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MBDVseries

Low voltage servo system

Hardware Manual

Shanghai Anpu Mingzhi Automation Equipment Co., Ltd.

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content

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customer service

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1.1About this manual

This manual isMBDVHardware Manual for Series Low Voltage Servo Drives. it provides aboutMBDV

Servo unit installation,Configuration and basic operations. This document is intended for shipping,

assembly,Written by a qualified person who maintains this equipment.

1.2 MBDVSeries Low Voltage Servo Documentation

This manual is part of a series of documents,All series are composed as follows:

- MBDVSeries Low Voltage Servo Hardware Manual.Details on hardware installation,Configuration and Operation.
- CANopenCommunication Manual.detailing the driveCANopenCommunication function.
- ModbusCommunication Manual.detailing the driveModbus RTUCommunication function.
- LunaSoftware User Manual.introduceLunause of software.

1.3safety

To prevent harm to people and damage to property,Installation should only be performed by qualified personnel.


MBDVSeries of low voltage servo products use dangerous voltage.The drive must be properly grounded.

after you installMBDVBefore the series of low voltage servo products,Please read the product manual carefully. Failure

to follow safe operating instructions may result in personal injury or equipment damage.

1.4safety sign

Safety signs indicate potential personal hazard or equipment damage,If recommended precautions and practical safety practices are not

followed. Below are the cautionary safety symbols used in this manual and on the drive:


Danger


high voltage danger


ground


Beware of high temperature

1.5Safety Precautions

1.5.1storage

Please note the following when storing:

- Please put this drive in the box,store in dry,no dust,Avoid direct sunlight
- Storage ambient temperature at-20°Cto +65°Cbetween
- Storage environment humidity is10%arrive85%within range,and no condensation
- Avoid storage in corrosive atmospheres

1.5.2Installation Precautions

	◆ Prohibited in the presence of water vapor,Corrosive gas,Use this product in flammable and explosive environments
	◆ Do not vibrate strongly,Use this product in the place of impact
	◆ Do not use cables immersed in water or oil
	◆ do not squeeze,heavy cable,Avoid dangerous situations such as leakage of electricity caused by damage to the cable
	◆ Do not block the drive vents,Avoid conductive objects such as metal shavings from entering the drive during installation
	◆ Do not directly touch the rotating motor shaft with your hands
	◆ Do not knock the motor during installation,To avoid damage to the motor shaft or the internal optical encoder
	◆ During the first test run,First separate the coupling or belt of the mechanical equipment,Leave the motor in the no-load state
	◆ Incorrect parameters will cause abnormal operation under load
	◆ drive heat sink,motor,The temperature of the external regenerative resistor will rise during operation,Please avoid touching
	◆ Do not lift the motor lead wire during transportation and installation

1.5.3Wiring Precautions

	◆ Do not place theUVWThe motor terminals are connected to the grid power supply,can damage the drive or cause a fire
	◆ Please output the driverUVWand servo motorUVWdirect connection,Do not pass the electromagnetic contactor in the middle
	◆ Please tighten the fixing screws of the power supply and motor output terminals,Otherwise it may cause a fire
	◆ Do not frequently switch the main power supply of the drive,If you really need to switch the power supply repeatedly,please control1minute1times or less
	◆ Avoid bundling the main circuit cable with the input and output signal cables.
	◆ Please use twisted pair shielded wire for input signal wire and encoder signal wire
	◆ Please use the specified power supply voltage
	◆ One wire insertion opening of the terminal block,Please insert only one wire
	◆ When plugging in the wire,Please do not short-circuit the core wire with adjacent wires
	◆ Be sure to ensure that the driver power supply and motor are well grounded
	◆ Before power-on operation,Make sure all wiring is correct

1.5.4Precautions during trial operation

	◆ Do not directly touch the rotating motor shaft with your hands
	◆ During the first test run,First separate the coupling or belt of the mechanical equipment,Leave the motor in the no-load state
	◆ Incorrect parameters will cause abnormal operation under load
	◆ drive heat sink,motor,The temperature of the external regenerative resistor will rise during operation,Please avoid touching
	◆ Before the machine starts running,Please confirm whether the emergency stop device can be activated at any time
	◆ Using Servo Motors with Brakes on Vertical Loads,Avoid equipment alarming,Fault,fall when power is off

1.6Certified Specifications

MBDVThe series of low-voltage servo products are designed to meet the following standards.

		driver	motor
Europe	EMCinstruction	EN 61800-3	EN 55011
			EN 55014-1
			EN 55014-2
			EN 6100-3-2
			EN 6100-3-3
	LVD	EN 61800-5-1	EN 60034-1
			EN 60034-5
	functional safety (STO)	UL61800-5-2 (SIL2)	
		IEC61508	
		ISO13849-1 (PL d)	
ULstandard		UL 61800-5-1	UL 1004-1
			UL 1004-6
CSAstandard		C22.2 No.274-13	CSA C22.2 No.100

1.7Maintenance and Inspection

1.7.1Check items and cycles

The normal operating conditions of the servo are:

Annual average ambient temperature:30°C

average load rate:80%the following

daily operating time:20hours or less. The items

of daily inspection are as follows:

type	inspection cycle	Check item
daily inspection	daily	◆ Confirm the ambient temperature used,humidity,dust,foreign body,Whether condensation
		◆ Is there any abnormal vibration or noise
		◆ voltage
		◆ peculiar smell
		◆ Are there any foreign objects in the vents?
		◆ Whether the connector is loose
		◆ Whether there is foreign matter between the cable and the connector,Whether the cable conductor is exposed
		◆ Is the fastening part loose?

1.7.2Replacement of parts

The components inside the servo product will be worn out or aged,The timing of component replacement depends on environmental conditions,Change in usage.When replacement is required,Please contact our company or our agent.

Except for the company,Do not disassemble and repair by yourself.

part	part	Standard replacement cycle	Remark
driver	Filter capacitor	about6year	The standard replacement cycle is for reference only. Even if the standard replacement cycle is not fulfilled,Once an exception occurs often need to be replaced.
	Aluminum electrolytic capacitors on circuit boards	about6year	
	Power-up buffer relay	about100,000Second-rate(According to the conditions of use)	
	Power-on snubber resistor	about20,000Second-rate(According to the conditions of use)	
motor	oil seal	5000Hour	

2.1Product confirmation

Please refer to subsequent chapters,Confirm the model of the driver and the model of the servo motor.

Complete operational servo,Should include the following components:

- Power-matched servo drives and servo motors
- used forUSBmouth to mouthPCmachineMini USBcommunication line(Shopping)
- used forWirelesswireless communication module(Shopping)
- used forI/Oport connector(Standard)
- used forEncoder outputEncoder signal frequency division output connector(For 2-in-1 drives,Standard)
- used forSTOoralSTOConnector(Standard)
- used forCOM1andCOM2port connector,used forCANopenorRS485for communication(Standard)

2.2Drive model introduction

2.2.1Drive model description

MBD V -2X -5 20A C -***

① ② ③ ④ ⑤ ⑥

① MBDVseries

② Multi-axis in one

null:single axis

2X:2 in 1

③ Input voltage

5: 24 ~ 60VDC

④ current

20A:continuous current20A(RMS)

peak current60A(RMS)

⑤ function type

C:CANopen,RS485

⑥ custom code

2.2.2Drive Specifications

input power	Main circuit power supply		24V ~ 60VDC±10%
	Control loop power		24VDC±10%
Insulation withstand voltage			once to the ground:Pressure resistance500VAC,1 min, (leakage:10 mA)
Use environment	temperature		◆ Operating temperature:0 ~ 50℃(If the ambient temperature exceeds45°C,Please place in a well-ventilated place) ◆ storage temperature:-20°C ~65°C
	humidity		storage and use:10 ~ 85%RH,No condensation
	altitude		altitude1000mthe following
	vibration		9.8m/s2the following,10 ~ 60Hz (Unsustainable use at resonance point)
encoder feedback			◆ 16-bitMagnetic incremental encoder ◆ 2500Line photoelectric incremental encoder
I/O*1	Digital signal	enter	4optocoupler isolated universal input,Functions can be configured by parameters,5 ~ 24VDC,20mA
		output	◆ 2optocoupler isolated general-purpose output,Functions can be configured by parameters,maximum30VDC,100mA ◆ 1Road optocoupler isolation motor brake control output
	Pulse signal*2	output	3roadLine Driveroutput:Encoder feedback frequency division outputA±,B±,Z±
Communication Interface	USB Mini		for connectionPCmachine for software debugging
	Wireless		For connecting wireless modules,Connect via wireless modulePCmachine for software debugging
	CANopen		CANopenProtocol communication
	RS-485*3		Modbus/RTUProtocol communication
ledshow			2bit7partledshow
Regenerative resistor			External regenerative resistor
control mode			◆ CANopenCommunication control method: meets theCiA402standard,supportPP,PV,PVT,TQandHMmodel ◆ Modbus/RTUCommunication control method: Command position mode,Command speed mode,Command torque mode
control input signal			Alarm clear,Forward/Reverse prohibition limit,Gain switching,Zero speed clamp,emergency stop,just/Reverse running torque limit,speed limit,Universal input
control output signal			failure (error),warning (alarm),Servo-Readystate,Motor brake control,speed to reach,Torque arrives,Location arrives, Servo-ONstate,Dynamic error following,Positioning completed,Zero speed signal,same speed, same torque,speed limit,torque limit,back to origin complete,Software limit (forward rotation,reverse),Universal output
Protective function			overcurrent,overvoltage,undervoltage,overheat,The encoder feedback is abnormal,overload,too fast,Position error is too large, emergency stop,Forward/Reverse limit,Communication exception
dynamic braking			built-in
STO			built-in
Certification			RoHS,CE
drive weight	MBDV-520AC		0.4kg
	MBDV-2X-520AC		0.9kg

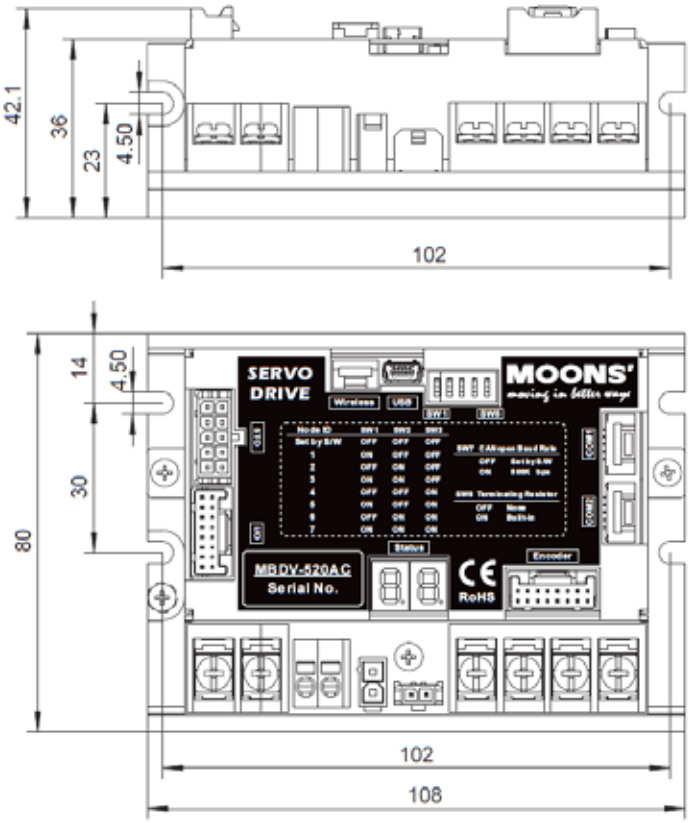
*1A multi-axis drive is a description of a single axis

*2Single-axis drives do not support this function,Can be customized if needed

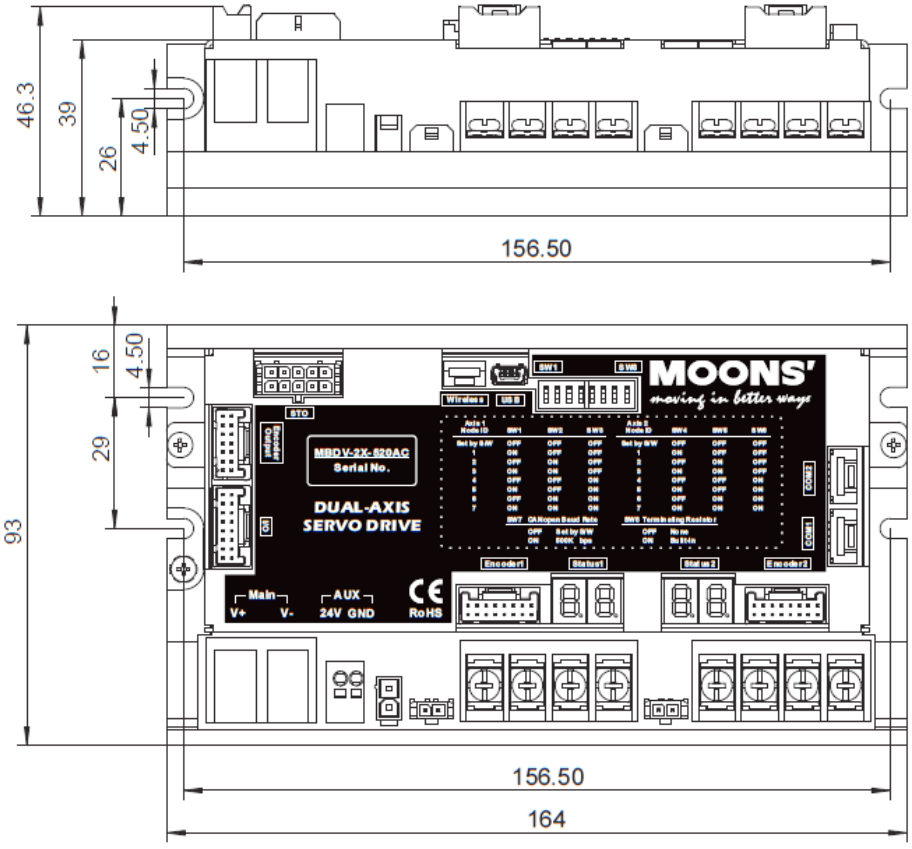
*3RS485andCANopenShared communication interface

2.2.3Dimensions of the driver (unit:mm)

2.2.3.1 MBDV-520AC

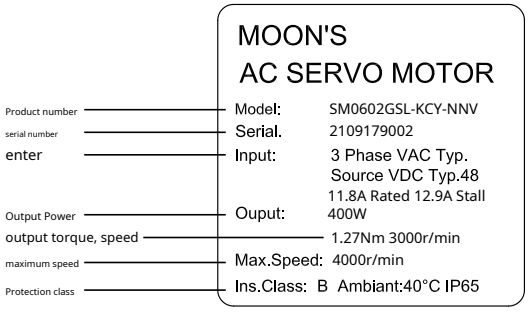


2.2.3.2 MBDV-2X-520AC



2.3Motor model introduction

2.3.1Motor nameplate description



2.3.2Motor model description

SM 0 6 0 2 GSL - KCY - NNV**

SM 系列

机座尺寸
04-□40mm
06-□60mm
08-□80mm

电机长度			
	□ 40	□ 60	□ 80
01		200W	
02	100W	400W	
03			750W

绕组规格 (DC)	
G	48V
J	24V

制动器代码
N：不带制动器
B：带 24VDC 制动器

定制代号

出轴及引线类型
KCY：标准键槽出轴，压 Y 型端子

编码器类型
SL 16-bit 增量式磁性编码器，通讯型
EL：16-bit 增量式磁性主编码器，通讯型 1000line 增量式光电辅编码器

2.3.3Motor Specifications and Dimensions

2.3.3.1□40mmSpecifications and Dimensions

□ Specification

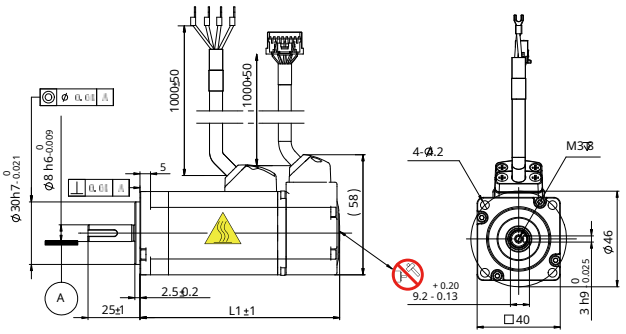
model		SM0402JSL-KCY-□NV	SM0402GSL-KCY-□NV
Recommended drive input voltage at rated speed (DC-Bus)		twenty four	48
Rated output power	watts	100	100
Rated speed	rpm	3000	3000
maximum speed	rpm	4500	4200
Rated torque	Nm	0.32	0.32
peak torque	Nm	0.96	0.96
Rated current	A (rms)	8.6	3.4
peak current	A (rms)	23.5	9.48
Reaction potential constant±5%	V (rms) / K rpm	2.53	6.04
torque factor±5%	Nm / A (rms)	0.042	0.099
Winding resistance (Line-Line)	Ohm @25°C	0.23	1.23
Winding reactance (Line-Line)	mH (typ.)	0.25	1.39
Moment of inertia	Kg m_2	$0.0428\times10_{-4}$	$0.0428\times10_{-4}$
Moment of inertia - with brake	Kg m_2	$0.0494\times10_{-4}$	$0.0494\times10_{-4}$
Axial load	N (max.)	50	50
Radial load (shaft end)	N (max.)	60	60
weight	kg	0.55	0.55
Weight - with brake	kg	0.8	0.8

Note:The actual output speed/torque of the motor is limited by the drive input voltage,Please select the appropriate DC input voltage according to your needs.

□ Indicates whether there is a brake

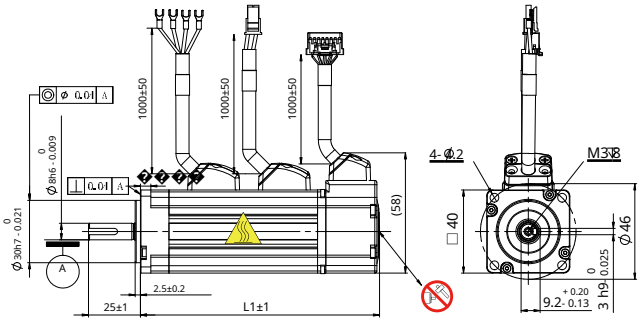
□ Dimensions (units:mm)

1)without brake



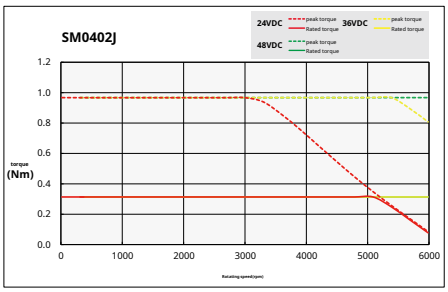
Brakeless model	L1
SM0402JSL-KCY-NNV	96
SM0402GSL-KCY-NNV	96

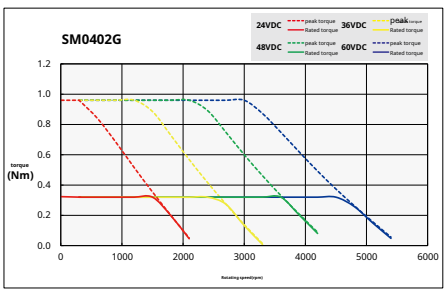
2)with brake



Brake model	L1
SM0402JSL-KCY-BNV	133
SM0402GSL-KCY-BNV	133

□ torque curve





2.3.3.2□60mmSpecifications and Dimensions

□ Specification

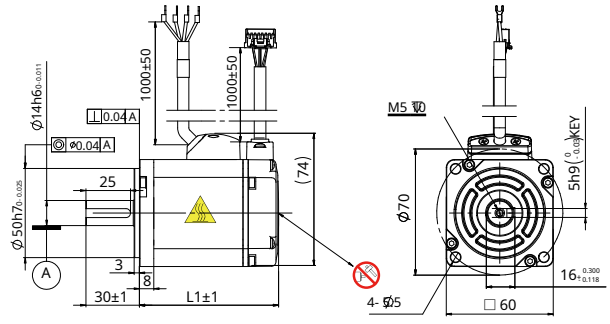
model		SM0601JSL-KCY-□NV	SM0601GSL-KCY-□NV	SM0602GSL-KCY-□NV
Recommended drive input voltage at rated speed (DC-Bus)		twenty four	48	48
Rated output power	watts	200	200	400
Rated speed	rpm	3000	3000	3000
maximum speed	rpm	4200	3900	4000
Rated torque	Nm	0.64	0.64	1.27
peak torque	Nm	1.92	1.92	3.81
Rated current	A (rms)	14.3	6.5	11.8
peak current	A (rms)	42.44	19.3	30.6
Reaction potential constant±5%	V (rms) / K rpm	2.97	6.52	7.41
torque factor±5%	Nm / A (rms)	0.049	0.108	0.122
Winding resistance (Line-Line)	Ohm @25°C	0.1	0.52	0.22
Winding reactance (Line-Line)	mH (typ.)	0.28	1.348	0.625
Moment of inertia	Kg m_2	0.165×10^{-4}	0.165×10^{-4}	0.31×10^{-4}
Moment of inertia - with brake	Kg m_2	0.22×10^{-4}	0.22×10^{-4}	0.36×10^{-4}
Axial load	N (max.)	70	70	70
Radial load (shaft end)	N (max.)	200	200	240
weight	kg	1.1	1.1	1.6
Weight - with brake	kg	1.6	1.6	2.0

Note:The actual output speed of the motor/Torque limited by drive input voltage,Please select the appropriate DC input voltage according to your needs.

□ Indicates whether there is a brake

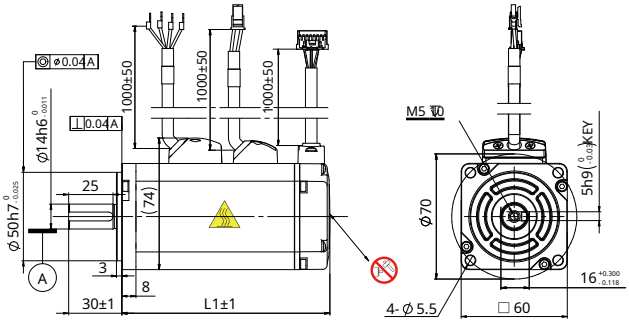
□ Dimensions (units:mm)

1)without brake



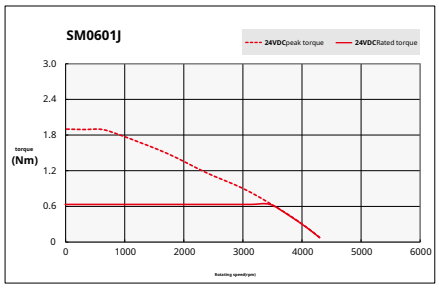
Brakeless model	L1
SM0601JSL-KCY-NNV	78
SM0601GSL-KCY-NNV	78
SM0602GSL-KCY-NNV	107

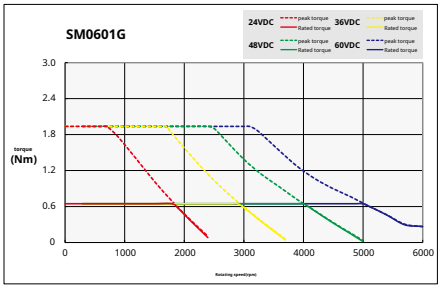
2)with brake

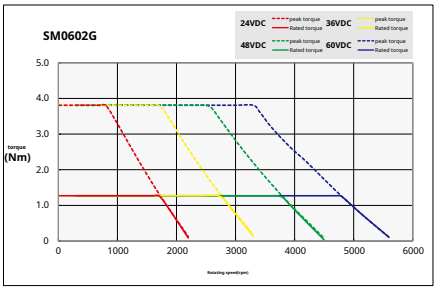


Brake model	L1
SM0601JSL-KCY-BNV	117.5
SM0601GSL-KCY-BNV	117.5
SM0602GSL-KCY-BNV	146.5

□ torque curve







2.3.3.3□80mmSpecifications and Dimensions

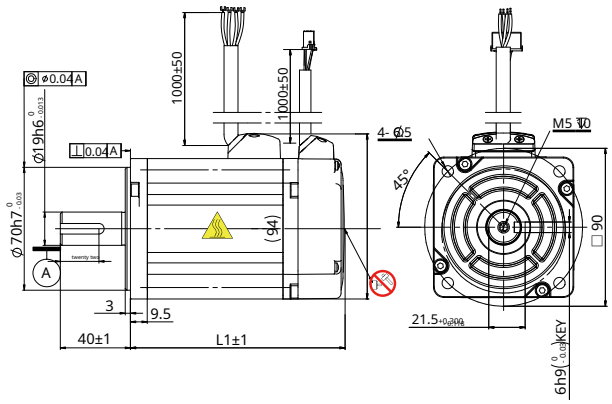
□ Specification

model		SM0803GSL-KCY-NNV	SM0803GSL-KCY-BNV
Recommended drive input voltage at rated speed (DC-Bus)		48	48
Rated output power Rated speed maximum speed	watts rpm rpm	750 3000 3600	750 3000 3600
Rated torque peak torque	Nm Nm	2.4 7.2	2.4 7.2
Rated current peak current	A (rms) A (rms)	18.8 56.7	18.8 56.7
Reaction potential constant±5% torque factor±5% Winding resistance (Line-Line) Winding reactance (Line-Line)	V (rms) / K rpm Nm / A (rms) Ohm @25°C mH (typ.)	8.36 0.138 0.094 0.366	8.36 0.138 0.094 0.366
Moment of inertia Axial load Radial load (shaft end) weight	Kg m_2 N (max.) N (max.) kg	0.89×10^{-4} 90 270 2.6	0.97×10^{-4} 90 270 3.4

Note:The actual output speed of the motor/Torque limited by drive input voltage,Please select the appropriate DC input voltage according to your needs.

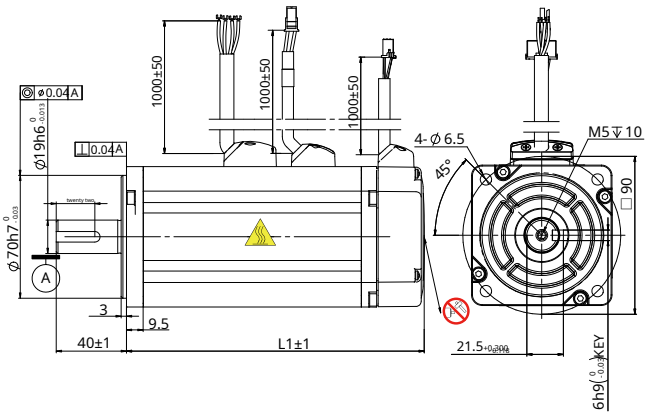
□ Dimensions (units:mm)

1)without brake



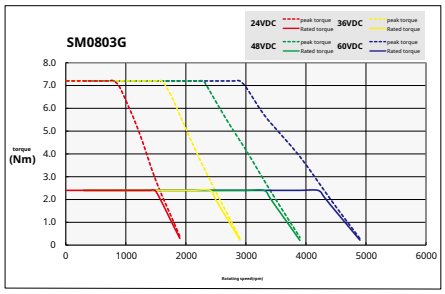
Brakeless model	L1
SM0803GSL-KCY-NNV	110

2)with brake



Brake model	L1
SM0803GSL-KCY-BNV	156.8

□ torque curve



2.3.3.4□60mmSpecifications and Dimensions

□ Specification

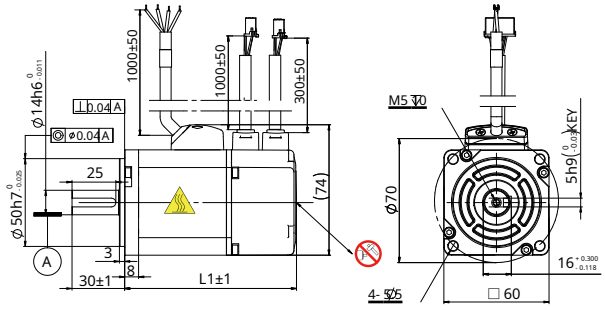
model		SM0601JEL-KCY-□NV	SM0601GEL-KCY-□NV	SM0602GEL-KCY-□NV
Recommended drive input voltage at rated speed (DC-Bus)		twenty four	48	48
Rated output power	watts	200	200	400
Rated speed	rpm	3000	3000	3000
maximum speed	rpm	4200	3900	4000
Rated torque	Nm	0.64	0.64	1.27
peak torque	Nm	1.92	1.92	3.81
Rated current	A (rms)	14.3	6.5	11.8
peak current	A (rms)	42.44	19.3	30.6
Reaction potential constant±5%	V (rms) / K rpm	2.97	6.52	7.41
torque factor±5%	Nm / A (rms)	0.049	0.108	0.122
Winding resistance (Line-Line)	Ohm @25°C	0.1	0.52	0.2
Winding reactance (Line-Line)	mH (typ.)	0.28	1.348	0.625
Moment of inertia	Kg m2	0.165×10-4	0.165×10-4	0.31×10-4
Moment of inertia - with brake	Kg m2	0.22×10-4	0.22×10-4	0.36×10-4
Axial load	N (max.)	70	70	70
Radial load (shaft end)	N (max.)	200	200	240
weight	kg	1.1	1.1	1.6
Weight - with brake	kg	1.6	1.6	2.0

Note:The actual output speed of the motor/Torque limited by drive input voltage,Please select the appropriate DC input voltage according to your needs.

□ Indicates whether there is a brake

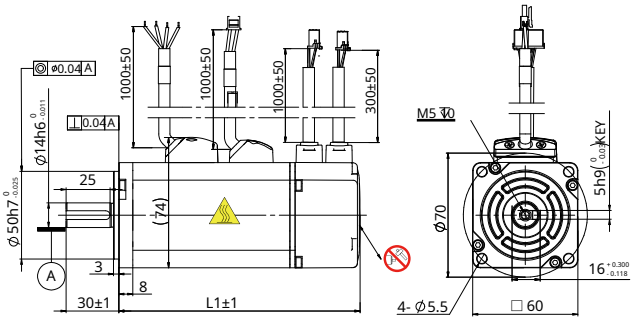
□ Dimensions (units:mm)

1)without brake



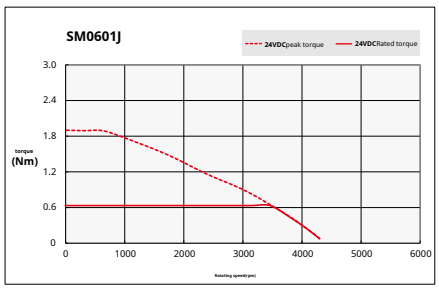
Brakeless model	L1
SM0601JEL-KCY-NNV	98
SM0601GEL-KCY-NNV	98
SM0602GEL-KCY-NNV	127

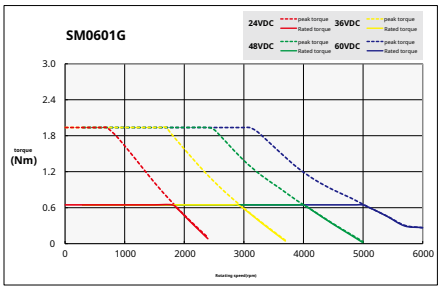
2)with brake

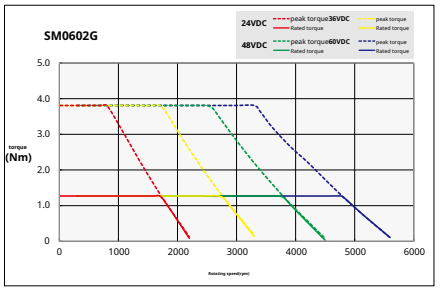


Brake model	L1
SM0601JEL-KCY-BNV	137.5
SM0601GEL-KCY-BNV	137.5
SM0602GEL-KCY-BNV	166.5

□ torque curve







2.3.3.5□80mmSpecifications and Dimensions (Unit:mm)

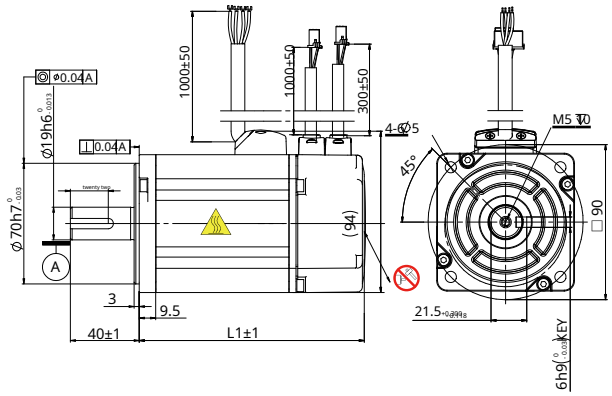
□ Specification

model		SM0803GEL-KCY-NNV	SM0803GEL-KCY-BNV
Recommended drive input voltage at rated speed (DC-Bus)		48	48
Rated output power	watts	750	750
Rated speed	rpm	3000	3000
maximum speed	rpm	3600	3600
Rated torque	Nm	2.4	2.4
peak torque	Nm	7.2	7.2
Rated current	A (rms)	18.8	18.8
peak current	A (rms)	56.7	56.7
Reaction potential constant±5%	V (rms) / K rpm	8.36	8.36
torque factor±5%	Nm / A (rms)	0.138	0.138
Winding resistance (Line-Line)	Ohm @25°C	0.094	0.094
Winding reactance (Line-Line)	mH (typ.)	0.366	0.366
Moment of inertia	Kg m_2	$0.89\times10_{-4}$	$0.097\times10_{-4}$
Axial load	N (max.)	90	90
Radial load (shaft end)	N (max.)	270	270
weight	kg	2.6	3.4

Note:The actual output speed of the motor/Torque limited by drive input voltage,Please select the appropriate DC input voltage according to your needs.

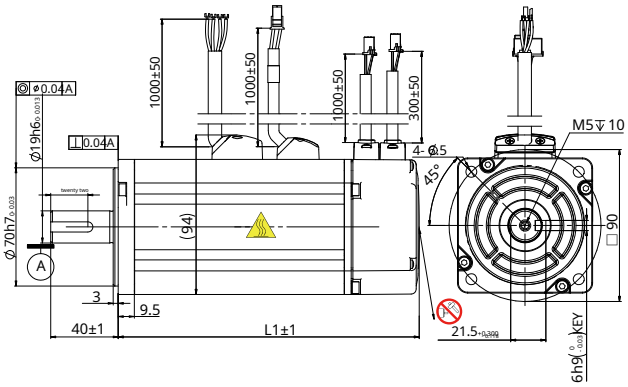
□ Dimensions (units:mm)

1)without brake



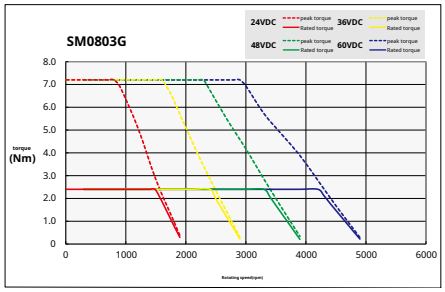
Brakeless model	L1
SM0803GEL-KCY-NNV	130.8

2)with brake



Brake model	L1
SM0803GEL-KCY-BNV	178.8

□ torque curve



2.4General Motor Specifications

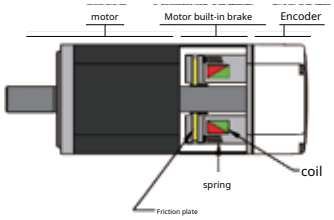
Insulation class	Class B (130°C)
Protection class	IP65(Except shaft penetration)
Installation conditions	Indoor installation, avoid direct sunlight, corrosive and flammable gases
ambient temperature	Operating temperature:0°C-40°C; Storage temperature:-20°C -60°C
humidity	Storage and use:20 - 85%RH (no condensation)
altitude	altitude1000mthe following
vibration	49m/s:the following,10 - 60Hz (Unsustainable use at resonance point)

2.5Brake Specifications

The motor brake is used to prevent the motor from turning when the brake is de-energized.The most common use is when the motor is used to control vertical loads, When the motor is not enabled or powered off,In order to prevent the mechanical mechanism driven by the motor from shifting due to gravity and other reasons,Requires a servo motor with a brake.

The brake is energized,The armature is adsorbed,brake pad release,The motor can run normally;When the brake is de-energized,armature will release, Brake pads locked,The motor does not turn normally.

Base series	40mm	60mm	80mm
static friction torqueNm	0.32	1.5	3.2
Rated voltageVDC	twenty four		
Power consumptionW(20°CTime)	6.3	7.2	9.6
currentA	0.26	0.3	0.4
braking time	Standard air gap,20°Cdown<70ms		
release time	<25ms		
release voltage	18.5VDC max.(at 20°C)		



in normal operation,Do not use the motor's brake to decelerate the motor,damage to the brake.

3Install

3.1Storage conditions

Please note the following when storing:

- Please put this drive in the box,store in dry,no dust,Avoid direct sunlight
- Storage ambient temperature at-20°Cto +65°Cbetween
- Storage environment humidity is10%arrive85%within range,and no condensation
- Avoid storage in corrosive atmospheres

3.2Installation conditions

The environmental conditions for the use of the driver of this product are as follows::

1)temperature is0°C ~50°C.If the ambient temperature exceeds45°Cabove,Please place in a well-ventilated place.It is recommended to run for a long time in45°C ambient temperature below,To ensure the reliable performance of the product.

2)If this product is installed in a distribution box,Distribution boxes must be sized and ventilated so that all electronic devices used inside do not risk overheating.

