to control the forward and reverse rotation,IN2Connect to logic levelDI1, control the motor to rotate forward; IN3 Connect to logic levelDI2, control the motor to reverse.COMConnect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2 Set limits for forward and reverse rotation respectively.



picture4.19 PWMSignal speed regulation (edge trigger) Switch quantity (left picture)/logic level (right picture) control mode wiring method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we canPWMDifferent operation methods of signals, switch quantities and logic levels can realize the start, stop and forward and reverse control of the motor. The control logic is shown in the table4.56shown.

surface4.56 PWMSignal speed regulation (edge triggering) control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Falling edge/closing moment	Speed Control	PWMSignal speed regulation	
		Forward	K1After closing, open.K2Always disconnected	
		Reversal	K2After closing, open.K1Always disconnected	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	PWMSignal speed regulation	
		Forward	K1After opening, close.K2Always closed	
		Reversal	K2After opening, close.K1Always closed	
		stop	Limit or speed adjustment0Stop	
Logic Level	Falling edge/closing moment	Speed Control	PWMSignal speed regulation	
		Forward	DI1From high level to low level, DI2Always high	
		Reversal	DI2From high level to low level, DI1Always high	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	PWMSignal speed regulation	
		Forward	DI1From low level to high level, DI2Always low	
		Reversal	DI2From low level to high level, DI1Always low	
		stop	Limit or speed adjustment0Stop	

PWMIn the signal speed regulation (edge trigger) mode, the reference configuration of the relevant registers is shown in the table4.57shown.

surface4.57 PWMConfiguration of related registers of signal speed regulation (edge triggering) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	2,3	2: Falling edge trigger 3: Rising edge trigger
0x0083	Pulse signal type	0	PWM(default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V

0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

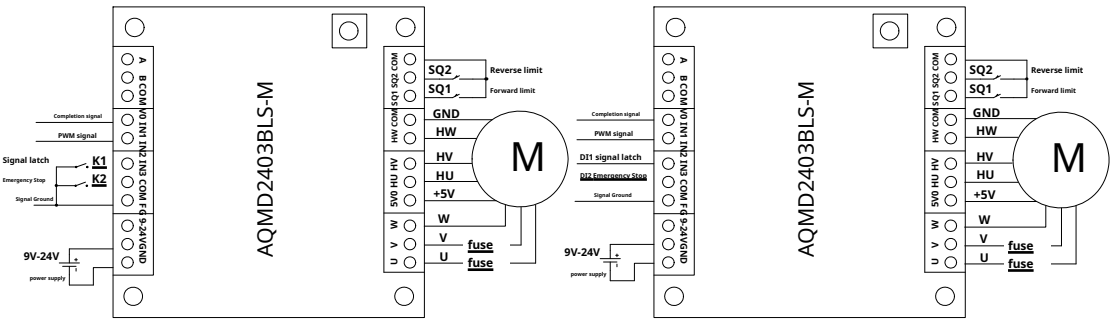
4.3.3 PWMSignal position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write0Select the pulse signal type asPWM,Towards0x009bRegister Write4 Configure the speed control mode as position closed-loop control to achievePWMSignal position control usage (can also be used with this driver)PC The machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.58shown.

surface4.58 PWMRelated configuration required for signal position control usage

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x03: Pulse signal	0x00:PWM	0x04: Position closed loop control

This usage is done through externalPWMThe signal adjusts the rotation position of the motor through the switch quantity/logic level input PWMThe signal is latched and the motor is stopped urgently.PWMThe connection method of signal position control is shown in the figure4.20As shown. Among them,IN1catch PWMSignal, used to adjust the motor rotation position.PWMSignal from0Gradually increase to100%During the process, the motor rotation position will change from the stroke starting point to the maximum stroke. When the switch quantity control signal latch and motor emergency stop are used, the switch K1catchIN2andCOMRoom, used forPWMInput signal latch; switchK2catchIN3andCOMWhen using logic level control signal latch and motor emergency stop,IN2Connect to logic levelDI1, used for inputPWM Signal latching;IN3Connect to logic levelDI2, control the motor to stop urgently.COMConnect to signal ground.VOOutput completion signal, used to feed back the position adjustment completion signal to the controller. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.20 PWMSignal position control switch quantity (left picture)/logic level (right picture) control mode wiring method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register0x0081and0x0085), we can achieve motor position adjustment, signal latching and emergency stop by operating pulse signals, switch quantities and logic levels in different ways. The control logic is shown in the table4.59shown.

surface4.59 PWMControl logic of signal control

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	PWMSignal Conditioning Location	
		Signal latch	K1closure,K2disconnect	
		Emergency Stop	K2closure	
	High level/disconnect	Adjust position	PWMSignal Conditioning Location	
		Signal latch	K1disconnect,K2closure	
		Emergency Stop	K2disconnect	
Logic Level	Low level/closed (default)	Adjust position	PWMSignal Conditioning Location	
		Signal latch	DI1Low level,DI2High level	
		Emergency Stop	DI2Low level	
	High level/disconnect	Adjust position	PWMSignal Conditioning Location	
		Signal latch	DI1High level,DI2Low level	
		Emergency Stop	DI2High level	

PWMIn the signal position control mode, the reference configuration of the relevant registers is shown in the table4.60shown.

surface4.60 PWMConfiguration of registers related to signal position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0083	Pulse signal type	0	PWM(default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following inputPWMFluctuation of signal duty cycle (default) Used for filtering to eliminate motor jitter caused by interference signals
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the system parameter configuration is used.

			Load current; used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.3.4Frequency signal speed regulation (level trigger)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3 Select the input signal type as pulse signal.0x0083Register Write1Select the pulse signal type as frequency,0x009bRegister Write 1~3Configure the speed control mode to duty cycle speed control, torque control or speed closed loop control.0x0081Register Write0,1Configure the digital signal polarity to low level/closed, high level/open, and you can achieve frequency signal speed regulation (level trigger) usage (you can also use this driver to matchPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.61shown.

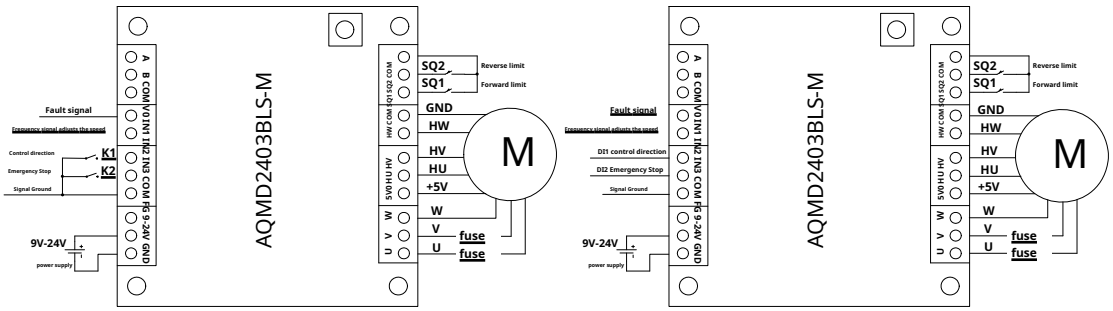
surface4.61Related configuration required for frequency signal speed regulation (level trigger) usage

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x03: Pulse signal	0x01:frequency	0x01: Duty cycle speed regulation	0x00：Low level/closed
			0x02: Torque control	0x01: High level/disconnect
			0x03: Speed closed loop control	

This usage adjusts the motor speed by inputting the frequency, and controls the start/stop and direction of the motor by switching/logic level. The connection method of frequency signal speed regulation is shown in the figure4.21As shown. Among them,IN1Connect frequency signal to adjust motor speed.

The motor speed increases with the increase of input frequency. We can calculate the motor speed by0x008cand0x008dRegister (see6.3.5 The pulse signal ratio is configured in the section System Parameter Configuration Register to change the proportional coefficient between the motor speed and the input frequency. For the duty cycle speed control working mode, the output duty cycle =MIN(Input frequency × pulse signal magnification ×0.1%,100.0%); For torque control mode, stall current =MIN(Input frequency × pulse signal ratio × maximum load current ×0.001, large load current), large load current can be0x006bRegister configuration; for speed closed-loop control mode, motor commutation frequency = MIN(input frequency × pulse signal ratio, maximum commutation frequency), the maximum commutation frequency can be obtained by0x0066 Registers to configure.

When using switch quantity to control the start, stop and direction of the motor, the switchK1catchIN2andCOMTo control the direction of motor rotation; switchK2catchIN3andCOMWhen using logic level to control the start, stop and direction of the motor, IN2Connect to logic levelDI1, control the direction of motor rotation;IN3Connect to logic levelDI2, control the motor to stop urgently.COM Connect to signal ground,VOIt is a fault output. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.21Frequency signal speed regulation (level trigger) Switch quantity (left picture)/logic level (right picture) control mode wiring method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of frequency signal, switch quantity and logic level. The control logic is shown in the table4.62shown.

surface4.62Frequency signal speed regulation (level trigger) control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	Frequency signal speed regulation	
		Forward	K1disconnect,K2disconnect	
		Reversal	K1closure,K2disconnect	
		Emergency Stop	K2closure	
	High level/disconnect	Speed Control	Frequency signal speed regulation	
		Forward	K1closure,K2closure	
		Reversal	K1disconnect,K2closure	
		Emergency Stop	K2disconnect	
Logic Level	Low level/closed (default)	Speed Control	Frequency signal speed regulation	
		Forward	DI1High level,DI2High level	
		Reversal	DI1Low level,DI2High level	
		Emergency Stop	DI2Low level	
	High level/disconnect	Speed Control	Frequency signal speed regulation	
		Forward	DI1Low level,DI2Low level	
		Reversal	DI1High level,DI2Low level	
		Emergency Stop	DI2High level	

In the frequency signal speed regulation (level trigger) mode, the reference configuration of the relevant registers is shown in the table4.63shown.

surface4.63Configuration of registers related to frequency signal speed regulation (level trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger 1: High level trigger

0x0083	Pulse signal type	1	frequency
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x008c-0x008d	Pulse signal magnification	1.0f	default value1.0f; Used to change the proportional coefficient between input frequency and motor speed
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

4.3.5Frequency signal speed regulation (edge trigger)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write1Select the pulse signal type as frequency,0x009bRegister Write 1~3 Configure the speed control mode to duty cycle speed control, torque control or speed closed loop control.0x0081Register Write2,3Configure the digital signal polarity to the falling edge/closing moment, rising edge/opening moment, and then realize the frequency signal speed regulation (edge trigger) Usage (can also be used with this driverPCThe machine sample program configures the relevant registers. For details, see AQMDBLS_Demo User Manual) and related configurations are shown in the table4.64shown.

surface4.64Frequency signal speed regulation (edge trigger) usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x03: Pulse signal	0x01:frequency	0x01: Duty cycle speed regulation	0x02: Falling edge/Closed moment
			0x02: Torque control	0x03: Rising edge/disconnection moment
			0x03: Speed closed loop control	

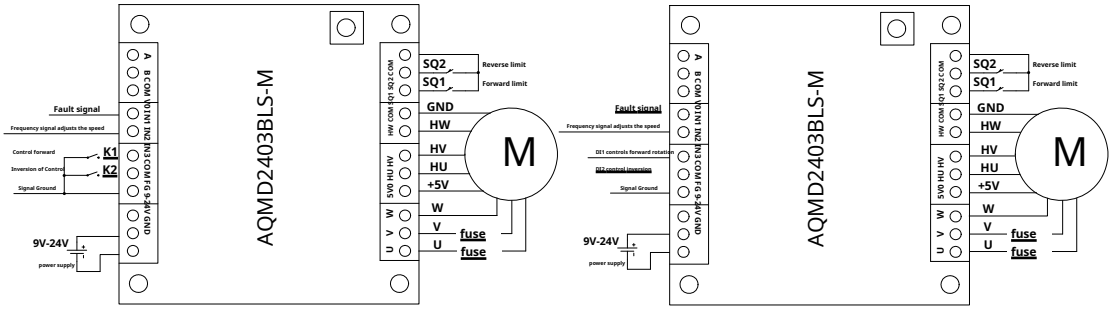
This usage adjusts the motor speed by inputting the frequency, and controls the start/stop and direction of the motor by switching/logic level. The connection method of frequency signal speed regulation is shown in the figure4.22As shown. Among them,IN1Connect frequency signal to adjust motor speed.

The motor speed increases with the increase of input frequency. We can calculate the motor speed by0x008cand0x008dRegister (see6.3.5 The pulse signal ratio is configured in the section System Parameter Configuration Register to change the proportional coefficient between the motor speed and the input frequency. For the duty cycle speed control working mode, the output duty cycle =MIN(Input frequency × pulse signal magnification ×0.1%,100.0%); For torque control mode, stall current =MIN(Input frequency × pulse signal ratio × maximum load current ×0.001, large load current), large load current can be0x006bRegister configuration; for speed closed-loop control mode, motor commutation frequency = MIN(input frequency × pulse signal ratio, maximum commutation frequency), the maximum commutation frequency can be obtained by0x0066 Registers to configure.

When using switch quantity to control the motor direction, the switchK1catchIN2andCOMControl the motor to rotate forward; switchK2 catchIN3andCOMWhen using logic level to control the direction of the motor,IN2Connect to logic levelDI1,

Control the motor to rotate forward;IN3Connect to logic levelDI2, control the motor to reverse.COMConnect to signal ground,VOIt is a fault output.

Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.22Frequency signal speed regulation (edge trigger) Switch quantity (left picture)/logic level (right picture) control mode wiring method

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of frequency signal, switch quantity and logic level. The control logic is shown in the table4.65shown.

surface4.65Frequency signal speed regulation (edge trigger) control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Falling edge/closing moment	Speed Control	Frequency signal speed regulation	
		Forward	K1After closing, open.K2Always disconnected	
		Reversal	K2After closing, open.K1Always disconnected	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	Frequency signal speed regulation	
		Forward	K1After opening, close.K2Always closed	
		Reversal	K2After opening, close.K1Always closed	
		stop	Limit or speed adjustment0Stop	
Logic Level	Falling edge/closing moment	Speed Control	Frequency signal speed regulation	
		Forward	DI1From high level to low level, DI2Always high	
		Reversal	DI2From high level to low level, DI1Always high	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	Frequency signal speed regulation	
		Forward	DI1From low level to high level, DI2Always low	
		Reversal	DI2From low level to high level, DI1Always low	
		stop	Limit or speed adjustment0Stop	

In the frequency signal speed regulation (edge trigger) mode, the reference configuration of the relevant registers is shown in the table4.66shown.

surface4.66Configuration of frequency signal speed regulation (edge trigger) related registers

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default)

			1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	2,3	2: Falling edge trigger 3: Rising edge trigger
0x0083	Pulse signal type	1	frequency
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x008c-0x008d	Pulse signal magnification	1.0f	default value1.0f; Used to change the proportional coefficient between input frequency and motor speed
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

4.3.6Frequency signal position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write1Select the pulse signal type as frequency,0x009bRegister Write 4Configure the digital signal polarity as position closed loop control to achieve frequency signal position control usage (this driver can also be used as a supportingPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.67shown.

surface4.67Frequency signal position control should send the required configuration

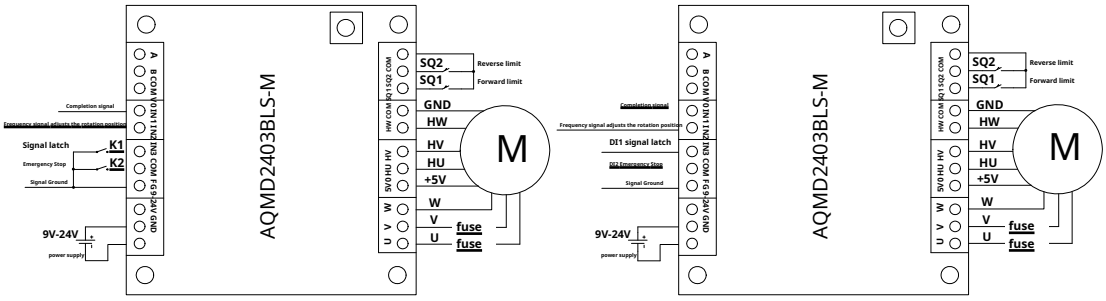
Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x03: Pulse signal	0x01:frequency	0x04: Position closed loop control

This usage adjusts the motor rotation position by inputting the frequency, and controls the frequency signal latch and motor emergency stop by switching quantity/ logic level. The connection method of frequency signal position speed regulation is shown in the figure4.23As shown. Among them,IN1Connect frequency signal to adjust the motor rotation position.

The motor rotation position increases with the increase of input frequency, which can be calculated by0x008cand0x008dRegister (see 6.3.5The pulse signal ratio is configured to change the proportional coefficient between the motor rotation position and the input frequency.MIN(Input frequency × pulse signal ratio × total stroke ×0.001, total stroke), the total stroke can be 0x00a2and0x00a3Register configuration or obtained through trip learning (see3.1.6section).