3)The ambient humidity is10%~85% RH,No condensation

4)vibration9.8m/s$_2$the following

5)Do not use in corrosive gas,flammable gas,Use the drive near combustibles

6)Please install the driver in an indoor electrical control box without water and direct sunlight

7)Please avoid using this drive in dusty places

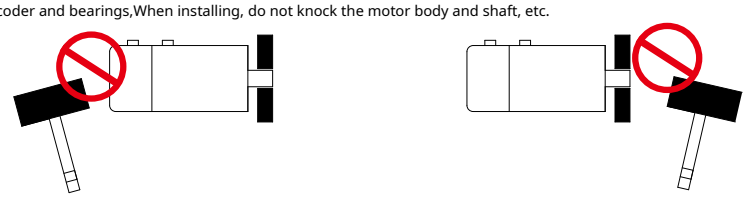
3.3Drive installation space

- when installing the drive,Please leave enough space up, down, left and right for the drive,Ensure good circulating cooling effect.
- Do not block the cooling vents of the drive.
- To ensure the temperature inside the electrical control box,It is recommended to install a cooling fan in the electrical control box.
- Please ground the drive well when installing

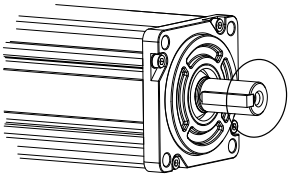
3.4Motor Installation Precautions

3.4.1Protection of encoders and bearings

- To prevent damage to the encoder and bearings,When installing, do not knock the motor body and shaft, etc.



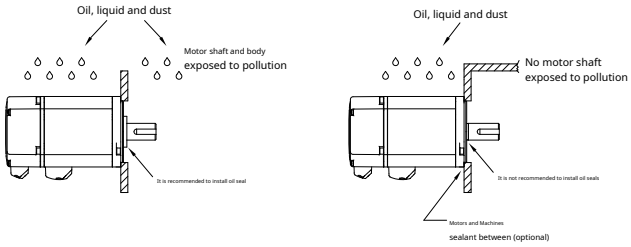
- Disruptive couplings designed for servo motors are recommended,It can provide some cushioning when eccentric or deflected
- When installing the coupling,Please wipe clean the anti-rust oil on the shaft end of the motor
- When using the keyway,Please use the standard key in the motor box
- When installing a pulley on a servo motor with a keyway,Please use the threaded hole of the motor shaft,Use the screw to squeeze the pulley into the motor shaft



- When removing the pulley,Please use professional tools such as pulley remover,To prevent bearing injury
- When connecting the shaft,Make sure to achieve the desired concentricity.If the concentricity is poor,The resulting vibrations can damage bearings and encoders
- Axial or radial load applied to the motor,Do not exceed the range specified in the specification,Please refer to the specification sheet of each servo motor
- The material of the shaft of the servo motor has no anti-rust ability,Although the factory has used grease for rust protection,However, if the storage time exceeds six months,To keep the motor shaft free from rust,Please check the condition of the motor shaft regularly every three months and replenish the appropriate anti-rust grease in time.

3.4.2Precautions for motor in oil and water environment

- Do not use oil,Water gets inside the motor
- Do not place cables in water or oil
- Because the through part of the motor shaft and the lead wire of the motor are notIP65Protection design,Make sure that no water or oil enters the motor from such parts
- Motor industrial grade skeleton oil seal can block pollutants (oil,impurities) to extend the life of the motor.The oil seal will be attached to the box when leaving the factory,But it will not be installed on the motor output shaft.After installing the oil seal,The oil seal will cause a certain resistance and torque loss to the rotation of the motor shaft, Recommended motor derating.
- In applications with liquids,Please install the motor wiring port downward



- When installing the oil seal, make sure that the lip of the oil seal faces outwards

3.4.3wiring

- If using a cable chain,Please use a super flexible cable.and ensure that there are100mmabove the bending diameter
- Do not twist the cable
- while moving the motor,Do not pull on the cable
- Do not use the same sleeve for the main circuit cable and the input/output signal cable/encoder cable,Don't tie it together.When wiring,The main circuit cable and the input/output signal cable/encoder cable should be separated from each other30cmabove.

3.4.4Motor temperature rise

Servo motors are rated for mounting on a standard heat sink and an ambient temperature of40°Crated value allowed for continuous operation.When installing a servo motor in a small device,Due to the reduced heat dissipation area of the servo motor,Therefore, the temperature may rise substantially.

Servo motor standard heat sink dimensions are as follows:

Base series	power	Heat sink size
40mm	100W	200*200*6aluminum
60mm	200W,400W	250*250*6aluminum
80mm	750W	250*250*6aluminum

If the installation environment is difficult to use a large heat sink,or operating in ambient temperatures exceeding specifications. you need to

follow the following requirements:

- Do not work at rated power,Select the motor power larger than the actual need1~2times the motor.
- Reduce the acceleration and deceleration of the duty cycle,to reduce motor load.
- reduced workDuty Cycle.
- External forced air cooling of the servo motor using a cooling fan or other means.
- When using a motor with an oil seal,The oil seal will cause a certain resistance and torque loss to the rotation of the motor shaft,and heat up due to the friction between the two,The required load torque needs to be equal to the rated torque of the motor70%.

Notice:Do not put any thermal insulation material between the servo motor and the metal heat sink,In order to prevent the motor from being unable to dissipate heat and cause the motor temperature to rise,and may cause motor failure.

4wiring

4.1Electromagnetic Compatibility (EMC)

⚠	MBDVHigh-speed switching elements are used inside the servo drive,High frequency or low frequency interference will be generated during normal operation,and interfere with peripheral equipment through conduction or radiation.
	There is also a low voltage unit inside the servo drive,Likely to be disturbed by noise from the drive peripherals. A disturbed signal may cause the device to behave unexpectedly.

Follow the electromagnetic compatibility practices described in this manual during installation and wiring,This product can meet the following specifications:EN 61800-3 To prevent mutual electromagnetic interference between the servo drive and its peripheral equipment,The following countermeasures can be taken according to.

- Please make sure that the driver and motor are well grounded,And the ground wire is best to useAWG10above cables.
- Do not use the same sleeve for the main circuit cable and the input/output signal cable/encoder cable,Don't tie it together.When wiring,The main circuit cable and the input/output signal cable/encoder cable should be separated from each other30cmabove.
- Please use twisted-pair wire or multi-core twisted-pair shielded wire for input/output signal cable and encoder cable.
- Input and output signal cable length is3mthe following,The encoder cable is in5mthe following.
- Do not use a welder,EDM, etc. use the same power supply.even if not the same power supply,When there is a high frequency generator nearby,Connect a noise filter to the input side of the main circuit power cable and control power cable.

4.1.1ground handling

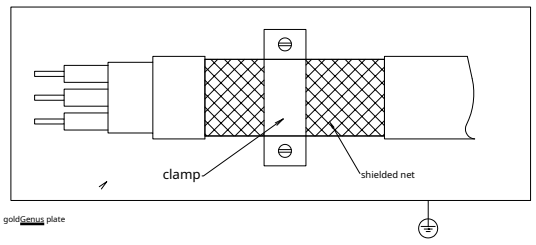
good grounding,can give full play toEMIfilter effect,Greatly reduce interference.

- Must be grounded at a single point in parallel
- Power extension cable between driver and motor,Use shielded cables
- The shielding net of the motor power line must be grounded and connected to the ground terminal of the drive

4.1.2Shielding of motor cables

Select the motor wire with shielding net and install the shielding net correctly installed,can get betterEMCEffects and Suppressing Interference Effects.Please note the following points:

- Use a cable with a shielded mesh (it is better if there is a double-layer isolation layer)
- The shielding net at both ends of the motor wire must be grounded with the shortest distance and the maximum contact area,Use clamps to fix the shielding mesh at both ends of the motor cable to the metal plane as shown in the figure below,Please see the connection method below.
- The protective paint needs to be removed at the fixed place between the clamp and the metal plane,to ensure good contact,Please see the image below.



4.1.3Ferrite Ring

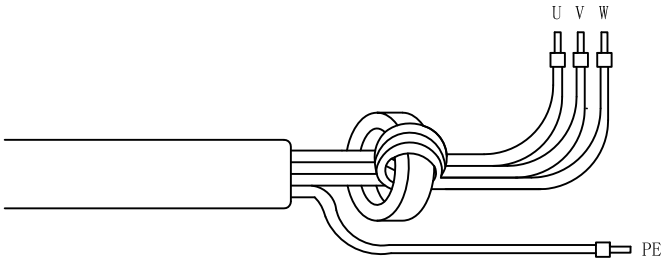
Ferrite ring, also referred to as magnetic ring,Can effectively absorb the radiation interference of the wire beam.

Magnetic rings have different impedance characteristics at different frequencies,Generally, the impedance is small at low frequencies,When the signal frequency increases,The impedance exhibited by the magnetic ring increases sharply,make it easy for normally useful signals to pass through,It can also effectively suppress the path of high-frequency interference signals.,Fix the power cord,High-Frequency Interference Suppression Issues for Signal Lines and Connectors.

When the magnetic ring suppresses common mode interference,Eddy current loss of high frequency signal through magnetic ring,Convert high frequency components to heat loss,This creates a low-pass filter,Make high frequency noise produce greater attenuation,while the impedance for signals useful at low frequencies is negligible,Does not affect the normal operation of the circuit.

The wire passing through the magnetic ring can be repeatedly wound around the magnetic ring to increase the inductance,So as to enhance the use effect of the magnetic ring.But too many turns will make the loss too large and the temperature of the magnetic ring will rise too high.The recommended winding method and number of turns are as follows

signal line	Engaging the necessary number of turns on the magnetic ring. (2-3lock up)
motor wire	move the motorU/V/Wphase winding on the magnetic ring2-3lock up. The ground wire and shielding net cannot be wound into the magnetic ring.
Encoder line	Engaging the necessary number of turns on the magnetic ring. (2-3lock up)



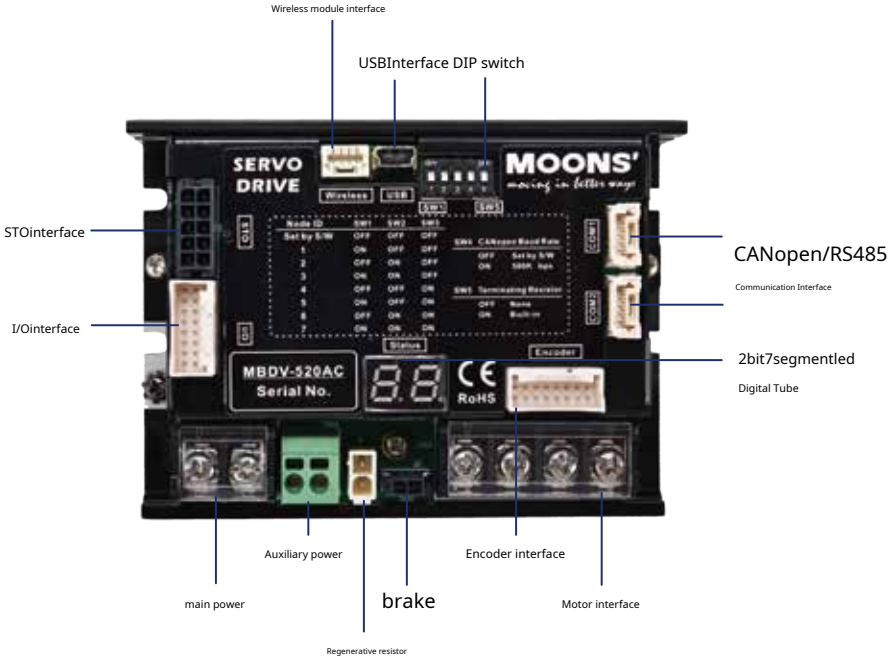
Magnetic ring recommended model:

MOONS'Optional models	Manufacturer's model	manufacturer
M2-OP3035	ZCAT3035-1330	TDK

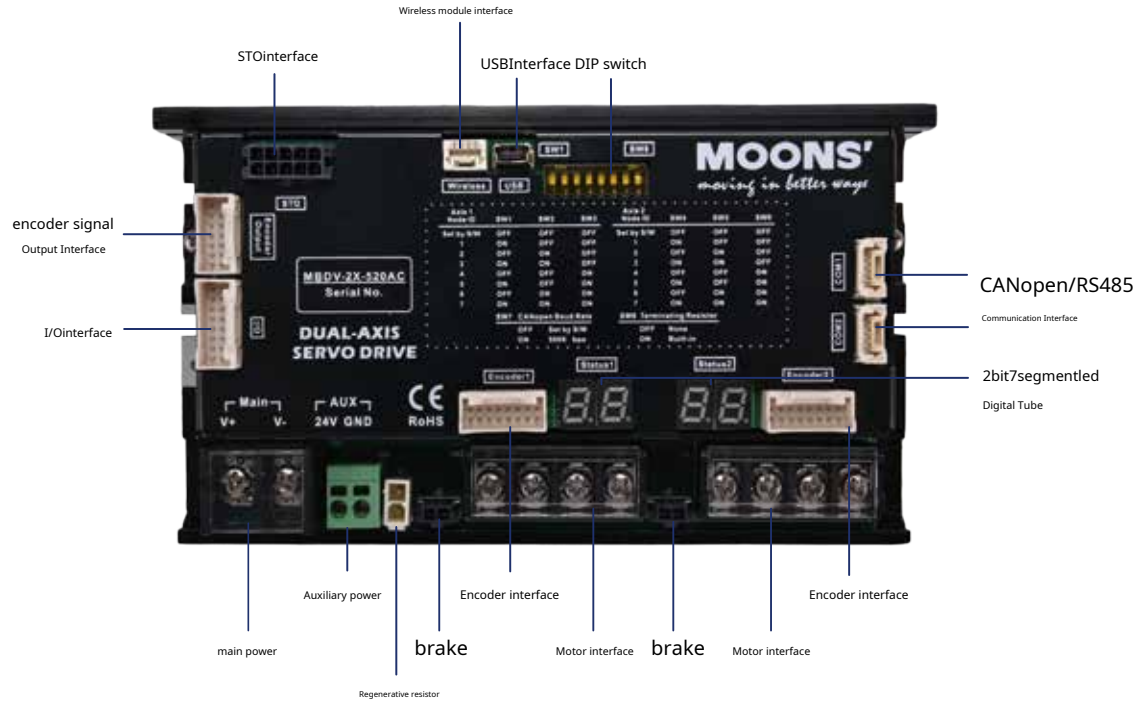
4.2External circuit wiring

4.2.1Interface introduction

4.2.1.1 MBDV-520AC



4.2.1.2 MBDV-2X-520AC



4.2.2DIP switch function description

MBDVdrive has1DIP switch,to setCANopenCommunication node address,Baud rate and optional termination resistors,The specific definition is as follows.

● MBDV-520AC

Node address:

SW1	SW2	SW3	Function Description
0	0	0	Node address viaLunasoftware settings,The default is1
1	0	0	The node address is1
0	1	0	The node address is2
1	1	0	The node address is3
0	0	1	The node address is4
1	0	1	The node address is5
0	1	1	The node address is6
1	1	1	The node address is7

baud rate:

SW4	Function Description
0	baud rate passLunasoftware settings,The default is1Mbps
1	500kpbs

Optional terminal matching resistor:

SW5	Function Description
0	CAN_HandCAN_Lnot connected120Ωresistance
1	CAN_HandCAN_Lconnection between120Ωresistance

● MBDV-2X-520AC

1#Node address:

SW1	SW2	SW3	Function Description
0	0	0	Node address viaLunasoftware settings,The default is1
1	0	0	The node address is1
0	1	0	The node address is2
1	1	0	The node address is3
0	0	1	The node address is4
1	0	1	The node address is5
0	1	1	The node address is6
1	1	1	The node address is7

2#Node address:

SW4	SW5	SW6	Function Description
0	0	0	Node address viaLunasoftware settings,The default is1
1	0	0	The node address is1
0	1	0	The node address is2
1	1	0	The node address is3
0	0	1	The node address is4
1	0	1	The node address is5
0	1	1	The node address is6
1	1	1	The node address is7

baud rate:

SW7	Function Description
0	baud rate passLunasoftware settings,The default is1Mbps
1	500kpbs

Optional terminal matching resistor:

SW8	Function Description
0	CAN_HandCAN_Lnot connected120Ωresistance
1	CAN_HandCAN_Lconnection between120Ωresistance

4.2.3Driver terminal description

type	name	illustrate		
Main	V+,V-	V+	Positive power supply of power circuit	
		V-	Power circuit power supply negative	
AUX	24V,GND	24V	Control circuit power supply+24V	can not pick up
		GND	Control circuit power supplyGND	
REG	REG	External regenerative energy absorption resistor connector		
Motor	U,V,W	U	red	Three-phase power supply for the motor
		V	yellow	
		W	blue	
	Brake	Motor brake connector		
Encoder	Encoder signal input interface	Motor encoder connector		
I/O	I/Oconnect	Input and output signal connector		
Encoder Output	Encoder signal output interface	Encoder signal output connector		
STO	STOinterface	Safe torque off function connector		
Wireless	Wireless debugging module interface	Wireless debugging module connection port		
USB	USBdebug interface	connect toPCmachine		
COM1 / COM2	CANopen/RS-485 interface	CANopen/RS-485Communication Interface		

4.2.4Please pay attention to the following points when wiring

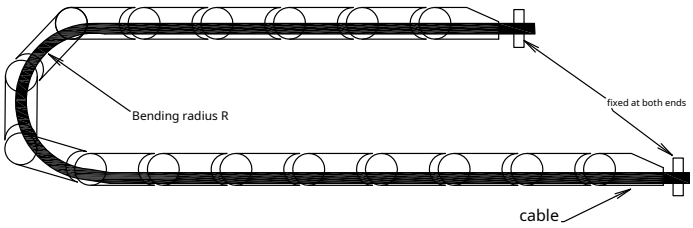
- Please make sure that the driver and motor are well grounded,And the ground wire is best to useAWG10above cables.
- Grounding must be a single point ground.
- an examinationV+,V-Is the wiring correct?,and connect to the correct voltage.
- If using auxiliary power,please24VThe positive side of the power supply is connected to24V,The negative connector of the power supply toGND.
- make sureU,V,Win order of red,yellow,blue,Wrong sequence will cause the motor not to rotate or to rotate randomly.
- An emergency stop circuit must be provided,to ensure that when there is a fault,Power can be cut off immediately.
- There is a large capacity capacitor in the servo drive,even after a power outage,will remain high pressure,After a power outage5Do not touch the exposed parts of the drive and motor terminals for a few minutes.
- Do not use the same sleeve for the main power cable and the input/output signal cable/encoder cable,Don't tie it together.When wiring,The main power cable and the input/output signal cable/encoder cable should be separated from each other30cmabove.Getting too close can lead to misoperation.
- Use twisted-pair wire or multi-core twisted-pair shielded wire for input/output signal cable and encoder cable.
- The maximum wiring length of the cable for input and output signals is3m,The maximum wiring length of the encoder cable is5m.

4.2.5Precautions for the use of drag chain cables

Where motor cable movement is required or when cables are installed in energy chains,Please use a dedicated flexible and bend-resistant cable.Ordinary cables are easily damaged by repeated bending,Cause the servo motor to not work properly.

When using drag chain cables,need to ensure:

- Correctly select the cable that meets the required bending times
- Bending radius of the cableRUsually in the outer diameter of the cable10times more than
- Avoid pulling on cables,When wiring inside the drag chain,Do not fasten or bundle,To avoid pulling the cable due to insufficient bending radius when bending
- Please bundle the cables at the two ends of the towline and where the mechanical parts are fixed



- Internal wiring of e-chains®,not too dense,Make sure that the cable occupies less than60%
- Mixed wiring of cables with large differences in outer diameter should be avoided,If you really need mixed wiring,Please set the baffle

4.2.6Recommended wire

- The main circuit is recommended to use withstand voltage600V, 75°CInsulated wire above
- Be sure to choose a wire that uses the corresponding current,Prevent wires from overheating

4.2.6.1Recommended wire

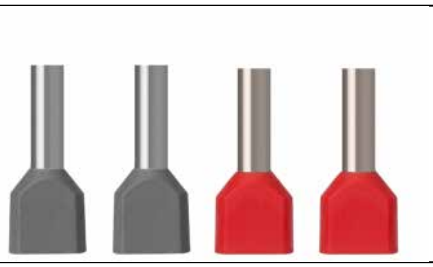
The recommended cables for each part of the driver are as follows:

Drive and matching servo motor		rated power (W)	Wire diameter (AWG)						
			Connector Main	Connector AUX	Connector REG	Connector Motor		Connector Encoder	- - -
			V+/V-	24V/GND	REG	U/V/W	Brake	Encoder	power ground
MBDV-520AC	SM0402GSL-KCY-□NV	100	1.0 ~ 1.5mm² AWG16 ~ 18	1.0 ~ 1.5mm² AWG16 ~ 18	1.0 ~ 1.5mm² AWG16 ~ 18	1.0 ~ 1.5mm² AWG16 ~ 18	0.5mm² AWG20	0.1mm² AWG26	2.0 ~ 5.3mm² AWG10 ~ 14
	SM0601GSL-KCY-□NV	200	2.0 ~ 3.5mm² AWG12 ~ 14			2.0 ~ 3.5mm² AWG12 ~ 14			
	SM0602GSL-KCY-□NV	400							
	SM0803GSL-KCY-□NV	750	3.5 ~ 5.3mm² AWG10 ~ 12			4.0 ~ 6.0mm² AWG10 ~ 12			
MBDV-2X-520AC	SM0401GSL-KCY-□NV	50	2.0 ~ 3.5mm² AWG12 ~ 14			1.0 ~ 1.5mm² AWG16 ~ 18			
	SM0402GSL-KCY-□NV	100							
	SM0601GSL-KCY-□NV	200	4.0 ~ 6.0mm² AWG10 ~ 12			2.0 ~ 3.5mm² AWG12 ~ 14			
	SM0602GSL-KCY-□NV	400							
	SM0803GSL-KCY-□NV	750	8.0mm² AWG8			4.0 ~ 6.0mm² AWG10 ~ 12			

◇represents the encoder type, □Indicates whether there is a brake

4.2.7crimp terminal

power connectorAUXPlease use insulated pin terminals.

◆ pin type	◆ Sleeve type	◆ Parallel terminal:For when two wires are combined into one terminal
		

- Please select the appropriate size of pin terminal according to the recommended wire.

  Wire Types for Connectors:AWG16 ~ AWG18 Connector

  Applicable Wire Outside Diameter:ø1.0~ 1.5mm

4.2.8ground terminal

- for betterEMCEffect,please use5.3mm$_2$/AWG10special copper conductor cables
- Ground terminal tightening torque

Drive model	ground screw	
	Specification	Tightening torque
MBDV-520AC MBDV-2X-520AC	M4	1.4Nm

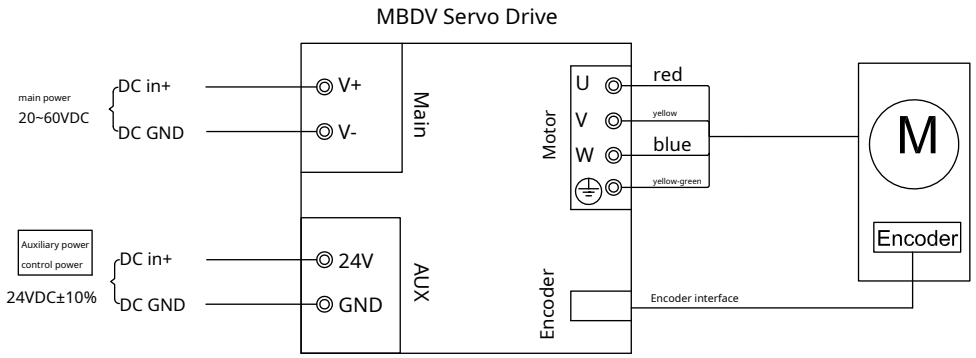
Notice:

- Exceeding the maximum tightening torque can cause damage to the screw holes
- Do not install ground screw with power on,May cause electrical sparks
- Please check regularly whether the ground screw is loose

4.3 Main & AUX -Driver power wiring method

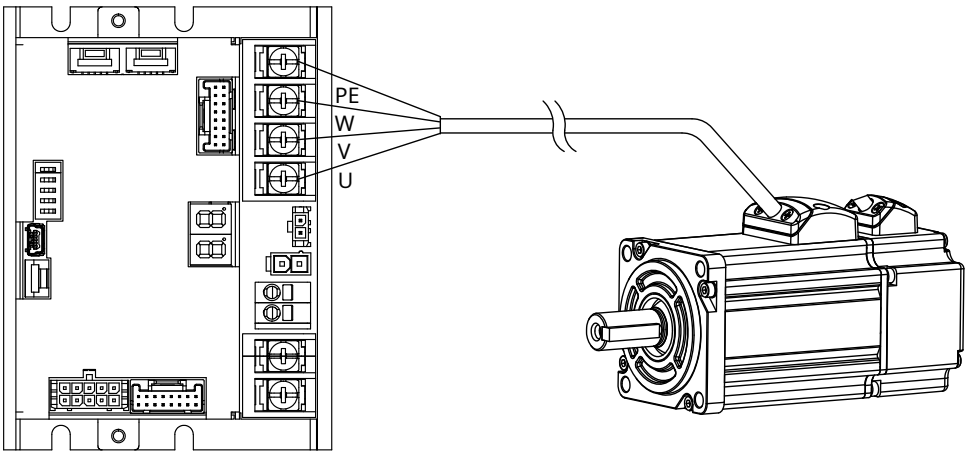
MBDVThe series DC servo has two power supplies.

	pin	Features	input specification
main power	V+,V-	Drive main power input	24 ~ 60VDC
Auxiliary Power/Control Power	24V,GND	In the event of a mains power failure,The following two applications require an auxiliary power supply: a)drive requiredDSPWhen part of normal work b)Use the dedicated brake output port on the driver to directly drive the motor's brake When power is restored to the main circuit,The upper computer controller can quickly restore the position control.	24VDC±10%



4.4 Motor-The connection method of the driver and the motor power line

4.4.1Block diagram of the connection between the driver and the motor power line



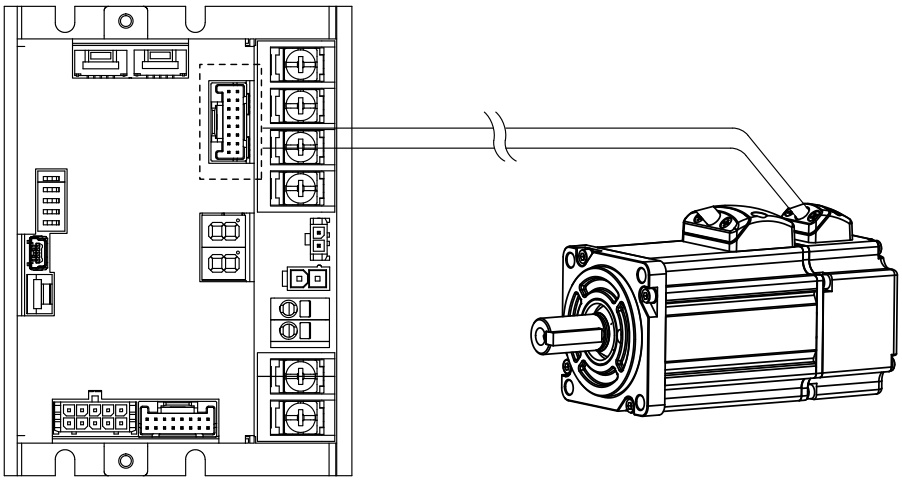
4.4.2Definition of motor power line wiring

Signal	U	V	W	PE
name	UMutually	VMutually	WMutually	Motor ground wire
color	red	yellow	blue	yellow/blue

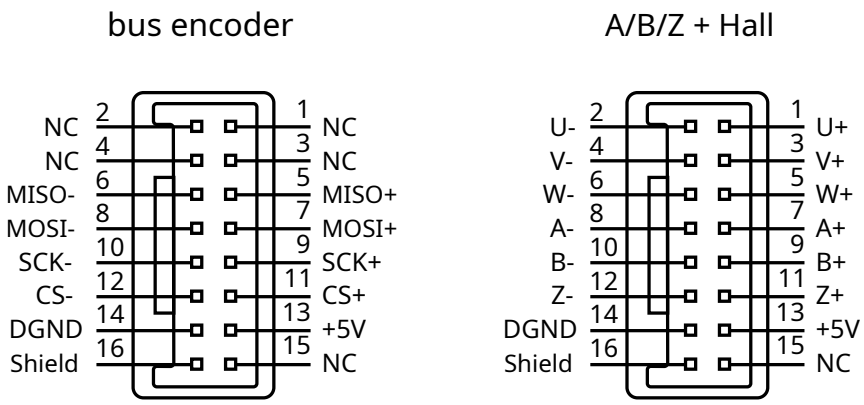
Notice:make sure**U**,**V**,**W**in order of red,yellow,blue,Wrong sequence will cause the motor not to rotate or to rotate randomly

4.5 Encoder-The connection method of the driver and the motor encoder line

4.5.1The block diagram of the connection between the driver and the motor encoder line

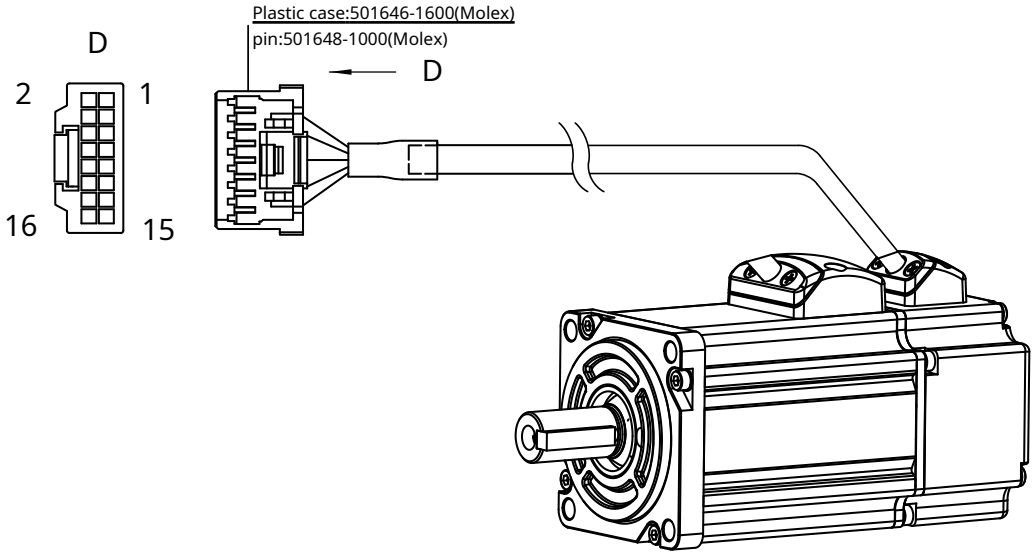


4.5.2Encoder Interface Definition



pin	bus encoder		A/B/Z + Hall
	Signal		Signal
1	NC		U+
2	NC		U-
3	NC		V+
4	NC		V-
5	MISO+		W+
6	MISO-		W-
7	MOSI+		A+
8	MOSI-		A-
9	SCK+		B+
10	SCK-		B-
11	CS+		Z+
12	CS-		Z-
13	5V		5V
14	DGND		DGND
15	NC		NC
16	Shield		Shield

4.5.3Encoder line interface definition



Applicable motor encoder type	Pin	Signal	color
Communication encoder	1	NC	— —
	2	NC	— —
	3	NC	— —
	4	NC	— —
	5	MISO+	blue
	6	MISO-	blue/black
	7	MOSI+	green
	8	MOSI-	green/black
	9	SCK+	yellow
	10	SCK-	yellow/black
	11	CS+	brown
	12	CS-	brown/black
	13	+5V	red
	14	DGND	black
	15	NC	— —
	16	Shield	— —

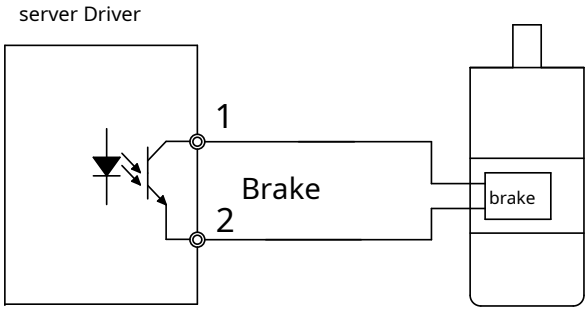
Notice:Do not make any connections to undefined pins

4.6 Brake-Motor connection with electromagnetic brake

Servo motors are used in loads such as vertical axes,When the motor is not enabled or powered off,In order to prevent the mechanical mechanism driven by the motor from falling due to gravity and other reasons,Servo motor with electromagnetic brake is required.

Notice:The brake of the servo motor can only be used as the motor to maintain the position of the mechanism when the motor is not enabled or powered off.,Do not use for braking during deceleration, Otherwise the motor will be damaged.

4.6.1Connection diagram



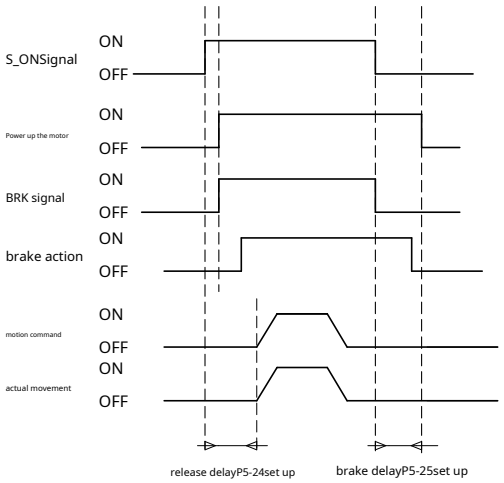
4.6.2Precautions for the use of brake motors

- The special output interface of the drive to control the brake can directly drive the brake of the motor,Auxiliary power supply must be connected24VDC.
- Electromagnetic brake is normally closed,without power to the brake,The motor shaft cannot turn.
- When the brake is in the braking/release action,will make a clicking sound,will not affect use.
- Recommended Use0.5mm$_2$(AWG20)above cables,Prevents voltage drop caused by too thin cables.
- Brake specifications are as follows

motor model	Motor Power	holding torque Nm	lasts on release current A	lasts on release Power consumption W@20°C	Rated voltage VDC	release time ms	release voltage VDC	braking time ms
SM0402JSL-KCY-BNV SM0402GSL-KCY-BNV	100W	0.32	0.26	6.3	twenty four	< 25	18.5	< 70
SM0601J*L-KCY-BNV SM0601G*L-KCY-BNV	200W	1.5	0.3	7.2		< 25	18.5	< 70
SM0602G*L-KCY-BNV	400W	1.5	0.3	7.2		< 25	18.5	< 70
SM0803G*L-KCY-BNV	750W	3.2	0.4	9.6		< 25	18.5	< 70

4.6.3Brake action sequence

Since the brake has an action delay when releasing and braking,To avoid damage to the brake,Attention should be paid to the action timing during use.



Release delay and braking delay time can be usedLunasoftware to set.

4.7 REG-Regenerative energy absorption resistor wiring method

When the direction of torque and speed of the motor are opposite,The motor is in a generator-like mode,The external energy is converted into voltage by the motor terminal and fed back to the driver,causes the driver bus voltage to rise,The energy in this process is called regenerative energy.For example, when the motor is decelerating,Excessive bus voltage can damage the drive, Therefore, when the bus voltage is higher than a certain limit,A regenerative energy absorbing resistor must be used to dissipate this part of the voltage,Otherwise, the drive will generate an overvoltage alarm.

MBDVThere is no built-in regenerative energy absorption resistor in any series,The table below isMBDVSpecifications of regenerative energy absorption resistors recommended for series drivers.

driver	Minimum resistance value of external absorption resistor (Ohm)
MBDV-520AC	10
MBDV-2X-520AC	10

4.7.1Calculation method of regenerative energy

A.reciprocating motion

When the motor decelerates,The kinetic energy during deceleration will be converted into electrical energy and fed back to the bus capacitor.

The energy when decelerating is divided into two parts:

A)The energy generated when the motor decelerates

B)Energy generated when an external load decelerates

The following provides a simple method to quickly calculate the required regenerative energy absorption resistance.

1)Calculate the energy when the motor deceleratesE M

The table below isM2series servo motor without external load,From3000rpmslow down to0rpm,energy generated.

Motor series	Motor Power (W)	Servo motor model	Rotor inertia J_M (10^{-4}Kgm)	3000rpmslow down to0rpm energy generated E_M (Joule)	Maximum energy absorbed by the driver capacitor E_C (Joule)
M2	100	SM0402JSL**** SM0402GSL****	0.043	0.21	8.7
	200	SM0601J*L**** SM0601G*L****	0.152	0.75	8.7
	400	SM0602G*L****	0.243	1.20	13
	750	SM0803G*L****	0.856	4.22	27

2)Calculate the energy generated by the dragged load during decelerationE L

It is assumed that the inertia of the load is the inertia of the motorNtimes,then the dragged load from3000rpmslow down to0rpmTime,The energy produced is:

$$E_L = N \times E_M$$

if$E_M + E_L < E_C$during deceleration,The energy generated by the motor and the dragged load is less than the energy absorbed by the drive capacitors,There is no need to worry about the problem of regenerative energy absorption.

3)Calculate the average power of the regenerative energy absorption resistor requiredP AV

$$P_{AV} = \frac{E_M + E_L - E_C}{t_{dec}}$$

in:$t_{dec}$is the deceleration time + the interval time between two decelerations

4)judge

whenP_{AV} < 0,That is, the total power generated during the deceleration process is less than the power absorbed by the bus capacitor in the driver,No external snubber resistor is required.

whenP_{AV} > 0,That is, the total power generated during deceleration is greater than the power absorbed by the bus capacitor in the driver,External absorbing resistor is required,for reasonable Control the temperature rise of the external absorption resistor,The minimum resistance power isP_{AV} / 0.5.

◆ Calculation example:

choose400WofSM0602G*L****,The load inertia is the motor inertia15times,Assumptiont_{dec}(deceleration time + interval time between two decelerations) for0.5s,Every movement is made by3000rpmslow down to0rpm,Then the required power of the absorbing resistor is calculated as:

E_M = 1.2J, E_C = 13.04J

E_L= N x E_M = 15 x 1.2 = 18J

P_{AV} = (1.2+18-13.04) / 0.5 = 12.32Watt Because the power absorbed by the bus capacitors in the drive is less than the total power generated during deceleration,Therefore, an external absorbing resistor is required.

b.External load torque drags the motor,Motor continuous negative power output

Most application motors are doing positive work,That is, the torque output direction of the motor is consistent with the rotation direction.in some special applications,The torque output direction of the motor is opposite to the rotation speed direction,At this time, the external energy will be fed back into the driver.vertical downward movement such as heavy loads,Servo system to meet the position requirements and speed requirements,The motor will output the opposite force against the gravity of the external load.long time running,Bus capacitors are full,Can't continue to absorb regenerative energy,At this time, a regeneration resistor is required to absorb this energy,The power calculation formula is as follows:

$$P_T = 2\pi T_M N_M$$

in:

T_M Torque output for the motor,unitNmNm is the speed

N_M output by the motor,unitrpsrevolutions per second

◆ Calculation example:

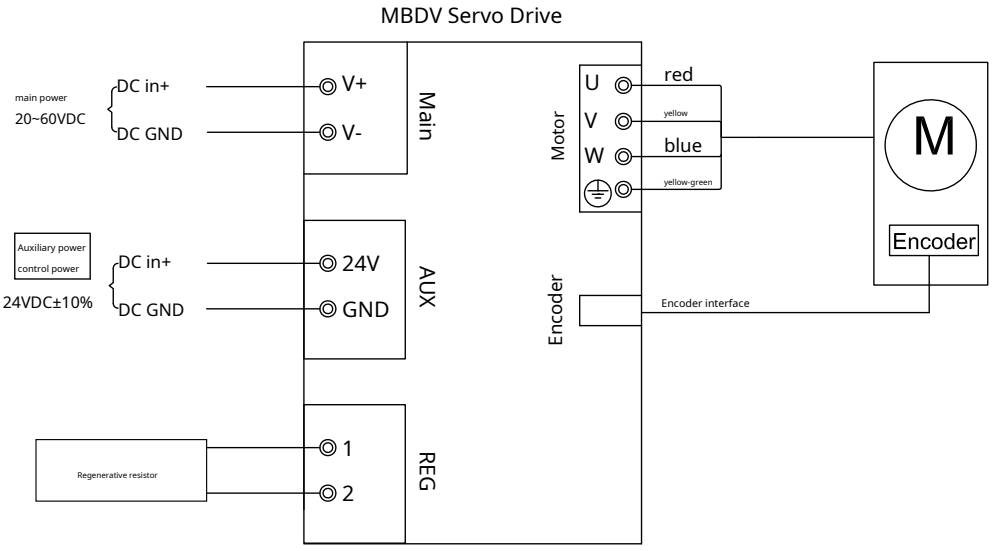
The torque output direction of the motor is opposite to the rotation speed direction,When the motor output torque is0.6Nm,torque2400rpm,At this time, the power is:

P_T= 2 x 3.14 x 0.6 x 2400 / 60 = 150.72Watt

In this case, an external absorbing resistor is required,The minimum power is150.72watt.In order to reasonably control the temperature rise of the external absorption resistor,Minimum power selection 300watt.

4.7.2Wiring method

When regenerative EMF is generated in some applications with high deceleration,In order to prevent the driver from over-voltage alarm,Requires external snubber resistor.



4.7.3device setting parameters

Related parameters

parameter	instruction	name	Value range	Defaults	unit	describe
P1-19	ZR	Regenerative absorption resistor resistance	10 ~ 32000	10	Ohm	Set the resistance value of the regenerative energy absorption resistor
P1-20	ZC	Regenerating Absorption Resistor Power	1 ~ 32000	40	Watt	Set the power of the regenerative energy absorption resistor
P1-21	ZT	Regeneration absorption time constant	0 ~ 8000	1000	ms	Sets the sustainable absorption time of the regenerative energy absorption resistor

Notice:

Please set the resistance value of the absorption resistor correctly,Power and Absorption Time,Otherwise, it will affect the use of this function,cause overvoltage in the drive,Regeneration energy absorption failure and other alarms.

When an external absorbing resistor is used,Please make sure that the total resistance value cannot be less than the minimum allowable resistance value of the driver.If multiple resistor strings are used,Parallel mode,Please calculate the total resistance and total power correctly.

external:100Ω,200Wresistance	Parameter setting: P1-19 = 100 P1-20 = 200
external:two50Ω,200Wresistance,Tandem relationship	Parameter setting: P1-19 = 100 P1-20 = 400
external:two100Ω,200Wresistance,Parallel relationship	Parameter setting: P1-19 = 50 P1-20 = 400

4.8Communication Interface

4.8.1 USB-Host computer debugging interface

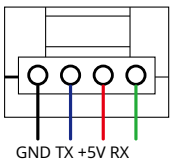
USBport for drive withPCcommunication between machines.useLunasoftware,Control mode can be set,Change parameters,Online automatic tuning and other operations.

pin	logo	Features
1	+5V	USBpower supply
2	D-	data-
3	D+	data+
4	—	reserve
5	GND	power ground

4.8.2 Wireless -Host computer wireless debugging interface

Wirelessport is used for the drive to connect the wireless debugging module withPCmachine to communicate.useLunasoftware,Control mode can be set,Change parameters, Online automatic tuning and other operations.

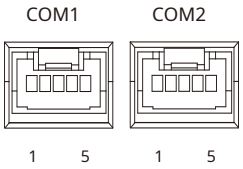
Wireless



pin	logo	Features
1	GND	power ground
2	TX	data sending
3	+5V	data-
4	RX	data reception

4.8.3 COM1/2 - CANopen/RS485Communication Interface

COM1/2port for the drive to connect to the controller forCANopenorModbus RTUcommunication.

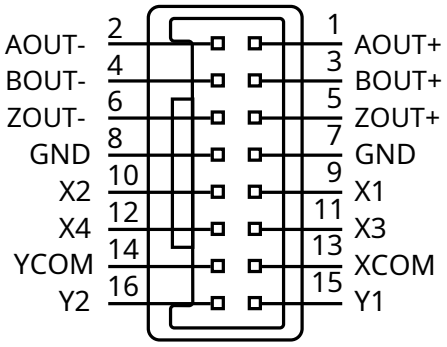


COM1/2pin	CANopen	RS485
1	NC	RS485+
2	NC	RS485-
3	CAN_H	NC
4	CAN_L	NC
5	GND	GND

4.9 I/OInput and output signal wiring (MBDV-520AC)

4.9.1 I/OInput and output signal specifications

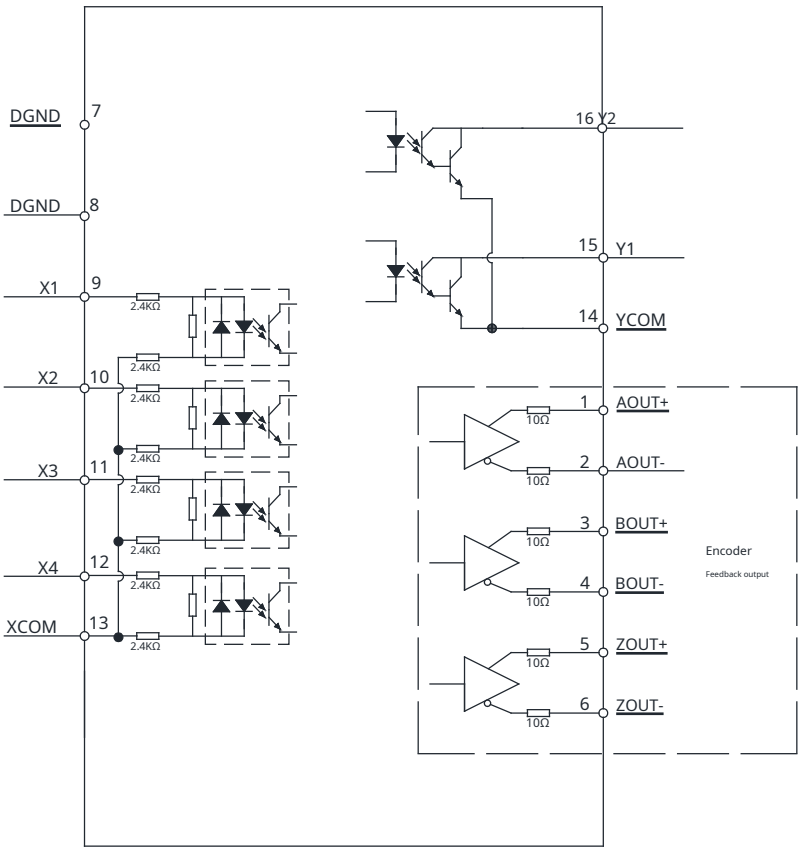
MBDV-520AClow voltage servo drivesI/OPorts are used to connect input and output signals,The pins are defined as follows:



Input and output signal specifications are as follows:

	Classification	describe
number Signal	enter	4optocoupler isolated universal input,Functions can be configured by parameters,24VDC,Maximum current20mA
	output	2optocoupler isolated general-purpose output,Functions can be configured by parameters,maximum30VDC,Maximum output current30mA
pulse Signal	output	3roadLine Driveroutput:EncoderA,B,ZFeedback output

4.9.2 I/OI/O Signal Pin Block Diagram


DGND
7
DGND
8
X1
9
X2
10
X3
11
X4
12
XCOM
13
2.4KΩ
16
Y2
15
Y1
14
YCOM
1
AOUT+
2
AOUT-
3
BOUT+
4
BOUT-
5
ZOUT+
6
ZOUT-
10Ω
Encoder
Feedback output

4.9.3 I/OInput and output pin labels

pin number	Signal	illustrate
1	AOUT+	Encoder outputA+
2	AOUT-	Encoder outputA-
3	BOUT+	Encoder outputB+
4	BOUT-	Encoder outputB-
5	ZOUT+	Encoder outputZ+
6	ZOUT-	Encoder outputZ-
7	DGND	digitally
8	DGND	digitally
9	X1	digital input1
10	X2	digital input2
11	X3	digital input3
12	X4	digital input4
13	XCOM	Digital input common terminal
14	YCOM	Digital output common terminal
15	Y1	digital output1
16	Y2	digital output2

Notice:MBDV-520ACDo notSupport encoder frequency division output function,For this feature,please chooseMBDV-520AC-H01.

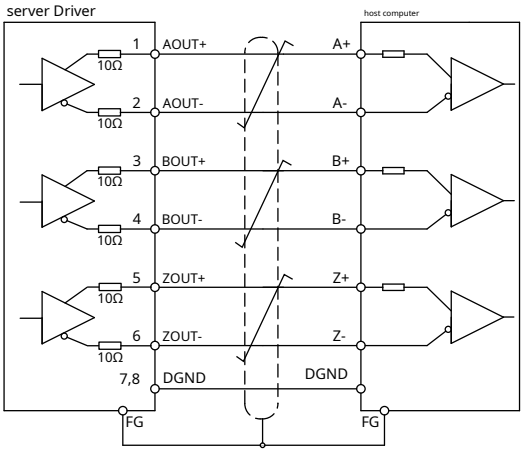
4.9.3.1Encoder frequency division output signal

MBDV-520AC-H01The low-voltage servo drive can convert the encoder signalAMutually,BMutually,Zpass throughLine DriverDifferential output,The output specification is5V.

The host computer must useLine Receiverreceiver receives signal,And the transmission line uses twisted pair shielded wire.

I/O-pin number	Signal name		illustrate
1	AOUT+	encoder signal Pulse output	The feedback signal of the encoder isA,B,Z Differential output in the way
2	AOUT-		
3	BOUT+		
4	BOUT-		
5	ZOUT+		
6	ZOUT-		
7,8	DGND		

◆ **A/B/Z**Differential Signal Connection Example



Notice:Make sure to connect the host computer to the digital ground of the drive.

4.9.3.2digital input signal

MBDV-520ACLow voltage servo drives have4digital input signal.Each digital input signal can be configured to a specific function through parameters,and the logic of the input level.

◆ specific function signal

e.g. alarm clear,Limit sensor input,Origin sensor input,emergency stop, etc..

◆ Universal input signal

as a universal input signal,no specific function.

Signal					Factory default		
I/O-pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	enter logic*1	Defaults
9	X1	digital input1	P5-00	MU1	CCW-LMT	Closed	7
10	X2	digital input2	P5-01	MU2	CW-LMT	Closed	5
11	X3	digital input3	P5-02	MU3	HOM-SW	Closed	39
12	X4	digital input4	P5-03	MU4	E-STOP	Closed	13
13	XCOM	digital inputCOMend	-	-	X1,X2,X3,X4input common		

Note:

*** 1.**The level logic of the pin input is as follows:

Closed:The driver digital input circuit forms a loop,Current flows into or out of the input pins.

Open: The driver digital input circuit does not form a loop,No current flows into or out of the input pins.

2.For details, please see:**7.1.1**Input signal setting

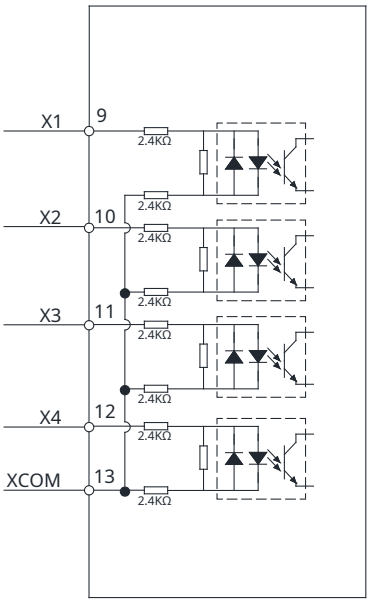
◆ I/Odigital input,Output signal wiring instructions (MBDV-520ACmodel)

MBDV-520ACLow voltage servo drives have4The total of optocoupler isolationCOMpoint single-ended input signal.Because these input circuits are opto-isolated,They require a power supply.If you are connected toPLC,you can usePLCpower supply.If you are connecting a relay or a mechanical switch,you need one24VDCpower supply.The maximum withstand current is20mA.

what is**COM?**

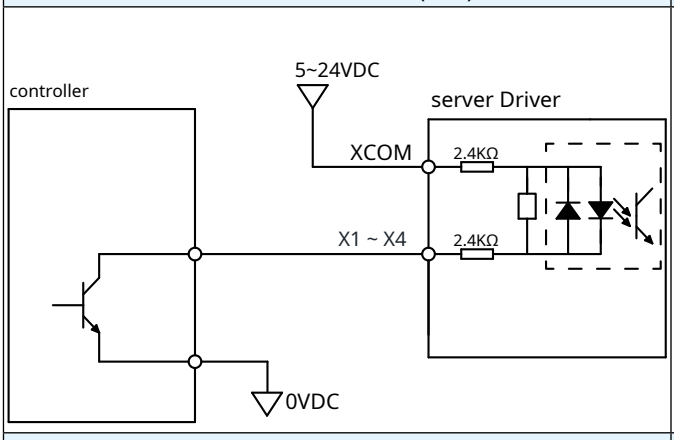
"Common"represents an equipotential common.If you are using source current(PNP)Signal,you should putCOMground(Negative power supply),If you are using sink current(NPN)Signal,SoCOMshould be connected to the positive.

◆ X1 ~ X4The internal circuit block diagram is as follows

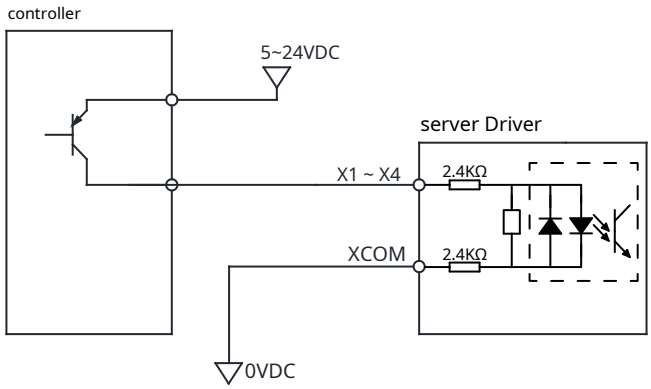


◆ digital inputX1 ~ X4Wiring example

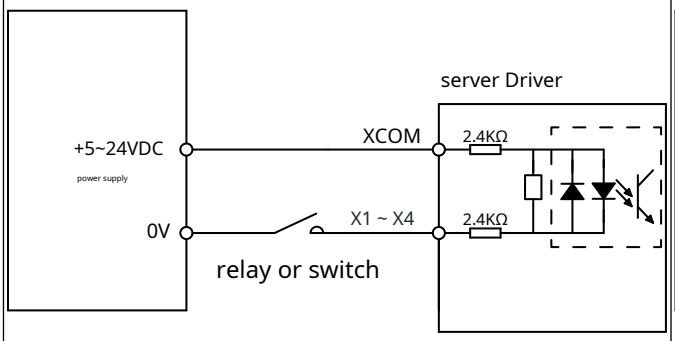
A.controllerSINKMode (Sink)



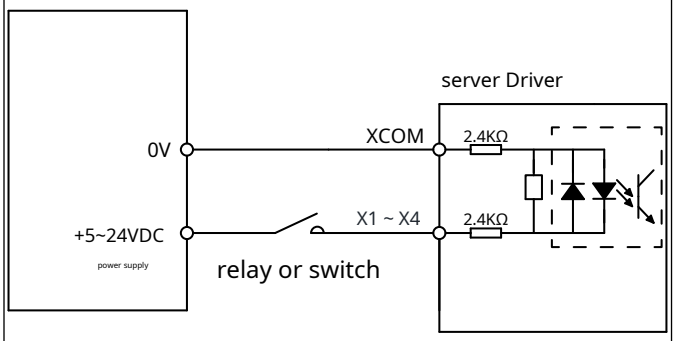
b.controllerSourcingmode (source current)



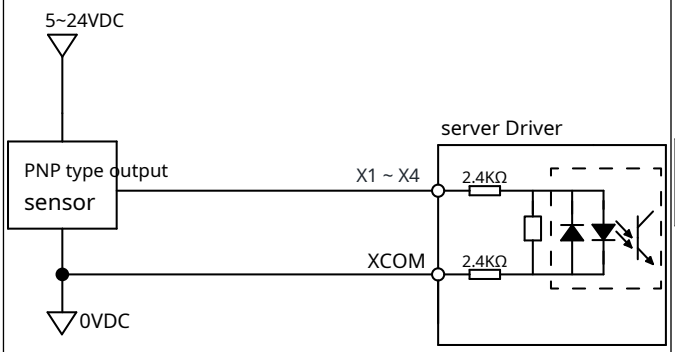
c.Connect relay contacts or switches (XCOMpick up+5~24V)



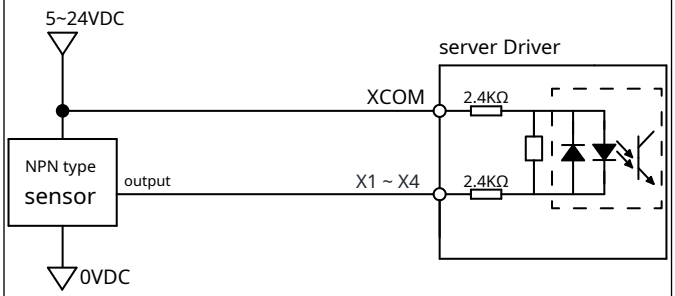
D.Connect relay contacts or switches (XCOMcatch0V)



E.connectPNPtype sensor



F.connectNPNtype sensor



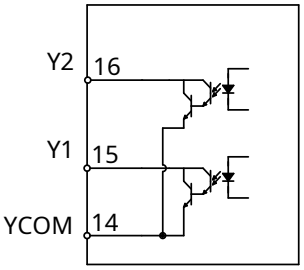
4.9.3.3digital outputY1 ~ Y2

MBDV-520ACLow voltage servo drives have2The total of optocoupler isolationCOMpoint output signalY1andY2,Each output signal can be configured to a specific function through parameters,and the logic of the output level.

Maximum withstand voltage30VDC,current100mA.

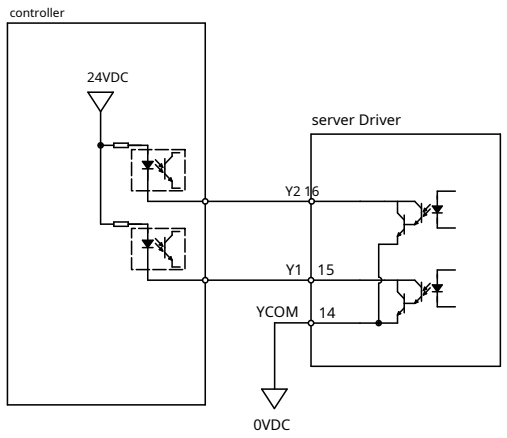
Signal					Factory default		
CN2- pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	output logic * 1	Defaults
15	Y1	digital output1	P5-12	MO1	ALM	Open	2
16	Y2	digital output2	P5-13	MO2	SON-ST	Closed	7
14	YCOM	digital output	-		Y1,Y2output common		

◆ Y1 ~ Y2Internal block diagram of output signal

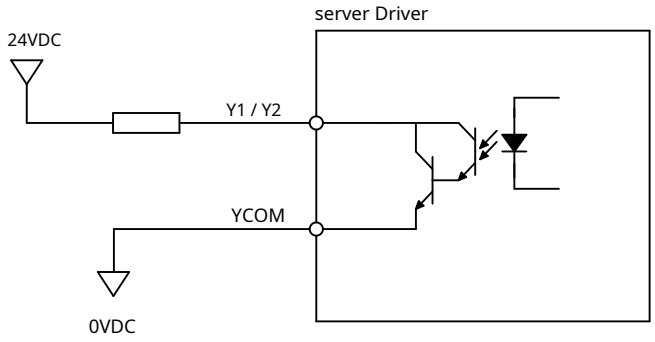


◆ Y1 ~ Y2Example of output connection

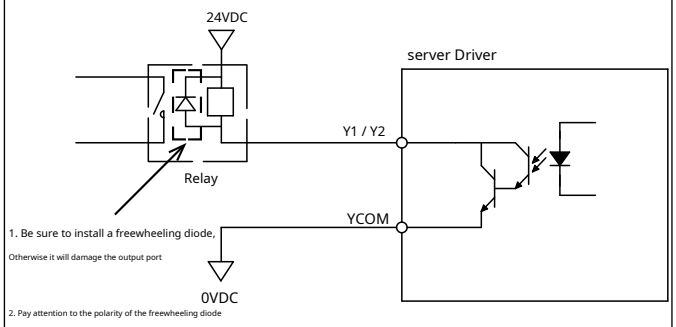
A.Connect to control optocoupler



b.connected to an impedance load



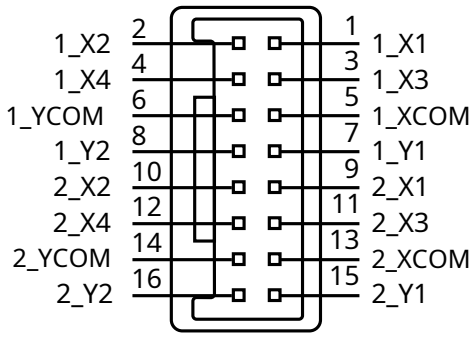
c.Connect to inductive loads such as relays



4.10 I/OInput and output signal wiring (MBDV-2X-520AC)

4.10.1 I/OInput and output signal specifications

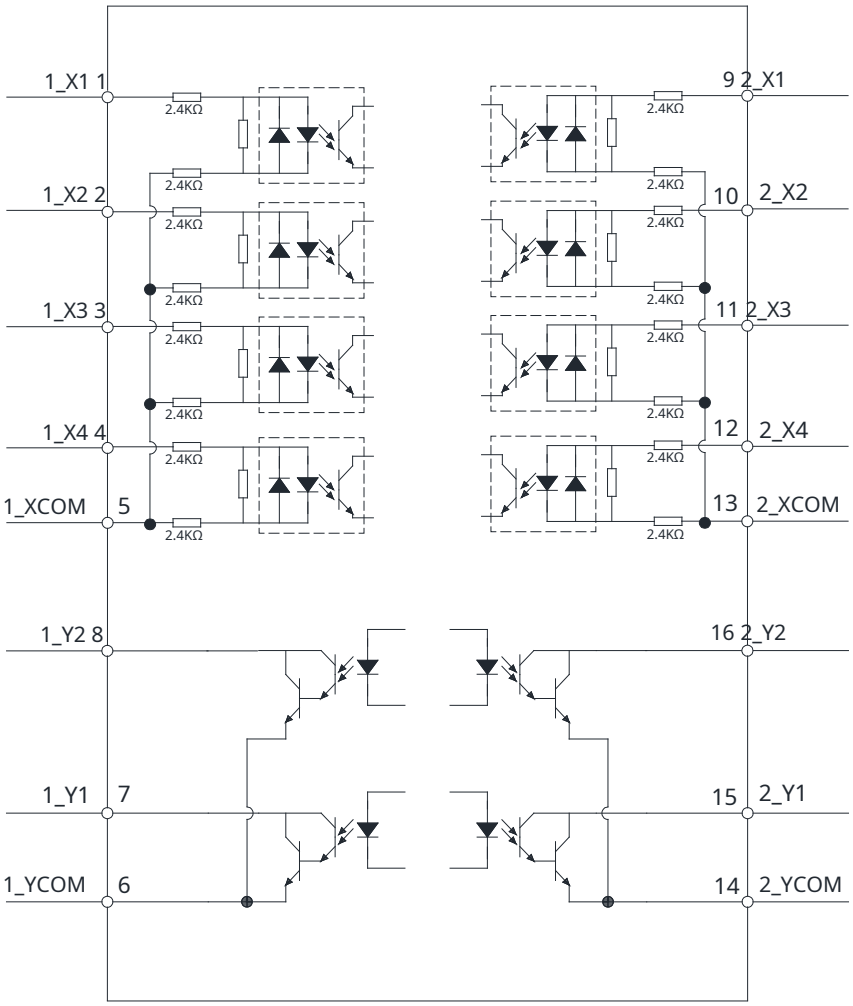
MBDV-2X-520AClow voltage servo drivesI/OPorts are used to connect input and output signals,The pins are defined as follows:



Input and output signal specifications are as follows:

axis	Classification		describe
1#	number Signal	enter	4optocoupler isolated universal input,Functions can be configured by parameters,24VDC,Maximum current20mA
		output	2optocoupler isolated general-purpose output,Functions can be configured by parameters,maximum30VDC,Maximum output current100mA
2#	number Signal	enter	4optocoupler isolated universal input,Functions can be configured by parameters,24VDC,Maximum current20mA
		output	2optocoupler isolated general-purpose output,Functions can be configured by parameters,maximum30VDC,Maximum output current100mA

4.10.2 I/OI/O Signal Pin Block Diagram



4.10.3 I/OInput and output pin labels

pin number	Signal	illustrate
1	1_X1	1#axis_axis digital input1
2	1_X2	1#axis_axis digital input2
3	1_X3	1#axis_axis digital input3
4	1_X4	1#axis_axis digital input4
5	1_XCOM	1#AXIS_DIGITAL INPUT COMMON POINT
6	1_YCOM	1#Axis_Digital output common point
7	1_Y1	1#AXIS_DIGITAL OUTPUT1
8	1_Y2	1#AXIS_DIGITAL OUTPUT2
9	2_X1	2#AXIS_DIGITAL INPUTS1
10	2_X2	2#AXIS_DIGITAL INPUTS2
11	2_X3	2#AXIS_DIGITAL INPUTS3
12	2_X4	2#AXIS_DIGITAL INPUTS4
13	2_XCOM	2#AXIS_DIGITAL INPUT COMMON POINT
14	2_YCOM	2#Axis_Digital output common point
15	2_Y1	2#AXIS_DIGITAL OUTPUT1
16	2_Y2	2#AXIS_DIGITAL OUTPUT2

4.10.3.1digital input signal

MBDV-2X-520ACEach axis of the low-voltage servo drive has4digital input signal.Each digital input signal can be configured to a specific function through parameters,and the logic of the input level.

Signal					Factory default		
I/O-pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	input logic * 1	Defaults
1	1_X1	1#AXIS_DIGITAL INPUTS1	P5-00	MU1	GPIN	Closed	0
2	1_X2	1#AXIS_DIGITAL INPUTS2	P5-01	MU2	GPIN	Closed	0
3	1_X3	1#AXIS_DIGITAL INPUTS3	P5-02	MU3	GPIN	Closed	0
4	1_X4	1#AXIS_DIGITAL INPUTS4	P5-03	MU4	E-STOP	Closed	13
5	1_XCOM	1#AXIS_DIGITAL INPUTSCOMend	— —	— —	X1,X2,X3,X4input common		
9	2_X1	2#AXIS_DIGITAL INPUTS1	P5-00	MU1	GPIN	Closed	0
10	2_X2	2#AXIS_DIGITAL INPUTS2	P5-01	MU2	GPIN	Closed	0
11	2_X3	2#AXIS_DIGITAL INPUTS3	P5-02	MU3	GPIN	Closed	0
12	2_X4	2#AXIS_DIGITAL INPUTS4	P5-03	MU4	E-STOP	Closed	13
13	2_XCOM	2#AXIS_DIGITAL INPUTSCOMend	— —	— —	X1,X2,X3,X4input common		

Note:

*** 1.**The level logic of the pin input is as follows:

Closed:The driver digital input circuit forms a loop,Current flows into or out of the input pins.

Open: The driver digital input circuit does not form a loop,No current flows into or out of the input pins.

2.For details, please see:**7.1.1**Input signal setting

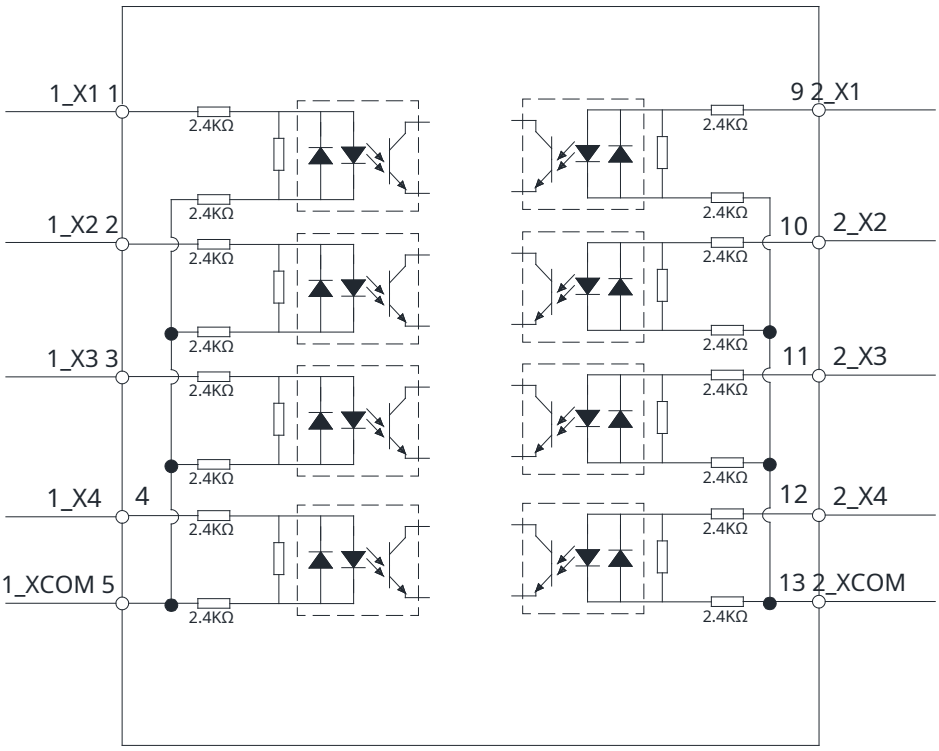
◆ digital input,Output signal wiring instructions

MBDV-2X-520ACEach axis of the low-voltage servo drive has4The total of optocoupler isolationCOMpoint single-ended input signal.Because these input circuits are opto-isolated,They require a power supply.If you are connected toPLC,you can usePLCpower supply.If you are connecting a relay or a mechanical switch,you need one24VDCpower supply.The maximum withstand current is20mA.

what is**COM?**

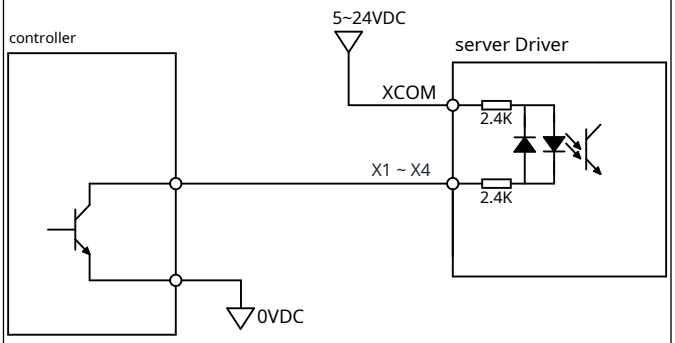
"Common"represents an equipotential common.If you are using source current(PNP)Signal,you should putCOMground(Negative power supply),If you are using sink current(NPN)Signal,SoCOMshould be connected to the positive.

◆ X1 ~ X4The internal circuit block diagram is as follows

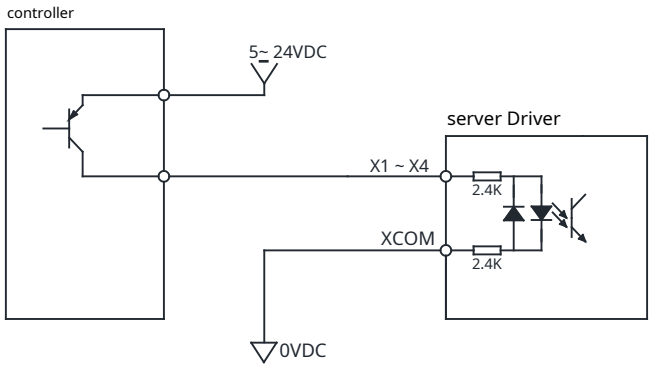


◆ digital inputX1 ~ X4Wiring example

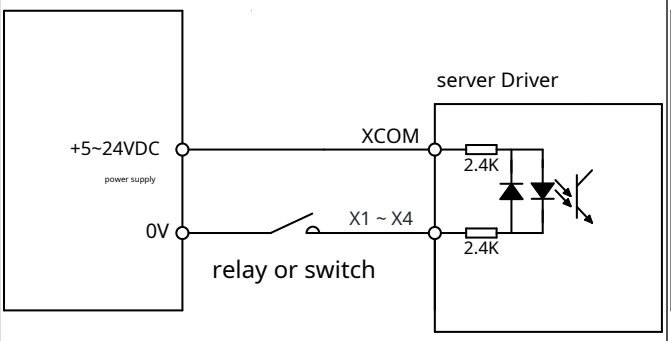
A.controller**SINK**model**(**sink current**)**



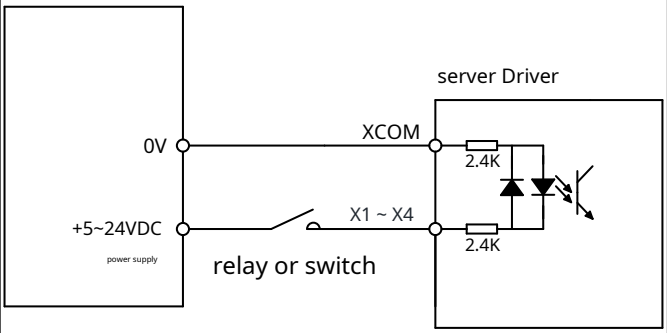
b.controller**Sourcing**model**(**source current**)**



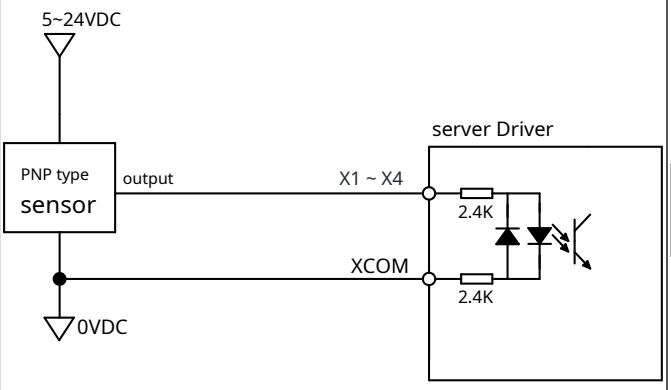
c.Connecting relay contacts or switches**(XCOM**catch**+5~24V)**



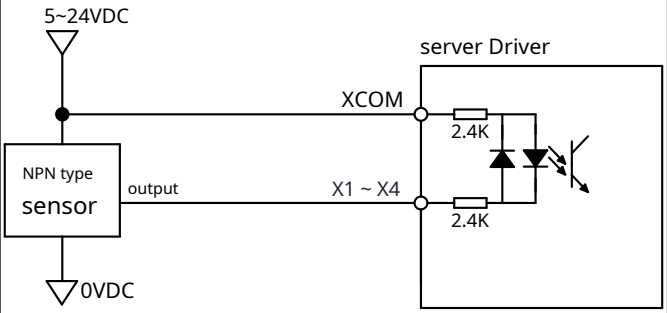
D.Connecting relay contacts or switches**(XCOM**catch**0V)**



E.connect**PNP**type sensor



F.connect**NPN**type sensor



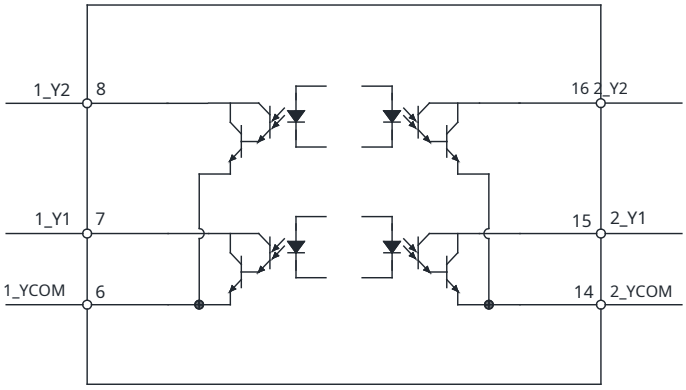
4.10.3.2digital outputY1 ~ Y2

MBDV-2X-520ACEach axis of the low-voltage servo drive has2The total of optocoupler isolationCOMpoint output signalY1andY2,Each output signal can be configured to a specific function through parameters,and the logic of the output level.