When using the switch control signal latch and motor emergency stop, the switchK1catchIN2andCOMTime, used for input frequency signal latch; switchK2catchIN3andCOMIndirectly, control the motor emergency stop; when using the logic level control signal latch and motor emergency stop,IN2Connect to logic levelDI1, used for signal latching,IN3Connect to logic levelDI2, control the motor to stop urgently.COMConnect to signal ground.VOOutput completion signal, used to feedback the position adjustment completion status to the controller

Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.23Connection method of switch quantity (left picture)/logic level (right picture) control method of frequency signal position control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor through different operation methods of frequency signal, switch quantity and logic level. The control logic is shown in the table4.68shown.

surface4.68Control logic of frequency signal position control

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Adjust position	Frequency signal adjustment position	
		Signal latch	K1closure,K2disconnect	
		Emergency Stop	K2closure	
	High level/disconnect	Adjust position	Frequency signal adjustment position	
		Signal latch	K1disconnect,K2closure	
		Emergency Stop	K2disconnect	
Logic Level	Low level/closed (default)	Adjust position	Frequency signal adjustment position	
		Signal latch	DI1Low level,DI2High level	
		Emergency Stop	DI2Low level	
	High level/disconnect	Adjust position	Frequency signal adjustment position	
		Signal latch	DI1High level,DI2Low level	
		Emergency Stop	DI2High level	

In the frequency signal position control mode, the reference configuration of the relevant registers is shown in the table4.69shown.

surface4.69Configuration of registers related to frequency signal position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0083	Pulse signal type	1	frequency
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V

			2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x008c-0x008d	Pulse signal magnification	1.0f	default value1.0f; Used to change the proportional coefficient between input frequency and motor rotation position
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	1,2,3,4	1:SQ2Reset (default) 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a2-0x00a3	Total travel		The total itinerary can be obtained through itinerary learning
0x00a7	Amount of signal change to ignore	1	neglect0.1%The following input frequency fluctuations (default) Used for filtering to eliminate motor jitter caused by interference signals
0x00a9	Current during reset	0~300	When non-zero, multiply by0.01is the maximum load current during reset, in units ofA; When it is zero, the large load current configured by the system parameters is used; it is used to configure the torque during reset. When the motor stall detection mode is reset, the current configuration here is Just enough to drag the load steadily, and the stall stop time is set Set to non-zero
0x008e	Stall stop time	0~255	Multiply the value by0.1is the stall stop time, in units ofs; For motor stall detection (not using limit switch detection When resetting the travel measurement, the stall stop time should be configured as non-zero. The recommended configuration is0.1~1s, for stall detection

4.3.7Pulse signal speed regulation (level trigger)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write2Select the pulse signal type as pulse (counting),0x009b Register Write1~3 Configure the port input type to duty cycle speed regulation, torque control or speed closed loop control.0x0081Register Write0,1Configuring the polarity of the digital signal to be low level/closed, high level/disconnected, can achieve the usage of pulse signal speed regulation (level trigger) (can also be used with this driver)PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_Demo User Manual) and related configurations are shown in the table4.70shown.

surface4.70Pulse signal speed regulation (level trigger) usage required configuration

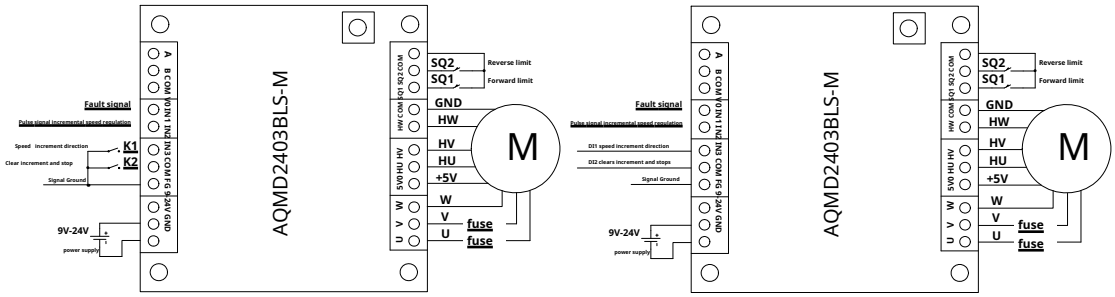
Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x03: Pulse signal	0x02: Pulse (count)	0x01: Duty cycle speed regulation	0x00：Low level/closed
			0x02: Torque control	0x01: High level/disconnect

			0x03: Speed closed loop control	

This usage uses pulse counting to increase the motor speed, and controls the speed increment direction and motor stop through logic level/switch quantity. The connection method of pulse signal speed control is shown in the figure4.24As shown. Among them,IN1Receive pulse signal and adjust the motor speed in increments.

We can0x008cand0x008dRegister (see6.3.5The pulse signal magnification is configured to change the increment coefficient. For each pulse generated by the input signal, for duty cycle speed regulation, the output duty cycle changes by the pulse signal magnification ×1%; For torque control, the output current change is pulse signal ratio × maximum load current ×1%, large load current can be0x006bRegister configuration; For speed closed-loop control, the motor commutation frequency change is the pulse signal multiplier × maximum commutation frequency ×1%, the maximum commutation frequency can be achieved by0x0066The increment direction indicates whether the output is increasing or decreasing.

When using logic levels to control speed increment direction and motor stop,IN2Connect to logic levelDI1, used to control the direction of speed increment;IN3Connect to logic levelDI2, used to clear the speed increment accumulated value and brake the motor at the same time; when the switch quantity is used to control the speed increment direction and the motor stop, the switchK1catchIN2andCOMIt is used to control the speed increment direction; switchK2catch IN3andCOMIt is used to clear the speed increment accumulated value and brake the motor at the same time.COMConnect to signal ground.VOOutput fault signal. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.24Connection diagram of pulse signal speed regulation (level trigger) switch quantity (left picture)/logic level (right picture) control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of pulse signal, switch quantity and logic level. The control logic is shown in the table4.71shown.

surface4.71Pulse signal speed regulation (level trigger) control logic

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	Pulse signal speed regulation	
		Forward	K1disconnect,K2disconnect	
		Reversal	K1closure,K2disconnect	
		stop	K2closure	
	High level/disconnect	Speed Control	Pulse signal speed regulation	
		Forward	K1closure,K2closure	
		Reversal	K1disconnect,K2closure	
		stop	K2disconnect	
Logic Level	Low level/closed (default)	Speed Control	Pulse signal speed regulation	
		Forward	DI1High level,DI2High level	
		Reversal	DI1Low level,DI2High level	
		stop	DI2Low level	

	High level/disconnect	Speed Control	Pulse signal speed regulation	
		Forward	DI1Low level,DI2Low level	
		Reversal	DI1High level,DI2Low level	
		stop	DI2High level	

In the pulse signal speed regulation (level trigger) mode, the reference configuration of the relevant registers is shown in the table4.72shown.

surface4.72Configuration of related registers for pulse signal speed regulation (level trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger 1: High level trigger
0x0083	Pulse signal type	2	Pulse (Count)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

4.3.8Pulse signal speed regulation (edge trigger)

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write2Select the pulse signal type as pulse (counting),0x009b Register Write1~3 Configure the port control type to duty cycle speed regulation, torque control or speed closed loop control.0x0081Register Write2,3Configure the digital signal polarity to the falling edge/closing moment, rising edge/breaking moment, and then the pulse signal speed regulation (edge trigger) can be realized (this driver can also be used as a supportingPCThe machine sample program configures the relevant registers. For details, see AQMDBLS_DemoUser Manual) and related configurations are shown in the table4.73shown.

surface4.73Pulse signal speed regulation (edge trigger) usage required configuration

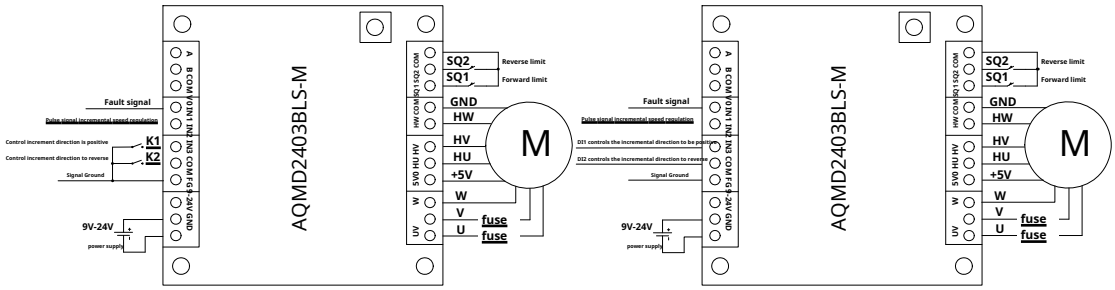
Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)	Digital signal polarity (0x0081register)
Digital/Analog Signal Number control mode	0x03: Pulse signal	0x02: Pulse (count)	0x01: Duty cycle speed regulation	0x02: Falling edge/Closed moment
			0x02: Torque control	

			0x03: Speed closed loop control	0x03: Rising edge/disconnection moment

This method uses pulse counting to increase the motor speed and controls the speed increment direction through logic level/switch quantity. The connection method of pulse signal speed control is shown in the figure4.25As shown. Among them,IN1Receive pulse signal and adjust the motor speed in increments.

We can0x008cand0x008dRegister (see6.3.5The pulse signal magnification is configured to change the increment coefficient. For each pulse generated by the input signal, for duty cycle speed regulation, the output duty cycle changes by the pulse signal magnification ×1%; For torque control, the output current change is pulse signal ratio × maximum load current ×1%, large load current can be0x006bRegister configuration; For speed closed-loop control, the motor commutation frequency change is the pulse signal multiplier × maximum commutation frequency ×1%, the maximum commutation frequency can be achieved by0x0066The increment direction indicates whether the output is increasing or decreasing.

When using logic levels to control the speed increment direction,IN2Connect to logic levelDI1, used to control the speed increment direction to be positive; IN3Connect to logic levelDI2, used to control the speed increment direction to the reverse direction; when the switch quantity is used to control the speed increment direction, the switchK1catchIN2andCOMThe switch is used to control the speed increment direction to be positive;K2catchIN3andCOMIt is used to control the speed increment direction to be reverse.COMConnect to signal ground.VOOutput fault signal. Limit switchSQ1andSQ2 Set limits for forward and reverse rotation respectively.



picture4.25Connection diagram of switch quantity (left)/logic level (right) control of pulse signal speed regulation (edge trigger)

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of pulse signal, switch quantity and logic level. The control logic is shown in the table4.74shown.

surface4.74Control logic of pulse signal speed regulation (edge triggering)

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Falling edge/closing moment	Speed Control	Pulse signal speed regulation	
		Forward	K1After closing, open.K2Always disconnected	
		Reversal	K2After closing, open.K1Always disconnected	
		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	Pulse signal	
		Forward	K1After opening, close.K2Always closed	
		Reversal	K2After opening, close.K1Always closed	
		stop	Limit or speed adjustment0Stop	
Logic Level	Falling edge/closing moment	Speed Control	Pulse signal speed regulation	
		Forward	DI1From high level to low level, DI2Always high	
		Reversal	DI2From high level to low level, DI1Always high	

		stop	Limit or speed adjustment0Stop	
	Rising edge/disconnection moment	Speed Control	Pulse signal speed regulation	
		Forward	DI1From low level to high level, DI2Always low	
		Reversal	DI2From low level to high level, DI1Always low	
		stop	Limit or speed adjustment0Stop	

In the pulse signal speed regulation (edge trigger) mode, the reference configuration of the relevant registers is shown in the table4.75shown.

surface4.75Configuration of related registers for pulse signal speed regulation (edge triggering) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	2,3	2: Falling edge trigger 3: Rising edge trigger
0x0083	Pulse signal type	2	Pulse (Count)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

4.3.9Pulse signal position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write2Select the pulse signal type as pulse (counting),0x009b Register Write4 Configure the port control type to position closed-loop control to achieve pulse signal position control (this driver can also be used as a supporting PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.76shown.

surface4.76Pulse signal position control usage required control

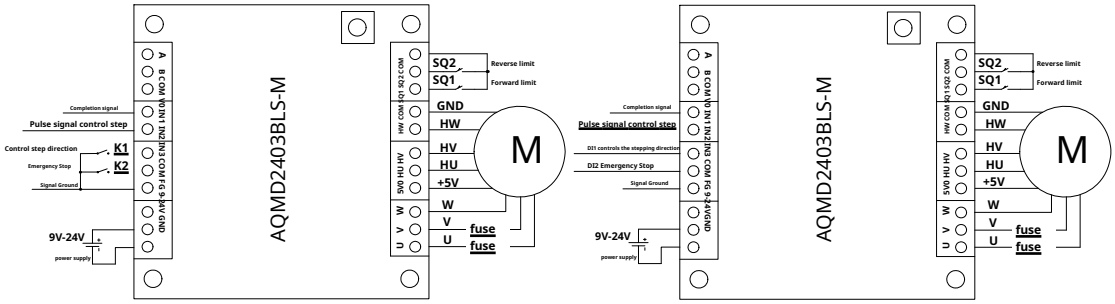
Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x03: Pulse signal	0x02: Pulse (count)	0x04: Position closed loop control

This usage uses pulse signals to step the motor, and controls the step direction and emergency stop through switches/logic levels.4.26As shown.IN1Receive pulse signal to control the motor step by step.

Each time the input signal generates a pulse, the number of commutations (i.e., the step amount) of the motor rotation can be calculated by0x008cand 0x008dRegister (see6.3.5The pulse signal magnification is changed by configuring the pulse signal magnification in the section System Parameter Configuration Register Description. Each step is equal to the pulse signal magnification. The step direction is whether to increase or decrease based on the previous step accumulation value. When the motor is progressively controlled, there is no need to wait for the motor to complete the previously given step amount. The step accumulation value can be given to multiple pulses continuously. It is also possible to continuously give multiple reverse step amount signals while the motor is rotating, so that the direction of the step accumulation value is opposite to the current rotation direction of the motor. Then the driver will automatically perform acceleration and deceleration control to change the rotation direction of the motor.

After the motor is stopped by the emergency stop signal, the accumulated step value will not be reset nor will it be changed to the step value corresponding to the position where the motor stops. After the emergency stop signal is removed, if the motor rotation position is not the position corresponding to the accumulated step value, the motor will continue to rotate. If the motor is required to rotate in the reverse direction after the emergency stop signal is removed, sufficient reverse step value signals should be given before the emergency stop signal is removed.

When using logic levels to control stepper direction and emergency stop,IN2Connect to logic levelDI1, used to control the stepping direction; IN3Connect to logic levelDI2, used for emergency braking of the motor. When using switch quantity to control stepping direction and emergency stop, the switchK1catchIN2andCOMTime, used to control the stepping direction; switchK2catchIN3andCOMIt is used for emergency braking of the motor.COMConnect to signal ground,VOOutput completion signal. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.26Connection method of pulse signal position control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor through different operation methods of pulse signals, switch quantities and logic levels. The control logic is shown in the table4.77shown.

surface4.77Control logic of pulse signal position control

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Stepper control	Pulse signal	Stepping
		Step amount positive	K1disconnect,K2disconnect	
		Step amount reverse	K1closure,K2disconnect	
		Emergency Stop	K2closure	
	High level/disconnect	Stepper control	Pulse signal	
		Step amount positive	K1closure,K2closure	
		Step amount reverse	K1disconnect,K2closure	
		Emergency Stop	K2disconnect	
Logic Level	Low level/closed (default)	Stepper control	Pulse signal	Stepping
		Step amount positive	DI1High level,DI2High level	
		Step amount reverse	DI1Low level,DI2High level	

		Emergency Stop	DI2Low level	
	High level/disconnect	Stepper control	Pulse signal	
		Step amount positive	DI1Low level,DI2Low level	
		Step amount reverse	DI1High level,DI2Low level	
		Emergency Stop	DI2High level	

In pulse signal position control mode, the reference configuration of related registers is shown in Table4.78shown.

surface4.78Configuration of registers related to pulse signal position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0083	Pulse signal type	2	Pulse (Count)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x008c-0x008d	Pulse signal magnification	1.0f	default value1.0f; Used to configure the step size per pulse
0x009a	Port input type	3	Pulse Xinhai
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	0	No reset; usually no reset is required for step control, but Configure the reset mode according to the situation

4.4Preset speed control connection and configuration

When the motor speed does not need to be adjusted and the motor start/stop and forward/reverse rotation are controlled by switches or logic levels, we can use the preset speed mode.6.3.7Section)0x00B2and0x00B3Configure the forward and reverse speeds separately, by0x00B0 Register configuration speed control mode (configurable as duty cycle speed control, torque control, speed closed-loop control, position closed-loop control), through0x00B1Configure the operation mode, whether a single button (or a single control signal) controls forward and reverse rotation or two buttons (or two control signals) control forward and reverse rotation respectively.