Maximum withstand voltage30VDC,current100mA.

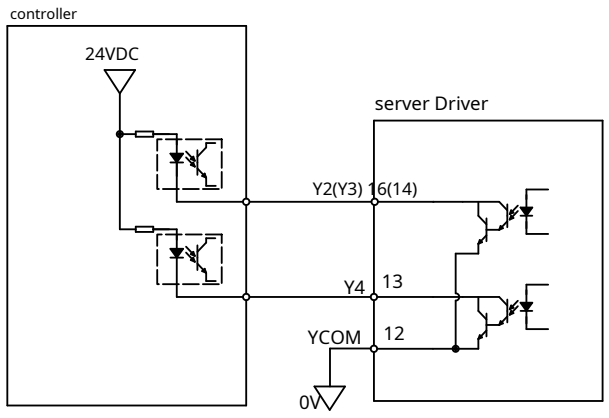
Signal					Factory default		
I/O-pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	output logic	Defaults
7	Y1	1#AXIS_DIGITAL OUTPUT1	P5-12	MO1	ALM	Open	2
8	Y2	1#AXIS_DIGITAL OUTPUT2	P5-13	MO2	SON-ST	Closed	7
6	YCOM	1#AXIS_DIGITAL OUTPUT	-		Y1,Y2output common		
15	Y1	2#AXIS_DIGITAL OUTPUT1	P5-12	MO1	ALM	Open	2
16	Y2	2#AXIS_DIGITAL OUTPUT2	P5-13	MO2	SON-ST	Closed	7
14	YCOM	2#AXIS_DIGITAL OUTPUT	-		Y1,Y2output common		

◆ Y1 ~ Y2Internal block diagram of output signal

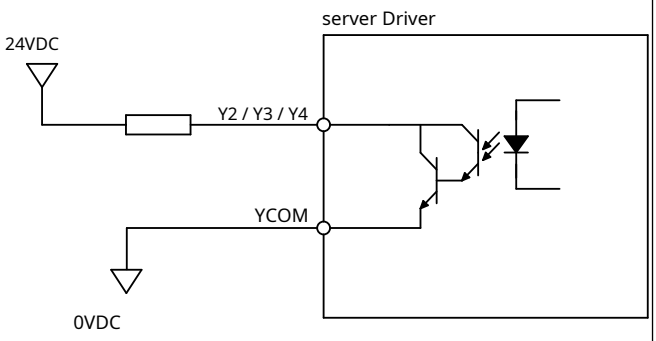


◆ Y1 ~ Y2Example of output connection

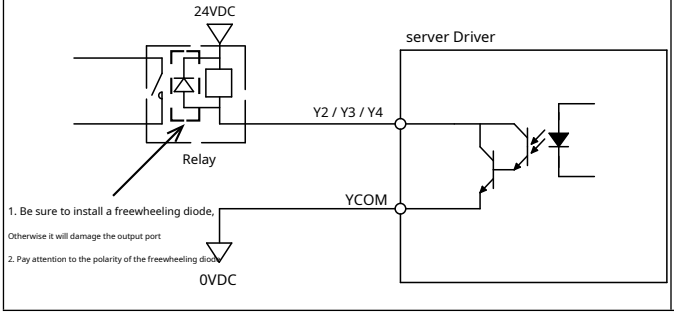
A.Connect to control optocoupler



b.connected to an impedance load



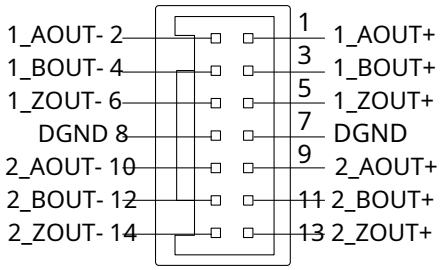
c.Connect to inductive loads such as relays



4.10.4 EncoderEncoder feedback output

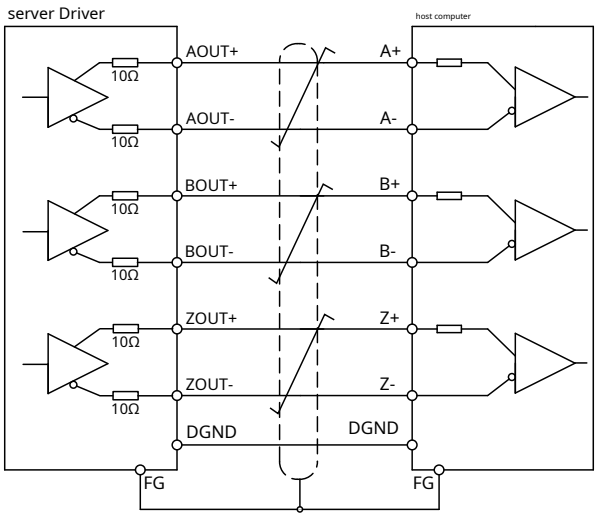
MBDV-2X-520ACThe low-voltage servo drive can convert the encoder signalAMutually,BMutually,Zpass throughLine DriverDifferential output,The output specification is5V.

The host computer must useLine Receiverreceiver receives signal,And the transmission line uses twisted pair shielded wire.



Encoder -pin number	Signal name		illustrate
1	1_AOUT+	1#Shaft encoder signal Pulse output	The feedback signal of the encoder isA,B,Z Differential output in the way
2	1_AOUT-		
3	1_BOUT+		
4	1_BOUT-		
5	1_ZOUT+		
6	1_ZOUT-		
7,8	DGND	digitally	
9	2_AOUT+	2#Shaft encoder signal Pulse output	The feedback signal of the encoder isA,B,Z Differential output in the way
10	2_AOUT-		
11	2_BOUT+		
12	2_BOUT-		
13	2_ZOUT+		
14	2_ZOUT-		

◆ **A/B/Z**Connection example



Notice:Make sure to connect the host computer to the digital ground of the drive.

4.11 STO-Safe torque off function

MBDVSeries of low voltage servo drives with safe torque inhibit function,which isSTO,The connection port is the drive'sSTOmouth.

Safe torque off (Safe Torque Off)It is a hardware-level security protection function.whenSTOWhen the function works,The hardware circuit of the driver will trigger, Forcibly turn off the power tube inside the driver,thereby preventing the motor from working,Drive is disabled,It is a hardware-level safety protection device,It can protect the safety of people and equipment in emergency situations.

whenSTOWhen the function is triggered to work,will clear the driveServo ReadySignal,Motor is disabled,and changes to the alarm state,on the drive panelledwill display the alarm code " 20 ".

4.11.1Safe torque offSTOFeature Notes

1)If you don't need to useSTOFeatures,Please ensure that the factory-configuredSTOThe mating terminal is correctly inserted in theCN5port.

2)useSTOFeatures,Make sure to understandSTOWork mechanism and safety precautions.

3)existSTOWhen the function works,Due to the presence of external forces (e.g. vertical axis loads),The motor will rotate due to external force.therefore,Make sure to use a servo motor with a brake in this case,And connect the brake control circuit correctly.

4)existSTOWhen the function works,The motor will free stop,Therefore, it should be noted that under the action of inertia,The stopping distance will increase.

5)existSTOWhen the function works,Please note that the internal power tube of the driver will be cut off from the output,But the drive power will not be cut off.So make sure if you need to cut off the power when troubleshooting.

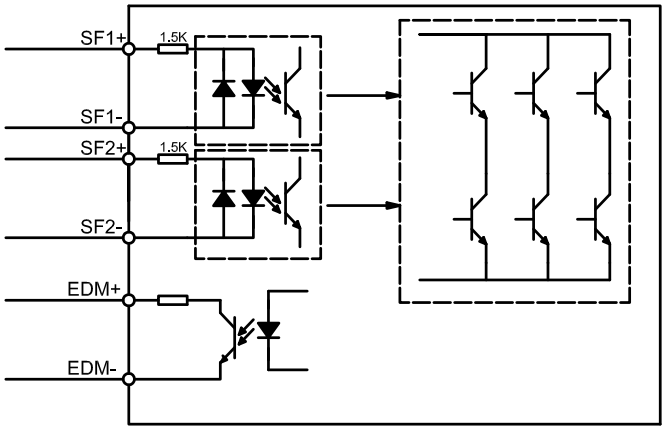
6)existSTOWhen the function works,The drive will be in an alarm state and the motor is disabled.

7) STOThe input signal returns to normal,STOAlarm status is automatically cleared and outputServo ReadySignal,But the drive will still be disabled.

4.11.2 STOFunction input and output signal

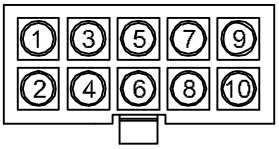
4.11.2.1Input and output internal block diagram

The internal block diagram is as follows:



4.11.2.2I/O pin labels

driverCN5The pin definition is as follows:



Connector and terminal models are as follows:

	model	manufacturer
Connector	43025-1000	MOLEX
PIN	43030-0005	MOLEX

4.11 STO-Safe torque off function

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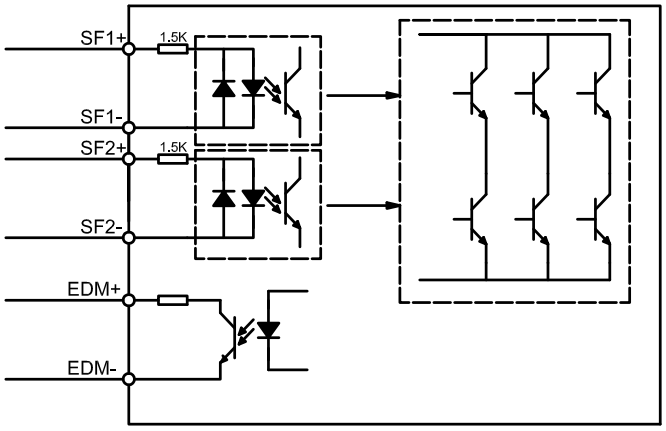
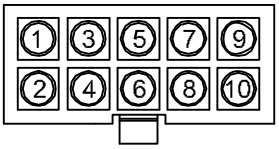


4.11.2.2I/O pin labels

driverCN5The pin definition is as follows:



Connector and terminal models are as follows:

	model	manufacturer
Connector	43025-1000	MOLEX
PIN	43030-0005	MOLEX

4.11.2.3 STOFunction input and output signal definition STO

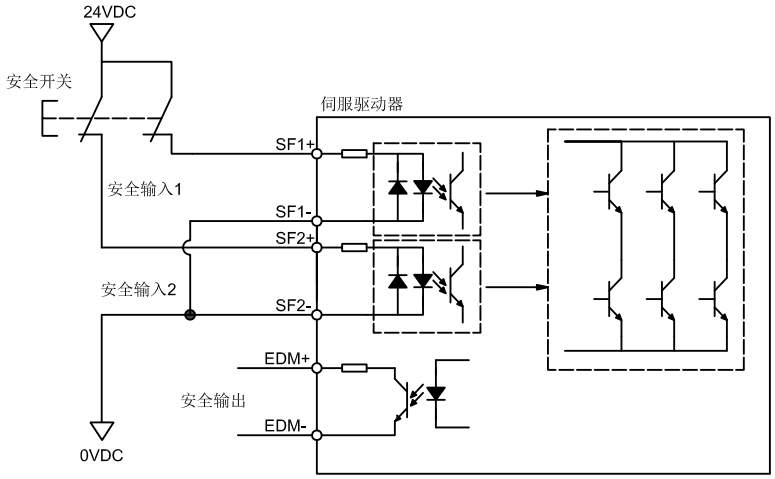
The function input and output signals are as follows:

signal name	logo	pin	illustrate	Applicable mode
Safety signal input1	SF1+	1	whenSF1When there is no input signal,which isSF1disconnected,SF1The internal optocoupler is inOFFstate. The drive signal of the power tube inside the driver will be cut off.	All control modes
	SF1-	5		
Safety signal input2	SF2+	3	whenSF2When there is no input signal,which isSF2disconnected,SF2The internal optocoupler is inOFFstate. The drive signal of the power tube inside the driver will be cut off.	
	SF2-	2		
Safety signal output	EDM+	6	whenSTOAfter the function works,This signal output	
	EDM-	4		
digitally	DGND	7,8	+5VDCpower ground	
+5Vpower supply	+5V	9,10	+5VDCPower Output	

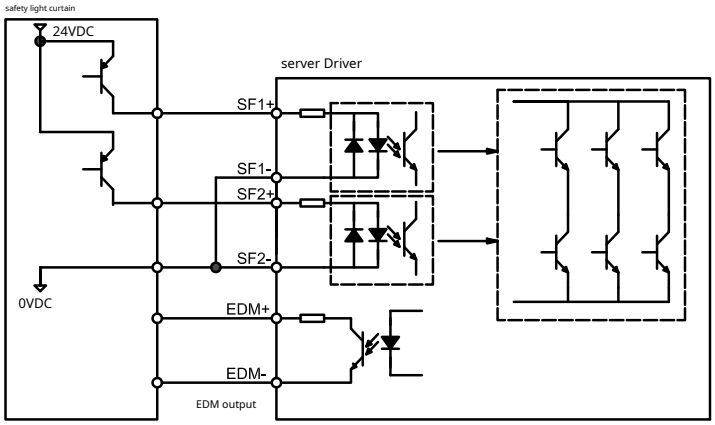
Notice:When any security input**SF1**,**SF2**for**OFF**Time,**STO**functions will start working.

4.11.2.4 STOConnection example

◆ Connect with safety switch



◆ Connection with safety light curtains

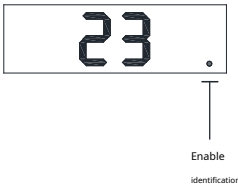


5 LEDsshow

5.1Display panel names and functions

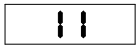
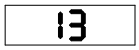
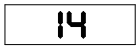
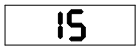
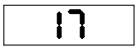
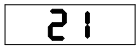
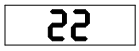
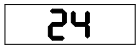
5.2Display content

5.2.1decimal point meaning

Display content	illustrate
	◆ enable flag:ledThe decimal point in the lower right corner of the panel is the identification bit of whether the drive is enabled Always bright:Indicates that the driver is enabled,The motor is energized and the excitation is turned off:Indicates that the driver is disabled,The motor is not powered

5.3Abnormal alarm display

in any case,Once the drive generates the following alarms,will enter the abnormal alarm display mode.The alarm display code is as follows.

Display content	illustrate	type of alert	Drive status after alarm
	Drive over temperature alarm	report an error	Servo off
	Internal voltage alarm	report an error	Servo off
	Drive overvoltage alarm	report an error	Servo off
	overcurrent	report an error	Servo off
		report an error	Servo off
		report an error	Servo off
	Encoder signal error	report an error	Servo off
	Position error overrun	report an error	Servo off
	Drive low voltage alarm	report an error	Servo off
	Stall Alarm	report an error	Servo off
	Forward rotation prohibition limit and reverse rotation prohibition limit	warn	do not change the current state
	Reverse prohibition limit	warn	do not change the current state,The motor cannot continue to reverse
	Forward rotation prohibition limit	warn	do not change the current state,The motor cannot continue to rotate forward
	drive overload	warn	do not change the current state
	Communication exception	warn	do not change the current state
	Failed to save parameters	warn	do not change the current state
	Safe torque off	warn	Servo off
	Regeneration potential drain failure warning	report an error	Servo off
	Undervoltage warning	warn	do not change the current state
	noneQprogram warning	warn	do not change the current state
	Command the motor to rotate when it is not enabled alarm	warn	do not change the current state
	Drive internal voltage error	report an error	Servo off
		report an error	Servo off
	emergency stop	warn	Motor decelerates to stop
	memory error	report an error	Servo off
	Motor overtemperature	report an error	Servo off
	Drive processor overtemperature	report an error	Servo off
	Motor stall	report an error	Servo off
	Back-to-origin parameter configuration error	warn	do not change the current state

Display content	illustrate	type of alert	Drive status after alarm
	Motor Collision Alarm	report an error	Servo off
	Encoder communication error	report an error	Servo off
	I/OSignal function multiplexing	warn	do not change the current state
	Bus watchdog trigger	warn	do not change the current state

6test run

During test run,It is recommended to disconnect the servo motor from the mechanical part,No-load operation.

6.1Inspection before commissioning

In order to ensure the safety of the servo drive and mechanical structure,It is strongly recommended to check the following items before powering on the drive.

1)Wiring inspection

Check the power input terminalsMain,AUX,Motor output terminalMotor,Encoder inputEncoder,Communication terminalUSBIs it wired correctly,Is the wiring firm?,Is there a short circuit.Confirm proper grounding.

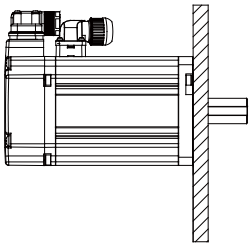
2)Power supply voltage check

an examinationV+,V-Whether the voltage between the,an examination24V,GNDIs the voltage between the.

3)Make sure the motor and drive are securely mounted

4)Make sure the motor shaft is not loaded

6.2Test run steps

step	content	illustrate
1	Please fix the servo motor. 	1)Servo motor can be mounted on the machine 2)Please do not connect the load to the servo motor
2	Make sure the connection between the motor and the driver is correct	1)motorU,V,Wmust correspond to the red of the pinout,yellow,blue.PEcorresponds to yellow-green.If the wrong motor is connected, it will not work normally 2)Verify that the motor encoder is properly connected toEncoder
3	Make sure the power circuit wiring is correct	refer to4.2External main circuit wiring Chapter Confirm whether the power input circuit is correct
4	power on	enter24~60VDCpower supply
5	Under normal circumstances,will show  In the event of an alarm,then show 	1)Under normal circumstances,The drive has no alarm display,and is disabled 2)if it appearsr-09Call the police,Indicates a problem with the encoder cable connection,Please check whether the wiring is correct after power off 3)For other alarms, please refer to10.Troubleshooting
6	Use a motor with an electromagnetic brake,use The electromagnetic brake control circuit needs to be set before	refer to4.6Motor connection with electromagnetic brake
7	jogJOGMode operation	There is no exception in the above steps,to jogJOGMode trial run

Notice:Please be sure to use the motor before moving,Follow the steps below to set the motor parameters.

6.3Connect to a computer for parameter setting

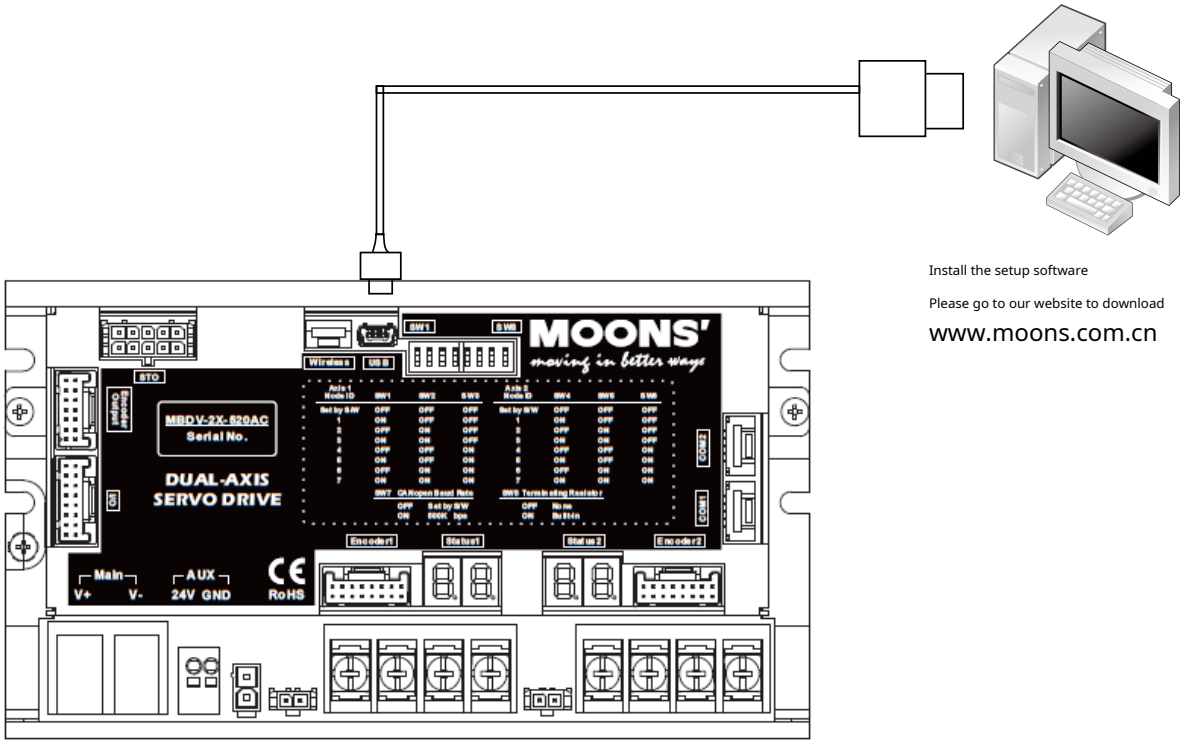
If the servo drive and motor meet the design requirements for use,users must useLunaThe debugging software is set as follows:

1.Select work mode

2.Set the driver input and output signal function

3.Using the online auto-tuning function,debuggingPIDparameter

connection method



Install the setup software

Please go to our website to download

www.moons.com.cn

LunaFor detailed usage, please refer to the software instruction manual.

7.1I/O signal setting

Input and output signal connectorsI/OThere are pre-assigned functions on,Pre-assigned functions can also be changed to other functions according to application requirements,or change the input logic.Function and logic can be set by parameters.

7.1.1Input signal setting

7.1.1.1Input Signal Assignable Functions

The functions and logic that can be assigned to the input signal are as follows.

Signal name	shorthand notation	Set value and effective logic	
		Closedvalid when	Openvalid when
Universal input	GPIN	0	-
Servo enable	S-ON	1	2
Alarm clear	A-CLR	3	4
Forward rotation prohibition limit	CW-LMT	5	6
Reverse prohibition limit	CCW-LMT	7	8
Gain switching	GAIN-SEL	11	12
emergency stop	E-STOP	13	14
Return-to-origin start	S-HOM	15	16
Torque limit input	TQ-LMT	19	20
Zero speed clamp input	ZCLAMP	twenty one	twenty two
Speed limit input	V-LMT	37	38
Origin sensor input	HOM-SW	39	40
implementQprogram	START-Q	45	46

The level logic of the input pin is as follows:

Closed:The driver digital input circuit forms a loop,Current flows into or out of the input pins.

Open:The driver digital input circuit does not form a loop,No current flows into or out of the input pins.

7.1.1.2Default function of input signal

input signalX1~X4corresponding parameters,The functions and default parameter values in each mode are as follows.

Signal				Factory default		
Signal name	Signal description	Corresponding parameters	instruction	Signal name	enter logic	Defaults
X1	digital input1	P5-00	MU1	CCW-LMT	Closed	7
X2	digital input2	P5-01	MU2	CW-LMT	Closed	5
X3	digital input3	P5-02	MU3	HOM-SW	Closed	39
X4	digital input4	P5-03	MU4	E-STOP	Closed	13
XCOM	digital inputCOMend	-	-	Xinput common		

7.1.2Output signal setting

7.1.2.1Assignable functions of output signals

The functions and logic that can be assigned to the output signal are as follows.

Signal name	shorthand notation	Logic and set value when output signal is valid	
		Output when the signal is valid Closed	Output when the signal is valid Open
Universal output	GPOUT	0	-
fault output	ALM	1	2
warning output(Call the police)	WARN	3	4
Motor brake release output	BRK	5	not support
Servo-onStatus output	SON-ST	7	8
Positioning complete output	IN-POS	9	10
Dynamic position follow output	DYM-LMT	11	12
Torque reaches output	TQ-REACH	13	14
Output during torque limit	T-LMT	15	16
Speed consistent output	V-COIN	17	18
speed reaches output	AT-SPD	19	20
Output in speed limit	V-LMT	twenty one	twenty two
Servo Readyoutput	S-RDY	twenty three	twenty four
Return-to-origin completion signal	HOMED	25	26
same location	P-COIN	31	32
Zero speed signal	Z-SPD	33	34
Torque consistent output	I-COIN	35	36

The level logic of the output pin is as follows:

Closed:The driver digital output circuit forms a loop,Current flows into or out of the input pins.

Open:The driver digital output circuit does not form a loop,No current flows into or out of the input pins.

7.1.2.2Default function of output signal

MBDVSeries low voltage servo drives have2digital output signal.

Signal				Factory default		
Signal name	Signal description	Corresponding parameters	instruction	Signal name	output logic	Defaults
Y1	digital output2	P5-12	MO1	ALM	Open	2
Y2	digital output3	P5-13	MO2	SON-ST	Closed	7
YCOM	digital output	-		Y1,Y2output common		

7.1.3Servo enable (Servo On)

Set the signal to control servo motor enable/disable.

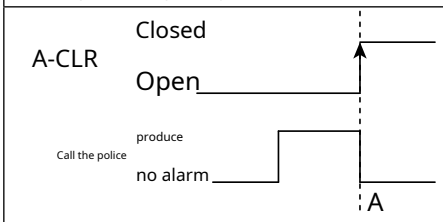
◆ Signal logic

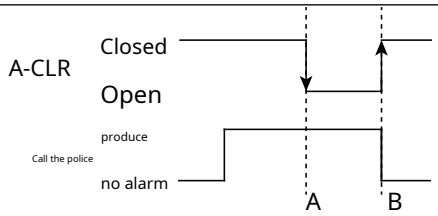
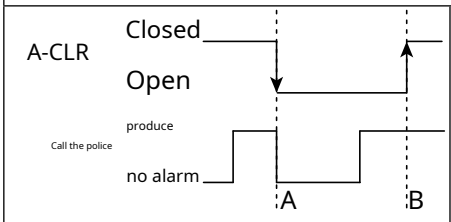
type	Signal name	set value	Signal logic	Features
enter	S-ON	1	Closed	When the input state isClosedstate,drive enable
		2	Open	When the input state isOpenstate,drive enable

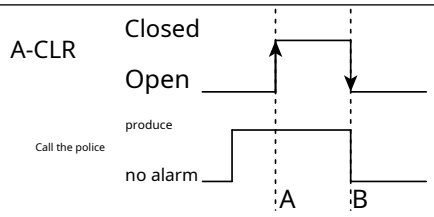
7.1.4Alarm clear (Alarm Reset)

Used to clear abnormal warnings or alarms generated by the drive.

◆ Signal logic

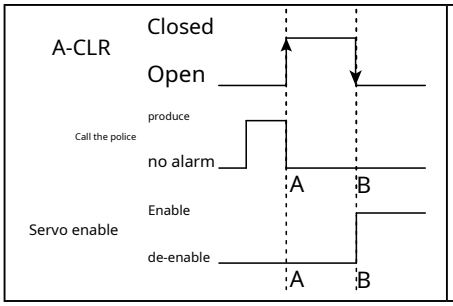
<table>
<tr><th>type</th><th>Signal name</th><th>set value</th><th>Signal logic</th><th>Features</th></tr>
<tr><td rowspan="4">enter</td><td rowspan="4">A-CLR</td><td rowspan="2">3</td><td rowspan="2">Closed</td><td colspan="2">under normal circumstances,input must remain inOpen(high level)state.This is an edge-triggered signal,only when input fromOpen(high level)becomeClosed(low level),will clear the alarm.</td></tr>
<tr><td> 


</td></tr>
<tr><td>1) A-CLRforOpen,Do not clear the alarm
2)existApoint,A-CLRDepend onOpenarriveClosed,Alarm clear</td><td>1) A-CLRforClosed,Do not clear the alarm
2)existApoint,A-CLRDepend onClosedarriveOpen,Do not clear the alarm
3)existBpoint,A-CLRDepend onOpenarriveClosed,clear alarm</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">Open</td><td colspan="2">under normal circumstances,A-CLRinput must remain inClosed(low level)state.This edge-triggered signal , only whenA-CLRFromClosed(low level)becomeOpen(high level)Time,will clear the alarm.</td></tr>
<tr><td> 


</td></tr>
<tr><td>1) A-CLRforClosed,Do not clear the alarm
2)existApoint,A-CLRDepend onClosedarriveOpen,Alarm clear
3)existBpoint,A-CLRDepend onOpenarriveClosed,Do not clear the alarm</td><td>1) A-CLRforOpen,Do not clear the alarm
2)existApoint,A-CLRDepend onOpenarriveClosed,Do not clear the alarm
3)existBpoint,A-CLRDepend onClosedarriveOpen,clear alarm</td></tr>
</table>

Notice:

When all input pins of the driver are not configured"Servo Enable"function time, ""Alarm Clear"Can be used to enable the driver, as shown below:



1) Apoint,A-CLRThe rising edge of the input clears the alarm
2) Bpoint,Alarm has been cleared,A-CLRfalling edge of input,Servo enable

7.1.5just,Reverse limit

In order to prevent the movable parts of the machine from exceeding the movable range,avoid accidents,It is necessary to set positive,Reverse limit switch.

◆ Signal logic

type	Signal name	set value	Signal logic	Features
enter	CCW-LMT	7	Closed	When the input state isClosedstate,Motor reverse direction limit warning, Can't continue to reverse after triggering
		8	Open	When the input state isOpenstate,Motor reverse direction limit warning, Can't continue to reverse after triggering
	CW-LMT	5	Closed	When the input state isClosedstate,The motor cannot continue forward rotation after the limit warning in the forward rotation direction is triggered
		6	Open	When the input state isOpenstate,The motor cannot continue forward rotation after the limit warning in the forward rotation direction is triggered

◆ **MBDV**Serial Drive Default Settings

Signal name	enter name	PINfoot position (I/O)	parameter	instruction	Signal logic set value	effect	Support mode			
CCW-LMT	X1	9	P5-00	MU1	7	Motor reverse direction limit signal input	P	V	T	
	XCOM	13								
CW-LMT	X2	10	P5-01	MU2	5	Motor forward rotation direction limit signal input				
	XCOM	13								

7.1.6Gain switching function

Gain switching can use an external input signal or automatically switch by the driver's internal switching

conditions. Using the gain switching function,to meet different load conditions,

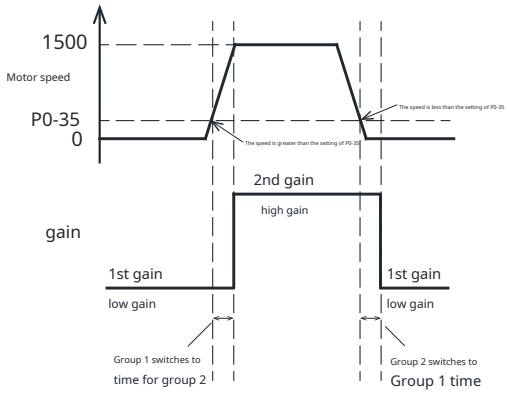
1)Increase gain while positioning,Shorten positioning settling time

2)Decrease the gain when the motor is stopped,Suppress vibration

3)while the motor is running,boost gain,Get better instruction following performance

Example:

Use a lower gain when the motor is at low speed or stationary,reduce noise.while the motor is rotating,switch to higher gain,Improve command following.



1)Gain switching related parameters

parameter	instruction	parameter name	type	Defaults	unit
P0-05	KP	first position loop gain	first set of gains	52	0.1Hz
P0-07	KD	1st position loop differential time constant		0	ms
P0-08	KE	First position loop differential filter frequency		20000	0.1Hz
P0-11	KF	First command speed gain		10000	0.01%
P0-12	VP	first speed loop gain		183	0.1Hz
P0-13	VI	1st speed loop integral time constant		189	ms
P0-16	KC	First command torque filter frequency		1099	0.1Hz
P0-17	UP	Second position loop gain	second set of gains	52	0.1Hz
P0-19	UD	Second position loop differential time constant		0	ms
P0-20	UE	The second position loop differential filter frequency		20000	0.1Hz
P0-21	UF	Second command speed gain		10000	0.01%
P0-22	UV	Second speed loop gain		183	0.1Hz
P0-23	UG	Second speed loop integral time constant		189	ms
P0-24	UC	Second command torque filter frequency		1099	0.1Hz
P0-33	SD	Gain switching condition selection	-	0	
P0-34	PN	Gain Switching Condition - Position	-	0	counts
P0-35	VN	Gain Switching Condition - Speed	-	0	0.025rps
P0-36	TN	Gain Switching Condition - Torque	-	10	0.1%
P0-37	SE1	Second gain switch to first gain delay time	-	10	ms
P0-38	SE2	1st gain to 2nd gain delay time	-	10	ms

2)External input signal switching

Using an external input signalGAIN-SEL,whenGAIN-SELWhen the input conditions are met,switch1gain to2gain.

type	Signal name	set value	Signal logic	Features
enter	GAIN-SEL	11	Closed	The default is the1Gain effective. When the input state isClosedstate,the first2The gain takes effect when the input state isOpenstate,the first1Gain takes effect
		12	Open	When the input state isClosedstate,the first1The gain takes effect when the input state isOpenstate,the first2Gain takes effect

Notice:

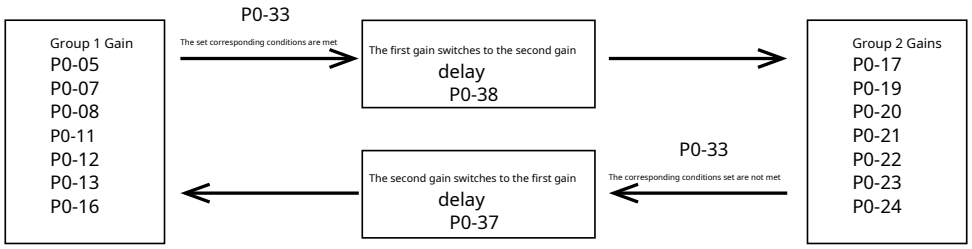
When the gain switching method is configured as external input signal switching,Automatic gain switching is invalid,i.e. no matterP0-33How to set,Gain switching is determined by external input signal.

3)Automatic gain switching

parameterP0-33Method used to set automatic gain switching

parameter	set value	switch condition	handover wait time
P0-33	0(Defaults)	fixed at the1Group	-
	1	switch to2group condition:Absolute value of position error≥ P0-34set value	P0-38
		switch back to1group condition:Absolute value of position error <P0-34set value	P0-37
	2	switch to2group condition:Absolute value of actual speed≥ P0-35set value	P0-38
		switch back to1group condition:Absolute value of actual speed<P0-35set value	P0-37
	3	switch to2group condition:Absolute value of actual torque≥ P0-36set value	P0-38
		switch back to1group condition:Absolute value of actual torque<P0-36set value	P0-37
	4	switch to2group condition:The location arrival condition does not hold	P0-38
		switch back to1group condition:Location reach condition is met	P0-37

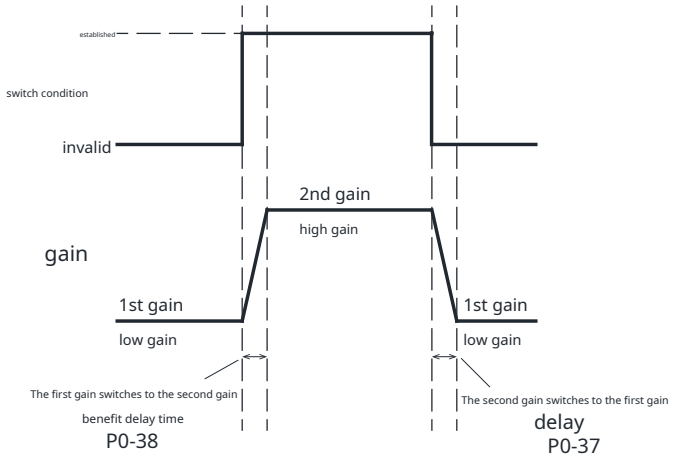
Auto switch mode



4)toggle transition time

When the switching conditions are met,The first set of gains will go throughP0-38Gain switching delay time,Gradually switch to the second set of gains.Avoid jitter caused by immediate gain switching;

When the switching condition does not hold,The second set of gains will go throughP0-37Gain switching delay time,Gradually switch to the first set of gains.Avoid jitter caused by immediate gain switching.



7.1.7Emergency stop input

Emergency stop is a function of forcibly stopping the operation of the servo motor through an external

digital input signal. When using emergency stop,need to signalE-STOPAssign to digital input port.

When there is an emergency stop input signal valid,drive withP2-01the maximum braking deceleration to stop,after stop,Disable the motor, And generate "emergency stop" failure error.

type	Signal name	set value	Signal logic	Features
enter	E-STOP	13	Closed	When the input state isClosedstate,Drive emergency stop when the input state isOpenstate,Emergency stop does not take effect
		14	Open	When the input state isOpenstate,Drive emergency stop when the input state isClosedstate,Emergency stop does not take effect

◆ **MBDV**Serial Drive Default Settings

Signal name	enter name	PINfoot position (I/O)	parameter	instruction	Signal logic set value	Signal logic	effect	Support mode			
E-STOP	X4	12	P5-04	MU5	39	Closed	Drive emergency stop	P	V	T	
	XCOM	13				Open	Emergency stop does not take effect				

7.1.8error output

When the drive fails,will produceerror output,And the servo system will change from enabled state to disabled state.

parameterP5-12 ~ P5-13Set the drive digital outputY1 ~ Y2function. To use this function,One digital output of the servo drive is configured asALMFeatures.

type	Signal name	Output function set value	Signal logic	Features
output	ALM	1	Closed	The drive is faulty and an error is generated,The output isClosedstate
			Open	Drive is OK,No fault report,The output isOpenstate
		2	Open	The drive is faulty and an error is generated,The output isOpenstate
			Closed	Drive is OK,No fault report,The output isClosedstate

Display content	illustrate	alarm type	after the alarm drive status		Display content	illustrate	alarm type	after the alarm drive status
01	Drive over temperature alarm	report an error	Servo off		21	Regenerative potential release failed	report an error	Servo off
02	Internal voltage alarm	report an error	Servo off		25	Drive internal voltage error	report an error	Servo off
03	Drive overvoltage alarm	report an error	Servo off		26		report an error	Servo off
04	overcurrent	report an error	Servo off		28	Full closed loop position error overrun	report an error	Servo off
05		report an error	Servo off		29	Second encoder error	report an error	Servo off
06		report an error	Servo off		30	memory error	report an error	Servo off
09	Encoder signal error	report an error	Servo off		34	Motor overtemperature	report an error	Servo off
10	Position error overrun	report an error	Servo off		35	Drive processor overtemperature	report an error	Servo off
11	Drive low voltage alarm	report an error	Servo off		36	Absolute encoder multi-turn error	report an error	Servo off
12	Stall Alarm	report an error	Servo off		37	Motor stall	report an error	Servo off
19	AC power input phase loss	report an error	Servo off		40	Motor Collision Alarm	report an error	Servo off
20	Safe torque off	report an error	Servo off		41	Encoder communication error	report an error	Servo off

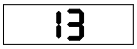
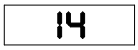
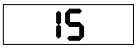
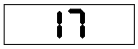
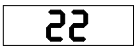
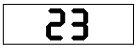
◆ **MBDV**Serial Drive Default Settings

Signal name	enter name	PINfoot position (I/O)	parameter	instruction	Signal logic set value	Signal logic	effect	Support mode			
ALM	Y1	15	P5-12	MO1	2	Closed	Drive emergency stop	P	V	T	
	YCOM	14				Open	Emergency stop does not take effect				

7.1.9warning output

When the driver generates the following types of abnormal warnings,There will be a warning signal output. parameterP5-12 ~ P5-13Set the drive digital outputY1 ~ Y2function. To use this function,One digital output of the servo drive is configured asWARNFeatures.

type	Signal name	Output function set value	Signal logic	Features
output	WARN	3	Closed	The drive has an abnormal warning generated,The output isClosedstate
			Open	Drive is OK,No exception warning,The output isOpenstate
		4	Open	The drive has an abnormal warning generated,The output isOpenstate
			Closed	Drive is OK,No exception warning,The output isClosedstate

Display content	illustrate	type of alert	Drive status after alarm
	Forward rotation prohibition limit and reverse rotation prohibition limit	warn	do not change the current state,Motor does not spin
	Reverse prohibition limit	warn	do not change the current state,The motor cannot continue to reverse
	Forward rotation prohibition limit	warn	do not change the current state,The motor cannot continue to rotate forward
	drive overload	warn	do not change the current state
	Communication exception	warn	do not change the current state
	Failed to save parameters	warn	do not change the current state
	Undervoltage warning	warn	do not change the current state
	noneQprogram warning	warn	do not change the current state
	Command the motor to rotate when it is not enabled alarm	warn	do not change the current state
	emergency stop	warn	Motor decelerates to stop
	Absolute encoder battery undervoltage	warn	do not change the current state
	Absolute position lost	warn	do not change the current state
	Absolute value position overflow	warn	do not change the current state
	Back-to-origin parameter configuration error	warn	do not change the current state
	I/OSignal function multiplexing	warn	do not change the current state
	Bus watchdog trigger	warn	do not change the current state

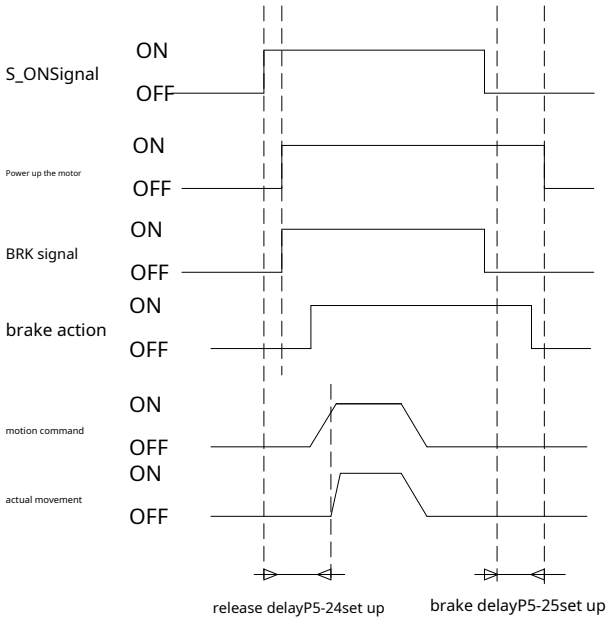
7.1.10Motor brake control

When the drive power isOFFOr in order to keep the position fixed when the motor is disabled,Requires a servo motor with a brake,Ensure that the mechanical mechanism driven by the motor will not move due to its own weight or external force.

When using a servo motor with a brake,One of the digital outputs of the servo drive must be configured asBRKFeatures.

type	Signal name	Output function set value	Signal logic	Features
output	BRK	5	Closed	When the servo is enabled,outputBRKSignal,The output state isClosed
			Open	When the servo is disabled,not outputBRKSignal,The output state isOpen

Because the brake has a delay in action,To avoid damage to the brakes,Attention should be paid to the action timing during use.



Release delay and braking delay time can be usedLunato set.

◆ **MBDV**Serial Drive Default Settings

Signal name	output name	PINfoot position	parameter	instruction	Signal logic set value	Signal logic	effect	Support mode			
BRK	BRK	BRK	P5-14	MO3	5	Closed	When the servo is enabled,outputBRKSignal	P	V	T	

Note:Wiring method and precautions of brake,Please see chapter**4.6**The connection method of the electromagnetic brake of the motor

7.1.11 Servo ReadySignal output

When the servo drive is powered on,The drive does not have any alarms,can outputServo ReadySignal,Indicates that the servo drive is ready, can operate.Servo Readymeans that the following conditions are satisfied:

1)There is nothing wrong with the drive

2)Power supply is normal

3) STOno trigger

4)emergency stopE-STOPno trigger

When the servos are not ready,even if the drive receivesS-ON(enable) signal,The drive will also not be enabled,Motor does not excite.

type	Signal name	Output function set value	Signal logic	Features
output	S-RDY	twenty three	Closed	drive ready,output signal,The output state isClosed
			Open	drive not ready,no output signal,The output state isOpen
		twenty four	Open	drive ready,no output signal,The output state isOpen
			Closed	drive not ready,output signal,The output state isClosed

7.1.12Servo enable status signal output

The output of the servo enable state signal reflects whether the servo motor is in the enabled state.

parameterP5-12 ~ P5-13Set the drive digital outputY1 ~ Y2function. To use this function,A digital output

of the servo drive needs to be configured asSON-STFeatures.

type	Signal name	Output function set value	Signal logic	Features
output	SON-ST	7	Closed	drive is enabled,output signal,The output state isClosed
			Open	Drive is not enabled,no output signal,The output state isOpen
		8	Open	drive is enabled,no output signal,The output state isOpen
			Closed	Drive is not enabled,output signal,The output state isClosed

◆ **MBDV**Serial Drive Default Settings

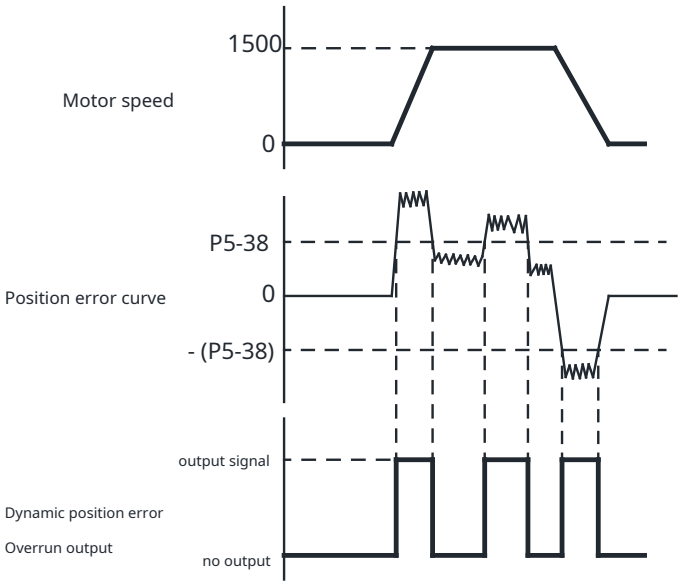
Signal name	enter name	PINfoot position (I/O)	parameter	instruction	Signal logic set value	Signal logic	effect	Support mode			
SON-ST	Y2	16	P5-13	MO2	7	Closed	drive is enabled	P	V	T	
	YCOM	14				Open	Drive is not enabled				

7.1.13Dynamic error following output

The dynamic position error following output means that the motor is in the process of running,The difference between the actual position of the motor and the command position is greater thanP5-38(dynamic following error threshold),output this signal.

type	Signal name	Output function set value	Signal logic	Features
output	DYM-LMT	11	Closed	error more thanP5-38set up,output signal,The output state isClosed
			Open	error does not exceedP5-38set up,no output signal,The output state isOpen
		12	Open	error more thanP5-38set up,no output signal,The output state isOpen
			Closed	error does not exceedP5-38set up,output signal,The output state isClosed

The figure below is the set value of11,That is, the error exceedsP5-38set up,output signal,The output state isClosedschematic diagram of.



7.1.14Software limit output

The software limit output refers to the limit switch that touches or triggers the current running direction when the motor is running.,When the motor cannot continue to run in the current direction , output this signal.This output has two:

1)Output during forward limit limitSLCW

2)Output in reverse limit limitSLCCW

type	Signal name	set value	Signal logic	Features
output	SLCW	27	Closed	Forward limit switch has input,Forward rotation limit is in progress,output signal,The output state is Closed
			Open	Forward limit switch has no input,No forward limit limit,no output signal,The output state is Open
		28	Open	Forward limit switch has input,Forward rotation limit is in progress,no output signal,The output state is Open
			Closed	Forward limit switch has no input,No forward limit limit,output signal,The output state is Closed
output	SLCCW	29	Closed	Reverse limit switch has input,Reverse limit limit,output signal,The output state is Closed
			Open	Reverse limit switch no input,No reverse limit limit,no output signal,The output state is Open
		30	Open	Reverse limit switch has input,Reverse limit limit,no output signal,The output state is Open
			Closed	Reverse limit switch no input,No reverse limit limit,output signal,The output state is Closed

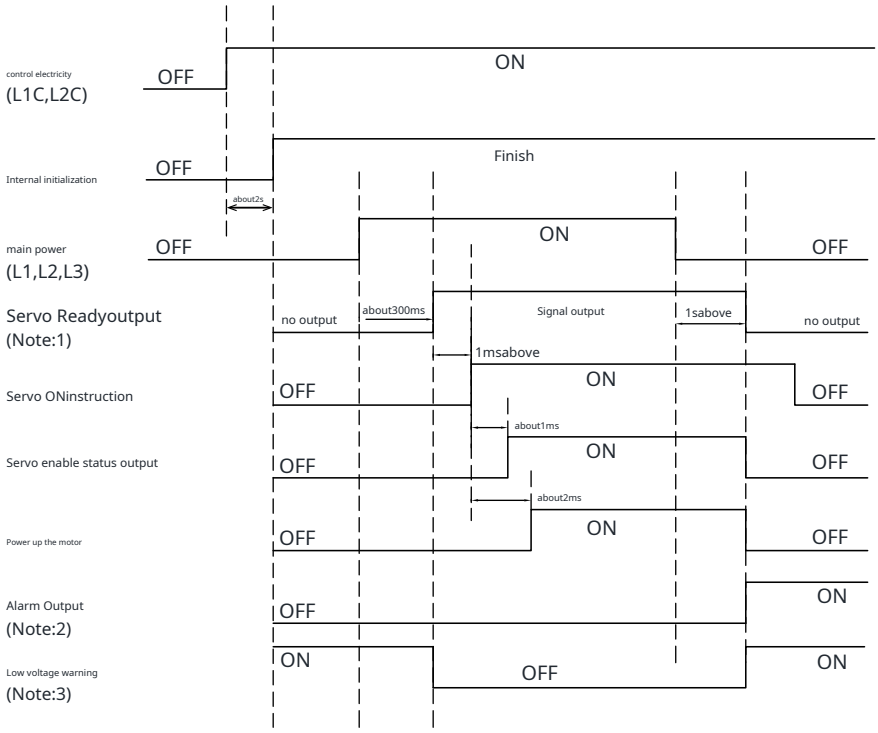
in an absolute value system,The types of limit switches are as follows,When any of the following conditions hold,will output the corresponding rotation limit signal..

1)Limit signal of digital input

2)parameterP5-47(software positive limit) and parametersP5-48(software negative limit) setting.

7.1.15Timing diagram

7.1.15.1Timing chart for turning on the power



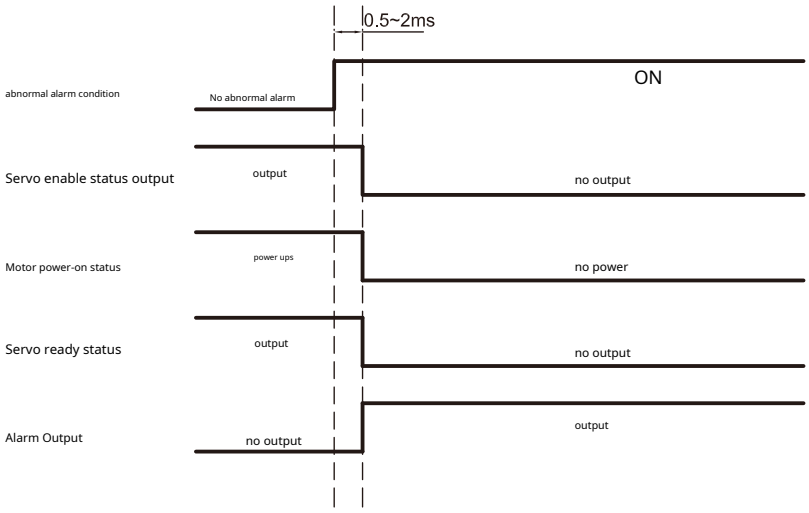
Note:

1:When the main circuit is powered off,Due to the presence of capacitance in the driver,might need**1s**or longer,will stop output**Servo Ready**Signal.

Note**2**:in the enabled state,When the main circuit is powered off,Possible alarm contents are:Undervoltage alarm(warn),Voltage is too low(Fault),Position error overrun(If the motor is powered off while in motion).

Note**3**:When mains power is not supplied,**Servo ready**signal not output,There will also be a low voltage warning.

7.1.15.2Timing chart when fault alarm occurs

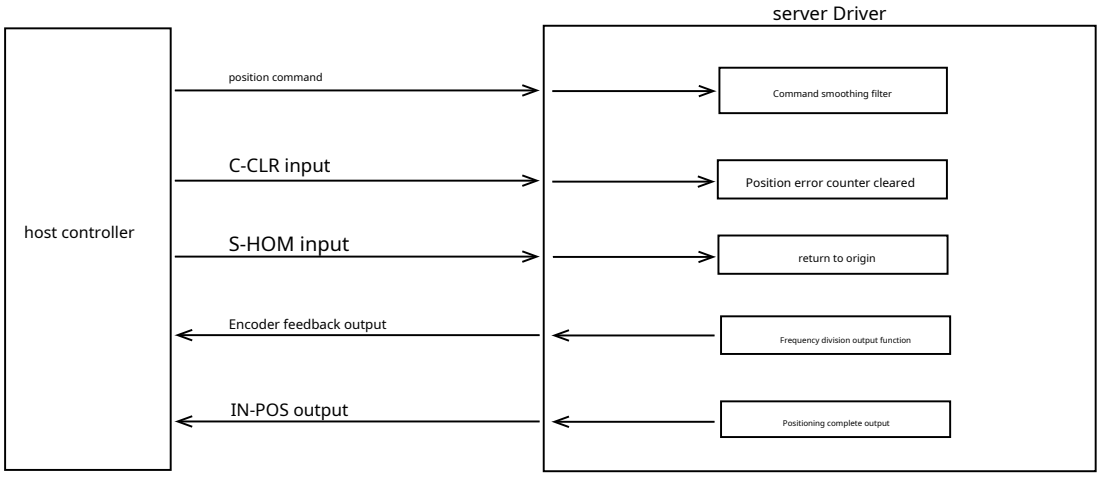


7.2Location mode

7.2.1Location Mode Setting Process Overview

The position mode is to control the position by the position command input from the host controller.The basic settings for position control are explained below..

◆ Function setting block diagram



◆ Location mode selection

Location mode is widely used in devices that require precise positioning,MBDVSeries low voltage servo supports command position mode.

passLunaDebug software to parametersP1-00Set the following values,The servo drive will work in the corresponding mode.

parameter	instruction	set value	model	control signal	illustrate
P1-00	CM	twenty one	Command position mode	◆ Qprogramming ◆ Modbus/RTU	useQprogramming orModbus/RTUCommunication command for position control

◆ Command smoothing filter

Filter the position command or speed command,Smoothing motion commands,Reduces operating transients in motors and mechanical systems,make running smoother.

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P2-05	JT	jerk time	0 ~ 50	10	ms	Time constant for smoothing filtering in internal trajectory mode
P2-28	KJ	low pass smoothing filter	0 ~ 1000	10	ms	Set the low-pass filter of position command or speed command time constant

Detailed parameter setting,Please refer to chapter**7.2.5**Command smoothing filter setting

◆ Positioning complete signal

in location mode,Use the positioning completion signal to indicate the current positioning status of the servo motor.When the absolute value of the difference between the command position and the actual position of the servo motor,That is, when the position error is less than the set value of the parameter,will output the positioning completion signal.

Related settings

type	Signal name	set value	Signal logic	Features
output	IN-POS	9	Closed	Positioning completedIN-POSCondition established,output signal,The output state isclosed
			Open	Positioning completedIN-POScondition does not hold,no output signal,The output state isopen
		10	Open	Positioning completedIN-POSCondition established,output signal,The output state isopen
			Closed	Positioning completedIN-POScondition does not hold,no output signal,The output state isclosed

Detailed parameter setting,Please refer to chapter**7.2.8**Positioning complete signal

◆ Pulse frequency division output

The pulse frequency division output function of the servo drive is a kind of use of the position information fed back by the encoder.90°out of phase2Phase pulse (A/BPhase) Differential output function,Also supportsZPhase pulse output.

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P3-12	PO	Pulse frequency division output mode	0 ~ 256	1	-	Pulse frequency division output mode setting
P3-13	ON	Pulse divider output ratio numerator	0 ~ 65535	10000	-	Set the numerator of the pulse output distribution ratio
P3-14	OD	Pulse frequency division output ratio denominator	0 ~ 65535	65535	-	Set the denominator of the pulse output distribution ratio

Detailed parameter setting,Please refer to chapter**7.6**Encoder frequency division output

7.2.2Command smoothing filter setting

When the position command or speed command of the servo system jumps,It is easy to make the whole system vibrate,Operating noise also increases.Command smoothing filter is to filter the position command or speed command,Smoothing motion commands,Reduces operating transients in motors and mechanical systems, make running smoother.

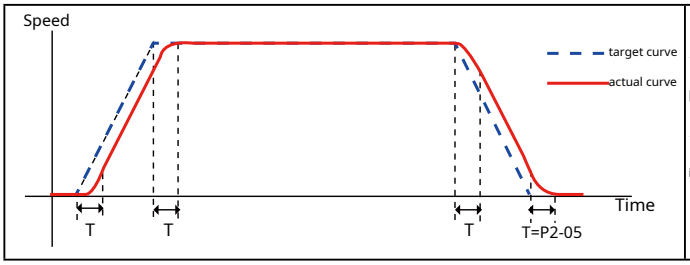
Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P2-05	JT	jerk time	0 ~ 125	10	ms	Time constant for smoothing filtering in internal trajectory mode
P2-28	KJ	low pass smoothing filter	0 ~ 10000	10	ms	Set the low-pass filter of position command or speed command time constant

Notice:set as**0**Time,Filter function is invalid

7.2.2.1jerk time

parameterP2-05Jerk time in internal trajectory mode(Location,speed,torque),It takes effect when the communication command is controlled. The effect of jerk smoothing on the input command is as follows.

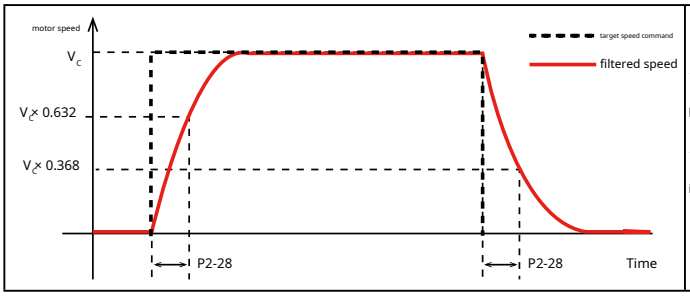


◆ The jerk filter will cause a certain delay to the commandT,But it will not affect the final positioning accuracy

◆ P2-05The larger the time constant,The smoother effect is more obvious,Command response delay will also increase,should be based on the actual application,Set a reasonable filter time constant

7.2.2.2low pass smoothing filter

parameterP2-28Low pass smoothing filter in internal trace mode(Location,speed,torque),It takes effect when the communication command is controlled. The smoothing effect of the low-pass filter on the input command is as follows.



◆ The low-pass smoothing filter will cause a certain delay to the motion commandT,But it will not affect the final positioning accuracy

◆ P2-28The larger the time constant,The smoother effect is more obvious,Command response delay will also increase,should be based on the actual application,Set a reasonable filter time constant

7.2.3Positioning complete signal

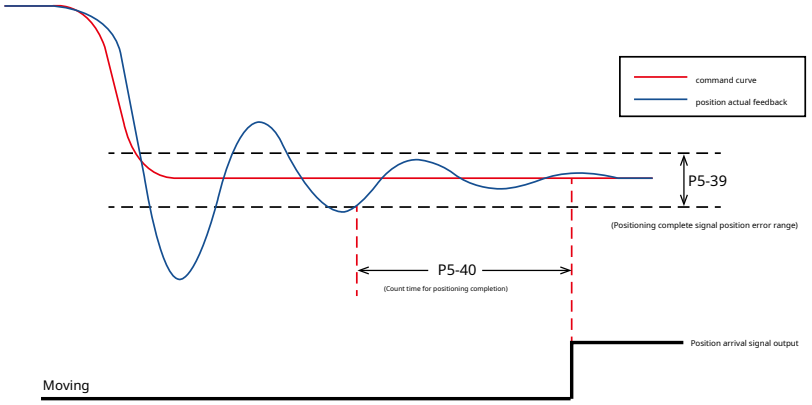
in location mode,Use the positioning completion signal output to indicate the current positioning status of the servo motor.When the absolute value of the difference between the command position and the actual position of the servo motor,That is, when the position error is less than the set value of the parameter,will output the positioning completion signal.

type	Signal name	set value	Signal logic	Features
output	IN-POS	9	Closed	Positioning completedIN-POSCondition established,output signal,The output state isclosed
			Open	Positioning completedIN-POScondition does not hold,no output signal,The output state isopen
		10	Open	Positioning completedIN-POSCondition established,output signal,The output state isopen
			Closed	Positioning completedIN-POScondition does not hold,no output signal,The output state isclosed

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-39	PD	Positioning complete signal position error threshold	0 ~ 32000	40	pulses	Positioning complete signal position error range
P5-40	PE	Motion judgment condition count time	0 ~ 32000	10	ms	Counting time for positioning completion

As shown below



7.2.4position reached output

position reached outputP-COINThe signal is to indicate that the actual position of the motor is equal to the parameterP5-46the set position.

◆ position reached output**P-COIN**settings

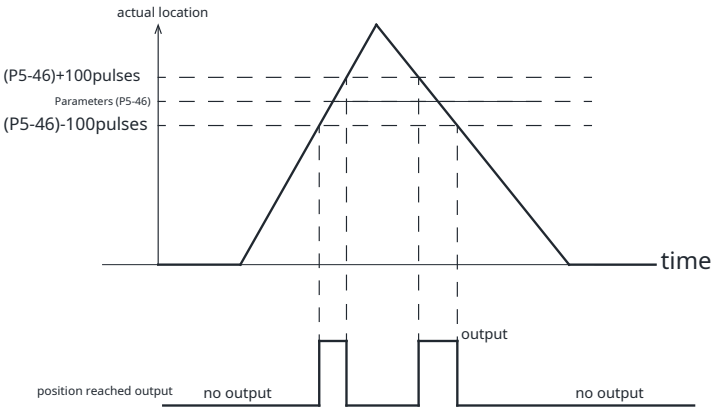
type	Signal name	set value	Signal logic	Features
output	P-COIN	31	Closed	Location arrivesP-COINJudgment condition is established,output signal,The output state isclosed
			Open	Location arrivesP-COINJudgment condition does not hold,no output signal,The output state isopen
		32	Open	Location arrivesP-COINJudgment condition is established,output signal,The output state isopen
			Closed	Location arrivesP-COINJudgment condition does not hold,no output signal,The output state isclosed

Related parameter settings

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-46	DG	absolute arrival position	- 2147483647 ~ +2147483647	10000	pulses	Determine the target position of the output position coincidence signal

◆ Location arrives**P-COIN**Analyzing conditions

When the actual position is equal to the parameterP5-46When setting,will output the location to reachP-COINSignal.The fluctuation range is±100pulses.



7.2.5Gain parameter in position mode

in location mode,Reasonable gain parameters can make the servo system run more smoothly,precise,And has excellent positioning performance. useLunaThe following gain parameters in position mode can be automatically adjusted.

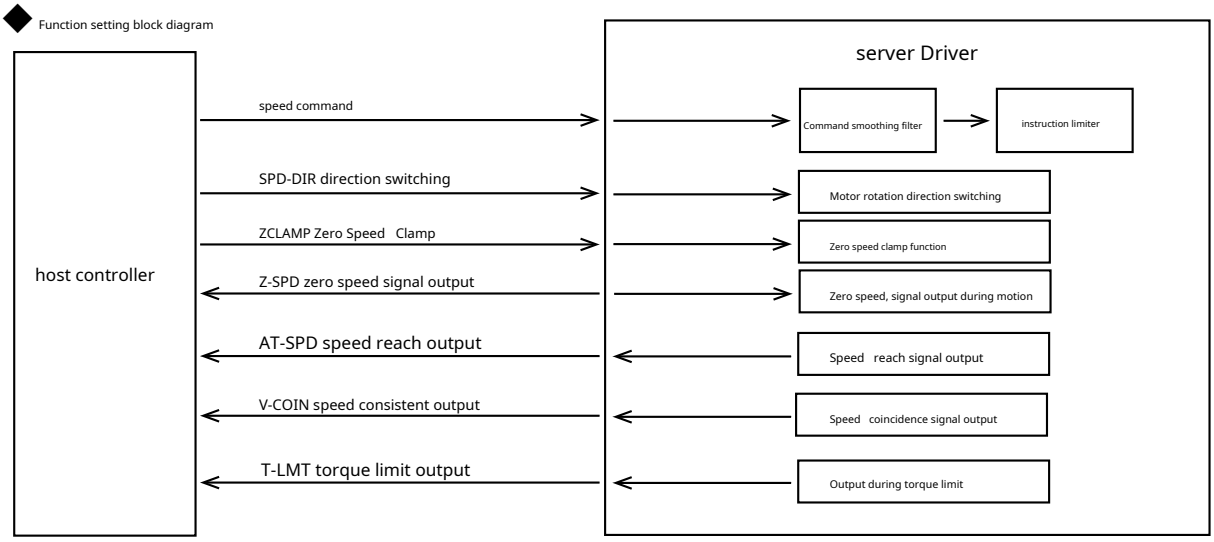
parameter	instruction	parameter name	type	Defaults	unit
P0-05	KP	first position loop gain	first set of gains	52	0.1Hz
P0-07	KD	1st position loop differential time constant		0	ms
P0-08	KE	First position loop differential filter frequency		20000	0.1Hz
P0-11	KF	First command speed gain		10000	0.01%
P0-12	VP	first speed loop gain		183	0.1Hz
P0-13	VI	1st speed loop integral time constant		189	ms
P0-16	KC	First command torque filter frequency		1099	0.1Hz
P0-17	UP	Second position loop gain	second set of gains	52	0.1Hz
P0-19	UD	Second position loop differential time constant		0	ms
P0-20	UE	The second position loop differential filter frequency		20000	0.1Hz
P0-21	UF	Second command speed gain		10000	0.01%
P0-22	UV	Second speed loop gain		183	0.1Hz
P0-23	UG	Second speed loop integral time constant		189	ms
P0-24	UC	Second command torque filter frequency		1099	0.1Hz
P0-33	SD	Gain switching condition selection	-	0	
P0-34	PN	Gain Switching Condition - Position	-	0	pulses
P0-35	VN	Gain Switching Condition - Speed	-	0	rps
P0-36	TN	Gain Switching Condition - Torque	-	10	0.1%
P0-37	SE1	Second gain switch to first gain delay time	-	10	ms
P0-38	SE2	1st gain to 2nd gain delay time	-	0	ms

7.3speed mode

7.3.1Speed control mode selection

Speed control mode is used for precise speed control.

◆ Function setting block diagram



◆ Speed control mode selection

MBDVSeries Servo Drive Command Speed Mode.

Command speed mode:Use MOONS' uniqueQprogramming to control the motor,or useModbusCommand control motor speed.

model	control signal	parameterP1-00set up	illustrate
Command speed mode	Internal speed command,communication instruction orQprogramming	15	◆ Internal speed mode ◆ useQProgram function control ◆ useModbuscommand control useModbusWhen the command directly controls the operation of the motor,must beP1-00set astwenty one

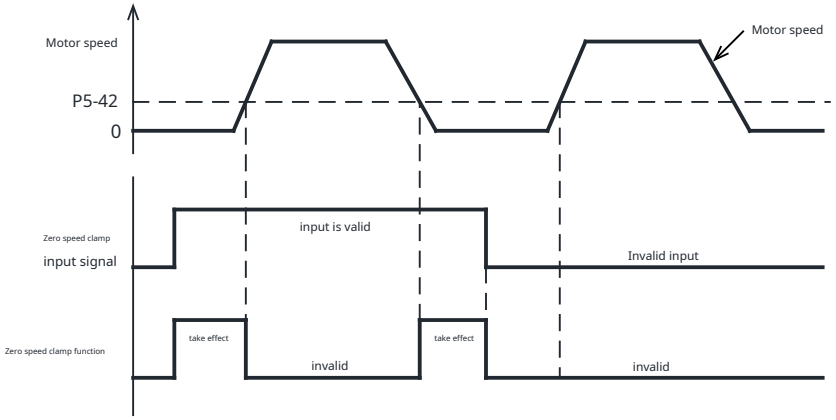
7.3.2Zero speed clamp function

in speed control mode,Zero speed clamp function can be set.

◆ when**P5-51(**Zero-speed clamp function in speed mode**)**The set value is**0**

Zero speed clamp input signalZCLAMPwhen valid,and the command speed is less thanP5-42(When the set value of zero speed judgment threshold),Servo motor enters zero position lock state.At this time, the internal position loop control of the drive,Even if it rotates due to external force,also returns the position when clamped.

If the speed command is greater thanP5-42set value of,Servo motor exits clamp state,byP2-03The acceleration value is accelerated to the current command speed.



If the zero speed clamp is in effect,Servo motor vibrates,Position loop gain needs to be adjusted. A reasonable zero-speed judgment

threshold needs to be set,Too large setting value,Strong vibration due to rapid deceleration.

Zero speed clamp input signal**ZCLAMP**set up

When using the zero-speed clamp signal,Digital input pins need to be assigned this function.

type	Signal name	set value	Signal logic	Features
enter	ZCLAMP	twenty one	Closed	The input signal is valid,and the speed command is less thanP5-42Time,ZCLAMPfunction takes effect
			Open	Invalid input signal,Even if the speed command is less thanP5-42,ZCLAMPfunction does not work
		twenty two	Open	The input signal is valid,and the speed command is less thanP5-42Time,ZCLAMPfunction takes effect
			Closed	Invalid input signal,Even if the speed command is less thanP5-42,ZCLAMPfunction does not work

◆ when**P5-51(**Zero-speed clamp function in speed mode**)**The set value is**1** Zero

Speed Clamp Status and Zero Speed Clamp Input SignalZCLAMPirrelevant.

When the command speed is0,The actual speed of the motor is less thanP5-42(Zero speed judgment threshold) set value,and the duration reachesP5-40When setting the value,Servo motor enters zero position lock state.At this time, the internal position loop control of the drive,Even if it rotates due to external force,also returns the position when clamped.

When the command speed setting value is not zero,Servo motor exits clamp state,byP2-03The acceleration value is accelerated to the current command speed.

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-40	PE	Motion judgment condition count time	0 ~ 30000	10	ms	MS=0 When the command speed is less than or equal to the zero speed judgment threshold Time,The drive considers it to be at zero speed at this point
P5-42	ZV	Zero speed judgment threshold	0.1 ~ 2	0.5	rps	
P5-51	MS	Zero-speed clamp function in speed mode	0 ~ 1	0	-	

7.3.3Rotation direction switch

in speed mode,Normally, the rotation direction of the motor is determined by the positive and negative of the command speed..When a pin in the digital input is set to switch the direction of the speed commandSPD-DIRTime,Servo drive takes absolute value of command speed,Determine the final direction of the motor based on the logic state of the input signal.

Speed command direction switching**SPD-DIR**settings

Use speed command direction switchingSPD-DIRTime,Digital input pins need to be assigned this function.

type	Signal name	set value	Signal logic	Features
enter	SPD-DIR	35	Closed	The input signal is valid,Reverse the direction of the speed command
			Open	Invalid input signal,The rotation direction of the motor is determined by the direction of the speed command
		36	Open	The input signal is valid,Reverse the direction of the speed command
			Closed	Invalid input signal,The rotation direction of the motor is determined by the direction of the speed command
	GP	0	-	When all input pins of the driver are not configured with this function,The rotation direction of the motor is determined by the positive and negative of the command speed

The actual rotation direction of the motor is determined by the parameterP1-11Motor rotation direction,Speed command (communication command),Speed command direction switchingSPD-DIRThe three decide,The detailed relationship is as follows.

◆ When all input pins of the driver are not configured with this function

parameterP1-11Motor rotation direction set value	speed command (communication command)	Speed command direction switchingSPD-DIR enter	Actual motor rotation direction
0	just	This input function is not set	CWClockwise
0	just	This input function is not set	
0	burden	This input function is not set	CCWcounterclockwise
0	burden	This input function is not set	
1	just	This input function is not set	CCWcounterclockwise
1	just	This input function is not set	
1	burden	This input function is not set	CWClockwise
1	burden	This input function is not set	

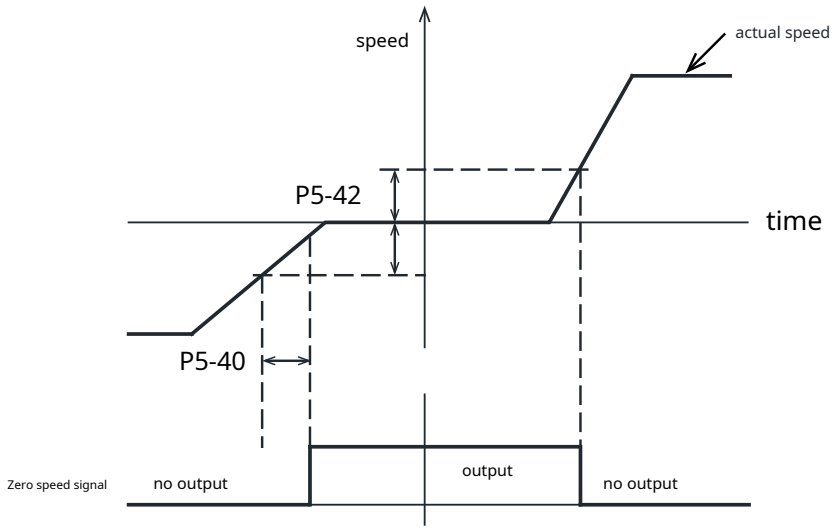
◆ When the drive input pin is configured for speed command direction switching**SPD-DIR**

parameterP1-11Motor rotation direction set value	speed command (communication command)	Speed command direction switchingSPD-DIR enter	Actual motor rotation direction
0	just	invalid	CWClockwise
0	burden	invalid	
0	just	efficient	CCWcounterclockwise
0	burden	efficient	
1	just	invalid	CCWcounterclockwise
1	burden	invalid	
1	just	efficient	CWClockwise
1	burden	efficient	

7.3.4Zero speed detection output

When the absolute value of the actual speed of the motor is less thanP5-42(Zero speed judgment threshold),and the duration reachesP5-40(When the set time of motion judgment condition count time),Servo drive outputs zero speed signalZ-SPD.on the contrary,If the absolute value of the actual speed of the motor is greater than this value,then no zero speed signal is outputZ-SPD.

The judgment of the zero-speed signal is not affected by the control mode and servo state,Therefore, this signal can also be used as the motor is running (Moving)Signal.