4.4.1Preset speed two-button control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write4Select the input signal type as built-in program,0x009bRegister Write5Configure the port control type to preset speed control.0x00b1 Register Write0Select the control mode as double contact to realize the preset speed double key control usage (you can also use the drive configuration

setPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.79shown.

surface4.79Preset speed dual-button control usage required configuration

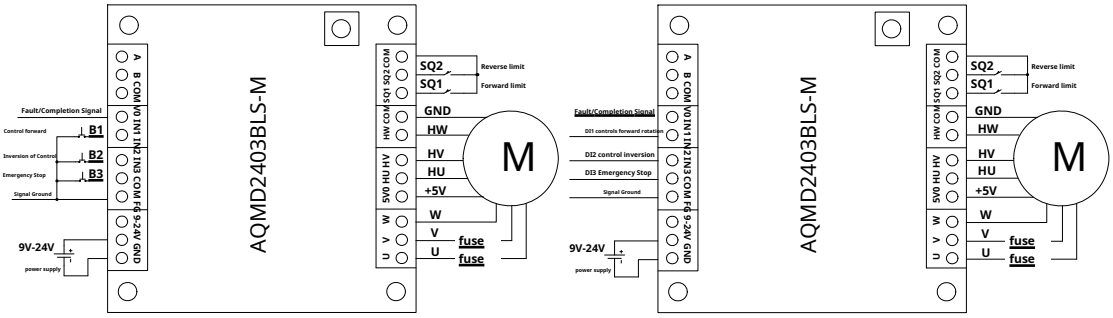
Control method (Button switch)	Port input type (0x009aregister)	Port Control Type (0x009bregister)	Control method (0x00b1register)
Digital/analog signal control method	0x04: Built-in program	0x05: Preset speed control	0x00: Double contact

This usage controls forward, reverse and stop respectively by presetting the forward and reverse speeds through three-way switch quantity/logic level signals. The connection method of the preset speed double-key control is shown in the figure4.27shown.

When using the switch quantity to control forward, reverse and stop, press the buttonB1catchIN1andCOMTime, used to control forward rotation; button B2catchIN2andCOMTime, used to control the reversal; buttonB3catchIN3andCOMWhen the digital signal polarity is low level trigger (can be0x0081registers to configure polarity),B1When pressed, the motor rotates forward.B2When pressed, the motor reverses.B1andB2When both are lifted, the motor stops.B3The motor stops urgently. When the digital signal polarity is falling edge trigger, pressB1Then the motor will rotate forward, pressB2Then flip up the motor and reverse it.B3The motor stops urgently.

When using logic level to control forward, reverse and stop,IN1Connect to logic levelDI1, used to control forward rotation;IN2Connect to logic levelDI2, used for inversion of control;IN3Connect to logic levelDI3, used for emergency stop.

COMWhen the speed control mode is duty cycle speed control, torque control or speed closed loop control,VOOutput fault signal; when the speed control mode is position control,VOOutput completion signal. Limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



picture4.27Connection method of preset speed double key control

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of switch quantity and logic level. The control logic is shown in the table4.80shown.

surface4.80Control logic for two-button control of preset speeds

Digital signal type	Digital signal polarity	Functions implemented	How to operate	Wiring scheme
Switching quantity	Low level/closed (default)	Speed Control	Preset speed	
		Forward	B1closure,B2,B3All disconnected	
		Reversal	B2closure,B1,B3All disconnected	
		Normal stop	B1,B2,B3All disconnected	
		Emergency Stop	B3closure	
	High level/disconnect	Speed Control	Preset speed	
		Forward	B1disconnect,B2,B3All closed	
		Reversal	B2disconnect,B1,B3All closed	

		Normal stop	B1,B2,B3All closed	
		Emergency Stop	B3disconnect	
	Falling edge/closing moment	Speed Control	Preset speed	
		Forward	B1After closing, open. B2,B3Always disconnected	
		Reversal	B2After closing, open. B1,B3Always disconnected	
		Emergency Stop	B3closure	
	Rising edge/disconnection moment	Speed Control	Preset speed	
		Forward	B1After opening, close. B2,B3Always closed	
		Reversal	B2After opening, close. B1,B3Always closed	
		Emergency Stop	B3disconnect	
Logic Level	Low level/closed (default)	Speed Control	Preset speed	
		Forward	DI1Low level,DI2,DI3High level	
		Reversal	DI2Low level,DI1,DI3High level	
		Normal stop	DI1,DI2,DI3High level	
		Emergency Stop	DI3Low level	
	High level/disconnect	Speed Control	Preset speed	
		Forward	DI1High level,DI2,DI3Low level	
		Reversal	DI2High level,DI1,DI3Low level	
		Normal stop	DI1,DI2,DI3Low level	
		Emergency Stop	DI3High level	
	Falling edge/closing moment	Speed Control	Preset speed	
		Forward	DI1From high level to low level, DI2,DI3Always high	
		Reversal	DI2From high level to low level, DI1,DI3Always high	
		Emergency Stop	DI3Low level	
	Rising edge/disconnection moment	Speed Control	Preset speed	
		Forward	DI1From low level to high level, DI2,DI3Always low	
		Reversal	DI2From low level to high level, DI1,DI3Always low	
		Emergency Stop	DI3High level	

In the preset speed double-key control mode, the reference configuration of the relevant registers is shown in the table4.81shown.

surface4.81Configuration of registers related to preset speed double-key control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger

			2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1,2,3	0: Low level trigger 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels Row Configuration
0x009a	Port input type	4	Built-in programs
0x009b	Port Control Type	5	Preset speed control
0x00b0	Working Mode	0,1,2,3	0: Duty cycle 1: Torque 2: Speed closed loop 3：Position closed loop
0x00b1	Control method	0	Dual contact/logic level control
0x00b2	Forward speed	Duty cycle mode:0~1000 Torque mode:0~1000 Speed/position closed loop:0~65535	Preset forward speed Duty Cycle:0~100.0% Current corresponding to limited torque:0~10.00A Speed corresponds to commutation frequency:0~6553.5Hz
0x00b3	Reverse speed	Duty cycle mode:0~1000 Torque mode:0~1000 Speed/position closed loop:0~65535	Preset reverse speed Duty Cycle:0~100.0% Current corresponding to limited torque:0~10.00A Speed corresponds to commutation frequency:0~6553.5Hz

4.4.2Preset speed single button control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write4Select the input signal type as built-in program,0x009bRegister Write5Configure the port control type to preset speed control.0x00b1 Register Write1Select the control mode as single contact, you can achieve the preset speed single key control usage (you can also use this driver to matchPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table4.82shown.

surface4.82Preset speed single button control usage required configuration

Control method (Button switch)	Port input type (0x009aregister)	Port Control Type (0x009bregister)	Control method (0x00b1register)
Digital/analog signal control method	0x04: Built-in program	0x05: Preset speed control	0x01: Single contact

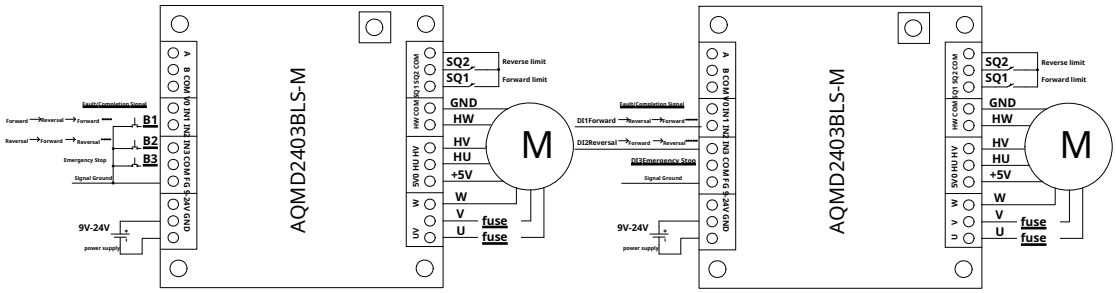
This usage uses a single switch/logic level signal to realize the forward, reverse and stop control of the motor.

The connection method of single-button control is shown in the figure4.28shown.

When using the switch quantity to control forward, reverse and stop, press the buttonB1catchIN1andCOMTime, used to control forward/stop/reverse switching; buttonB2catchIN2andCOMTime, used to control reverse/stop/forward switching; buttonB3catchIN3and COMWhen the digital signal polarity is low level trigger (can be0x0081registers to configure polarity),B1The motor rotates forward when pressed, and stops when released.B1When you press it again, the motor will reverse, and when you push it up again, the motor will stop, and the cycle will repeat.B2The motor reverses when pressed, and stops when released.B2When pressed again, the motor rotates forward, and when it is released again, the motor stops, and the cycle repeats.B3When the digital signal polarity is falling edge trigger, pressB1Then pop up the motor to rotate forward, and press it againB1Then pop up the motor to stop, and press it againB1Then pop up the motor to reverse, and press it againB1Then the motor pops up and stops, repeating the cycle; pressB2Then pop up the motor to reverse, and press it again B2Then pop up the motor to stop, and press it againB2Then pop up the motor to rotate forward, and press it againB2Then the motor stops and repeats this cycle; pressB3The motor stops urgently.

When using logic level to control forward, reverse and stop,IN1Connect to logic levelDI1, used to control forward/stop/reverse; IN2 Connect to logic levelDI2, used to control reverse/stop/forward;IN3Connect to logic levelDI3, used for emergency stop.

COMWhen the speed control mode is duty cycle speed control, torque control or speed closed loop control,VOOutput fault signal; when the speed control mode is position control,VOOutput completion signal.



picture4.28Preset speed single key control connection

By configuring the different types and polarities of digital signals (see6.3.5Section System Parameter Configuration Register 0x0081and0x0085), we can realize the start and stop and forward and reverse control of the motor by different operation methods of switch quantity and logic level. The control logic is shown in the table4.83shown.

surface4.83Control logic for single-button control of preset speeds

Digital signal type	Digital signal polarity	Functions implemented		How to operate	Connection party case
Switching quantity	Low level/closed (default)	Speed Control		Preset speed	Jog
		state Switch	Forward → Stop → Reverse → Stop Stop → Forward...	B1After closing, it rotates forward, and after opening, it rotates forward. Stop, close again and reverse, then Disconnect and stop, and repeat this cycle; B2,B3All disconnected	
			Reverse → Stop → Forward → Stop Stop → Reverse...	B2Reverse after closing, and reverse after opening Stop, close again and rotate forward, then Disconnect and stop, and repeat this cycle; B1,B3All disconnected	
		Emergency Stop		B3closure	
	High level/disconnect	Speed Control		Preset speed	
		state	Forward → Stop	B1After disconnection, it rotates forward, and after closing, it rotates	

		Switch	→ Reverse → Stop Stop → Forward...	Stop, disconnect the reverse again, and then Close and stop, repeat this cycle; B2,B3All closed	
			Reverse → Stop → Forward → Stop Stop → Reverse...	B2Reverse after opening, reverse after closing Stop, disconnect forward again, and then Close and stop, repeat this cycle; B1,B3All closed	
		Emergency Stop		B3closure	
	Falling edge/closing moment	Speed Control		Preset speed	Self-insurance
		state Switch	Forward → Stop → Reverse → Stop Stop → Forward...	B1After closing, disconnect to keep forward rotation. B1After closing, disconnect and keep stopping end,B1After closing, disconnect the Keep reversing and repeat this cycle; B2,B3Always disconnected	
			Reverse → Stop → Forward → Stop Stop → Reverse...	B2After closing, open and keep reversing. B2After closing, disconnect and keep stopping end,B2After closing, disconnect the Keep rotating in the forward direction and repeat this cycle; B1,B3Always disconnected	
		Emergency Stop		B3closure	
	Rising edge/disconnection moment	Speed Control		Preset speed	
		state Switch	Forward → Stop → Reverse → Stop Stop → Forward...	B1After disconnection, closing keeps forward rotation. B1After opening again, close and keep stop,B1Then open and close Keep reversing and repeating this cycle; B2,B3Always disconnected	
			Reverse → Stop → Forward → Stop Stop → Reverse...	B2After opening, closing keeps reversing. B2After opening, close and keep stopping end,B2After disconnecting, close the Keep rotating in the forward direction and repeat this cycle; B1,B3Always disconnected	
		Emergency Stop		B3closure	
Logic Level	Low level/closed (default)	Speed Control		Preset speed	Level
		state Switch	Forward → Stop → Reverse → Stop Stop → Forward...	DI1Low level forward rotation, high level Stop at a low level, and then reverse at a low level. Then high level stops, and the cycle continues ring;DI2,DI3High level	
			Reverse → Stop → Forward → Stop Stop → Reverse...	DI2Invert when low level, invert when high level Stop at level, then turn forward at low level. Then high level stops, and the cycle continues ring;DI1,DI3High level	
		Emergency Stop		DI3Low level	

	High level/disconnect	Speed Control		Pulse signal speed regulation	
		state Switch	Forward → Stop → Reverse → Stop Stop → Forward...	DI1When the level is high, it rotates forward, and when the level is low, it rotates forward. Stop at a flat level, and then reverse at a high level. Then the low level stops, and the cycle continues. ring;DI2,DI3Low level	
			Reverse → Stop → Forward → Stop Stop → Reverse...	DI2Invert when high level, invert when low level Stop at level, then rotate forward at high level. Then the low level stops, and the cycle continues. ring;DI1,DI3Low level	
		Emergency Stop		DI3High level	
	Falling edge/closing moment	Speed Control		Preset speed	edge
		state Switch	Forward → Stop → Reverse → Stop Stop → Forward...	DI1From high level to low level change,DI1From high level to Low level stops,DI1Again by High level turns to low level and reverses. This cycle;DI2,DI3Always High level	
			Reverse → Stop → Forward → Stop Stop → Reverse...	DI2From high level to low level change,DI2From high level to Low level stops,DI2Again by High level turns to low level, and the This cycle;DI1,DI3Always High level	
		Emergency Stop		DI3Low level	
	Rising edge/disconnection moment	Speed Control		Preset speed	
		state Switch	Forward → Stop → Reverse → Stop Stop → Forward...	DI1From low level to high level change,DI1From low level to High level stops,DI1Again by The low level turns into high level inversion. This cycle;DI2,DI3Always Low level	
			Reverse → Stop → Forward → Stop Stop → Reverse...	DI2From low level to high level change,DI2From low level to High level stops,DI2Again by The low level turns to high level and the This cycle;DI2,DI3Always Low level	
		Emergency Stop		DI3High level	

In the preset speed single-key control mode, the reference configuration of the relevant registers is shown in the table4.84shown.

surface4.84Configuration of registers related to preset speed single-key control mode

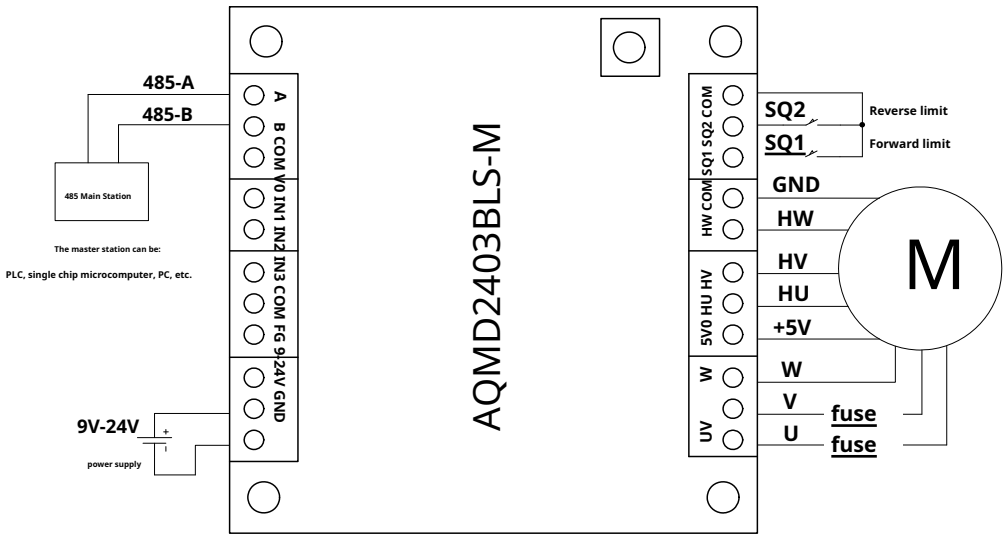
Register Address	Register function	value	describe

0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1,2,3	0: Low level trigger 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	4	Built-in programs
0x009b	Port Control Type	5	Preset speed control
0x00b0	Working Mode	0,1,2,3	0: Duty cycle 1: Torque 2: Speed closed loop 3: Position closed loop
0x00b1	Control method	1	Single contact/logic level control
0x00b2	Forward speed	0~65535	Preset forward speed
0x00b3	Reverse speed	0~65535	Preset reverse speed

4.5 485Communication connection and configuration

4.5.1 485Communication control

Use the button to switch the control mode to485Communication control mode, the yellow indicator light is off and the green indicator light is on 0.5/2Hz Frequency flashing (For details on how to operate the buttons, see2.1.1section), this usage is done by485Communication realizes the control operation of the motor.485The connection method of communication control is shown in the figure4.29shown.485Master station (the master station can bePLC, MCU orPC Machine, etc.)485The two signal lines followAA,BBThe way and drive485The interface is connected.485The master station passes Modbus-RTUThe communication protocol operates the driver's related registers to perform speed regulation, direction control, position control and other operations on the motor.485Under communication control mode, the driver supports duty cycle speed regulation, speed closed-loop control and position closed-loop control.



picture4.29 485Communication control connection

useRS485When communicating with the driver, the communication parameters and device address should be consistent with the driver. Communication parameters include baud rate, parity check mode and stop bit. The default communication parameters of the driver are baud rate 9600bps, even parity,1The baud rate of the drive can be set by0x0090and0x0091Register configuration, the driver supports baud rate range of 1200~115200bps; Check mode and stop bit pass0x0092Register configuration, the driver supports even parity +1Stop bit, odd parity +1Stop bit and no parity +2Stop bit, communication parameter related registers are detailed in6.3.5Section System Parameter Configuration Registers.ModbusThe slave device address is passed through the register0x009cConfiguration.