◆ Zero speed signal output**Z-SPD**settings

Use zero speed signal outputZ-SPDTime,Digital output pins need to be assigned this function.

type	Signal name	set value	Signal logic	Features
output	Z-SPD	33	Closed	Z-SPDJudgment condition is established,output signal,The output state isclosed
			Open	Z-SPDJudgment condition does not hold,no output signal,The output state isopen
		34	Open	Z-SPDJudgment condition is established,output signal,The output state isopen
			Closed	Z-SPDJudgment condition does not hold,no output signal,The output state isclosed

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-40	PE	Motion judgment condition count time	0 ~ 30000	10	ms	When the speed is less than or equal toP5-42set value of, and the duration reachesP5-40when the set time, The drive considers it to be at zero speed at this point
P5-42	ZV	Zero speed judgment threshold	0.1 ~ 2	0.5	rps	

7.3.5speed reaches output

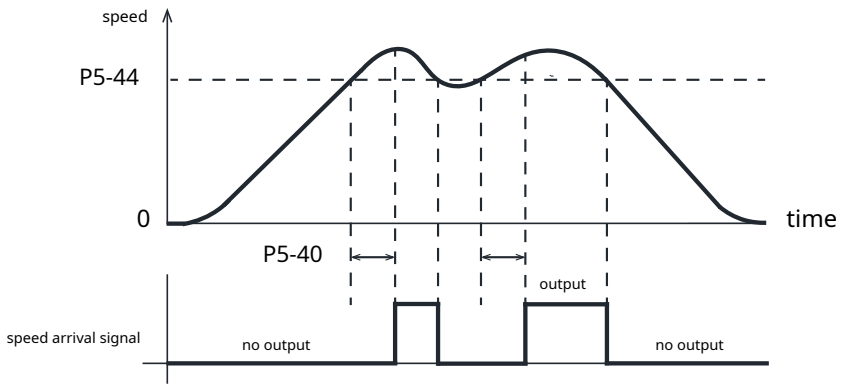
in speed mode,When the absolute value of the actual motor speed exceedsP5-44(speed reaches the threshold),and the duration reachesP5-40(When the set time of motion judgment condition count time),will output the speed arrival signalAT-SPD.

If the actual speed of the filtered motor does not exceedP5-44(speed reaches the threshold),then the speed arrival signal is not outputAT-SPD.

◆ speed reaches output**AT-SPD**settings

Use velocity to reach outputAT-SPDTime,Digital output pins need to be assigned this function.

type	Signal name	set value	Signal logic	Features
output	AT-SPD	19	Closed	AT-SPDJudgment condition is established,output signal,The output state isclosed
			Open	AT-SPDJudgment condition does not hold,no output signal,The output state isopen
		20	Open	AT-SPDJudgment condition is established,output signal,The output state isopen
			Closed	AT-SPDJudgment condition does not hold,no output signal,The output state isclosed



Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-40	PE	Motion judgment condition count time	0 ~ 30000	10	ms	When the absolute value of the actual motor speed exceedsP5-44,and the time reachesP5-40,will output the speed arrival signalAT-SPD
P5-44	VV	Judging that the speed reaches the target value	0 ~ 100	10	rps	

7.3.6Speed consistent output

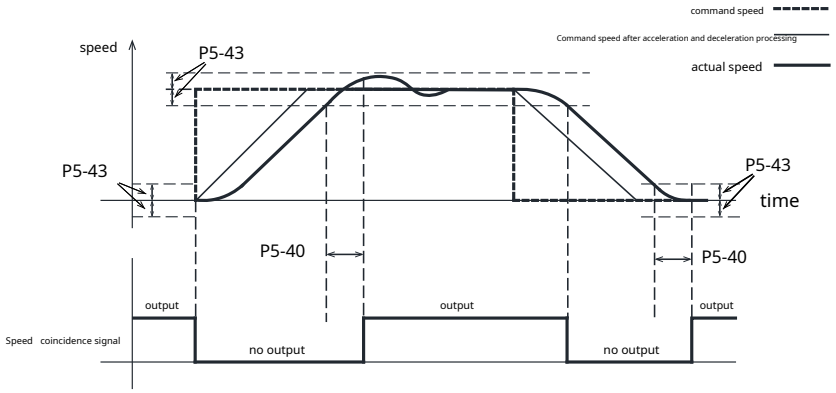
in speed mode,When the absolute value of the deviation between the actual speed of the motor and the command speed, the speed error isP5-43(speed consistent fluctuation threshold) within the range setting,and the duration reachesP5-40(motion judgment condition count time),Then it is determined that the actual speed of the motor is consistent with the command speed,Output speed coincidence signalV-COIN.

If the speed error exceedsP5-43(velocity-fluctuation threshold),The speed consistent signal will not be outputV-COIN.

◆ Speed consistent output**V-COIN**settings

Use speed consistent outputV-COINTime,Digital output pins need to be assigned this function.

type	Signal name	set value	Signal logic	Features
output	V-COIN	17	Closed	V-COINJudgment condition is established,output signal,The output state isclosed
			Open	V-COINJudgment condition does not hold,no output signal,The output state isopen
		18	Open	V-COINJudgment condition is established,output signal,The output state isopen
			Closed	Judgment condition does not hold,no output signal,The output state isclosed



Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-40	PE	Motion judgment condition count time	0 ~ 32000	10	ms	speed error inP5-43within the settings,and the duration reachesP5-40, Confirm that the actual speed of the motor is consistent with the command speed,Will output speed consistent signalV-COIN
P5-43	VR	Speed consistent fluctuation range	0.1 ~ 100	0.2	rps	

7.3.7Speed Mode Control Type

in speed mode,There are two types of control:

1.Real-time detection of position errors

2.speed control only(Default setting)

Related parameters

parameter	instruction	name	Value range	Defaults	unit	describe
P1-03	JM	Speed Mode Control Type	1,2	2	-	Set the control type in speed mode 1.Real-time detection of position errors 2.speed control only(Default setting)
P0-12	VP	Speed loop proportional gain	0 ~ 30000	183	0.1Hz	In set speed mode,whenP-15(JM)for2,Speed loop proportional coefficient
P0-13	VI	Speed loop integral time	0 ~ 30000	189	ms	In set speed mode,whenP-15(JM)for2,Speed loop integral coefficient

A) P1-03 = 1 Time,Real-time detection of position errors

under this control type,Position error will be detected in real time,When the absolute value of the difference between the actual position fed back by the encoder and the command position, that is, the position error exceedsP3-04(position error alarm limit),The drive will generate a fault alarm that the position error exceeds the limit.

B) P1-03 = 2 Time,speed control only

under this control type,Position error is not detected,Even if the motor is blocked,does not generate any alarms.

While in this control mode,The speed loop gain parameter is given byP0-12Speed loop proportional gain andP0-13Speed loop integral time setting.

7.4Torque Mode

7.4.1Control method of torque mode

Torque control mode is used for precise torque control.MBDVServo drive supports command torque mode. Command torque mode

is to use communication commands to control the motor.

model	control signal	P1-00(CM) definition	illustrate
Command torque mode	communication command	1	useModbusCommand write torque command

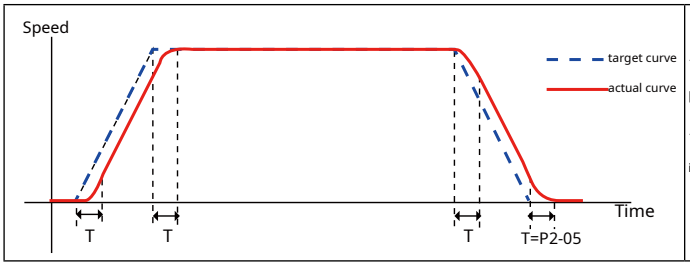
7.4.2Torque command smoothing filter

Smoothing the torque command,make commands smoother,reduce vibration.

◆jerk time

parameterP2-05Jerk time in internal trajectory mode(Location,speed,torque),It takes effect when the communication command is controlled.

The effect of jerk smoothing on the input command is as follows.



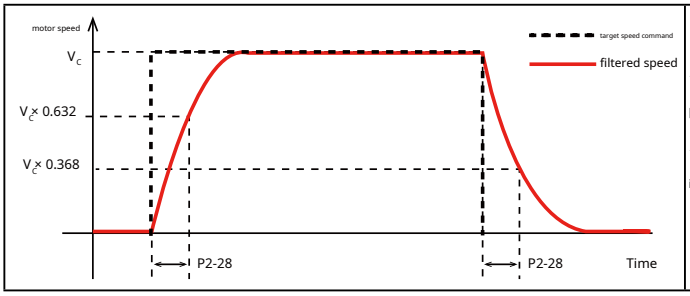
◆ The jerk filter will cause a certain delay to the commandT,But it will not affect the final positioning accuracy

◆ P2-05The larger the time constant,The smoother effect is more obvious,Command response delay will also increase,should be based on the actual application,Set a reasonable filter time constant

◆ low pass smoothing filter

parameterP2-28Low-pass filter can be active in the control mode used,E.g:Internal track mode(Location,speed,torque),Communication command control, etc..

The smoothing effect of the low-pass smoothing filter on the input command is as follows.



◆ Low-pass filtering will cause a certain delay to the command pulseT,But it will not affect the final positioning accuracy

◆ P2-28The larger the time constant,The smoother effect is more obvious,Command response delay will also increase,should be based on the actual application,Set a reasonable filter time constant

7.4.3Speed limit in torque mode

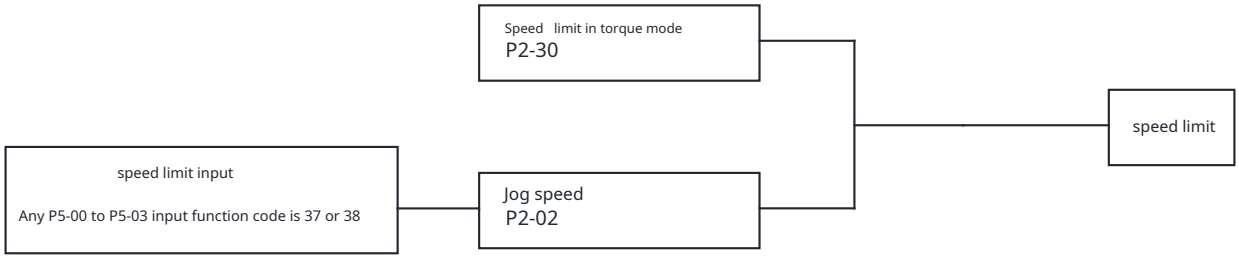
in torque mode,If the output speed of the motor is not limited,When the motor is connected to a small load,And when the torque command is too large,The motor will reach a very high speed,cause an accident.Therefore it is necessary to set the maximum speed of the motor in torque mode.

◆ Source of speed limit

in torque mode,The speed of the motor can be limited using the internal speed.After setting the speed limit function,The actual motor speed will be limited within the set value. After reaching the speed limit,The motor runs constantly at the limit value.

The setting of the speed limit value should be set according to the actual operation requirements.

Speed limited source	describe
Internal speed limit	There are two internal speed limits: 1.directly by parameterP2-30(VT)limited 2.The function of the digital input is set as the speed limit input (V-LMT)Time,When the input logic holds, Speed limit function takes effect,The speed limit is given byP2-02(JS)set up.

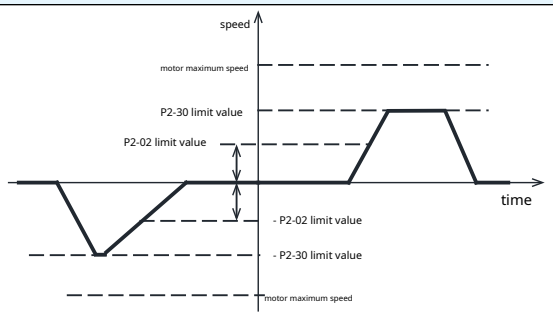
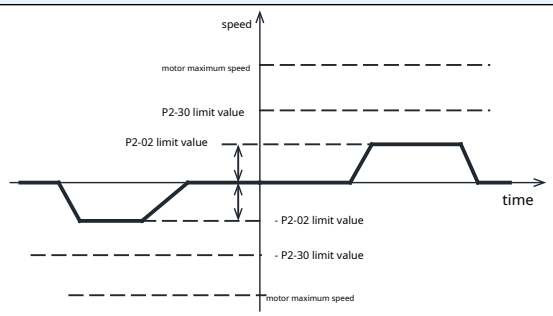


Related parameters

parameter	instruction	name	Value range	Defaults	unit	describe
P2-02	JS	Internal speed mode target speed	- 100 ~ 100	10	rps	in torque mode,using the internal speed limit as a limit to source,When the digital input function is set toV-LMTTime,This parameter is used as the speed limit value
P2-03	JA	Internal Velocity Mode Acceleration	0.167~ 5000	100	rps/s	acceleration in torque mode
P2-04	JL	Internal speed mode deceleration	0.167~ 5000	100	rps/s	Deceleration in torque mode
P2-30	VT	Speed limit in torque mode	0 ~ 100	80	rps	in torque mode,using the internal speed limit as a limit to source time,This parameter is used as the speed limit value
P5-00to P5-03	MU1~MU4	Function assignment of digital input ports	37 ~ 38	— —	— —	enter numbersX1 ~ X4The function of any input is set to "speed limit input"
P5-12to P5-13	MO1~MO2	Function assignment of digital output ports	21 ~ 22	— —	— —	digital outputY1 ~ Y2The function of any one of the inputs is set to the "speed limit in" output

◆ speed limit input**V-LMT**

When the digital input is set to the speed limit function (V-LMT)Time,in parameterP2-30Within the basis of the speed limit value,A digital input can be used to limit the motor speed in torque mode.at this time,When the input logic is active,The motor speed will be limited by the parameterP2-02set value of.

V-LMTWhen the input is invalid	V-LMTWhen the input is valid
	

7.4.4Output in speed limit (V-LMT)

in torque mode,Indicates that the motor output speed is limitedV-LMTSignal output. When the actual speed reaches the maximum

speed of the motor or reaches the speed limit value in torque mode,outputV-LMTSignal.

Related parameters

type	Signal name	set value	Signal logic	Features
output	V-LMT	twenty one	Closed	Motor output speed is limited,output signal,The output state isclosed
			Open	Motor output speed is not limited,no output signal,The output state isopen
		twenty two	Open	Motor output speed is limited,output signal,The output state isopen
			Closed	Motor output speed is not limited,no output signal,The output state isclosed

Notice:Please refer to**7.1.2**Output signal setting

7.4.5Torque reaches output

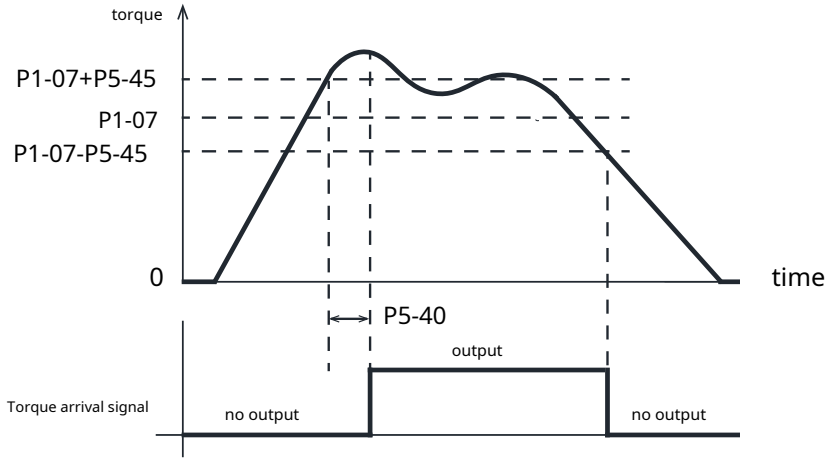
During the process of increasing the motor output torque,When the absolute value of the actual output torque exceedsP1-07(Judging that the torque reaches the target value) and P5-45(torque reaches the fluctuation range) and,and the duration reachesP5-40(When the set time of motion judgment condition count time),will output the torque arrival signal TQ-REACH;When the torque arrival signal is valid,When the absolute value of the actual output torque is less thanP1-07(Judging that the torque reaches the target value) and P5-45(torque reaches the difference in fluctuation range),Then the torque arrival signal is not outputTQ-REACH;No torque arrival signal is output in other states TQ-REACH.

This function applies to all control modes,as location,speed,torque etc..

◆ Torque arrival signal**TQ-REACH**settings

Use torque arrival signalTQ-REACHTime,Digital output pins need to be assigned this function.

type	Signal name	set value	Signal logic	Features
output	TQ-REACH	13	Closed	TQ-REACHJudgment condition is established,output signal,The output state isclosed
			Open	TQ-REACHJudgment condition does not hold,no output signal,The output state isopen
		14	Open	TQ-REACHJudgment condition is established,output signal,The output state isopen
			Closed	TQ-REACHJudgment condition does not hold,no output signal,The output state isclosed



Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P1-07	CV	Judging that the torque reaches the target value	0~3000	0	0.1%	output torque andP1-07difference is greater than5-45,and the duration reachesP5-40,will output the torque arrival signalTQ-REACH; output torque andP1-07difference is less thanP5-45 Time,The torque arrival signal is invalid
P5-40	PE	Motion Judgment Condition Count time	0 ~ 30000	10	ms	
P5-45	TV	Torque reaches the fluctuation range	0~3000	10	0.1%	

7.4.6Torque consistent output

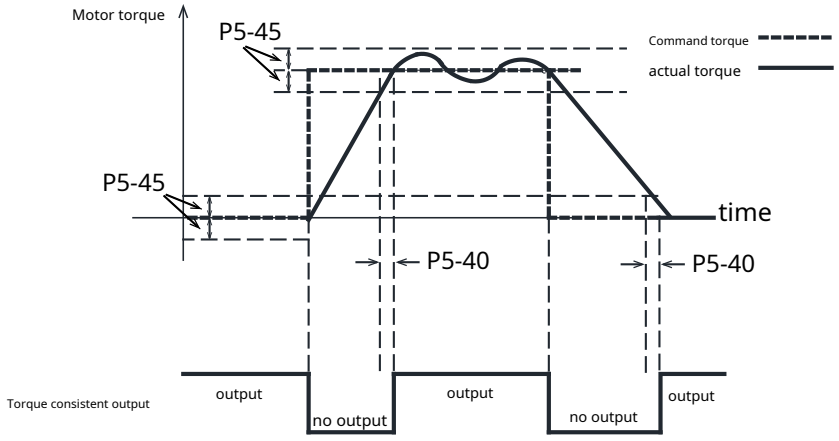
in torque mode,When the absolute value of the deviation between the actual output torque of the motor and the command torque, that is, the torque ripple isP5-45(Torque reaches the fluctuation range) within the setting,and the duration reachesP5-40(positioning completion count time),Then it is determined that the actual torque of the motor is consistent with the command torque,Output torque coincidence signalI-COIN.

If the torque ripple exceedsP5-45,Then the torque consistent signal will not be outputI-COIN.

◆ Torque coincidence signal**I-COIN**settings

Use torque consistent outputI-COINTime,Digital output pins need to be assigned this function.

type	Signal name	set value	Signal logic	Features
output	I-COIN	35	Closed	I-COINJudgment condition is established,output signal,The output state isclosed
			Open	I-COINJudgment condition does not hold,no output signal,The output state isopen
		36	Open	I-COINJudgment condition is established,output signal,The output state isopen
			Closed	Judgment condition does not hold,no output signal,The output state isclosed



Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-40	PE	Motion judgment condition count time	0 ~ 30000	10	ms	Torque ripple atP5-45Inside,and the duration reaches P5-40, Identify the actual torque and command torque of the motor consistent,The torque consistent signal will be outputI-COIN
P5-45	TV	Torque reaches the fluctuation range	0 ~ 3000	10	0.1%	

7.5Torque limit

Torque limit is to limit the output torque of the servo motor.

This function applies to all control modes,as location,speed,torque etc..

◆ method of torque limitation

parameterP1-10Defined5Torque Limiting Methods,The restrictions are as follows.

P1-10 Torque limit method setting	Positive torque limit source	Reverse torque limit source
0	registerY	registerZ
1	parameterP1-06	
2	parameterP1-06	parameterP1-25
3	TQ-LMTWhen the input is valid:P1-06	
	TQ-LMTWhen the input is invalid:P1-25	
5	TQ-LMTWhen the input is valid:P1-06	TQ-LMTWhen the input is valid:P1-25
	TQ-LMTWhen the input is invalid:P1-26	TQ-LMTWhen the input is invalid:P1-27

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P1-10	LD	Torque Limit Method	0 ~ 3,5	1	-	Torque limit method setting,Please refer to the above description for details
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the motor
P1-25	CX	Second torque limit	0~3000	3000	0.1%	Second torque limit for motor
P1-26	CY	Third torque limit	0~3000	3000	0.1%	Third torque limit for motor
P1-27	CZ	Fourth torque limit	0~3000	3000	0.1%	Fourth torque limit for motor

7.5.1Internal parameter restrictions

7.5.1.1just,Reverse torque is limited by different parameters---effective immediately

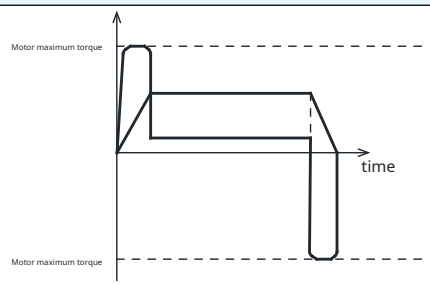
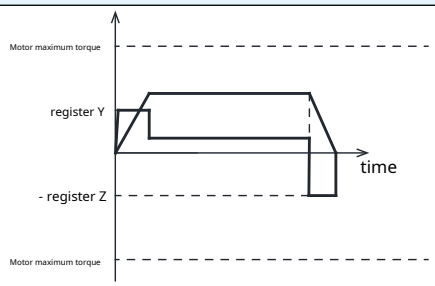
whenP1-10 = 0Time,The positive torque limit is determined by the parameterP1-06Decide,The reverse torque limit is set by the parameterP1-25Decide.

Related parameters

parameter	Modbusaddress	Value range	Defaults	unit	illustrate
registerY	40065	0~3000	0	0.1%	Motor forward torque limit,Effective immediately
registerZ	40066	0~3000	0	0.1%	Reverse torque limit for motor,Effective immediately

Notice:

Set value too small,Servo motor plus,Insufficient torque may occur during deceleration.

Do not activate torque limit	Enable internal parameter limit
	
Do not activate torque limit,The motor output torque can reach the maximum torque of the electrode.	whenP1-10 = 0,Enable internal parameter limit,The motor output forward torque is limited in the registerYset value of,The reverse torque output is limited to the registerZthe value of.

7.5.1.2just,The reverse torque is limited by the same parameter

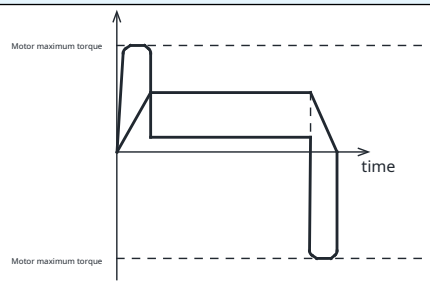
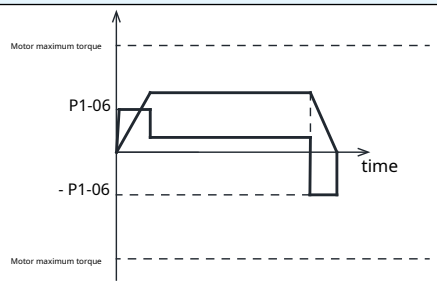
whenP1-10 = 1Time,The forward and reverse torque limits are set by the parameterP1-06Decide. Related

parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the motor

Notice:

P1-06 Set value too small,Servo motor plus,Insufficient torque may occur during deceleration.

Do not activate torque limit	Enable internal parameter limit
	
Do not activate torque limit,The motor output torque can reach the maximum torque of the electrode.	whenP1-10 = 1,Enable internal parameter limit,The motor output torque is limited to P1-06set value of.

7.5.1.3just,The reverse torque is limited by different parameters

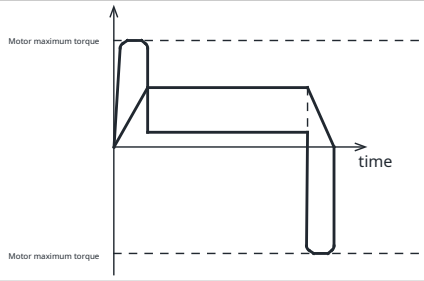
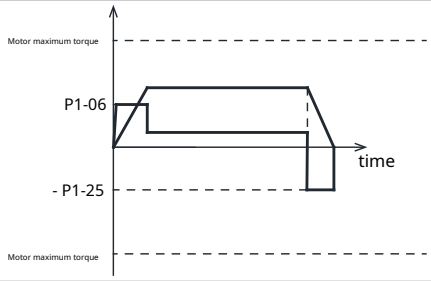
whenP1-10 = 2Time,The positive torque limit is determined by the parameterP1-06Decide,The reverse torque limit is set by the parameterP1-25Decide. Related

parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the motor
P1-25	CX	Second torque limit	0~3000	3000	0.1%	Second torque limit for motor

Notice:

P1-06,**P1-25**Set value too small,Servo motor plus,Insufficient torque may occur during deceleration.

Do not activate torque limit	Enable internal parameter limit
	
Do not activate torque limit,The motor output torque can reach the maximum torque of the electrode.	whenP1-10 = 2,Enable internal parameter limit,The motor output forward torque is limited to P1-06set value of,Reverse torque output is limited to -(P1-25)the value of.

7.5.1.4Torque limit inputTQ-LMTToggle Control---Positive,The reverse torque is limited by the same parameter whenP1-10 = 3Time

,The forward and reverse torque limits are input by the torque limitTQ-LMTThe logical state of.

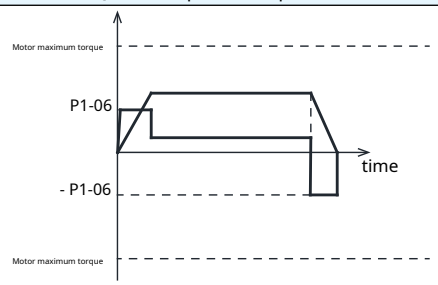
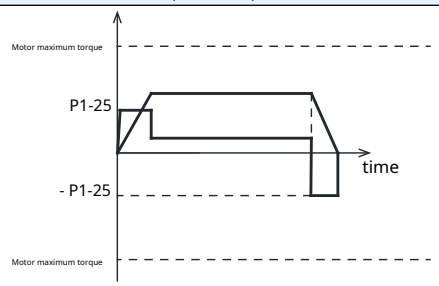
- whenTQ-LMTInput state logic condition is established,When the input is valid,The forward and reverse torque limits are set by the parameterP1-06Decide
- whenTQ-LMTInput state logic condition is not established,When the input is invalid,The forward and reverse torque limits are set by the parameterP1-25Decide

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the motor
P1-25	CY	Second torque limit	0~3000	3000	0.1%	Second torque limit for motor

Notice:

P1-06,**P1-25**Set value too small,Servo motor plus,Insufficient torque may occur during deceleration.

TQ-LMTTorque limit input valid	TQ-LMTTorque limit input is invalid
	
whenP1-10 = 3,TQ-LMTTorque limit input valid,The motor output torque is limited toP1-06set value of.	whenP1-10 = 3,TQ-LMTTorque limit input is invalid,The motor output torque is limited toP1-25set value of.

7.5.1.5Torque limit inputTQ-LMTToggle Control---Positive,Reverse Separate Restriction

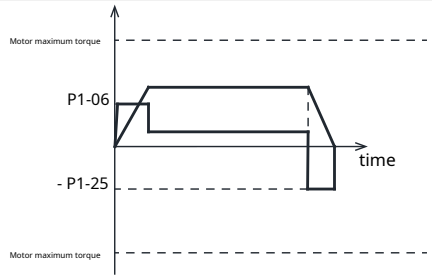
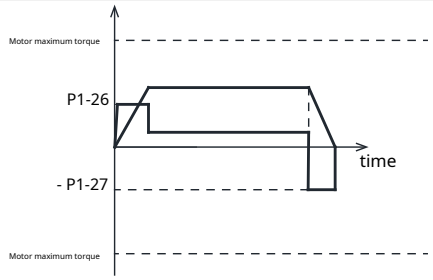
whenP1-10 = 5Time,The forward and reverse torque limits are input by the torque limitTQ-LMTThe logical state of.

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the motor
P1-25	CX	Second torque limit	0~3000	3000	0.1%	Second torque limit for motor
P1-26	CY	Third torque limit	0~3000	3000	0.1%	Third torque limit for motor
P1-27	CZ	Fourth torque limit	0~3000	3000	0.1%	Fourth torque limit for motor

Notice:

P1-06,**P1-25/26/27**Set value too small,Servo motor plus,Insufficient torque may occur during deceleration.

TQ-LMTTorque limit input valid	TQ-LMTTorque limit input is invalid
	
whenP1-10 = 5,TQ-LMTTorque limit input is invalid,The motor output forward torque is limited toP1-06set value of,Reverse torque is limited toP1-25set value of .	whenP1-10 = 5,TQ-LMTTorque limit input valid,The motor output forward torque is limited toP1-26set value of,Reverse torque is limited toP1-27set value of

7.5.2Output during torque limit (T-LMT)

Indicates the motor output torque limit stateT-LMTSignal output. Related

parameters

type	Signal name	set value	Signal logic	Features
output	T-LMT	15	Closed	Motor output torque is limited,output signal,The output state isclosed
			Open	Motor output torque is not limited,no output signal,The output state isopen
		16	Open	Motor output torque is limited,output signal,The output state isopen
			Closed	Motor output torque is not limited,no output signal,The output state isclosed

Notice:Please refer to**7.1.2**Output signal setting

7.6Pulse frequency division output function

The pulse frequency division output function of the servo drive is to use the position information fed back by the encoder or the external position command pulse to be used.90° out of phase2Phase pulse (A/BPhase) Differential output function.When the pulse source is the motor encoder,supportZPhase pulse output.

Related parameters

parameter	instruction	name	Value range	Defaults	illustrate
P3-12	PO	Pulse frequency division output mode setting	0 ~ 256	1	Pulse frequency division output setting
P3-13	ON	Numerator of pulse divider output ratio	0 ~ 65535	10000	Set the numerator of the pulse frequency division output ratio
P3-14	OD	The denominator of the pulse frequency division output ratio	0 ~ 65535	65535	Set the denominator of the pulse frequency division output ratio

7.6.1Pulse frequency division output signal pin

Encoder Output- pin number	Signal name	illustrate	Wiring
1	AOUT+	The feedback signal of the encoder isA,B,ZDifferential output can be set by parameters and the number of pulses per revolution and the frequency division of pulse output Compare	Reference chapter4.10.5Encoder Feedback output
2	AOUT-		
3	BOUT+		
4	BOUT-		
5	ZOUT+		
6	ZOUT-		

Notice:

1.The output circuit passes through**5V**Differential drive output,The host computer receiving circuit should also use the differential receiver to receive.If the differential signal cannot be accepted, Need to use differential to single-ended signal conversion board.Do not directly**OUT+**or**OUT-**Connect to the positive or negative pole of the power supply.

2.For good anti-interference,Output cable needs to use twisted pair shielded wire,The shielding layer must be connected**PE**,digitally**GND**To be connected with the digital quantity of the upper computer.

3.The output is**5V**differential signal,The maximum allowable current is**20mA**.

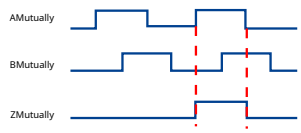
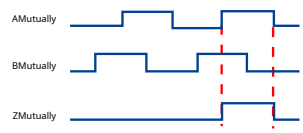
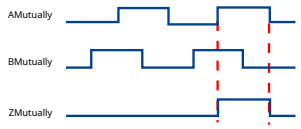
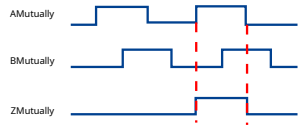
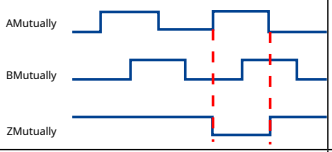
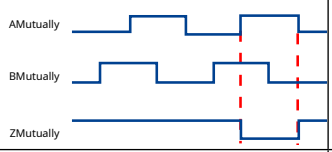
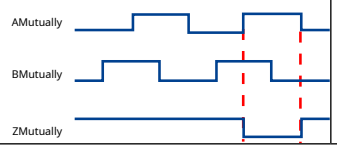
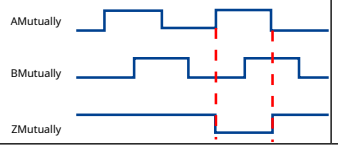
7.6.2Pulse frequency division output mode setting

When using the pulse frequency division output function,need to source the output pulse,output pulse phase,ZPulse output polarity,The frequency division ratio is set separately.

Use parametersP3-12Set the output pulse source,output pulse phase,ZPulse output polarity type,eachbitThe corresponding functions of the bits are as follows.

<table>
<tr><td colspan="8">parameterP3-12Pulse frequency division output mode</td></tr>
<tr><td>bit7</td><td>bit6</td><td>bit5</td><td>bit4</td><td>bit3</td><td>bit2</td><td>bit1</td><td>bit0</td></tr>
<tr><td rowspan="3">0</td><td rowspan="3">0</td><td rowspan="3">0</td><td rowspan="3">0</td><td>ZPulse output polarity</td><td>Forward rotationA,BPhase relationship</td><td colspan="2">output pulse source</td></tr>
<tr><td>0:positive polarity</td><td>0:AleadB 90°</td><td colspan="2" rowspan="2">bit1=0,bit0=1:Motor encoder</td></tr>
<tr><td>1:negative polarity</td><td>1:BleadA 90°</td></tr>
<tr><td colspan="8">bit0andbit1:output pulse source
bit2:Forward rotationA/BPhase
relationship bit3:ZPulse output polarity</td></tr>
</table>

7.6.2.1Frequency division output mode setting

ZPulse output polarity	Forward rotationA,B Phase relationship	output pulse source	Forward	reverse	parameterP3-12 set value (10base)
bit3	bit2	bit1=0,bit0=1			
0	0	Motor encoder			1
0	1	Motor encoder			5
1	0	Motor encoder			9
1	1	Motor encoder			13

7.6.3Pulse output frequency division ratio

By setting the frequency division of the encoder, the numerator and denominator of the frequency division ratio are output,The number of pulses output per motor revolution can be set.

$$\text{Number of output pulses per revolution} = \frac{\text{P3-13 Pulse frequency division output ratio numerator}}{\text{P3-14 Pulse frequency division output ratio denominator}} \times 65535$$

Notice:The number of output pulses per revolution refers to**A/B**Mutually**4**Related parameters

after frequency doubling

parameter	instruction	name	Value range	Defaults	illustrate
P3-13	ON	Pulse divider output ratio numerator	0 ~ 65535	10000	Set the numerator of the pulse frequency division output ratio
P3-14	OD	Pulse frequency division output ratio denominator	0 ~ 65535	65535	Set the denominator of the pulse frequency division output ratio

Notice:

1). P3-13 The frequency division ratio numerator needs to be less than**P3-14**divider ratio denominator

2).when**P3-13**Divider ratio numerator**>P3-14**When dividing the ratio to the denominator,The number of pulses output by one rotation of the motor**(A/B**Mutually**4**After frequency doubling**) = P3-13**

Example:

If you need output per revolution1000number of pulses.

1).if yes**A/B**same time count,and**4**frequency

doubling but:P3-13 = 1000

P3-14 = 65535orP3-14 = 1

2).if yes**A/B**same time count,And only the rising edge or falling edge is counted when

counting but:P3-13 = 2000

P3-14 = 65535orP3-14 = 1

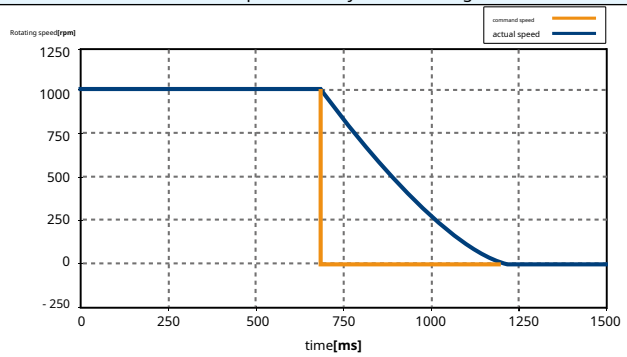
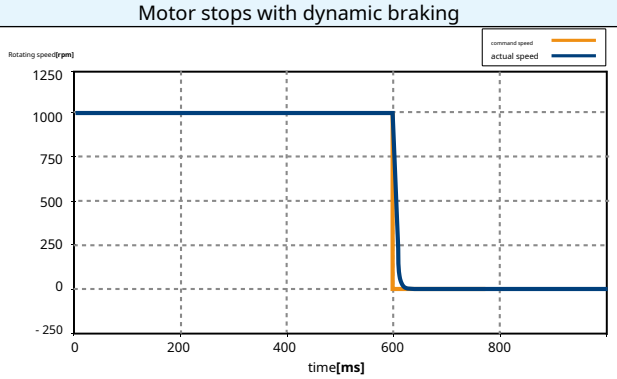
3).if only right**A**Phase output count,And only the rising edge or falling edge is counted when

counting but:P3-13 = 4000

P3-14 = 65535orP3-14 = 1

7.7dynamic braking

Servo caused by abnormalOFF,In case of drive error,At this point, the driver can no longer control the motor,The dynamic brake function can be used as the servo motor stop method.When dynamic braking works,move the motorU/V/WThree-phase short circuit,Make the motor stop at the fastest speed,So as to protect the safety of equipment and people.

Motor stops without dynamic braking	Motor stops with dynamic braking
	
When the drive fails alarm,drive to enable.The motor is in an uncontrollable free deceleration stop state,The stop time depends on the speed of the motor when it is disabled,External factors such as dragging load inertia and mechanical friction.	When the drive fails alarm,When the driver is disabled,Short circuit the three phases of the motor,Torque of current created in motor windings using back EMF,stop as fast as possible. Greatly reduces deceleration time,Protect equipment and personal safety.

Notice:

- Dynamic Braking with Quick Stop

  Do not enable via servo**/OFF**function to start and stop the operation of the motor.

- Dynamic braking is only suitable for short-term use,Only in the servo caused by the abnormalityOFF,Use when the driver reports an error, etc. After stopping with dynamic braking at high speed,interval**10**minutes to use again.

- Dynamic Braking function disabled in case of drive power loss

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P1-29	YV	Dynamic Brake when disengaged Actions	0 ~ 5	0	-	Select dynamic braking when the drive goes from servo enable to servo ClothesOFFmode of action
P1-30	YR	Dynamic braking when reporting an error action	0 ~ 3	0	-	Select the action of the dynamic brake when an error occurs
P1-31	YM	Dynamic braking during deceleration with disabling The longest action time in the process	0 ~ 30000	500	ms	set in the servoOFFcase,The maximum time for which dynamic braking is active
P1-32	YN	Dynamic brakes are decelerating in error The longest action time in the process	0 ~ 30000	0	ms	Set when the driver reports an error,dynamic The maximum time for the brake to work
P1-37	DV	Dynamic braking action speed	0 ~100	50	rps	Sets the speed of the motor when Dynamic Brake is activated
P5-42	ZV	Zero speed judgment threshold	0.1 ~ 2	0.5	rps	When the speed is less than or equal to this set value,drive Brake thinks it is at zero speed at this time

7.7.1ServoOFFDescription of dynamic braking action

ServoOFFTime,The action of dynamic braking is passed through the parameterP1-29set up,The longest action time during deceleration passes the parameterP1-31set up,Please refer to the table below.The deceleration process is when dynamic braking is in effect,Motor actual speed from parameterP1-37The speed decelerates to the parameterP5-42Within zero speed threshold,or the deceleration time reachesP1-31set time.

value	illustrate	
	deceleration process	after stop
0	with parametersP2-01set deceleration	maintain free movement
1	with parametersP2-01set deceleration	dynamic braking action
2	free movement	maintain free movement
3	free movement	dynamic braking action
4	dynamic braking action	maintain free movement
5	dynamic braking action	dynamic braking action

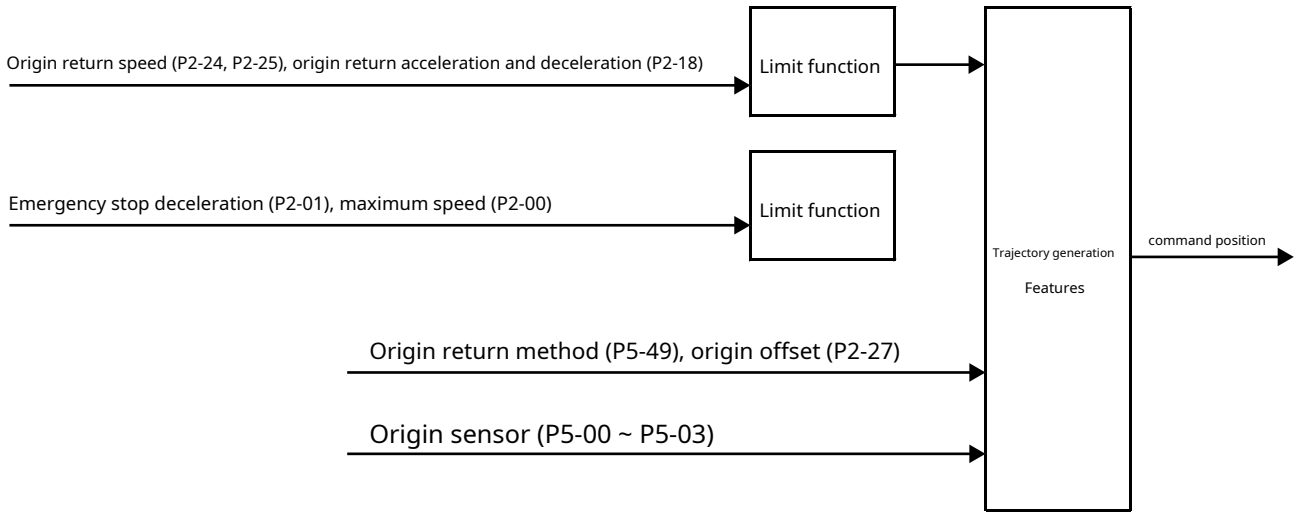
7.7.2Description of dynamic braking action when servo error is reported

When the servo reports an error,The action of dynamic braking is passed through the parameterP1-30set up,The longest action time during deceleration passesP1-32set up,Please refer to the table below.The deceleration process is when dynamic braking is in effect,Motor actual speed from parameterP1-37The speed decelerates to the parameterP5-42Within zero speed threshold, or the deceleration time reachesP1-31set time.

value	illustrate	
	deceleration process	stop
0	free movement	maintain free movement
1	free movement	dynamic braking action
2	dynamic braking action	maintain free movement
3	dynamic braking action	dynamic braking action

7.8Back to origin function

In homing control mode,The servo drive accelerates/decelerates according to the origin return set by the host controller,speed,Origin offset,Parameters such as origin return method and origin switch signal generate motion trajectory,Control the motor to execute the motion according to the generated motion trajectory;M3Series Servo Drive Support39 return-to-origin method.



There are three ways to enable homing:

◆ Digital input start (S-HOM)

type	Signal name	set value	Signal logic	Features
enter	S-HOM	15	Closed	Signal rising edgeS-HOMfeature enabled,start back to origin
			Open	S-HOMfunction not enabled
		16	Open	Signal falling edgeS-HOMfeature enabled,start back to origin
			Closed	S-HOMfunction not enabled

◆ use**Q**program instructions

◆ Using communication commands

Related parameters

parameter	instruction	name	Value range	Defaults	unit	illustrate
P5-49	HE	Back to origin method	- 4 ~ 35	1	-	Choose how to return to origin
P2-18	HA1	Return to origin acceleration/deceleration	0.167 ~ 5000	100	rps/s	Set acceleration/deceleration during homing
P2-24	HV1	The first speed of returning to the origin	0.0042 ~ 100	10	rps	Set the first speed in the process of returning to the origin
P2-25	HV2	The second speed of returning to the origin	0.0042 ~ 100	1	rps	Set the first speed in the process of returning to the origin
P2-27	HO	Return to origin offset	- 2147483647 ~ +2147483647	0	pulses	Set the offset after finding the origin when homing Location
P2-00	VM	Maximum speed	0 ~ 100	80	rps	maximum speed limit,in all control modes Limit motor speed
P2-01	AM	Servo brake deceleration	0.167 ~ 5000	3000	rps/s	Maximum deceleration value during emergency stop
P5-00 ~ P5-03	MU1 ~ MU4	Digital input port function	39 ~ 40	-	-	Set digital inputX1 ~ X4One of the inputs is the origin sensor

7.8.1Back to the origin basic concept

Back to the origin is used to find the mechanical origin,Positioning the relationship between the mechanical origin and the mechanical zero.

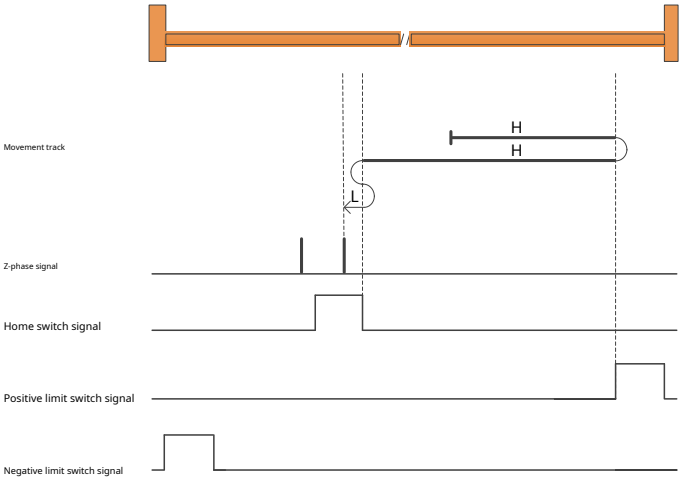
Mechanical origin:a fixed position on the machine,can be a certain sensor,Can also be motorZPhase signal. Mechanical zero:

mechanically absolutely0Location.

After returning to the origin,The position where the motor stops is the mechanical origin,By setting the origin offsetP2-27,The relationship between the mechanical origin and the mechanical zero can be set:

Mechanical origin = Mechanical zero +P2-27 whenP2-27=0Time,The

mechanical origin coincides with the mechanical zero.



H:The first speed of returning to the originP2-24L:

The first speed of returning to the originP2-25

Home switch signal:Set digital inputX1 ~ X4One of the inputs is the origin switch,HOM-SW=0Indicates that the origin signal is invalid, HOM-SW=1Indicates that the origin signal is valid.

Positive limit switch signal:Set digital inputX1 ~ X4One of the inputs is a positive limit switch,POT=0Indicates that the positive limit signal is invalid,POT=1 Indicates that the positive limit signal is valid.

Negative limit switch signal:Set digital inputX1 ~ X4One of the inputs is a negative limit switch,NOT=0Indicates that the negative limit signal is invalid, NOT=1Indicates that the negative limit signal is valid.

7.8.2Introduction to the way of returning to the origin

◆ Back to origin method**-4~-1**It is a manufacturer-defined return-to-origin method. The driver does not need an external switch signal as an auxiliary signal for returning to the origin,Instead, by limiting the torque of the motor during homing,When the mechanical hard limit is in contact with the load driven by the motor, it is blocked,When the motor-driven load produces the same thrust as the blocking force and the motor is stationary,Consider this position as the mechanical origin.The torque limit of the motor during homing passesP0-08((torque limit) setting of hardware limit homing mode,100%corresponds to1times the rated torque of the motor;Set the value of this object according to the actual application,If the setting value is too small, it may cause the position of returning to the origin to be inaccurate,Excessive setting may damage mechanical equipment.

Notice:

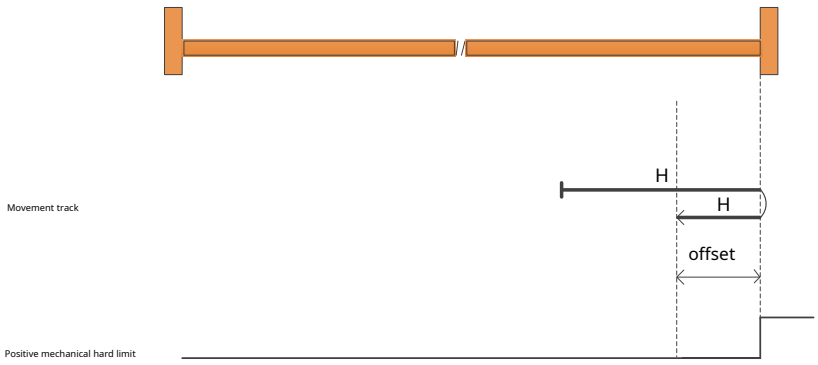
Use back-to-origin method**-4~-1**Time,A suitable back-to-origin offset needs to be set**P2-27**,After finding the mechanical origin in the process of returning to the origin, run the origin offset in the reverse direction.**P2-27**the distance,The load leaves the mechanical hard limit,The actual position after the motor stops is**0**.

◆ Back to origin method**1~35**is according to**CiA402**Return-to-origin method defined by motion control protocol

Notice:

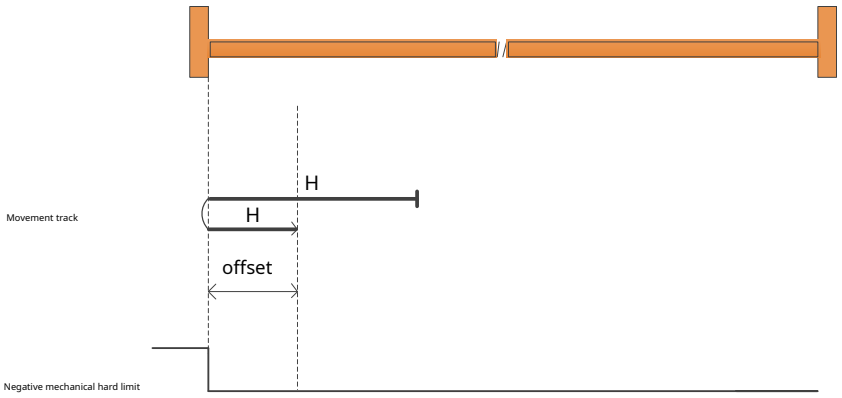
Use back-to-origin method**1~35**Time,After the motor returns to the origin,The actual position of the motor is the origin offset**P2-27**the value of.

7.8.2.1Back to origin method-4:positive regression,Looking for positive mechanical hard limit



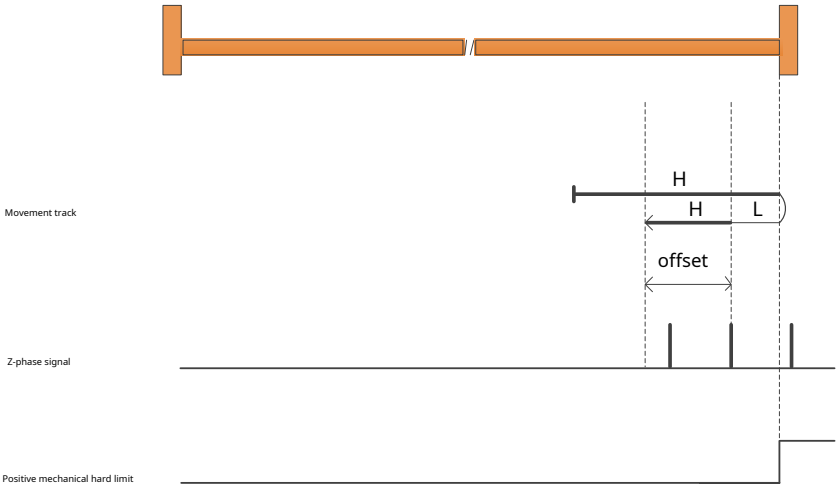
a)Start the return at a positive high speed,When the mechanical hard limit is met and the blocking force is equal to the torque limited by the motor, it will decelerate and stop,Origin offset at high speed in negative directionP2-27the distance,The position of the motor after stopping is0.

7.8.2.2Back to origin method-3:negative regression,Looking for negative mechanical hard limit



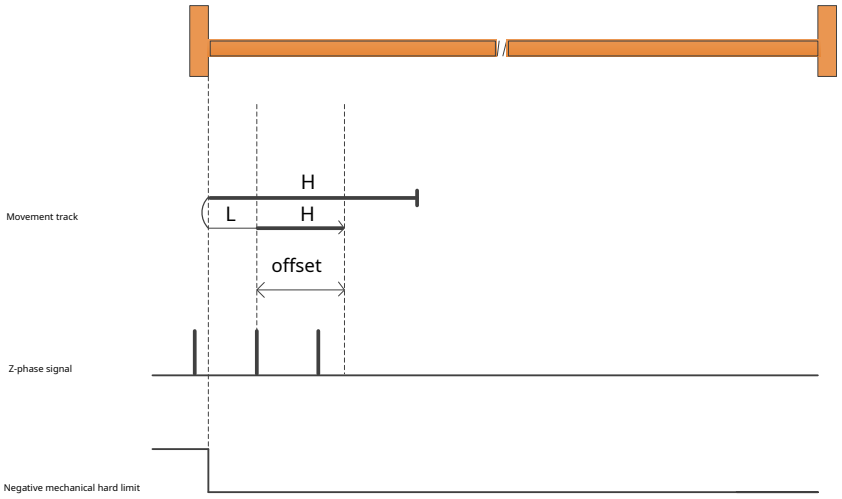
a)Start the return with a negative high speed,When the mechanical hard limit is met and the blocking force is equal to the torque limited by the motor, it will decelerate and stop,Origin offset in forward high-speed operationP2-27the distance,The position of the motor after stopping is0.

7.8.2.3Back to origin method-2:positive regression,Look for positive mechanical hard limit andZPhase pulse signal



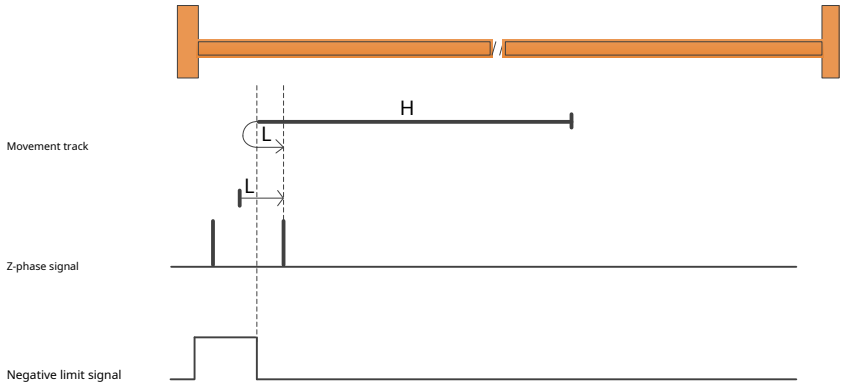
a)Start the return at a positive high speed,When the mechanical hard limit is met and the blocking force is equal to the torque limited by the motor, it will decelerate and stop,run at low speed in negative direction,meet the firstZpulse stop,Origin offset at high speed in negative directionP2-27the distance,The position of the motor after stopping is0.

7.8.2.4Back to origin method-1:negative regression,Look for negative mechanical hard limit andZPhase pulse signal



a)Start the return with a negative high speed,When the mechanical hard limit is met and the blocking force is equal to the torque limited by the motor, it will decelerate and stop,run at low speed forward,meet the firstZpulse stop,Origin offset in forward high-speed operationP2-27the distance,The position of the motor after stopping is0.

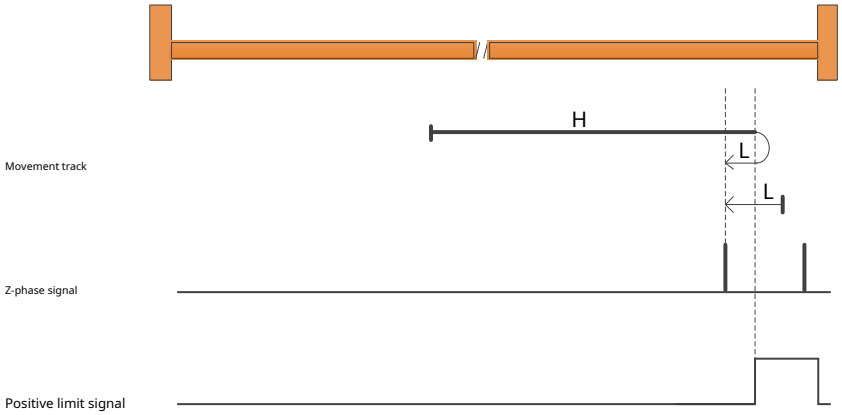
7.8.2.5Back to origin method1:negative regression,Find the negative limit andZPulse signal



a)when starting to returnNOT=0,Start the return with a negative high speed,meetNOTAfter rising edge,slow down,reverse,Forward low speed operation,meet NOTfirst after falling edgeZpulse stop.

b)when starting to returnNOT=1,Start the return at a forward low speed,meetNOTfirst after falling edgeZpulse stop.

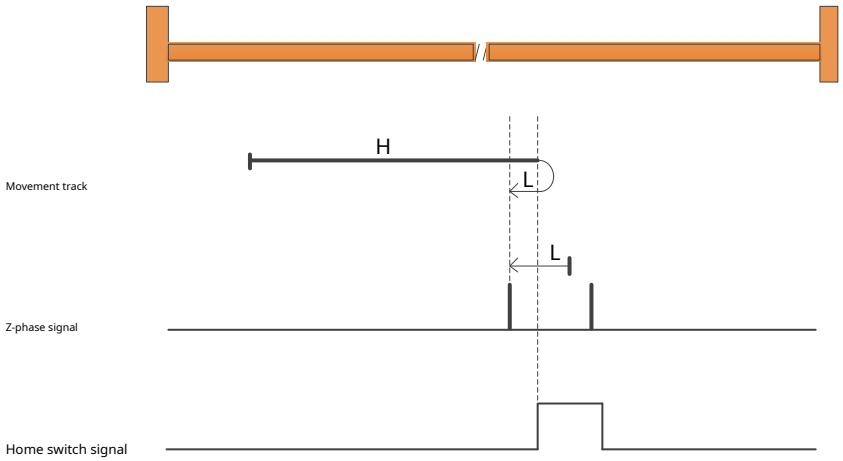
7.8.2.6Back to origin method2:positive regression,Find the positive limit andZPulse signal



a)when starting to returnPOT=0,Start the return at a positive high speed,meetPOTAfter rising edge,slow down,reverse,Negative low speed operation, meet POTfirst after falling edgeZpulse stop.

b)when starting to returnPOT=1,Start return at low speed in negative direction,meetPOTfirst after falling edgeZpulse stop.

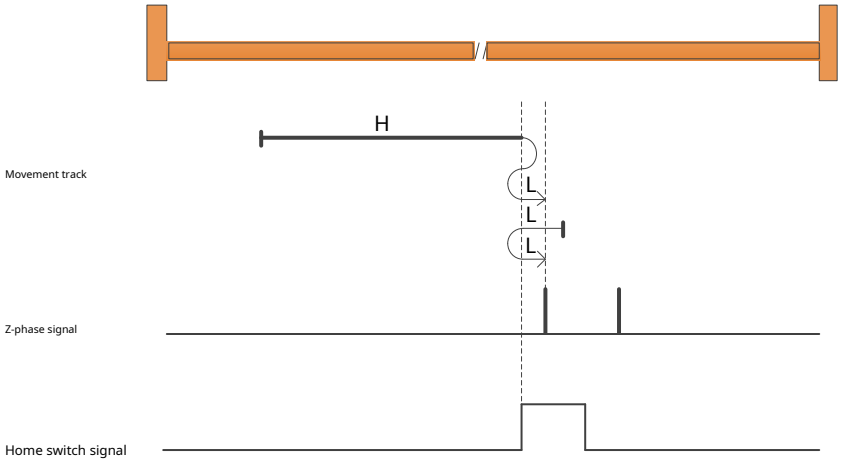
7.8.2.7Back to origin method3:positive regression,Find the origin sensor falling edge andZPulse signal



a)when starting to returnHOM-SW=0,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed operation,meetHOM-SWfirst after falling edgeZpulse stop.

b)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWfirst after falling edgeZpulse stop.

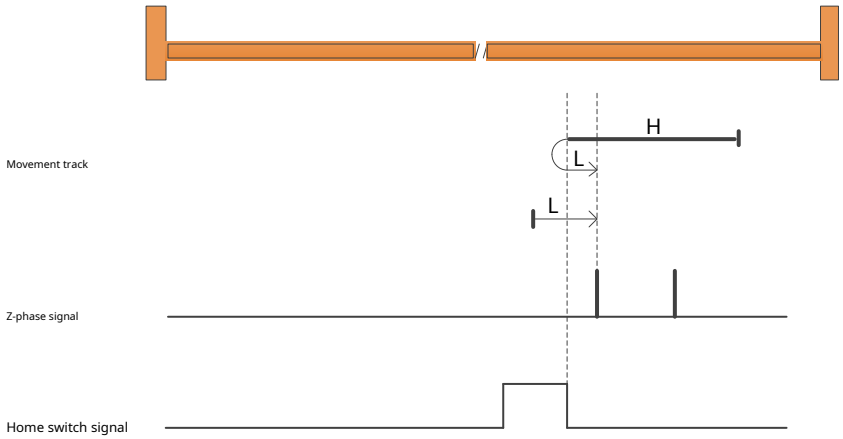
7.8.2.8Back to origin method4:positive regression,Find the origin sensor rising edge andZPulse signal



a)when starting to returnHOM-SW=0,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed running toHOM-SWDecelerate to stop after invalid position,After that, run forward at low speed again,meetHWThe first after the rising edgeZpulse stop.

b)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the rising edgeZpulse stop.

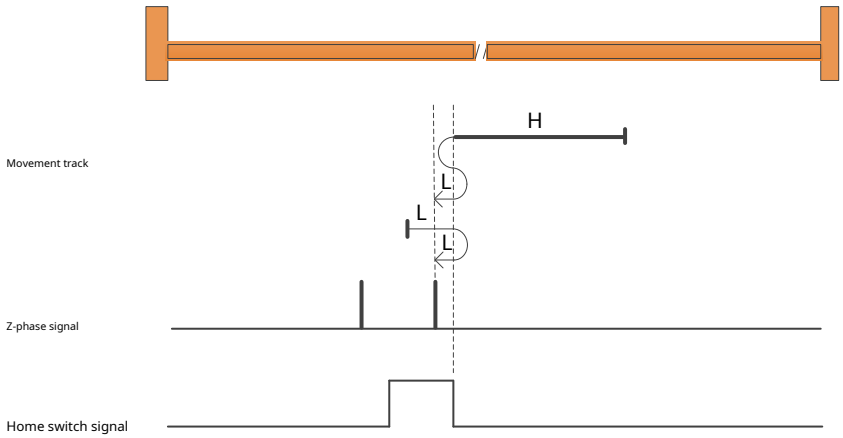
7.8.2.9Back to origin method5:negative regression,Find the origin sensor falling edge andZPulse signal



a)when starting to returnHOM-SW=0,Start the return with a negative high speed,meetHOM-SWAfter rising edge,slow down,reverse,Forward low speed operation,meetHOM-SWfirst after falling edgeZpulse stop.

b)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWfirst after falling edgeZpulse stop.

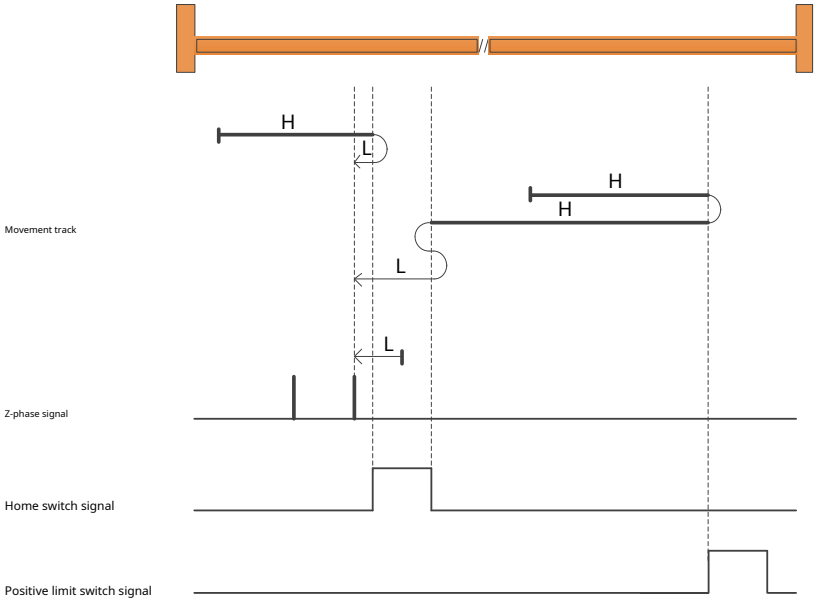
7.8.2.10Back to origin method6:negative regression,Find the origin sensor rising edge andZPulse signal



a)when starting to returnHOM-SW=0,Start the return with a negative high speed,meetHOM-SWAfter rising edge,slow down,reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHWThe first after the rising edgeZpulse stop.

b)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation,meetHOM-SWThe first after the rising edgeZpulse stop.

7.8.2.11Back to origin method7:positive regression,Find the origin sensor falling edge andZPulse signal,Automatic reverse when encountering positive limit

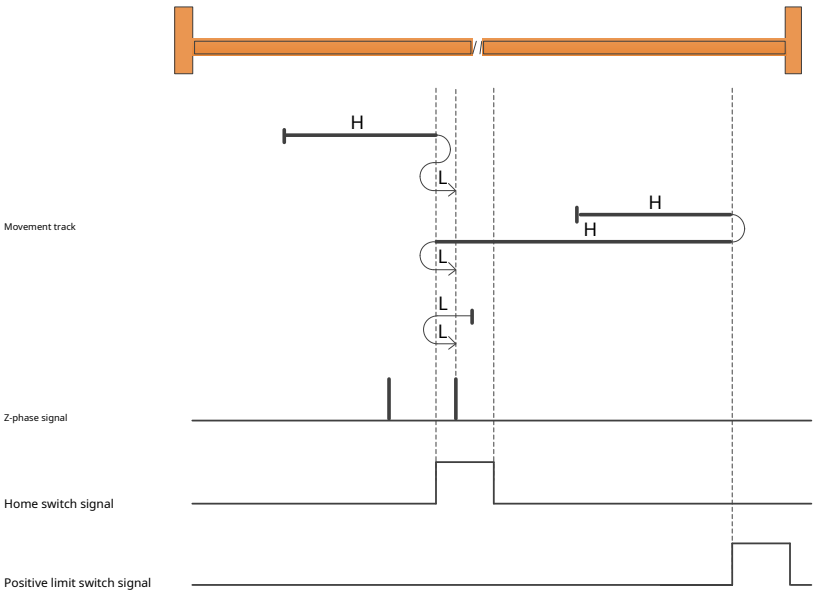


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SW After rising edge,slow down,reverse,Negative low speed operation,meetHOM-SWfirst after falling edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of, slow down,reverse,Negative high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Run forward at low speed toHOM-SW Decelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWThe first after the falling edge ofZpulse stop.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWfirst after falling edgeZpulse stop.

7.8.2.12Back to origin method8:positive regression,Find the origin sensor rising edge andZPulse signal,Automatic reverse when encountering positive limit

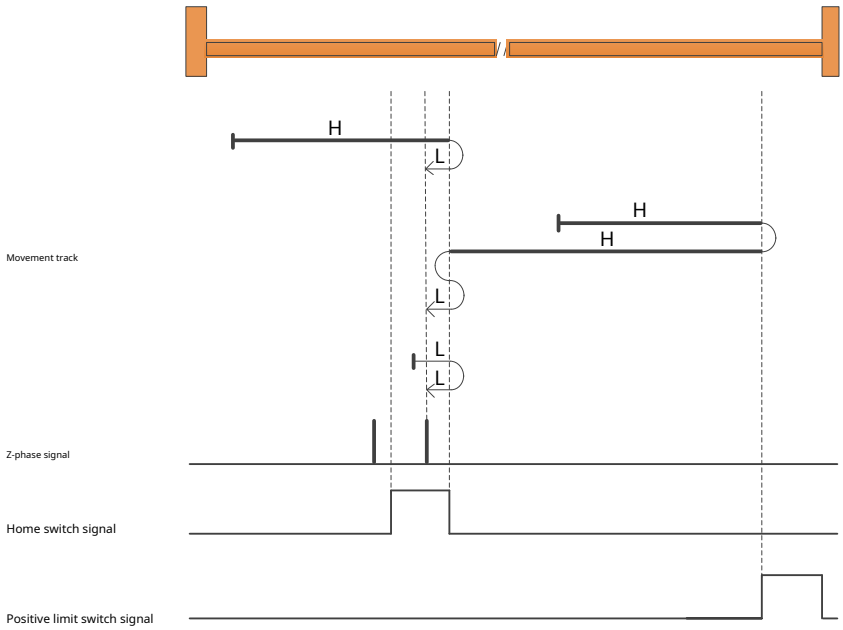


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed running toHOM-SWDecelerate to stop after invalid position,After that, run forward at low speed again,meet HOM-SWThe first after the rising edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of,slow down,reverse,Negative high speed operation;meetHOM-SWdecelerates after the falling edge of,reverse,Forward low speed operation, meetHOM-SWfirst after risingZpulse stop.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the rising edgeZpulse stop.

7.8.2.13Back to origin method9:positive regression,Find the origin sensor rising edge andZPulse signal,Automatic reverse when encountering positive limit

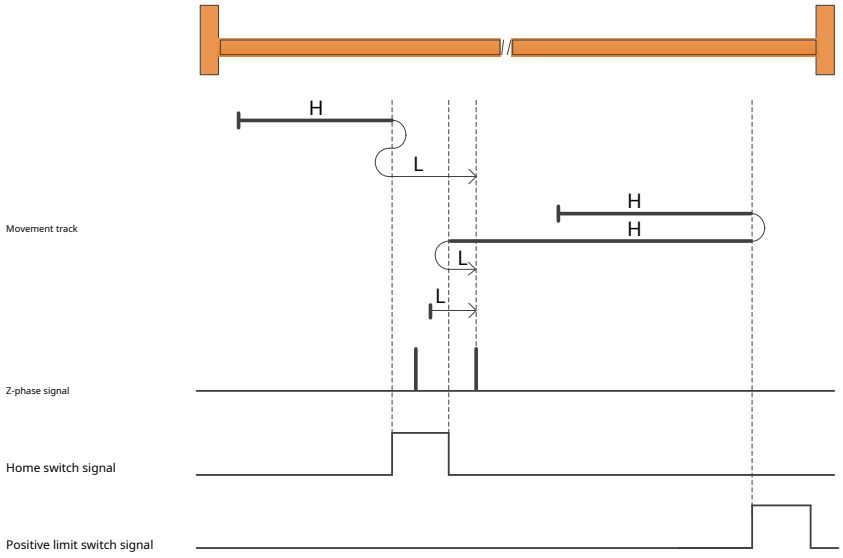


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SWDecelerate after falling edge,reverse,Negative low speed operation,meetHOM-SWThe first after the rising edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of, slow down,reverse,Negative high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWThe first after the rising edge ofZpulse stop.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation, meetHOM-SWThe first after the rising edge ofZpulse stop.

7.8.2.14Back to origin method10:positive regression,Find the origin sensor falling edge andZPulse signal,Automatic reverse when encountering positive limit

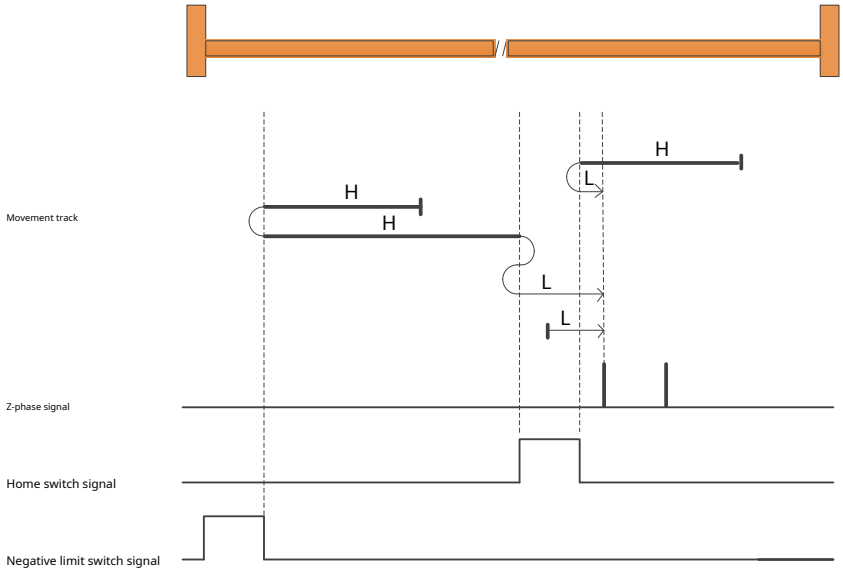


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed running toHOM-SWDecelerate to stop after invalid position,After that, run forward at low speed again,meetHOM-SWfirst after falling edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of, slow down,reverse,Negative high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Forward low speed operation,meetHOM-SWfirst after falling edgeZpulse stop.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWfirst after falling edgeZpulse stop.

7.8.2.15Back to origin method11:negative regression,Find the origin sensor falling edge andZPulse signal,Automatic reverse when encountering negative limit

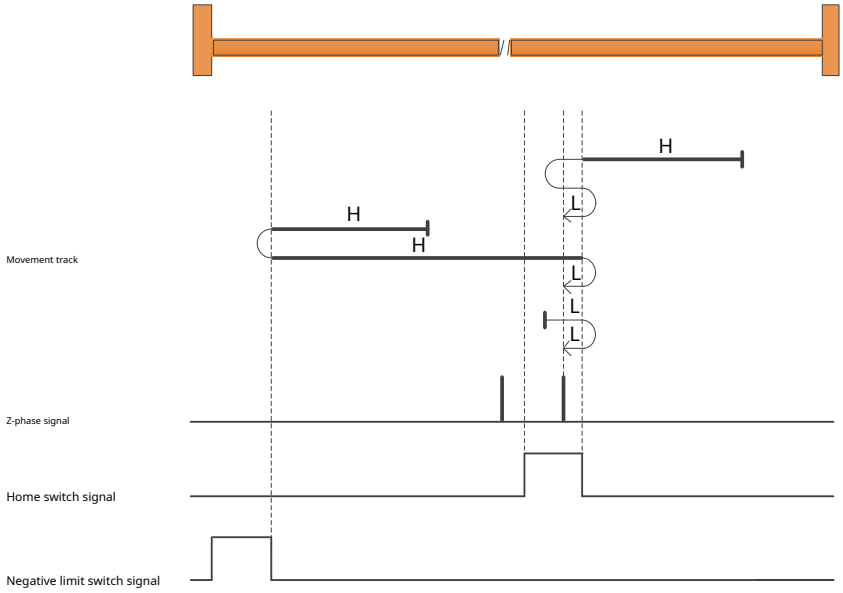


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWAfter rising edge, slow down,reverse,Forward low speed operation,meetHOM-SWfirst after falling edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed running toHOM-SWDecelerate to stop after invalid position ,After that, run forward at low speed again,meetHOM-SWThe first after the falling edge ofZpulse stop.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWfirst after falling edgeZpulse stop.