Before using the motor, you should first configure the rated current and operating current of the motor.0x006aand0x006b Register (see6.3.4The rated current and maximum load current of the motor are configured in the following sections. The configured motor rated current should be consistent with or slightly higher than the actual rated current of the motor. The maximum load current can be used to configure the motor's maximum load/locking torque. If there is no requirement, it is usually configured the same as the rated current. The braking current is configured consistent with the motor's rated current. The motor rated current can be obtained from the motor's nameplate or data sheet. If the motor rated current cannot be determined, it can be estimated by dividing the motor rated power by the rated voltage and then by the motor efficiency.12VMotor, good efficiency50%,for24VAnd above voltage motor, efficiency is desirable70%For the first use of a motor, or when the motor phase line or Hall signal line wiring sequence is changed, the motor should be trained first. For details on how to train the motor, see3.1.2Section.

Duty cycle speed control modePWMThe rise and fall buffer time and the acceleration and deceleration in the speed closed loop and position closed loop mode can be0x0050~0x0053Register (see6.3.3The description of the speed control register of the subsection) is temporarily changed separately; and the default duty cycle speed control mode at power-onPWMThe rise and fall buffer time and the acceleration and deceleration in the speed closed loop and position closed loop mode, as well as the large acceleration and deceleration and large commutation frequency are 0x0060~0x0067Register (see6.3.4Motor Control Parameters Configuration Register Description)

By writing0x0042The register sets the output duty cycle for duty cycle speed regulation; by writing0x0043The register sets the commutation frequency (corresponding to the speed) of the motor for closed-loop speed regulation;0x0044Set the commutation frequency (corresponding to the speed) of position control.0x0045The register sets the position control mode to be absolute or relative.0x0046and0x0047Two registers are written with four-byte integer target position values to perform position closed-loop control;0x0040The register performs the braking operation on the motor. The three speed control modes of duty cycle speed control, closed loop speed control and position control can be switched directly. Write the output register corresponding to each speed control mode (such as0x0042,0x0043,0x0047Registers, etc.) to switch to the corresponding speed control mode. For the position control speed control mode, you can only operate0x0046and0x0047Register or in0x0046Register single write 0After operation0x0047Registers for position control.0x0040~0x0047For a detailed description of the registers, see6.3.3Section.

The closed-loop speed control algorithm can be0x0070The registers are configured as speed closed loop control or time-position closed loop control.

It has the characteristics of small overshoot and smooth speed regulation at high speed, but the speed regulation may be uneven at low speed; the latter can realize the synchronous control of the rotation angles of multiple motors by multiple drivers, and the speed regulation is also smooth at low speed, which can meet the requirements of extremely low speed control, but there is a certain overshoot in the speed regulation process.

When the closed-loop speed regulation algorithm is speed closed-loop control,0x00c0~0x00c5Register configuration of closed loop speed regulationPID Parameters; when the closed-loop speed control algorithm is time-position closed-loop control,0x00c6~0x00cbRegister configuration closed loop speed control motor rotationPIDParameters, through0x00ba~0x00bfRegister configuration closed loop speed control motor self-lockingPIDParameters; when it is position closed loop control, it is also0x00c6~0x00cbRegister configuration position closed loop control motor rotationPIDparameter, 0x00ba~0x00bfWhen configuring the motor self-lockingPIDparameter.PIDIf the configuration of each parameter is too large, it may cause serious overshoot of speed or position control or even oscillation.PIDIf the parameters are configured too small, it may lead to slow adjustment and poor follow-up. They should be configured reasonablyPID Parameters to achieve the best adjustment effect.PIDFor details on parameter configuration related registers, see6.3.8introduce.

pass0x0080~0x0099Register (see6.3.5Section Description of System Parameter Configuration Registers) Configurable485 In the communication control mode, the limit switch trigger polarity, communication parameters, communication interruption protection time and stall stop time are determined.0x0095The communication interruption protection time is set by register. If there is no communication access to the driver within the set time, the driver will brake. This can solve the problem that the mechanical device is not controlled by the master station due to a communication line failure during the movement of the mechanical device. We can set the real-time status register (see6.3.2subsection) as a register that is periodically queried. We0x008eThe register sets the stall stop time. When the motor stalls, the current reaches the configured Large load current and motor speed0When this state lasts for a period of time equal to the configured stall stop time, the drive will brake. The stall stop state can be detected by0x0032Register reading, we can clear the stall stop flag by braking or reversing operation.

pass0x0020~0x0034Register (see6.3.2Section Description of the Real-time Status Register) we can read the output PWMvalue, motor commutation frequency, motor phase current, motor rotation position, motor speed and other motor-related real-time status values and real-time values of each input signal.0x0020Register ReadPWMOutput value,PWMThe output value reflects the voltage added to the motor phase line by the driver output. The phase voltage is approximately equal to the power supply voltage multiplied by the duty cycle.0x0022The register reads the motor commutation frequency. The motor commutation frequency is the frequency at which the Hall signal output by the Hall sensor changes when the motor rotates. The unit isHzThe motor phase current is the motorU,V,WThe average value of the current in the three-phase line, in units ofA.pass0x0024and0x0025 The motor rotation position read by the register is the number of commutation times (or the number of Hall pulses) when the motor rotates in a certain direction. The estimated completion time of the motor position control can be obtained by0x0026and0x0027Register read, completion status through0x0023Register read. Motor speed is measured by0x0034 Register reading, the motor speed is the measured real-time motor speed, the unit isRPMTo make the real-time speed of the motor consistent with the actual speed of the motor, you should first0x0073and0x0074Registers configure the number of motor poles and reduction ratio.

485The main registers related to the communication control method are shown in the table4.85shown.

surface4.85 485Configuration of communication control mode related registers

Register Address	Register function	value	describe
0x0040	Motor brake control	0, 1, 2	0: Normal stop 1: Emergency brake 2: Free stop
0x0042	Setting the Duty Cycle	- 1000~1000	Multiply the value by0.1%The target duty cycle
0x0043	Set the speed closed-loop control target speed	- 32768~32767	Multiply the value by0.1is the target commutation frequency, in units of Hz
0x0044	Set position closed loop control walking speed	- 32768~32767	Multiply the value by0.1is the target commutation frequency, in units of Hz
0x0045	Set the position closed loop control type	0,1	0: absolute position

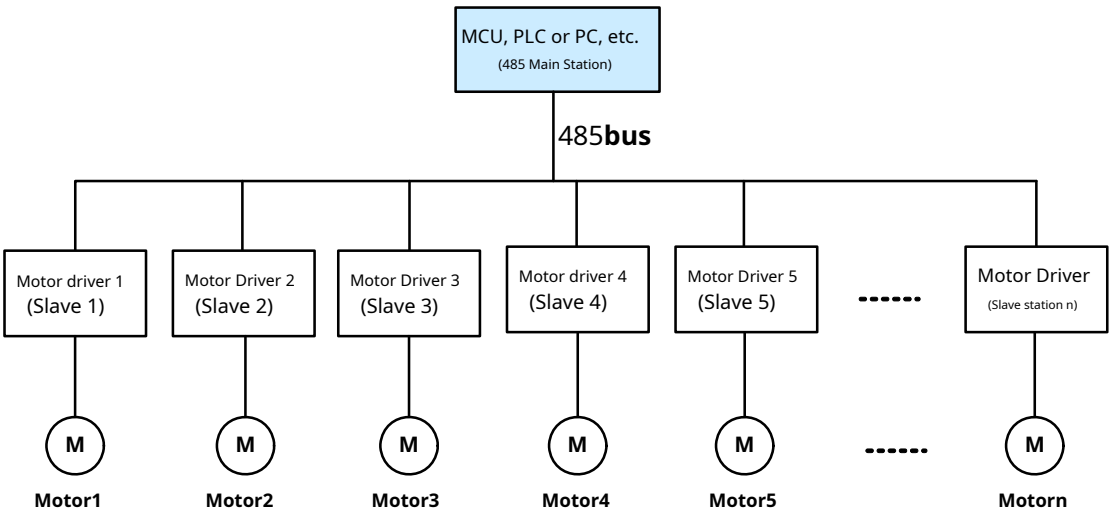
			1: Relative position
0x0046-0x0047	Set the position closed-loop control target Location	- 2147483648~2147483647	
0x0050	Temporarily set the duty cycle to increase the speed Speed buffer time	0~255	Multiply the value by0.1Output ratio is0Increase to 100.0%Time required
0x0051	Temporarily set the duty cycle to reduce the speed Speed buffer time	0~255	Multiply the value by0.1Output ratio is100. 0% Reduce to0Time required
0x0052	Temporarily set speed closed loop control, Position closed loop control acceleration Spend	0~66635	Multiply the value by0.1To increase the speed of the commutation frequency, PositionHz/s
0x0053	Temporarily set speed closed loop control, Position closed loop control deceleration and acceleration Spend	0~66635	Multiply the value by0.1To reduce the speed of the commutation frequency, PositionHz/s
0x006a	Configure motor rated current	0~400	Multiply the value by0.01is the current value, in units ofA
0x006b	Configure the motor for high load current	0~400	Multiply the value by0.01is the current value, in units ofA
0x006c	Configure the motor with large braking current	0~300	Multiply the value by0.01is the current value, in units ofA
0x0070	Configuring the speed closed-loop control algorithm	0, 1	0: Speed closed loop control 1: Time-position closed loop control
0x0071	Configuring position closed loop control allows error	0~65535	
0x0072	Configuring position closed loop control overshoot Whether to correct it later	0, 1	0: No correction 1: Make corrections
0x0073	Configure the number of motor poles	0~65535	Set the number of motor poles. The number of motor poles is usually3 Multiples of
0x0074	Configure motor reduction ratio	0~65535	
0x0020	PWMOutput value	0~1000	Multiply the value by0.1%Duty cycle
0x0021	Real-time motor phase current	0~600	Multiply the value by0.01is the current value, in units ofA
0x0022	Real-time motor commutation frequency	- 32768~32767	when0x0035Registers are1When , the value is the commutation frequency; when 0x0035Registers are0When the value is multiplied by0.1is the commutation frequency; the unit isHz; The commutation frequency is divided by the number of motor poles and then multiplied by20for Motor speed, unitRPM
0x0023	Position control completion status	0, 1	0: Not completed 1:Finish
0x0024-0x0025	Motor real-time position	- 2147483648~2147483647	
0x0026-0x0027	Position Control Estimated Remaining Completion time	0~4294967295	The unit isms
0x0032	Motor stall status	0, 1, 2	0: Not blocked 1: Forward rotation blocked and stopped 2: Reverse stall stop
0x0033	Error Status	0, 1, 2, 3, 4	0: No error

			1: Not yet learned 2：Stop 3: Hall Error 4: Unable to reach target speed
0x0034	Motor real-time speed	0~65535	when0x0035Registers are1When the value is multiplied by 10 is the speed; when0x0035Registers are0When , the value is the speed; the unit isRPM (Note: You must first pass0x0073and0x0074Registers are configured with the correct number of motor poles and reduction ratio. The speed you take is correct)
0x0035	Does the speed need to be multiplied by10	0, 1	0：The value is the speed 1: Multiply the value by10Speed

For more register descriptions, see6.3Section.

4.5.2 485Multi-site communication control

This usage uses a485Master station (the master station can bePLC, MCU orPCMachine, etc.) through485The communication method operates multiple drivers, thereby realizing the separate control of multiple motors. The topology diagram is shown in the figure4.30shown.485For multi-site communication connection, see5.4Section.



picture4.30 485Multi-site communication control topology diagram

5.Typical comprehensive connection method

5.1Typical connection method of potentiometer speed control

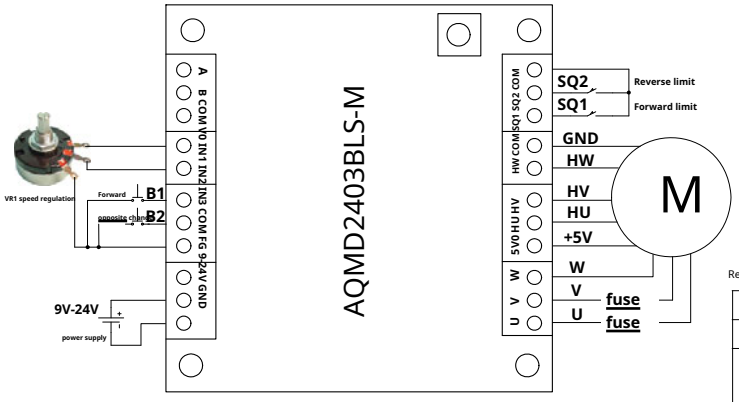
5.1.1Single potentiometer speed control method

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write0Select the potentiometer usage as single potentiometer,0x009bRegister Write 1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control, and you can achieve single potentiometer speed control mode (you can also use this driver to matchPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table5.1shown.

surface5.1Related configuration required for single potentiometer speed control method

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x01：Potentiometer	0x00：Single Potentiometer	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This connection method can use a single potentiometer to adjust the motor speed, control the start and stop and forward and reverse rotation of the motor through the switch, and limit the forward and reverse rotation through the limit switch. The typical connection method of single potentiometer speed control is shown in the figure5.1As shown in the figure, a potentiometer is usedVR1 Adjust the motor speed. PressB1, the motor rotates forward,B1When the forward limit switchSQ1After the limit is triggered, the motor stops.B1Invalid; PressB2, the motor reverses,B2When the limit switch is reversed, the motor stops. SQ2The motor stops when the limit is reached.B2invalid.



Register Configuration

Register Address	value	describe
0X009a	1	Potentiometer
0X009b	1	Duty cycle speed regulation
	3	Speed closed loop control
0X0080	0	Low level limit (default)
0X0081	0	Low level is valid (default)
0X0082	0	Single potentiometer (default)
0X0085	0	Switch value (default)

picture5.1Wiring diagram of single potentiometer speed control method

In the single potentiometer speed control mode, the reference configuration of the relevant registers is shown in the table5.2shown.

surface5.2Configuration of registers related to single potentiometer speed control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1,2,3	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger
0x0082	Potentiometer Usage	0	Single potentiometer (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

5.1.2Dual potentiometer speed control method

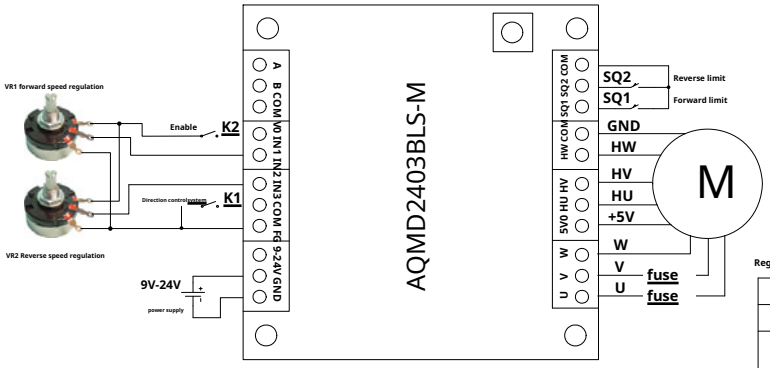
Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write1Select the input signal type as potentiometer,0x0082Register Write1,2Select the potentiometer usage as dual potentiometer independent or dual potentiometer collaborative. 0x009bRegister Write1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve dual potentiometer speed control (you can also use this driver as a supportingPCThe machine sample program configures the relevant registers. For details, see AQMDBLS_DemoUser Manual) and related configurations are shown in the table5.3shown.

surface5.3Related configuration required for dual potentiometer speed control

Control method (Button switch)	Port input type (0x009aregister)	Potentiometer Usage (0x0082register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x01：Potentiometer	0x01: Dual potentiometers independent	0x01: Duty cycle speed regulation
			0x02: Torque control
		0x02：Dual potentiometer synergy	0x03: Speed closed loop control

This connection method uses two potentiometers to adjust the speed and forward and reverse rotation of the motor. The typical comprehensive connection method of the dual potentiometer speed control method is shown in the figure5.2The usage of dual potentiometers includes independent control of dual potentiometers and cooperative control of dual potentiometers.

In the independent control mode of the potentiometer, use the potentiometerVR1andVR2The motor speed is adjusted for forward and reverse rotation respectively by switchingK2Control the motor enable through the switchK1Switch the motor rotation direction through the limit switchSQ1andSQ2Limit the forward and reverse directions respectively. For detailed usage, see4.1.4Section: In the dual potentiometer cooperative control mode, the potentiometerVR2Used to set the midpoint of the reference voltage, potentiometerVR1Control motor speed and direction, limit switchSQ1andSQ2Limit the forward and reverse rotation respectively. For detailed usage, see4.1.6Section.



Register Configuration

Register Address	value	describe
0X009a	1	Potentiometer
0X009b	1	Duty cycle speed regulation
	3	Speed closed loop control
0X0080	0	Low level limit (default)
0X0081	0	Low level is valid (default)
0X0082	1	Dual potentiometer independent
	2	Dual potentiometer synergy
0X0085	0	Switch value (default)

picture5.2Wiring diagram of dual potentiometer speed control method

Under dual potentiometer speed regulation, the reference configuration of related registers is shown in the table5.4shown.

surface5.4Configuration of related registers of dual potentiometer speed control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1,2,3	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger
0x0082	Potentiometer Usage	1,2	1: Dual potentiometers independent 2: Dual potentiometer synergy
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0	The minimum output voltage value of the potentiometer is0(default)
0x0087	Potentiometer maximum value	0x0CDA	The maximum output voltage of the potentiometer is3290mV(default)
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	1	Potentiometer

0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

5.2Typical connection method of single chip microcomputer control

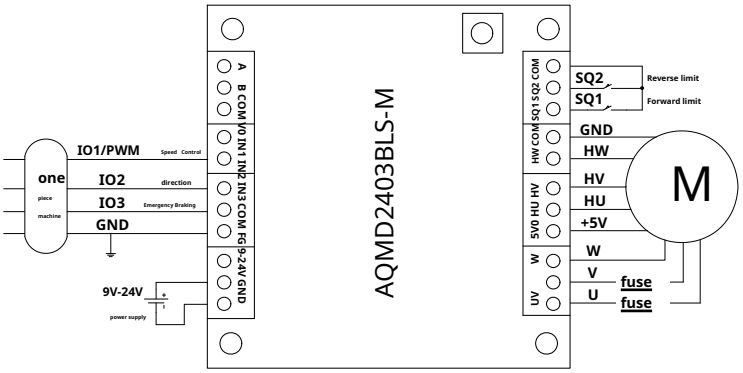
5.2.1MicrocontrollerPWMSignal speed control method

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write0Configure the pulse signal toPWM,Towards0x009bRegister Write1~3 Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achieve single chipPWMSignal speed control method (can also be used with this driver)PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table5.5 shown.

surface5.5MicrocontrollerPWMRelated configuration required for signal speed regulation

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x03: Pulse signal	0x00:PWM	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This connection method can realize the output through the microcontrollerPWMThe signal controls the motor speed through the microcontrollerIOThe signal controls the start and stop and the forward and reverse rotation, and the limit switches are used to limit the forward and reverse rotation.PWMThe typical connection method of signal duty cycle/closed loop speed regulation is shown in the figure5.3The driveCOMConnected to the power ground of the microcontroller;IN1Connect to microcontrollerPWMOutput, used for speed regulation;IN2andIN3The two differences with the microcontrollerIOThey are connected to control the motor forward and reverse rotation and emergency braking.SQ1 andSQ2Set limits for forward and reverse rotation respectively.



Register Configuration

Register Address	value	describe
0X009a	3	Pulse signal
0X009b	1	Duty cycle speed regulation
	3	Speed closed loop control
0X0080	0	Low level limit (default)
0X0081	0	Low level is valid (default)
0X0083	0	PWM (default)
0X0085	1	0/3.3V
	2	0/5V

picture5.3MicrocontrollerPWMConnection method of signal duty cycle/closed loop speed regulation mode

MicrocontrollerPWMIn the signal speed regulation mode, the reference configuration of the relevant registers is shown in the table5.6shown.

surface5.6MicrocontrollerPWMConfiguration of signal speed control related registers

Register Address	Register function	value	describe

0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0083	Pulse signal type	0	PWM(default)
0x0085	Logic level type	0,1,2	0: Switch value (default, if51The microcontroller should be configured as this) 1:0/3.3V（ARMThe microcontroller is usually3.3VOutput) 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

5.2.2Single chip pulse signal position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write2Configure the pulse signal as pulse (count),0x009bRegister Write4Configure the speed control mode as position closed-loop control to achieve the single-chip pulse signal position control mode (this driver can also be used as a supportingPCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table5.7shown.

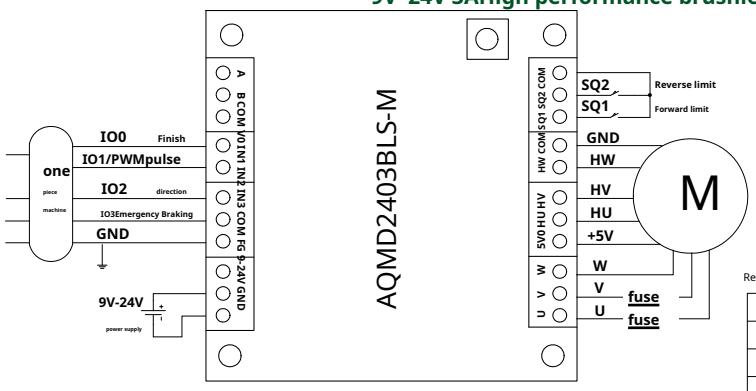
surface5.7Related configuration required for single chip pulse signal position control method

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x03: Pulse signal	0x02: Pulse (count)	0x04: Position closed loop control

This connection method can be used to control the motor rotation position using pulse signals in the single chip microcomputer. Typical connection diagram of single chip microcomputer pulse signal position control5.4shown.

DriverCOMConnected to the power ground of the microcontroller;IN1Connect to microcontrollerIO1, receiving pulse signals from the microcontroller, used to control the motor stepping;IN2Connect to microcontrollerIO2, used to control the stepping direction;IN3Connect to microcontrollerIO3, used to control emergency stop;VOWith microcontrollerIO0connected to output a completion signal to notify the microcontroller that the position control process has been completed; limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.

Note:VOThe output is3.3VLogic level, if the microcontroller does not accept3.3VLogic level, need to be converted to5V Logic level.



Register Configuration

Register Address	value	describe
0X009a	3	Pulse signal
0X009b	4	Position closed loop control
0X0080	0	Low level limit (default)
0X0081	0	Low level is valid (default)
0X0083	2	pulse

picture5.4Single chip microcomputer pulse signal position control method

In the single chip pulse signal position control mode, the reference configuration of the relevant registers is shown in the table5.8shown.

surface5.8Configuration of related registers of single chip microcomputer pulse signal position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0083	Pulse signal type	2	Pulse (Count)
0x0085	Logic level type	0,1,2	0: Switch value (default, if51The microcontroller should be configured as this) 1:0/3.3V（ARMThe microcontroller is usually3.3VOutput) 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x008c-0x008d	Pulse signal magnification	1.0f	default value1.0f; Used to configure the step size per pulse
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	0	No reset; usually no reset is required for step control, but Configure the reset mode according to the situation

5.3 PLCTypical connection method of control method

5.3.1 PLCAnalog signal speed control

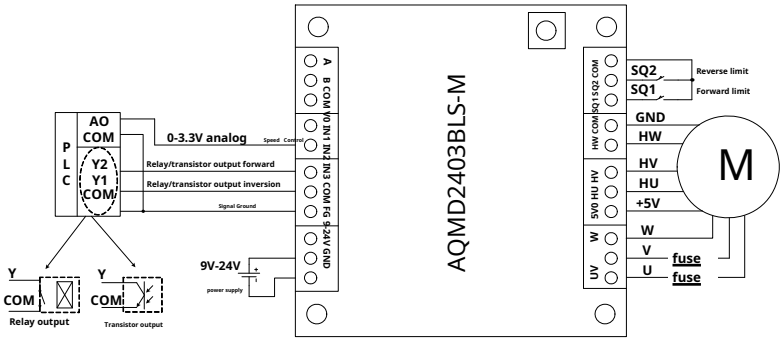
Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write2Select the input signal type as analog signal.0x0084Register Write0Configure the analog signal type to single-ended signal.0x009bStorage

Device Writing1~3Configure the speed control mode as duty cycle speed control, torque control or speed closed loop control to achievePLCAnalog signal speed control method (can also be used with this driver)PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_Demo User Manual) and related configurations are shown in the table5.9shown.

surface5.9 PLCRelated configuration required for analog signal speed control connection

Control method (Button switch)	Port input type (0x009aregister)	Analog signal type (0x0084register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x02:analog signal	0x00: Single-ended signal	0x01: Duty cycle speed regulation
			0x02: Torque control
			0x03: Speed closed loop control

This connection method can be usedPLCTo adjust the speed and forward and reverse rotation of the motor.PLCThe typical comprehensive connection method of analog signal duty cycle speed regulation is shown in the figure5.5The driveCOMandPLCRelayCOMThe terminal and the analog signal ground are connected;IN1 catchPLCAnalog outputAO, used for speed regulation;IN2,IN3RespectivelyPLCRelay/transistor outputY2andY1, respectively control the motor forward and reverse; through the limit switchSQ1andSQ2Set limits for forward and reverse rotation respectively.



Register Configuration

Register Address	value	describe
0X009a	2	analog signal
0X009b	1	Duty cycle speed regulation
	3	Speed closed loop control
0X0080	0	Low level limit (default)
0X0081	0	Low level is valid (default)
0X0084	0	Single-ended signal (default)
0X0085	0	Switch value (default)
0X0088	0	0mV
0X0089	0X0CE4	3300mV

picture5.5 PLCAnalog signal speed control wiring diagram

PLCIn analog signal speed control mode, the reference configuration of related registers is shown in Table5.10shown.

surface5.10 PLCConfiguration of registers related to analog signal speed regulation (level trigger) mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0084	Analog signal type	0	Single-ended analog signal (default)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x0088	Analog range minimum value	0	The minimum analog range is0(default)

0x0089	Analog range maximum value	0x0CE4	The maximum analog range is3300mV(Default), can also be configured to other values according to requirements
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as2000mV (Default), other logic levels are configured separately
0x0096-0x0097	Analog signal adjustment factork	1.0f	default value1.0f, used to adjust the analog signal magnification
0x0098	Analog signal adjustment factorb	0	The unit ismV,default value0, used to correct the analog signal dead zone
0x009a	Port input type	2	analog signal
0x009b	Port Control Type	1,2,3	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control

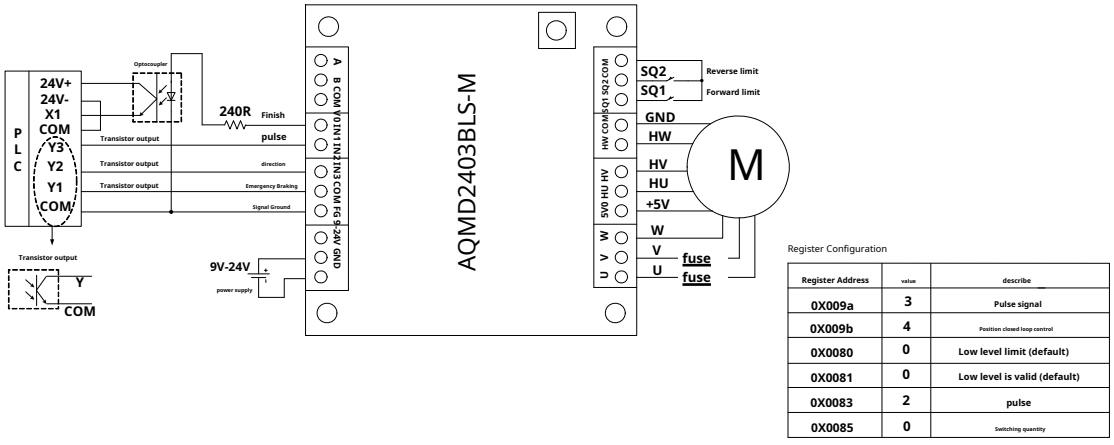
5.3.2 PLCPulse signal position control

Press the button to switch the control mode to digital/analog signal control mode. At this time, the yellow indicator light is always on and the green indicator light is always on.0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1subsection), to0x009aRegister Write3Select the input signal type as pulse signal.0x0083Register Write2Configure the pulse signal type to pulse (counting).0x009b Register Write4 Configure the speed control mode as position closed-loop control to achievePLCPulse signal position control method (can also be used with this driver)PCThe machine sample program configures the relevant registers. For details, seeAQMDBLS_DemoUser Manual) and related configurations are shown in the table5.11shown.

surface5.11 PLCRelated configuration required for pulse signal position control

Control method (Button switch)	Port input type (0x009aregister)	Pulse signal type (0x0083register)	Port Control Type (0x009bregister)
Digital/analog signal control method	0x03: Pulse signal	0x02: Pulse (count)	0x04: Position closed loop control

This connection can be realized inPLCThe motor rotation position is controlled by pulse signal.PLCThe typical integrated connection method of pulse signal position control is shown in the figure5.6The driveCOMcatchPLCSignal ground;IN1catchPLCofY3 ,acceptPLCThe pulse signal is used to control the motor stepping;IN2catchPLCofY2, used to control the stepping direction;IN3catchPLCof Y1, used to control the motor emergency stop; the driverVOPort series one240Ohm resistance, andVOandCOMandPLCofX1and 24V+ Connect an optocoupler between them to output a completion signal to notifyPLCPosition control process is complete; limit switch SQ1 andSQ2Set limits for forward and reverse rotation respectively.



Register Configuration

Register Address	value	describe
0X009a	3	Pulse signal
0X009b	4	Position closed loop control
0X0080	0	Low level limit (default)
0X0081	0	Low level is valid (default)
0X0083	2	pulse
0X0085	0	Switching quantity

picture5.6 PLCSchematic diagram of pulse signal position control connection

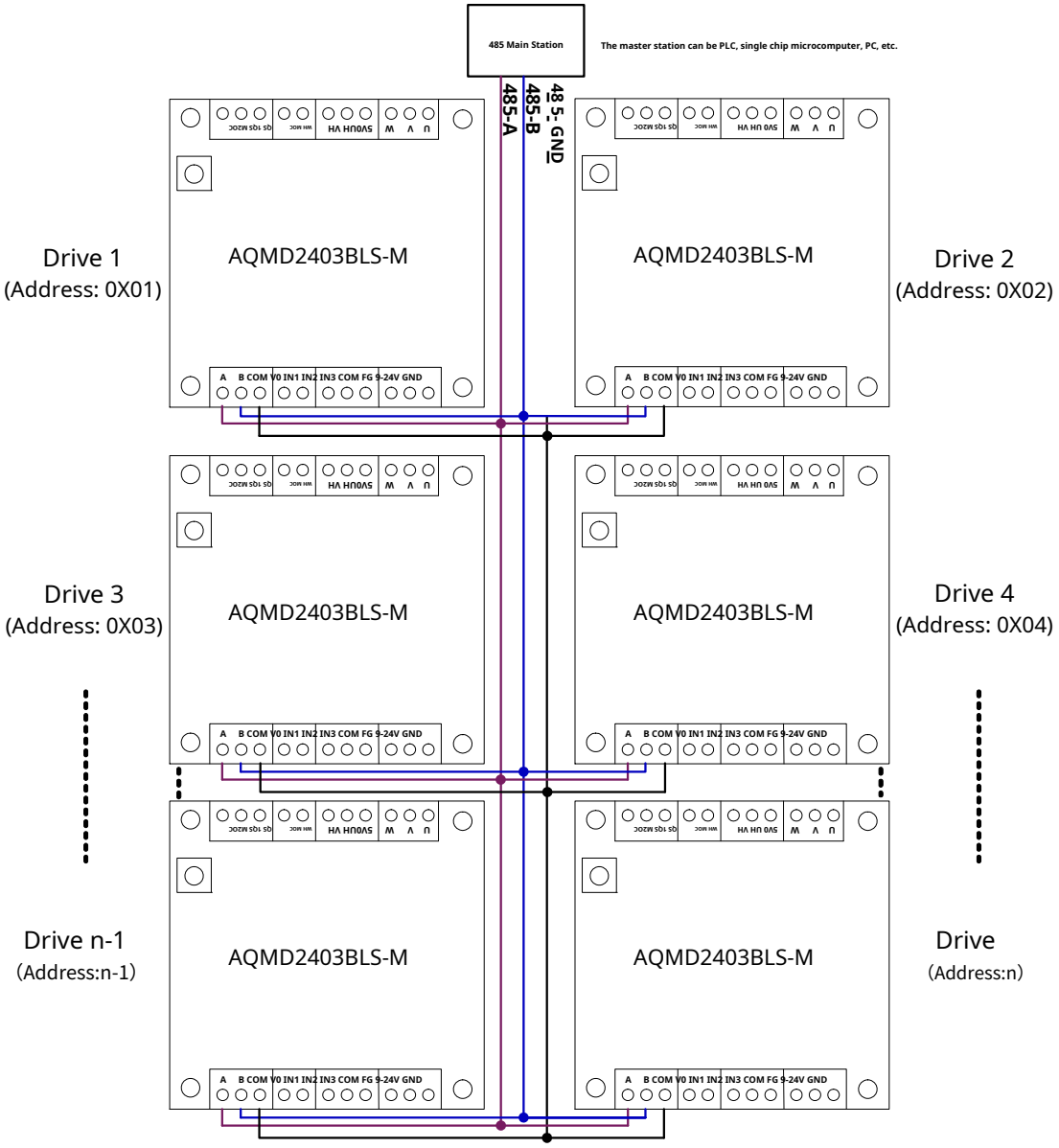
PLCIn pulse signal position control mode, the reference configuration of related registers is shown in Table5.12shown.

surface5.12 PLCConfiguration of registers related to pulse signal position control mode

Register Address	Register function	value	describe
0x0080	Limit trigger polarity	0,1,2,3,4	0: Low level trigger (default) 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1	0: Low level trigger (default) 1: High level trigger
0x0083	Pulse signal type	2	Pulse (Count)
0x0085	Logic level type	0,1,2	0: Switch value (default) 1:0/3.3V 2:0/5V
0x008a	Logic level threshold	0x07D0	The switching logic level voltage threshold can be configured as 2000mV(Default), other logic levels are configured separately
0x008c-0x008d	Pulse signal magnification	1.0f	default value1.0f; Used to configure the step size per pulse
0x009a	Port input type	3	Pulse signal
0x009b	Port Control Type	4	Position closed loop control
0x00a0	Position reset mode	0	No reset; usually no reset is required for step control, but Configure the reset mode according to the situation

5.4 485Multi-site communication control

RS485The schematic diagram of multi-site communication is shown in the figure5.7All drives485Signal lineA,BAfter being connected in parallel 485Main Station485Signal lineA,BTo make the signal more stable,COMAfter connection, it is connected to the signal ground of the master station. Switch the control mode to485Communication control mode, the yellow indicator light is off and the green indicator light is on0.5/2HzFrequency flashing (For details on how to operate the buttons, see2.1.1The slave address configured for each drive should be unique and cannot be the same as other drives. For the configuration method of the drive slave address, see2.1.5Section.485The master station specifies which drive to operate through the address byte in the communication frame. Only the drive with the same address as the address specified in the communication frame will respond to the master station's request (see How to configure the slave station address2.1.5If the communication line is long, you can485Signal lines are connected in parallel120ΩThe terminal resistance is used to eliminate the interference caused by reflection in the communication line.



picture5.7 RS485Multi-site communication wiring diagram

6.Communication Protocol

This drive usesMODBUS-RTU(National StandardGB/T19582-2008) communication protocol, supports one master station to control multiple slave stations, and can be configured through the DIP switch128slave station address, the master station can be a single-chip microcomputer,PLCorPCFor the configuration of slave station address, see2.1.5Section.

6.1Communication parameters

When using potentiometer/analog signal control mode, the serial port baud rate is fixed at9600bps, the data bits are8bit, even parity, stop bit is1bits; the slave address is fixed to0x01.

When using serial communication control mode, the baud rate defaults to9600bps, the data bits are8bit, even parity, stop bit is1Bit; Baud rate configurable range1200-115200bps, the data bits are fixed to8The check mode can be configured as odd check, even check or no check. When it is odd or even check, the stop bit is1When there is no check, the stop bit is2bits; the slave address is0x009c Register settings.

Each character uses11bits (1The start bit,8Data bit,1Check digit plus1stop bit or no parity bit plus2bit stop bit); when the baud rate is19200bpsWhen the character timeout is1.5Character spacing; 19200bpsWhen the time is above, the timeout period is0.75ms;When a character timeout occurs, the previously received data will be considered invalid; the frame timeout is 3.5character interval. When a frame timeout occurs, it means that the frame has been sent successfully.

6.2 MODBUS-RTUFrame format

This driver supportsMODBUSof0x03(Read Holding Register),0x06(write single register),0x10(write multiple registers) and0x2B(Read Device Identification Code) function code.

6.2.1 0x03Read Holding Registers

The master sends:

byte	1	2	3	4	5	6	7	8
content	ADR	0x03	Initial deposit High Byte	Initial deposit Low Byte	Number of registers High Byte	Number of registers Low Byte	CRCLow byte	CRChigh byte

No.1byteADR： Slave address code (=001~254)2

byte0x03： Read register value function code3,

4byte: The starting address of the register to be read

No.5,6byte: Number of registers to read

No.7,8byte: From Byte1arrive6ofCRC16Check code

Slave sendback:

byte	1	2	3	4,5	6,7		M-1,M	M+1	M+2
content	ADR	0x03	Total bytes	register data1	register data2	...	register dataM	CRCLow byte	CRChigh byte

No.1byteADR： Slave address code (=001~254)2

byte0x03： Return to read function code3byte:

from4arriveM(include4andM)

No.4arriveMByte: Register data

No.M+1,M+2Bytes: From Bytes1arriveMofCRC16When the slave receives an error, the slave returns:

byte	1	2	3	4	5
content	ADR	0x83	Exception code	CRCLow byte	CRChigh byte

No.1byteADR: From address code (=001~254)

No.2byte0x83: Reader value error

No.3Byte exception code: see6.2.4Sections

No.4,5Bytes: From Section1arrive3ofCRC16Check code

6.2.2 0x06Writing a single register

The master sends:

byte	1	2	3	4	5	6	7	8
content	ADR	0x06	Register High Byte Address	Register Low Byte Address	Data High byte	Data low byte	CRCcode Low Byte	CRCcode High Byte

When the slave receives the data correctly, it sends back:

byte	1	2	3	4	5	6	7	8
content	ADR	0x06	Register High Byte Address	Register Low Byte Address	Data High byte	Data low byte	CRCcode Low Byte	CRCcode High Byte

When a slave receives an error, the slave sends back:

byte	1	2	3	4	5
content	ADR	0x86	Exception code	CRCLow byte	CRChigh byte

No.1byteADR: From address code (=001~254)

No.2byte0x86: Write register value error function code

No.3Byte exception code: see6.2.4Sections

No.4,5Bytes: From Bytes1arrive3ofCRC16Check code

6.2.3 0x10Writing multiple register values

The master sends:

byte	1	2	3	4	5	6	7
content	ADR	0x10	Start register High byte address	Start register Low byte address	Number of registers High Byte	Number of registers Low Byte	Data Bytes total

byte	8,9	10,11	N,N+1	N+2	N+3
content	register data1	register data2	register dataM	CRCCode Low byte	CRCcode High Byte

When the slave receives the data correctly, it sends back:

byte	1	2	3	4	5	6	7	8
content	ADR	0x10	Register High Byte Address	Register Low Byte Address	Number of registers High Byte	Number of registers Low Byte	CRCcode Low Byte	CRCcode High Byte

When a slave receives an error, the slave sends back:

byte	1	2	3	4	5
content	ADR	0x90	Exception code	CRCLow byte	CRChigh byte

No.1byte ADR: Slave address code (=001~254)

No.2byte 0x90: Error writing register value

No.3byte Exception code: see6.2.4Sections

No.4,5byte: From Byte1arrive3ofCRC16Check code

6.2.4Error exception code

1. MODBUSException code

surface6.1 MODBUSAbnormal code table

Exception code	meaning
0x01	Illegal function code
0x02	Illegal data address
0x03	Illegal data value
0x04	Slave device failure
0x05	The request has been confirmed, but it will take a long time to process.
0x06	Slave device busy
0x08	Storage parity error
0x0A	Unavailable Gateway
0x0B	The gateway target device failed to respond

2. Extended exception code

surface6.2Extended exception code table

Exception code	meaning
0x40	Prohibited Operations
0x60	The motor phase sequence has not yet been learned
0xff	Undefined Error

6.3Register Definition

6.3.1Device Description Register

Register Address	describe	Value range	Support function code	Remark
0x0000	Equipment identification		0x03	
0x0001	Device version number		0x03	The high byte is the main version number, the low byte is Minor version number
0x0002 | 0x0009	Device Name		0x03	by'\0'End of string
0x000A	PWMThe inverse of resolution		0x03	
0x000B	PWMfrequency		0x03	The unit isHz

0x000C	Large output current		0x03	Multiply the value by0.01is the current value, single PositionA
0x000D	Current resolution		0x03	The unit ismA
0x000E	reserve		0x03	
0x000F	reserve		0x03	

6.3.2Real-time status register

Register Address	describe	Value range	Support function code	Remark
0x0020	real timePWM	0~1000	0x03	Multiply the value by0.1%Duty cycle
0x0021	Real-time current	0~600	0x03	Multiply the value by0.01is the current value, The unit isA
0x0022	Real-time commutation frequency (speed)	- 32768~32767	0x03	when0x0035Registers are1When , the value is the commutation frequency; when 0x0035Registers are0When the value is multiplied by0.1is the commutation frequency; single PositionHz; Commutation frequency divided by electrical The number of poles is multiplied by20For motor Speed, unitRPM
0x0023	Position control completion status	0, 1	0x03	0: Not completed 1:Finish
0x0024	Motor real-time position high half word	- 2147483648~2147483647	0x03	Motor commutation pulse number
0x0025	Motor real-time position low half word			
0x0026	Remaining completion time high half word	0~4294967295	0x03	The unit isms
0x0027	Remaining completion time is half a word lower			
0x0028	IN1Voltage	0~3300	0x03	The signal source is a potentiometer or analog signal NumberIN1Port voltage, in mV (Note: The signal source is a pulse signal When International voltage)
0x0029	IN2Voltage	0~3300	0x03	The unit ismV
0x002a	IN3Voltage	0~3300	0x03	The unit ismV
0x002b	Differential Voltage	- 3300~3300	0x03	The unit ismV
0x002c	SQ1Level	0,1	0x03	0：Low level 1: High level
0x002d	SQ2Level	0,1	0x03	0：Low level 1: High level
0x002e	IN1Input duty cycle	0~1000	0x03	Multiply the value by0.1%Duty cycle
0x002f	IN1Input frequency	0~100000	0x03	The unit isHz
0x0030	IN1Input pulse high half word	- 2147483648~2147483647	0x03	Number of input pulses
0x0031	IN1Input pulse low half word			

0x0032	Stall state	0, 1, 2	0x03	0: Not blocked 1：Forward rotation blocked and stopped 2: Reverse stall stop
0x0033	Error Status	0~9	0x03	0: No error 1: Not yet learned 2：Stop 3: Hall Error 4: Unable to reach target speed 5: Coil error (not supported by this model) 6: Overcurrent shutdown 7: Overtemperature shutdown 8: Overvoltage shutdown 9: Undervoltage shutdown
0x0034	Motor speed	0~65535	0x03	when0x0035Registers are1When , the value is multiplied by10is the speed; when 0x0035Registers are0When , the value is the speed; the unit isRPM (Note: You must first pass0x0073and 0x0074Register configuration is correct Number of motor poles and reduction ratio, read The speed is correct)
0x0035	Does the speed need to be multiplied by10	0, 1	0x03	0：The value is the speed 1: Multiply the value by10Speed
0x0037	Internal (drive circuit) temperature	- 400~1250	0x03	Multiply the value by0.1℃ is temperature
0x0038	Supply voltage	0~270	0x03	Multiply the value by0.1V is the voltage

6.3.3Speed Control Register

Register Address	describe	Value range	Support function code	Remark
0x0040	stop	0, 1, 2	0x06	0: Normal stop 1: Emergency brake 2: Free stop
0x0041	reserve		No access	
0x0042	Setting the Duty Cycle	- 1000~1000	0x06	Multiply the value by0.1%The target duty cycle
0x0043	Set the speed closed-loop control target Speed (commutation frequency)	- 32768~32767	0x06	Multiply the value by0.1The target switching frequency Rate, in units ofHz
0x0044	Set position closed loop control walking Speed (commutation frequency)	- 32768~32767	0x06	Multiply the value by0.1The target switching frequency Rate, in units ofHz
0x0045	Set the position closed loop control type	0, 1	0x06	0: absolute position 1: Relative position
0x0046	Set the position closed-loop control target Position high half word	- 2147483648~2147483647	0x06	If it is an absolute position, it can be used at any time Change the target position; if it is a relative position If the position is set, wait for the last position control The next operation can be performed only after completion
0x0047	Set the position closed-loop control target Position half word lower			

0x0048 | 0x004F	reserve		No access	
0x0050	Duty cycle speed regulation acceleration buffer between	0~255	0x03 0x06 0x10	Multiply the value by0.1Output ratio is 0Increase to100.0%Time required
0x0051	Duty ratio speed regulation deceleration buffer between	0~255	0x03 0x06 0x10	Multiply the value by0.1Output ratio is 100. 0%Reduce to0Time required
0x0052	Speed closed loop control, position closed loop Control acceleration	0~66635	0x03 0x06 0x10	Multiply the value by0.1To increase the commutation frequency Speed, inHz/s
0x0053	Speed closed loop control, position closed loop Control deceleration acceleration	0~66635	0x03 0x06 0x10	Multiply the value by0.1To reduce the commutation frequency Speed, inHz/s

6.3.4Motor control parameter configuration register

Register Address	describe	Value range	Support function code	Remark
0x0060	The default duty cycle speed control is increased when powered on. Speed buffer time	0~255	0x03 0x06 0x10	Multiply the value by0.1Output ratio is empty Depend on0Increase to100.0%Time required
0x0061	The default duty cycle speed reduction is set when power is turned on. Speed buffer time	0~255	0x03 0x06 0x10	Multiply the value by0.1Output ratio is empty Depend on100.0%Reduce to0Time required
0x0062	Speed closed loop control, position closed loop Controlling large acceleration	0~66635	0x03 0x06 0x10	Multiply the value by0.1is the commutation frequency Maximum increase rate, in units ofHz/s
0x0063	Default speed closed loop/bit at power on Closed loop control acceleration	0~66635	0x03 0x06 0x10	Multiply the value by0.1Increase the switching frequency Maximum speed, inHz/s
0x0064	Speed closed loop control, position closed loop Controlling large deceleration acceleration	0~66635	0x03 0x06 0x10	Multiply the value by0.1is the commutation frequency Maximum reduction speed, in unitsHz/s
0x0065	Default speed closed loop/bit at power on Closed loop control deceleration acceleration	0~66635	0x03 0x06 0x10	Multiply the value by0.1The commutation frequency is reduced Small speed, unit isHz/s
0x0066	Speed closed loop control, position closed loop Control maximum speed (commutation frequency)	0~32767	0x03 0x06 0x10	Multiply the value by0.1is the commutation frequency, The unit isHz
0x0067	Speed closed loop control at power on/position Set the closed loop control default speed (change Direction frequency)	0~32767	0x03 0x06 0x10	Multiply the value by0.1is the commutation frequency, The unit isHz
0x0068	reserve	0	0x03 0x06 0x10	
0x0069	Position control algorithm	0, 1, 2	0x03 0x06 0x10	0: Horizontal positioning control 1: Horizontal sliding positioning control 2：Vertical positioning control
0x006a	Motor rated current	0~400	0x03 0x06 0x10	Multiply the value by0.01is the current value, single PositionA
0x006b	Motor high load current	0~400	0x03 0x06 0x10	Multiply the value by0.01is the current value, single PositionA
0x006c	Motor large braking current	0~300	0x03 0x06 0x10	Multiply the value by0.01is the current value, single PositionA

0x006d | 0x006f	Motor phase sequence data6byte	1~6	0x03 0x06 0x10	Only the motor learning status is not learned To perform write operations, otherwise the write operation The operation will be ignored
0x0070	Speed closed loop control algorithm	0, 1, 2	0x03 0x06 0x10	0: Speed closed loop control 1: Time-position closed loop control 2: Time-position rate control
0x0071	Position closed loop control allowable error	0~65535	0x03 0x06 0x10	
0x0072	Position closed loop control overshoot correction	0, 1	0x03 0x06 0x10	0: No correction 1: Make corrections
0x0073	Number of motor poles	0~65535	0x03 0x06 0x10	
0x0074	Motor reduction ratio	0~65535	0x03 0x06 0x10	Multiply the value by0.1is the motor reduction ratio
0x0075	Motor learning status	0, 1	0x03 0x06 0x10	0: Not learned 1: Learned (Only through motor learning operation Ability to change unlearned status to learned Status, cannot be written directly1)
0x0076	Disable motor phase sequence learning function	0, 1	0x03 0x06 0x10	0: Not disabled 1: Disable
0x0077	Speed setting value ×10	0, 1	0x03 0x06 0x10	0: Disable 1: Enable
0x0078	Normal self-locking current	0~300	0x03 0x06 0x10	Multiply the value by0.01is the current value, single PositionA (Note: must be less than the rated power of the motor Flow1/2Otherwise, the motor may heat up. Burnt motor)
0x0079	The short-time maximum output current is Multiples of large load current	0, 100~200	0x03 0x06 0x10	0: Disable current doubler Others: Multiply the value by0.01times
0x007a	Allowable current double output time	0~999	0x03 0x06 0x10	0: Disable current doubler Others: Multiply the value by0.1Second

6.3.5System parameter configuration register

Register Address	describe	Value range	Support function code	Remark
0x0080	Limit trigger polarity	0,1,2,3,4	0x03 0x06 0x10	0: Low level trigger 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger 4: Disable limit function
0x0081	Digital signal polarity	0,1,2,3	0x03 0x06 0x10	0: Low level trigger 1: High level trigger 2: Falling edge trigger 3: Rising edge trigger

0x0082	Potentiometer Usage	0,1,2	0x03 0x06 0x10	0：Single Potentiometer 1: Dual potentiometers independent 2：Dual potentiometer synergy
0x0083	Pulse signal type	0,1,2	0x03 0x06 0x10	0:PWM 1:frequency 2:pulse
0x0084	Analog signal type	0,1,2,3	0x03 0x06 0x10	0: Single-ended signal 1: Differential signal 2: Dual single-ended signals independent 3: Dual single-ended signal coordination
0x0085	Logic level type	0,1,2	0x03 0x06 0x10	0：Switch quantity 1:0/3.3V 2:0/5V
0x0086	Potentiometer minimum value	0~3300	0x03 0x06 0x10	The unit ismV
0x0087	Potentiometer maximum value	0~3300	0x03 0x06 0x10	The unit ismV
0x0088	Analog range minimum value	0~3300	0x03 0x06 0x10	The unit ismV
0x0089	Analog range maximum value	0~3300	0x03 0x06 0x10	The unit ismV
0x008a	Logic level threshold	0~3300	0x03 0x06 0x10	The unit ismV
0x008b	Potential comparison dead zone	0~3300	0x03 0x06 0x10	The unit ismV
0x008c	Pulse signal multiplication four-byte floating point Type high half word		0x03 0x06 0x10	
0x008d	Pulse signal multiplication four-byte floating point Type low half word			
0x008e	Stall stop time	0~255	0x03 0x06 0x10	Multiply the value by0.1When the motor stops The unit iss
0x008f	Instantaneous overcurrent shutdown value			When the current peak reaches this value, the input is turned off. out
0x0090	Baud rate high half word	9600~115200	0x03 0x06 0x10	
0x0091	Baud rate low half word			
0x0092	Verification method	0,1,2	0x03 0x06 0x10	0：No check+2Stop bits 1: Odd parity +1Stop bits 2: Even parity +1Stop bits
0x0093	485Control the default speed control mode	0,1,2	0x03 0x06 0x10	0: Duty cycle 1: Speed closed loop control 2: Position closed loop control
0x0094	485Parameter configuration is prohibited during control	0, 1	0x03 0x06 0x10	0: Not prohibited 1:prohibit

0x0095	Communication interruption stop time	0~255	0x03 0x06 0x10	Multiply the value by0.1Stop for communication interruption End time, in units ofs
0x0096	Analog signal adjustment factorkFour characters Floating point high halfword		0x03 0x06 0x10	Cannot be less than0
0x0097	Analog signal adjustment factorkFour characters Floating point low halfword			
0x0098	Analog signal adjustment factorb	0~65535	0x03 0x06 0x10	The unit ismV
0x0099	Disable Alarm	0,1	0x03 0x06 0x10	0: Do not disable 1: Disable
0x009a	Port input type	1,2,3,4	0x03 0x06 0x10	1：Potentiometer 2:analog signal 3: Pulse signal 4: Built-in program
0x009b	Port Control Type	1,2,3,4,5,6	0x03 0x06 0x10	1: Duty cycle speed regulation 2: Torque control 3: Speed closed loop control 4: Position closed loop control 5: Preset speed control 6: Built-in program (Note: This register is in digital/analog (Effective in signal control mode)
0x009c	485Control mode Slave address	1~254		
0x009d	Digital/analog signal control method Communication parameters and slave address selection	0,1		0: Digital/analog signal control mode Baud rate9600bps, even test,1 Stop bit, slave address0x01 1: Digital/analog signal control mode Also used485Control mode communication Parameters and slave addresses

6.3.6Reciprocating position control parameters

Register Address	describe	Value range	Support function code	Remark
0x00a0	Reset Mode	0,1,2,3,4	0x03 0x06 0x10	0: Do not reset 1:SQ2Reset 2:SQ1Reset 3:SQ2Reset and fine tune 4:SQ1Reset and fine tune
0x00a1	Whether to enable reset fine adjustment	0, 1	0x03 0x06 0x10	0: Disable 1: Enable
0x00a2	Total stroke high half word	- 2147483648~ 2147483647	0x03 0x06 0x10	
0x00a3	Total stroke lower half word			
0x00a4	Reset coarse speed	0~65535	0x03 0x06 0x10	Multiply0.1is the commutation frequency

0x00a5	Reset fine speed	0~65535	0x03 0x06 0x10	Multiply0.1is the commutation frequency
0x00a6	Final speed after reaching the endpoint	0~65535	0x03 0x06 0x10	Multiply0.1is the commutation frequency
0x00a7	Amount of signal change to ignore	0~1000	0x03 0x06 0x10	Multiply the value by0.1%To be ignored The ratio of input signal change; To solve potentiometer, analog signal, Duty cycle or frequency signal fluctuation problem
0x00a8	Whether to reset after limit	0, 1	0x03 0x06 0x10	0:no 1:yes Used to solve the problem of mechanical wheel slippage Stroke error problem
0x00a9	Reset torque	0~300	0x03 0x06 0x10	0： Large torque 1: Torque corresponding to the configured current
0x00aa	Reset test	0,1,2,3,4	0x03 0x06 0x10	0: Non-reset state 1: Cancel reset 2:SQ1Reset 3:SQ2Reset 4：Measurement stroke

6.3.7Preset Speed Register

Register Address	describe	Value range	Support function code	Remark
0x00b0	Working Mode	0,1,2,3	0x03 0x06 0x10	0: Duty cycle 1: Torque 2: Speed closed loop 3：Position closed loop
0x00b1	Control method	0, 1	0x03 0x06 0x10	0: Double contact/logic level control 1: Single contact/logic level control
0x00b2	Forward speed	Duty cycle mode: 0~1000 Torque mode: 0~2000 Speed position closed loop: 0~65536	0x03 0x06 0x10	Multiply the value by0.1%is the duty cycle; Multiply the value by0.01is the torque; Multiply the value by0.1is the commutation frequency;
0x00b3	Reverse speed	Duty cycle mode: 0~1000 Torque mode: 0~2000 Speed position closed loop: 0~65536	0x03 0x06 0x10	Multiply the value by0.1%is the duty cycle; Multiply the value by0.01is the torque; Multiply the value by0.1is the commutation frequency;

6.3.8Closed-loop controlPIDParameter configuration register

Register Address	describe	Value range	Support function code	Remark
0x00ba	Position self-lockingPCoefficient four-byte floating point Type high half word	suggestion0.1~100	0x03 0x06 0x10	
0x00bb	Position self-lockingPCoefficient four-byte floating point Type low half word			
0x00bc	Position self-lockingICoefficient four-byte floating point Type high half word	suggestion0.001~1	0x03 0x06 0x10	
0x00bd	Position self-lockingICoefficient four-byte floating point Type low half word			
0x00be	Position self-lockingDCoefficient four-byte floating point Type high half word	suggestion0.001~1	0x03 0x06 0x10	
0x00bf	Position self-lockingDCoefficient four-byte floating point Type low half word			
0x00c0	Speed closed loop controlPCoefficient four bytes Floating point high halfword	suggestion0.001~1	0x03 0x06 0x10	
0x00c1	Speed closed loop controlPCoefficient four bytes Floating point low halfword			
0x00c2	Speed closed loop controlICoefficient four bytes Floating point high halfword	suggestion0.001~1	0x03 0x06 0x10	
0x00c3	Speed closed loop controlICoefficient four bytes Floating point low halfword			
0x00c4	Speed closed loop controlDCoefficient four bytes Floating point high halfword	suggestion0.001~1	0x03 0x06 0x10	
0x00c5	Speed closed loop controlDCoefficient four bytes Floating point low halfword			
0x00c6	Position closed loop controlPCoefficient four bytes Floating point high halfword	suggestion0.1~100	0x03 0x06 0x10	
0x00c7	Position closed loop controlPCoefficient four bytes Floating point low halfword			
0x00c8	Position closed loop controlICoefficient four bytes Floating point high halfword	suggestion0.001~1	0x03 0x06 0x10	
0x00c9	Position closed loop controlICoefficient four bytes Floating point low halfword			
0x00ca	Position closed loop controlDCoefficient four bytes Floating point high halfword	suggestion0.001~1	0x03 0x06 0x10	
0x00cb	Position closed loop controlDCoefficient four bytes Floating point high halfword			

6.3.9Motor Learning Register

Register Address	describe	Value range	Support function code	Remark
0x00e0	reserve	0	0x03	Do not operate this register.

0x00e1	Learning Commands	0,1	0x03 0x06 0x10	0: Not learned 1：Start motor learning/Learning
0x00e2	Learning status	0, 1, 2, 3, 4	0x03	0: Ready 1：Learning 2: Stopping 3：Complete learning 4: Learning failure
0x00e3	Learning progress		0x03	Subprocess number
0x00e4	Number of bytes of learning result data		0x03	
0x00e5 | 0x00ef	Learning outcome data		0x03	

6.3.10Security protection register

Register Address	describe	Value range	Support function code	Remark
0x0100	Overtemperature shutdown trigger temperature	- 40~125	0x03 0x06 0x10	The output will be turned off when the temperature reaches this value
0x0101	Disable current doubler trigger temperature	- 40~125	0x03 0x06 0x10	When the temperature reaches this value, the current doubler is disabled. out
0x0102	Overvoltage shutdown trigger voltage	80~270	0x03 0x06 0x10	Multiply the value by0.1Vis the voltage; The output will be turned off after the voltage exceeds this value
0x0103	Undervoltage shutdown trigger voltage	80~270	0x03 0x06 0x10	Multiply the value by0.1Vis the voltage; The output will be turned off after the value drops below this value.
0x0104	Overcurrent shutdown trigger current	0~900	0x03 0x06 0x10	0: Disable overcurrent shutdown function Non-zero: the value is multiplied by0.01AFor electricity When the current peak reaches this value, it will be turned off. Cut off output
0x0105	Hall error shielding time	0~100	0x03 0x06 0x10	unitms; When the Hall error state After reaching this time, the output is turned off
0x0106	Enable automatic adjustment of current loop coefficients	0, 1	0x03 0x06 0x10	0: Disable 1: Enabled; when the starting current rises Reduce when too fastPIDcoefficient
0x0107	reserve		0x03 0x06 0x10	
0x0108	Enable overheat protection when the temperature is below Automatically clear alarm after triggering value	0, 1	0x03 0x06 0x10	0: Disable 1: Enable
0x0109	reserve		0x03 0x06 0x10	
0x010a	Temperature correction factorK(multiple)	9500~10500	0x03 0x06 0x10	Multiply the value by0.0001times
0x010b	Temperature correction factorB(intercept)	- 100~100	0x03 0x06 0x10	Multiply the value by0.1℃
0x010c	Voltage correction factorK(multiple)	9700~10300	0x03 0x06 0x10	Multiply the value by0.0001times

0x010d	Voltage correction factorB(intercept)	- 10~10	0x03 0x06 0x10	Multiply the value by0.1V

6.3.11Configuration parameter storage registers

Register Address	describe	Value range	Support function code	Remark
0x0160	Store motor configuration parameters	1	0x06	
0x0180	Storage system configuration parameters	1	0x06	
0x01a0	Storage of reciprocating control parameters	1	0x06	
0x01b0	Store preset speed parameters	1	0x06	
0x01c0	Storage closed loop speed regulationPIDparameter	1	0x06	
0x01d0	Storage security parameters	1	0x06	
0x01f0	Storage of user process data	1	0x06	

Note: By0x10The parameters configured by the function code can be directly stored in the drive.0x06The parameters configured by the function code need to be stored in the memory through the above registers.

6.3.12Program Operation Register

Register Address	describe	Value range	Support function code	Remark
0x00f0	Virtual Machine Version		0x03	
0x00f1	Program space size		0x03	
0x00f2	Running status		0x03	
0x00f3	Position control completion status	0,1	0x03	0: Not completed 1:Finish
0x00f4 | 0x00f9	reserve			
0x00fa	Device Address		0x03 0x06	
0x00fb	Automatically run		0x03 0x06	

6.3.13 IOConfiguration Registers

Register Address	describe	Value range	Support function code	Remark
0x00d0	IO1direction	0,1,2	0x06	0: Floating input 1: Pull-up and pull-down input 2:output
0x00d1	IO1Level	0,1	0x06	0: Low level/pull down 1: High level/pull-up
0x00d2	IO2direction	0,1,2	0x06	0: Floating input 1: Pull-up and pull-down input 2:output
0x00d3	IO2Level	0,1	0x06	0: Low level/pull down 1: High level/pull-up

0x00d4	IO3direction	0,1,2	0x06	0: Floating input 1: Pull-up and pull-down input 2:output
0x00d5	IO3Level	0,1	0x06	0: Low level/pull down 1: High level/pull-up

6.3.14Peripheral operation related registers

Register Address	describe	Value range	Support function code	Remark
0x7000	3.3VOutput	0,1	0x06	0: Disable 1: Enable
0x7001	Call the police	0,1	0x06	0: Disable 1: Enable
0x7002	Input Type	0,1	0x06	0:simulation 1:number
0x7003	Input pulse direction	0,1	0x06	0:reduce 1:Increase
0x7004	Clear input pulse	0,1,2	0x06	0: Turn off automatic clearing of zeros 1: Manually clear zero 2: Start automatic clearing
0x7005 | 0x7009	reserve			
0x700a	Clear position count	0,1	0x06	0: No action 1: Clear position count
0x700b | 0x700f	reserve			
0x7010 0x7011	Read input pulse		0x03	if0x7004Wrote2, this register will automatically clear after reading
0x7012	Reading Input Duty Cycle	0~1000	0x03	Duty cycle multiplied by1000
0x7013	Read input frequency		0x03	
0x7014	Read Hall input status		0x03	
0x7015 | 0x701f	reserve			
0x7020	IO1Potentiometer percentage	0~1000	0x03	Multiply the percentage by1000
0x7021	IO1Voltage percentage	0~1000	0x03	Multiply the percentage by1000
0x7022	IO1Level		0x03	0: Low level 1: High level
0x7023	IO1edge		0x03 0x06	0:decline 1:rise 2: Not triggered Write Any: Clear Trigger

0x7024	reserve			
0x7025	IO2Potentiometer percentage	0~1000	0x03	Multiply the percentage by1000
0x7026	IO2Voltage percentage	0~1000	0x03	Multiply the percentage by1000
0x7027	IO2Level		0x03	0：Low level 1: High level
0x7028	IO2edge		0x03 0x06	0:decline 1:rise 2: Not triggered Write Any: Clear Trigger
0x7029	reserve			
0x702a	IO3Potentiometer percentage	0~1000	0x03	Multiply the percentage by1000
0x702b	IO3Voltage percentage	0~1000	0x03	Multiply the percentage by1000
0x702c	IO3Level		0x03	0：Low level 1: High level
0x702d	IO3edge		0x03 0x06	0:decline 1:rise 2: Not triggered Write Any: Clear Trigger
0x702e	reserve			
0x7040	Timer0Counter high word Festival	0~2000000000	0x06	
0x7041	Timer0Counter low word Festival			
0x7042	Timer0Control Register		0x06	0:prohibit 1: Enable single trigger (automatically clear the setting When the trigger flag 0x81: Enable single trigger (manual clear Timing trigger flag) 2: Enable periodic trigger
0x7043	Timer0Trigger status		0x03	0: Not triggered 1:trigger
0x7044	Timer1Counter high word Festival	0~2000000000	0x06	
0x7045	Timer1Counter low word Festival			
0x7046	Timer1Control Register		0x06	0:prohibit 1: Enable single trigger (automatically clear the setting When the trigger flag 0x81: Enable single trigger (manual clear Timing trigger flag) 2: Enable periodic trigger
0x7047	Timer1Trigger status		0x03	0: Not triggered 1:trigger

0x7048	Timer2Counter high word Festival	0~2000000000	0x06	
0x7049	Timer2Counter low word Festival			
0x704a	Timer2Control Register		0x06	0:prohibit 1: Enable single trigger (automatically clear the setting When the trigger flag 0x81: Enable single trigger (manual clear Timing trigger flag) 2: Enable periodic trigger
0x704b	Timer2Trigger status		0x03	0: Not triggered 1:trigger
0x704c	Timer3Counter high word Festival	0~2000000000	0x06	
0x704d	Timer3Counter low word Festival			
0x704e	Timer3Control Register		0x06	0:prohibit 1: Enable single trigger (automatically clear the setting When the trigger flag 0x81: Enable single trigger (manual clear Timing trigger flag) 2: Enable periodic trigger
0x704f	Timer3Trigger status		0x03	0: Not triggered 1:trigger
0x7060	System beat high byte	Long integer	0x03	
0x7061	System beat low byte			
0x7062	Last processID		0x03	
0x7063	Current ProcessID		0x03	
0x7100 | 0x711F	General registers		0x03 0x06	
0x8000	Program code/debug log		0x03	Debug Log

7.Common problems and precautions

7.1Frequently asked questions

1)When the switch (including limit switch) or button wiring is long, the switch or button is not operated, the driver malfunctions, and the switch or button does not respond properly.

A: This may be caused by interference on the switch or button signal line. It is recommended to add a few K The pull-up resistor toVO, or use shielded cable.

2) 485In communication mode, the master station cannot communicate with the drive or the communication is unstable. A: Please check whether the master serial port baud rate, verification mode, and slave address are consistent with the driver configuration. 485Is the communication wiring correct?485The master station and the slave station should be connected according toAA,BBIf the master station is connected in this way, check whether the frame format is correct.PCmachine, you can use it firstModbusThe debugging tool tests whether the communication is normal.

If the communication is unstable, the signal ground of the master station and the slave station can be connected, such as:USB-485The chassis ground and the driverCOMconnected.

3)The rated current parameter of the driver is configured as the rated current of the motor. The motor cannot carry the load, but the motor can drive the load when it is directly connected to the power supply without passing through the driver.

A: When the motor is overloaded, the driver will output a steady current, and the output current is the configured working current. While limiting the maximum working current of the motor, it also limits the maximum output torque of the motor. If the load is too large, the motor may not be able to carry the load. We can use the DIP switch or485Configure the working current parameter to be slightly larger to increase the maximum output current of the driver. In addition, if the motor current reaches the rated current of the motor but cannot carry the load, it means that the motor power is too small. If the motor can drive the overloaded load by increasing the output current of the driver, the motor will work in an overloaded state for a long time, which may affect the life of the motor. It is recommended to replace it with a motor with a higher power.

4)When the motor is stalled, it keeps vibrating, and it will not stop even if the stall stop function is enabled. A: The rated current parameter can be configured larger; if using485Configuration parameters can also configure the working current to the previous rated current value.

7.2Fault alarm processing

When an abnormality occurs during motor control, the yellow status indicator light flashes alone and can be0x0033Register to read the relevant fault code.

Yellow light alone Number of flashes	Fault Codes	Fault description	Disposal measures
1	0x01	Motor phase sequence not learned	Perform phase sequence learning on the motor under no-load condition. If learning fails, please refer to the fault code.0x03After dealing with the problem, learn the phase sequence.

2	0x03	Hall signal failure	1) If the motor cannot rotate and alarms, please check whether the motor Hall signal wiring is Is it correct and firm? When the motor is rotated by external force, check whether the voltage amplitude change of each Hall output signal of the motor is normal. 2) If the alarm sounds occasionally during the motor rotation, please check the motor Hall signal connection. Check whether the wires are firm; separate the motor Hall signal cable and the motor coil power cable and route them farther apart; if the motor speed is10000RPMBelow, one can be connected in parallel to each Hall signal line103capacitor to the Hall signal ground; if position control is not required, the Hall error shielding time register (0x0105) value is configured larger.
3	0x04	Unable to reach target speed	1) Check whether the maximum commutation frequency of the given drive exceeds the motor FullPWMMaximum commutation frequency that can be achieved under the condition; 2) Check whether the motor load is too large and whether the phase current output by the driver reaches To the configured large load current; 3) Is the large load current configuration too small or the acceleration configuration too large?
4	0x02	Stall stop	Check whether the motor load is too large and the motor is blocked.
5	0x05	reserve	
6	0x06	Overcurrent shutdown	1) Check whether the rated current of the configured motor is too small and the rated current of the motor is too high. The rated current or rated power is too large; 2) Check whether the motor power line is in good contact or short-circuited; 3) Whether the motor is suddenly stuck when rotating at high speed.
7	0x08	Overvoltage shutdown	1) Check whether the voltage of the power supply when it is unloaded exceeds the configured overvoltage shutdown voltage. Pressure; 2) Check whether the power supply voltage is A sudden rise above the configured overvoltage shutdown voltage.
8	0x09	Undervoltage shutdown	1) Check whether the power supply voltage drops when the motor is rotating with load. When the voltage is lower than the configured undervoltage shutdown voltage, the power supply power is too small or the power supply voltage regulation response is slow; 2) Check whether the power cord is too long or too thin. A large voltage drop occurs on the source line.
9	0x07	Thermal shutdown	1) Whether the drive is well ventilated; 2) Whether the drive is overloaded or works in a high temperature environment for a long time; 3) Whether the configured thermal shutdown temperature is too low.

7.3Precautions

1) The power supply voltage of the driver should be between 9 and 24 V. If the voltage is over-voltage, the driver may be burned after power-on.

2) When the driver is connected to a non-isolated user controller (signal line), the power supplies should not be grounded together, otherwise there will be potential safety hazards that may damage the driver or user controller. For principle analysis and solutions, see Section 9.1.

3) Since the control signal line is very fragile, the control signal**Any signal line cannot be connected to the power supply or motor interface wiring.**Otherwise, the driver is likely to burn out and be difficult to repair.

4) Power supply or motor**The interface wiring must not be connected together with the potentiometer, limit or communication interface.** Otherwise, some components of the driver may be burned. Do not connect the power ground or control signal ground to the chassis, otherwise the driver may work unstably. If conditions permit, please connect the chassis to the ground.

5) Driver**Power off**When**Do not directly or indirectly rotate the motor at high speed**Otherwise, the electromotive force generated by the motor may burn

Remove the drive.

6) The driver should be connected to the motor first.**Power on after connection is complete**, otherwise the fuse or driver may burn out.

7) Motor interface**No short circuit**, otherwise the fuse or driver may burn out.

8) Pay attention to the drive**don't want**damp,**don't want**Short-circuit the components on the driver board.**don't want**Touch the pins and pads of the components on the board with your hands.

9) If the drive**The fuse burns out during use**, please check the circuit and connect it correctly. After the fuse burns out, do not force the power on and continue to use it; otherwise the driver will be severely burned and cannot be repaired.

10) In Drive**Failure**When necessary, users should contact our company in time and are not allowed to repair or replace accessories without permission.

11) This driver**Can only be used to drive inductive loads**(such as motors), and cannot be used to drive resistive (such as resistors) or capacitive loads (such as capacitors).

12)**Please read the precautions and warranty instructions carefully, which will save you unnecessary trouble.**.

13)**Please read this user manual carefully and use this driver correctly**.

8.Warranty Manual

1)Please operate and use according to the instructions in the user manual.

2)From the date of purchase, if there is any quality problem with the product itself, it will be returned or replaced within three months.1Years free warranty.

3)When requesting warranty service, please be sure to bring your receipt and warranty instructions with you to our company.

4)The replacement of consumables (such as silicone sheets, radiators, etc.) and accessories is not covered by the warranty of this manual.

5)The company does not assume any responsibility for any loss or damage to profits caused by driver failure or deletion or change of programs by users or after-sales maintenance personnel during repair and replacement of accessories (as well as unreasonable claims made by third parties).

6)During the warranty period, the following situations will be repaired for a fee:

a)Failure to produce a receipt with the company's seal;

b)Failure caused by improper carrying, transportation or storage after purchase;

c)Failures caused by improper use;

d)Failure or damage caused by fire, earthquake, flood, lightning, rodent infestation and other disasters or theft;

e)Failures and damages caused by improper repairs.

7)Damage caused by operation contrary to the instructions in the user manual, unauthorized modification,CPUThe company does not provide repair services for failures and damages caused by damage, abnormal voltage.

8)If the user connects the power supply or motor output wiring with the control signal line, causing the driver to malfunction or be damaged, our company will not provide maintenance services.

9)If the user forcibly connects the power supply and continues to use the drive after the fuse burns out, causing the drive to burn out, this situation is not covered by the warranty.

10)The drive module without the housing (bare board) is a special drive promoted at cost price and does not provide warranty service.

11)After the free warranty period expires, the drive with housing can be3After the cost-only warranty period expires, repair costs will be charged according to market prices.

12)This instruction manual is only valid within the territory of the People's Republic of China.

13)This manual does not limit the customer's legal rights.

9.appendix

9.1The harm and solution of driver and user controller sharing the same ground

In the design of industrial control systems, many engineers have encountered situations where the controller power supply and the equipment power supply share the same ground, resulting in unexpected faults. After the fault occurs, it is often difficult to find the exact cause of the fault. We analyze the typical reasons for damage caused by the driver and the user controller sharing the same ground.

The typical reason is that there is no isolation inside the user controller, and the driver or user controller power ground wire is loose; or when the wiring is live, other parts are connected, the positive pole of the power supply is connected, and the negative pole is not connected, etc., which will cause the driver ground wire to be disconnected. For example, when the driver and controller are wired normally, the power current should flow in from the positive pole of the driver power interface, and then flow out from the negative pole of the driver power interface and return to the negative pole of the power supply. When the driver power ground wire is not connected, and the positive pole of the power supply and other signal ports are connected, the power current will flow in from the positive pole of the driver power supply, flow out from the driver signal interface, and then flow in from the user controller signal interface, and finally flow out from the user controller power ground wire, and finally return to the negative pole of the power supply. In this way, the power current flows through the signal interface of the driver and the user controller, which may cause damage to the circuit connected to the signal interface inside the driver or user controller. The following figure takes the loose driver ground wire as an example to illustrate its overvoltage principle.

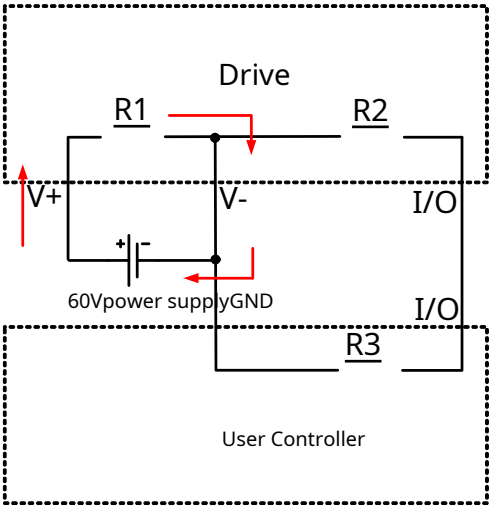


Figure 1: Normal situation

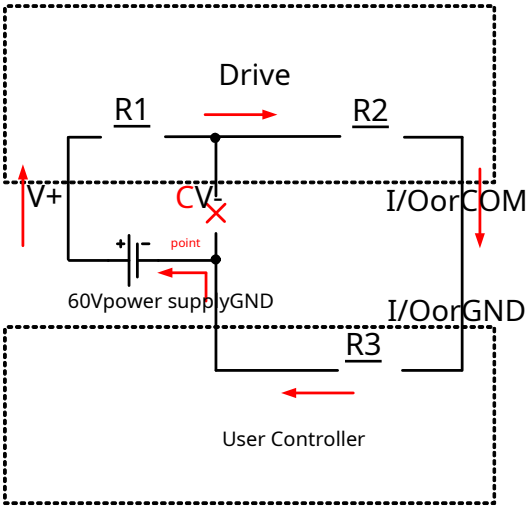


Figure 2: Ground wire is off

The internal circuits between the positive and negative poles of the driver power supply, between the negative pole of the driver power supply and the signal interface, and between the negative pole of the user controller and the signal interface are each equivalent to a resistor.RWhen connected normally, the power current flows from the positive pole of the power supply to the driver.V+, through the internal circuit of the driver (equivalent toR1) and then byV-It flows out and back to the negative pole of the power supply, and the current flow direction is shown in Figure 1.

When the negative pole of the driver power supply falls off, as shown in the figureCThe point is disconnected, and the power current flows from the positive pole of the power supply to the driverV+, through the internal circuit of the driver (equivalent toR1andR2) through the driver's signal interface (IOorCOM) and then flows out through the signal interface of the user controllerIOorGNDAfter the user controller's internal circuit (equivalent toR3) from the negative pole of the controller power supplyGNDThe current flows out and back to the negative pole of the power supply. At this time, the power supply current flows as shown in Figure 2. This may cause damage to the circuit connected to the signal interface inside the driver or user controller.

Solution:

1. If the user's controller has built-in power supply isolation or signal isolation, there is no need to consider the common ground problem. Most PLCs have built-in isolation. Leave.

2. If the signal interface between the user controller and the driver is only connected via 485, a 485 isolation function can be selected.

driver without considering the power common ground problem.

3. The driver and the user controller use different power supplies, and please isolate the power supply grounds of the two. 4. If the user controller must use the same power supply as the driver, then an isolated DC-DC can be connected to the power supply to power the user controller, or the signal output from the user controller to the driver can be isolated through an isolation device (such as: relay, optocoupler, magnetic isolation).

5. If the user controller is driven by a 5V power supply and the current of the driver's 5V output meets the use requirements, it can be powered from the driver's 5V output, and the output signal of the user controller can only be connected to the driver from which power is taken, and cannot be connected to other drivers. Of course, the driver's 5V output can also power the optocoupler.

9.2useWindowsBuilt-in calculator for decimal-hexadecimal conversion

1.useWindows XPThe steps for converting decimal to hexadecimal using your own calculator are as follows:

12)Open the system's built-in calculator tool, as shown in the figure9.1shown.

picture9.1 Windows XPBuilt-in calculator

13)Select the "View" - "Scientific" menu item, and the calculator interface will switch to the figure below.9.2shown.

picture9.2The calculator interface after switching to scientific mode

14)Click on the "Decimal" radio button and enter the decimal number to be converted to hexadecimal. We start with -100 For example, first enter100, then press the "+/-" button to enter the negative sign, as shown in the figure9.3 shown.

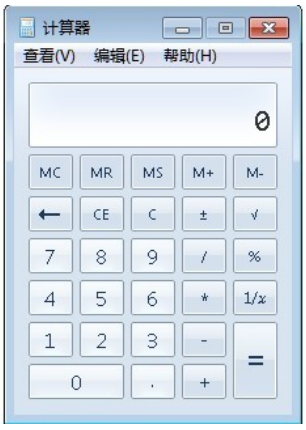
picture9.3In the calculator, enter "-100”

15)Then click the "Hexadecimal" radio button on the left. At this time, the decimal number we entered previously -100is converted to __int64The integers of type are displayed in hexadecimal.longtype,shortType orcharThe hexadecimal display of the integer type can be displayed by pressing the "Double Word", "Single Word" and "Byte" radio buttons on the right. The display result is shown in the figure9.4shown.

picture9.4 "-100"Convert toshortType and display in hexadecimal

2.useWindows 7The steps for converting decimal to hexadecimal using your own calculator are as follows:

16)Open the system's built-in calculator tool, as shown in the figure9.5shown.



picture9.5 Windows 7Built-in calculator

17)Select the "View" - "Programmer" menu item, and the calculator interface will switch to the figure below.9.6shown.

picture9.6The calculator interface after switching to scientific mode

18)Click on the "Decimal" radio button and enter the decimal number to be converted to hexadecimal. We start with -100 For example, first enter100, then press the "±" button to enter the minus sign, as shown in the figure9.7 shown.

picture9.7In the calculator, enter "-100”

19)Then click the "Hexadecimal" radio button on the left. At this time, the decimal number we entered previously -100is converted to __int64The integers of type are displayed in hexadecimal.longtype,shortType orcharThe hexadecimal display of the integer type can be displayed by pressing the "Double Word", "Word" and "Byte" radio buttons on the lower left.9.8shown.

picture9.8 "-100"Convert toshortType and display in hexadecimal

9.3 CRC16Calculation

ClanguageCRCGenerate functions like programs9.1All possibleCRCThe values are preloaded into two arrays, and can be simply indexed when calculating the message content. An array contains16BitCRCDomain all256The possible high-order bytes and the other array contain the values of the low-order bytes.CRCThe method provides a new calculation for each new character in the message buffer.CRCA faster way.

Note: This function internally performs a high/lowCRCThe bytes are swapped. This function returns the bytes that have been swapped.CRC That is, the value returned from this functionCRCThe value can be placed directly in the message for sending. The function takes two parameters:

unsigned char *puchMsg;Points to theCRCPointer to the binary data message buffer. unsigned short usDataLen;Number of bytes in the message buffer.

Note: The followingCRC16The generating function program is taken from <MODBUS over Serial Line Specification and Implementation Guide V1.02>.

program9.1 CRC16Generate function program listing

```
/*High ByteCRCvalue*/
static unsigned char auchCRCHi[] = {
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x 00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0x C1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x 80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x 41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x 00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x01, 0x C0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40


} ;
/*Low byteCRCvalue*/ static
char auchCRCLo[] = {
    0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4, 0x04,
    0xCC, 0x0C, 0x0D, 0xCD, 0x0F , 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09, 0x08, 0xC8,
    0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C,
    0xDC, 0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3, 0x11, 0xD1,
    0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35,
    0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
```

```
    0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E,
    0x2F, 0xEF, 0x2D,  0xED, 0xEC, 0x2 C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26, 0x22, 0xE2,
    0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6,
    0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0
    x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE,
    0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5, 0x77, 0xB7, 0xB6, 0x76, 0x72,
    0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x9 1, 0x51, 0x93, 0x53, 0x52, 0x92, 0x96,
    0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A,
    0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E,
    0x8E, 0x8F, 0x 4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82,
    0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40

};
unsigned short CRC16（puchMsg, usDataLen）          /*Functionunsigned shortType returnedCRC */ /*Used for
unsigned char *puchMsg, unsigned short              calculationCRCMessage*/ /*Number of bytes in the message*/
usDataLen {

    unsigned char uchCRCHi = 0xFF;                  /* CRCInitialize the high byte of */
    unsigned char uchCRCLo = 0xFF;                  /* CRCInitialize the low byte of */
    unsigned uIndex;                                /* CRCLookup table index*/

    while（usDataLen--） {                          /*Complete the entire message buffer */

        uIndex = uchCRCLo    * puchMsg++;     /*calculateCRC */
        uchCRCLo = uchCRCHi    auchCRCHi[uIndex];
        uchCRCHi = auchCRCLo[uIndex];
    }
    return（uchCRCHi << 8 | uchCRCLo);
}
```

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