7.8.2.16Back to origin method12:negative regression,Find the origin sensor rising edge andZPulse signal,Automatic reverse when encountering negative limit

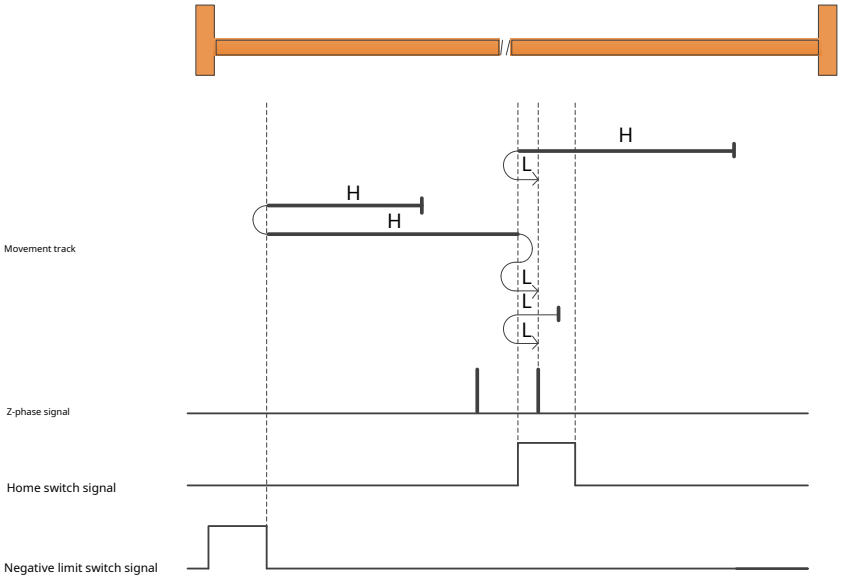


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWAfter rising edge, slow down, reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWThe first after the rising edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWafter the falling edge of,slow down,reverse,Negative low speed operation,meetHOM-SWThe first after the rising edgeZ pulse stop.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation, meet HOM-SWThe first after the rising edgeZpulse stop.

7.8.2.17Back to origin method13:negative regression,Find the origin sensor rising edge andZPulse signal,Automatic reverse when encountering negative limit

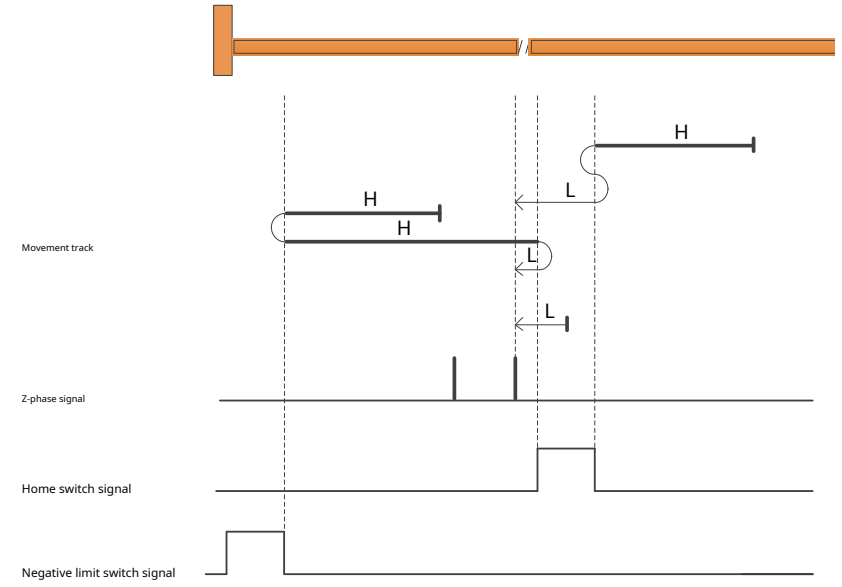


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWafter the falling edge of,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the rising edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed running toHOM-SW Decelerate to stop after invalid position,After that, run forward at low speed again,meetHOM-SWThe first after the rising edge ofZpulse stop.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation, meetHOM-SWThe first after the rising edge ofZpulse stop.

7.8.2.18Back to origin method14:negative regression,Find the origin sensor falling edge andZPulse signal,Automatic reverse when encountering negative limit

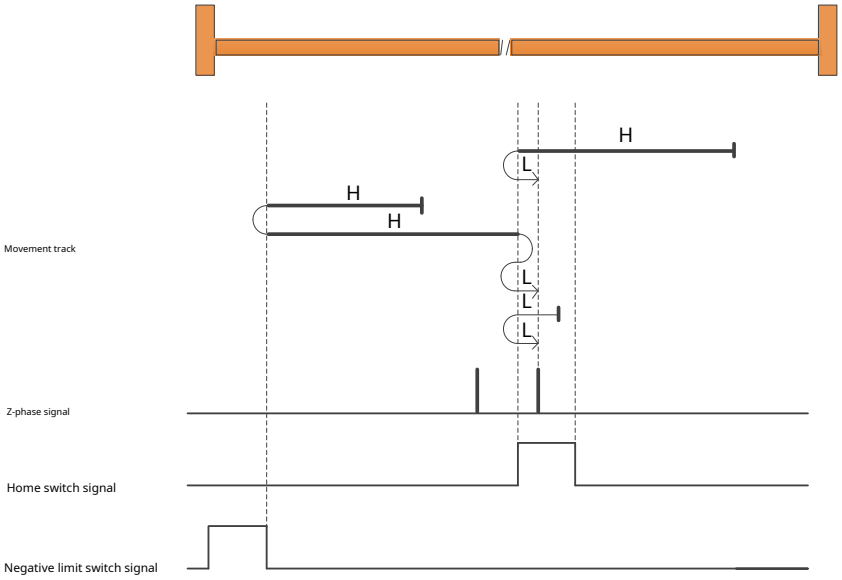


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWAfter rising edge, slow down,reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWfirst after falling edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed operation,meetHOM-SWfirst after falling edgeZpulse stop.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWfirst after falling edgeZpulse stop.

7.8.2.17Back to origin method13:negative regression,Find the origin sensor rising edge andZPulse signal,Automatic reverse when encountering negative limit

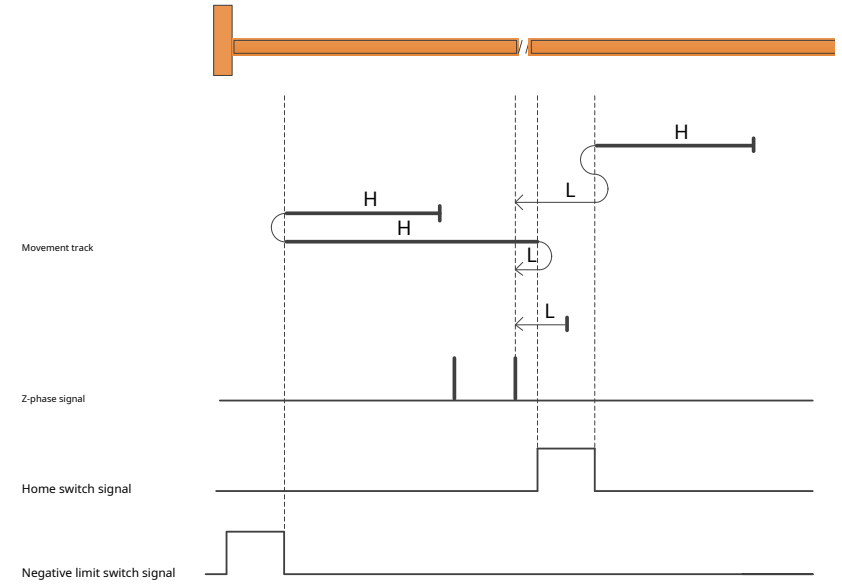


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWafter the falling edge of,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the rising edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed running toHOM-SW Decelerate to stop after invalid position,After that, run forward at low speed again,meetHOM-SWThe first after the rising edge ofZpulse stop.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation, meetHOM-SWThe first after the rising edge ofZpulse stop.

7.8.2.18Back to origin method14:negative regression,Find the origin sensor falling edge andZPulse signal,Automatic reverse when encountering negative limit



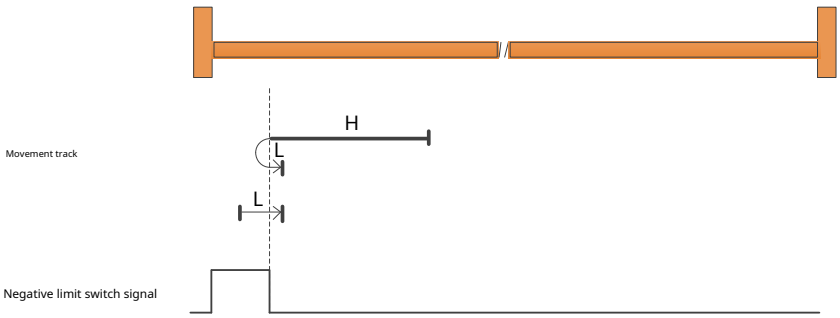
a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWAfter rising edge, slow down,reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWfirst after falling edgeZpulse stop.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed operation,meetHOM-SWfirst after falling edgeZpulse stop.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWfirst after falling edgeZpulse stop.

7.8.2.19Back to origin method15,16reserve

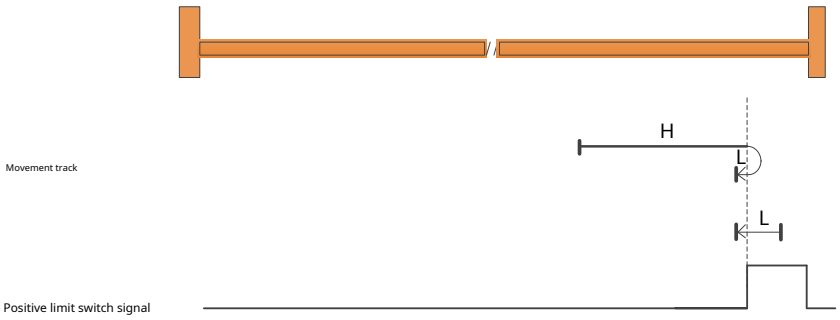
7.8.2.20Back to origin method17:negative regression,Looking for negative limit signal



a)when starting to returnNOT=0,Start the return with a negative high speed,meetNOTAfter rising edge,slow down,reverse,Forward low speed operation,meet NOTstop after falling edge.

b)when starting to returnNOT=1,Start the return at a forward low speed,meetNOTstop after falling edge.

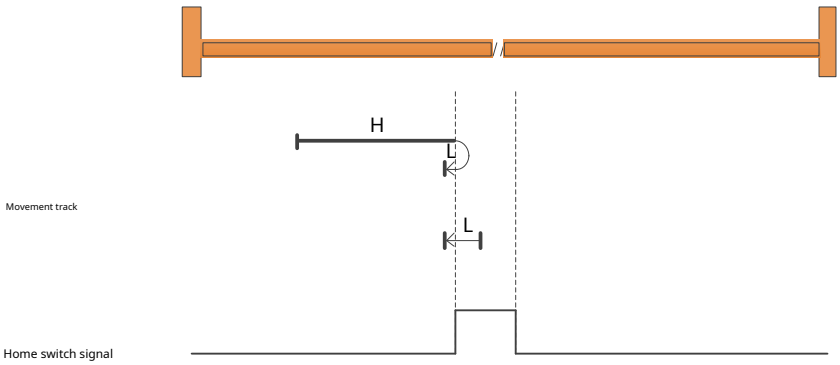
7.8.2.21Back to origin method18:positive regression,Looking for positive limit signal



a)when starting to returnPOT=0,Start the return at a positive high speed,meetPOTAfter rising edge,slow down,reverse,Negative low speed operation,meetPOTstop after falling edge.

b)when starting to returnPOT=1,Start return at low speed in negative direction,meetPOTstop after falling edge.

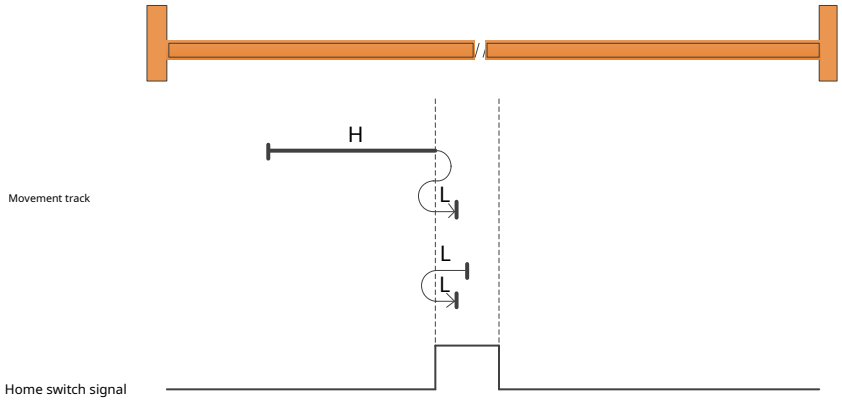
7.8.2.22Back to origin method19:positive regression,Find the origin sensor falling edge signal



a)when starting to returnHOM-SW=0,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed operation,meetHOM-SWstop after falling edge.

b)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWstop after falling edge.

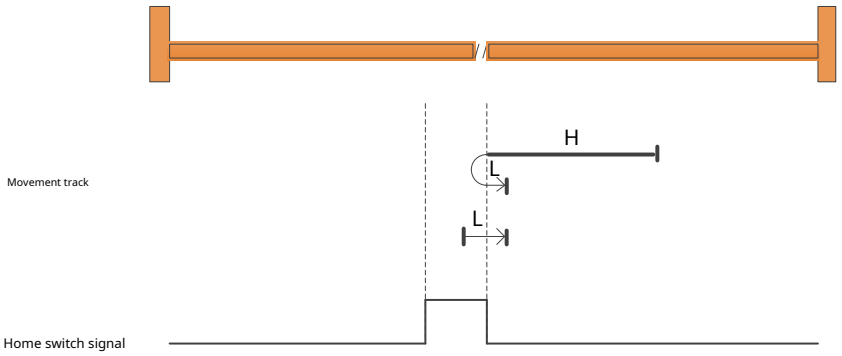
7.8.2.23Back to origin method20:positive regression,Find the origin sensor rising edge signal



a)when starting to returnHOM-SW=0,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed running toHOM-SWDecelerate to stop after invalid position,After that, run forward at low speed again,meetHOM-SWStop after rising edge.

b)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation,meetHOM-SWStop after rising edge.

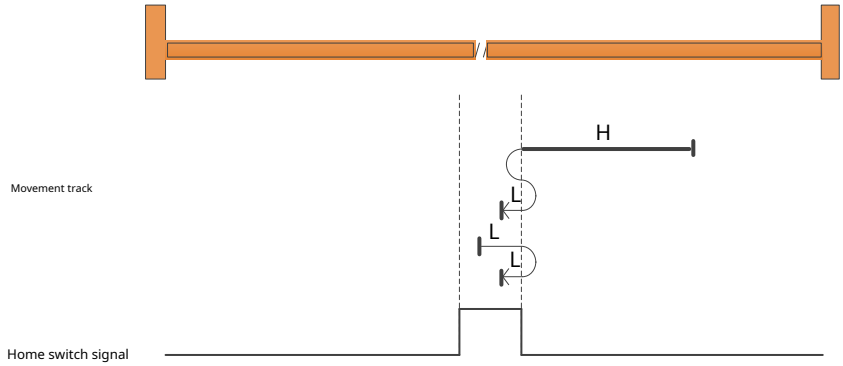
7.8.2.24Back to origin methodtwenty one:negative regression,Find the origin sensor falling edge signal



a)when starting to returnHOM-SW=0,Start the return with a negative high speed,meetHOM-SWAfter rising edge,slow down,reverse,Forward low speed operation,meetHOM-SWstop after falling edge.

b)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWstop after falling edge.

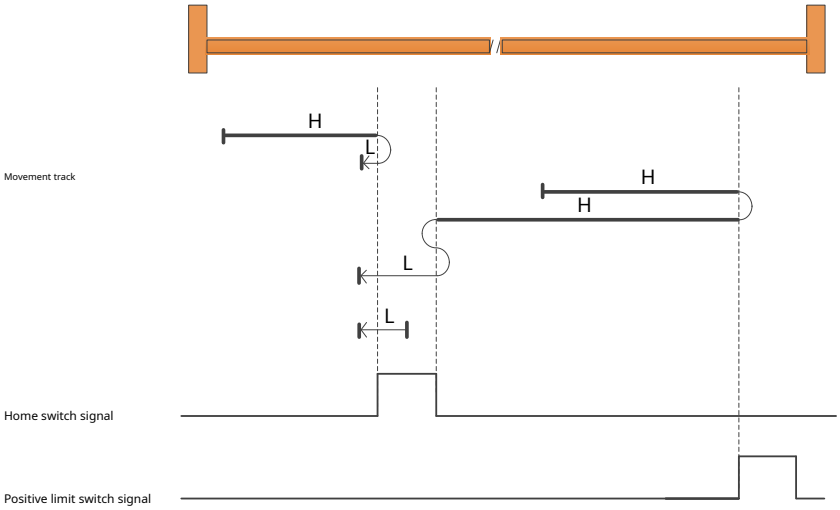
7.8.2.25Back to origin methodtwenty two:negative regression,Find the origin sensor rising edge signal



a)when starting to returnHOM-SW=0,Start the return with a negative high speed,meetHOM-SWAfter rising edge,slow down,reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWStop after rising edge.

b)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation,meetHOM-SWStop after rising edge.

7.8.2.26Back to origin methodtwenty three:positive regression,Find the origin sensor falling edge signal,Automatic reverse when encountering positive limit

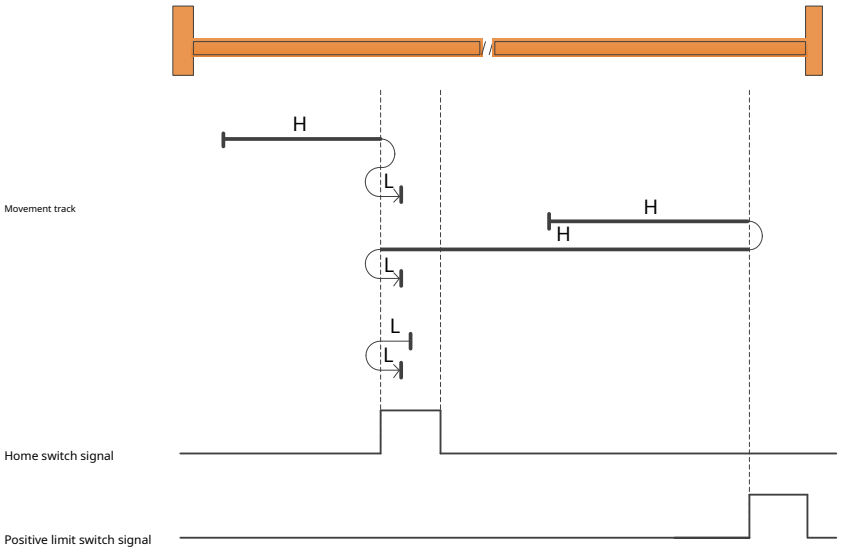


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed operation,meetHOM-SWstop after falling edge.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of, slow down,reverse,Negative high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Run forward at low speed toHOM-SW Decelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWstop after the falling edge of.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWstop after falling edge.

7.8.2.27Back to origin methodtwenty four:positive regression,Find the origin sensor rising edge signal,Automatic reverse when encountering positive limit

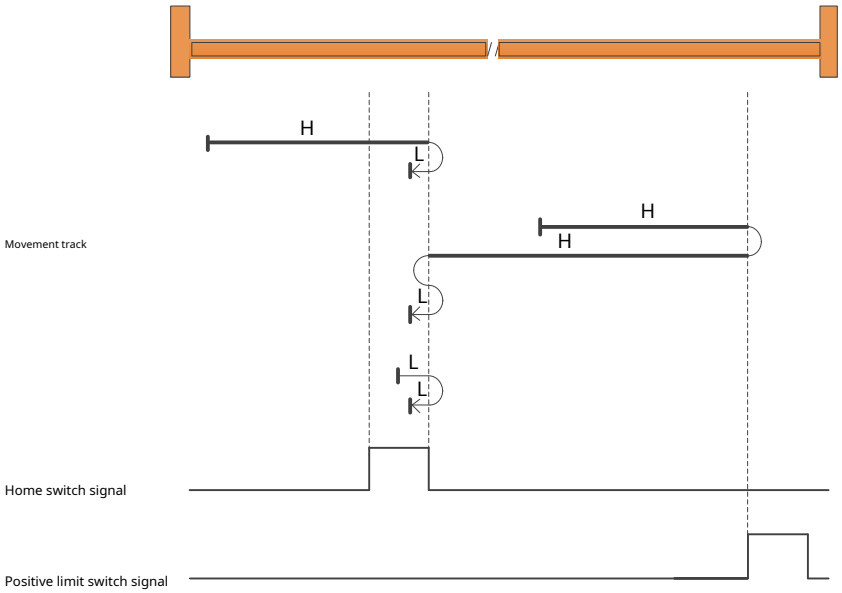


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed running toHOM-SWDecelerate to stop after invalid position,After that, run forward at low speed again,meet HOM-SWStop after rising edge.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of, slow down,reverse,Negative high speed operation;meetHOM-SWdecelerates after the falling edge of,reverse,Forward low speed operation,meetHOM-SWstop after rising.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation,meetHOM-SWStop after rising edge.

7.8.2.28Back to origin method25:positive regression,Find the origin sensor rising edge signal,Automatic reverse when encountering positive limit

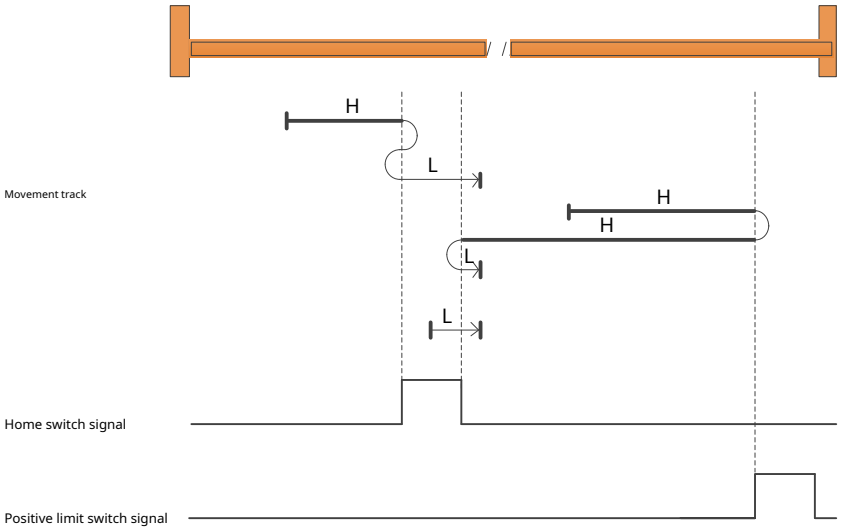


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SWDecelerate after falling edge,reverse,Negative low speed operation,meetHOM-SWStop after rising edge.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of, slow down,reverse,Negative high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Run forward at low speed toHOM-SW Decelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWstop after the rising edge of.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation,meetHOM-SWstop after the rising edge of.

7.8.2.29Back to origin method26:positive regression,Find the origin sensor falling edge signal,Automatic reverse when encountering positive limit

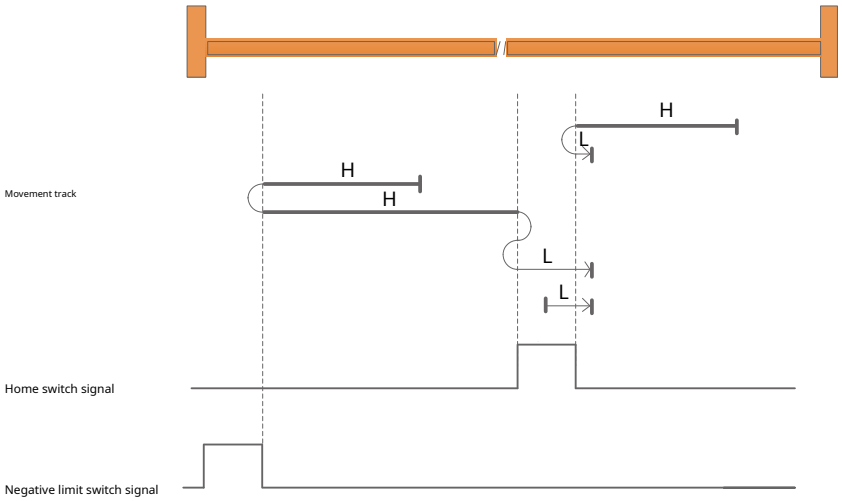


a)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return at a positive high speed,meetHOM-SWAfter rising edge,slow down,reverse,Negative low speed running toHOM-SWDecelerate to stop after invalid position,After that, run forward at low speed again,meetHOM-SWstop after falling edge.

b)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return at a positive high speed,meetPOTAfter the rising edge of, slow down,reverse,Negative high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Forward low speed operation,meetHOM-SWstop after falling edge.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWstop after falling edge.

7.8.2.30Back to origin method27:negative regression,Find the origin sensor falling edge signal,Automatic reverse when encountering negative limit

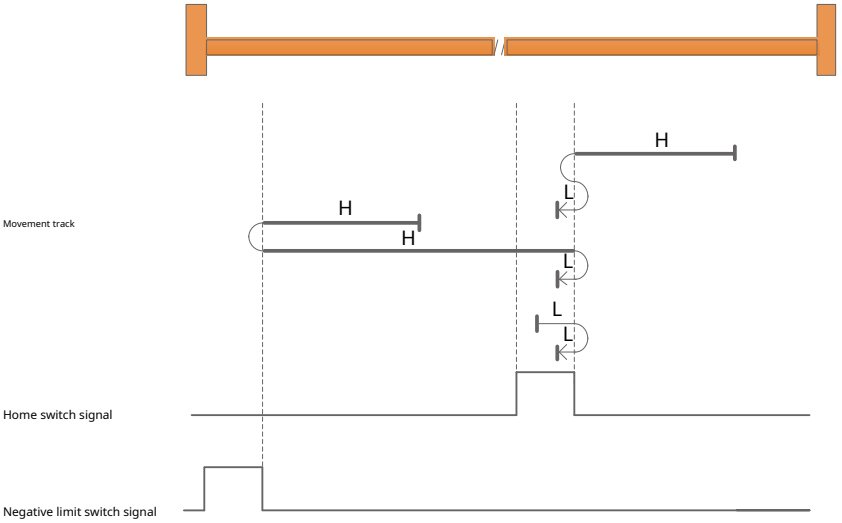


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWAfter rising edge,slow down,reverse,Forward low speed operation,meetHOM-SWstop after falling edge.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed running toHOM-SW Decelerate to stop after invalid position,After that, run forward at low speed again,meetHOM-SWstop after the falling edge of.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWstop after falling edge.

7.8.2.31Back to origin method28:negative regression,Find the origin sensor rising edge signal,Automatic reverse when encountering negative limit

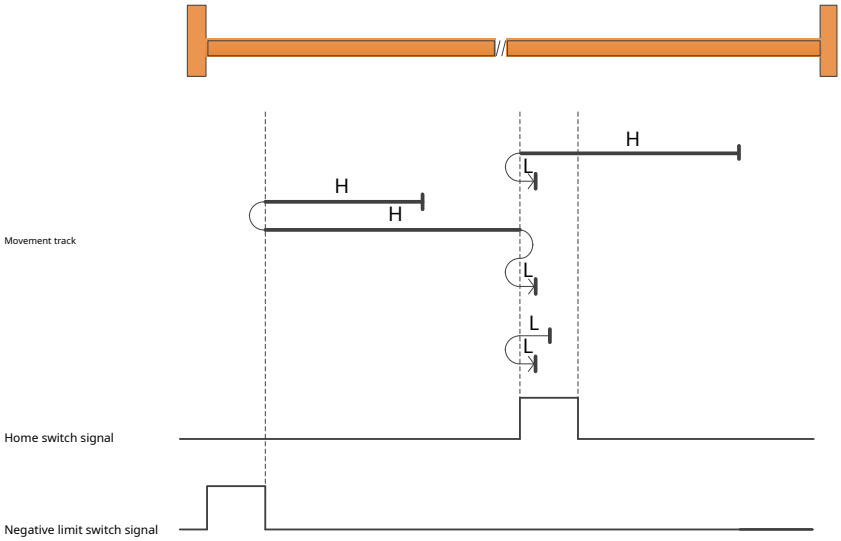


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWAfter rising edge, slow down,reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWStop after rising edge.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of, slow down,reverse,Forward high speed operation;meetHOM-SWafter the falling edge of,slow down,reverse,Negative low speed operation,meetHOM-SWStop after rising edge.

c)when starting to returnHOM-SW=1,Start the return at a forward low speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation,meet HOM-SWStop after rising edge.

7.8.2.32Back to origin method29:negative regression,Find the origin sensor rising edge signal,Automatic reverse when encountering negative limit

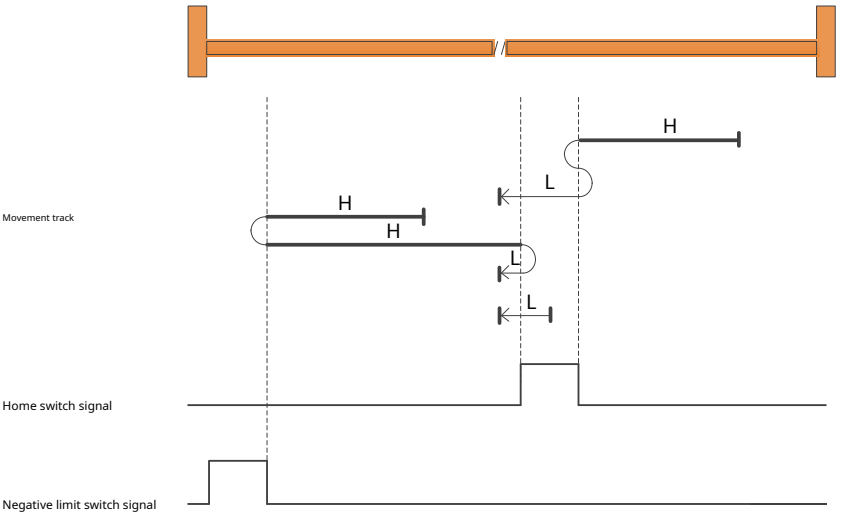


a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWafter the falling edge of,slow down,reverse,Forward low speed operation,meetHOM-SWStop after rising edge.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed running toHOM-SW Decelerate to stop after invalid position,After that, run forward at low speed again,meetHOM-SWstop after the rising edge of.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation,meetHOM-SWstop after the rising edge of.

7.8.2.33Back to origin method30:negative regression,Find the origin sensor falling edge signal,Automatic reverse when encountering negative limit



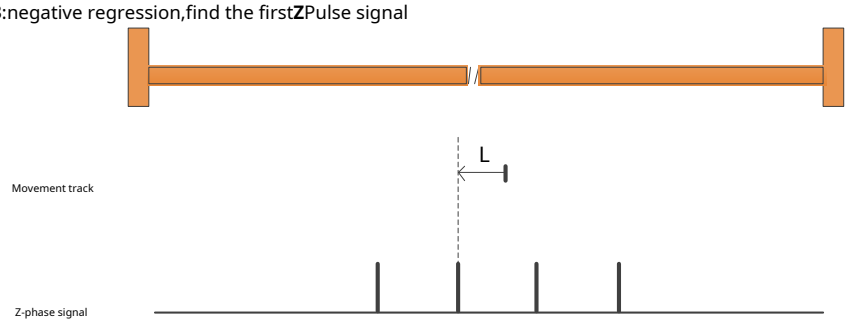
a)when starting to returnHOM-SW=0and on the positive side of the origin sensor location,Start the return with a negative high speed,meetHOM-SWAfter rising edge, slow down,reverse,Run forward at low speed toHOM-SWDecelerate to stop after invalid position,Then run at low speed in negative direction,meetHOM-SWstop after falling edge.

b)when starting to returnHOM-SW=0and on the negative side of where the origin sensor is located,Start the return with a negative high speed,meetNOTAfter the rising edge of, slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low speed operation,meetHOM-SWstop after falling edge.

c)when starting to returnHOM-SW=1,Start return at low speed in negative direction,meetHOM-SWstop after falling edge.

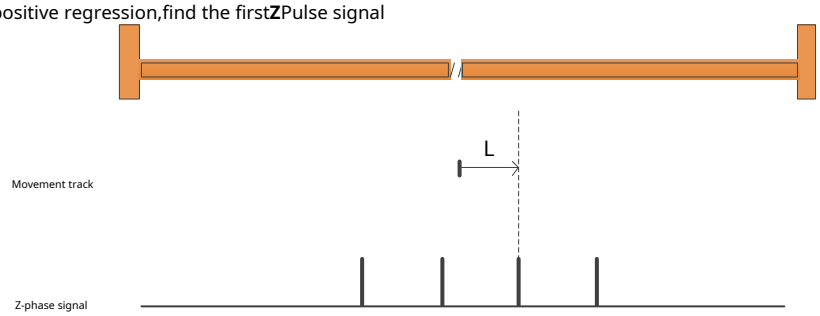
7.8.2.34Back to origin method31,32,34,35

- Back to origin method**31**,**32**reserve
- Back to origin method**33**:negative regression,find the first**Z**Pulse signal



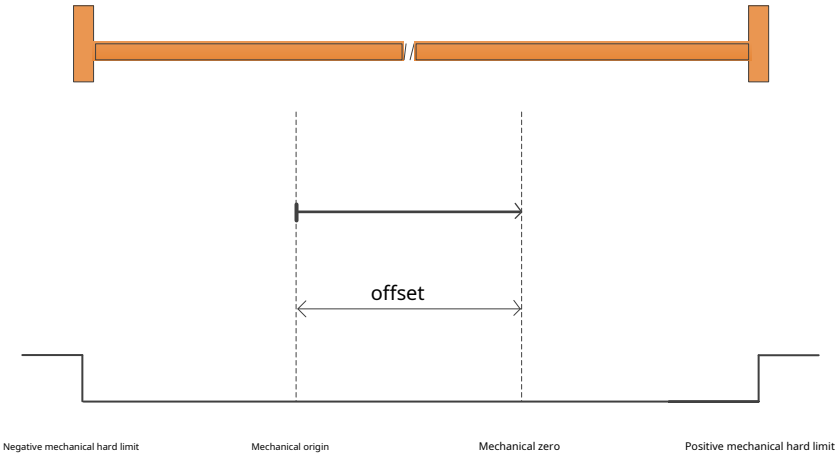
a)Start return at low speed in negative direction,meet the firstZPulse signal stop.

- Back to origin method**34**:positive regression,find the first**Z**Pulse signal



a)Start the return at a forward low speed,meet the firstZPulse signal stop.

- Back to origin method**35**:Take the current position as the machine origin



8.1Parameter classification

MBDVSeries Low Voltage Servo has5group parameter.

parameter group	type	Features
P0-XXGroup	PID---gain	Set the gain parameters of the servo
P1-XXGroup	Configuration---configure	Configuration function,Set various functional parameters of the drive
P2-XXGroup	Trajectory---Trajectory planning	When setting the internal control mode of the driver,Parameters related to motion trajectories
P3-XXGroup	Encoder & Step/Dir---Encoder and input pulse settings	Setup and Encoder,Pulse input/output related parameters
P5-XXGroup	I/O--IOset up	Set digital input,Output related functions

8.2List of parameters

P0-XX Group:**PID**Gain setting

serial number	instruction	Features	Defaults	scope	unit	Effective mechanism
P0-00	UM	Parameter tuning mode	0	0 ~ 2	— —	
P0-01	LY	load type	0	0 ~ 10	— —	
P0-02	NR	Load inertia ratio	0	0 ~ 100	— —	
P0-03	KG	first rigidity class	5	0 ~ 20	— —	
P0-04	KX	Second rigidity level	5	0 ~ 20	— —	
P0-05	KP	first position loop gain	52	0 ~ 20000	0.1Hz	
P0-07	KD	1st position loop differential time constant	2000	0 ~ 30000	ms	
P0-08	KE	First position loop differential filter frequency	20000	0 ~ 40000	0.1Hz	
P0-09	KL	Speed feed forward gain	10000	- 30000 ~ 3000	0.01%	
P0-10	KR	Velocity feedforward filter frequency	20000	0 ~ 40000	0.1Hz	
P0-11	KF	First command speed gain	10000	- 30000 ~ 3000	0.01%	
P0-12	VP	first speed loop gain	183	0 ~ 30000	0.1Hz	
P0-13	VI	1st speed loop integral time constant	189	0 ~ 30000	ms	
P0-14	KK	Acceleration feedforward gain	3000	0 ~ 10000	0.01%	
P0-15	KT	Acceleration feedforward filter frequency	20000	0 ~ 40000	0.1Hz	
P0-16	KC	First command torque filter frequency	1099	0 ~ 40000	01Hz	
P0-17	UP	Second position loop gain	52	0 ~ 20000	0.1Hz	
P0-19	UD	Second position loop differential time constant	2000	0 ~ 30000	ms	
P0-20	UE	The second position loop differential filter frequency	15000	0 ~ 40000	0.1Hz	
P0-21	UF	Second command speed gain	10000	- 30000 ~ 3000	0.01%	
P0-22	UV	Second speed loop gain	183	0 ~ 30000	0.1Hz	
P0-23	UG	Second speed loop integral time constant	189	0 ~ 30000	ms	
P0-24	UC	Second command torque filter frequency	1099	0 ~ 40000	01Hz	
P0-33	SD	Gain switching condition selection	0	0 ~ 4	— —	
P0-34	PN	Gain Switching Condition - Position	0	0 ~ 2147483647	Pulses	
P0-35	VN	Gain Switching Condition - Speed	0	0 ~ 100	rps	
P0-36	TN	Gain Switching Condition - Torque	10	0 ~ 3000	0.1%	
P0-37	SE1	Second gain switch to first gain delay time	10	0 ~ 10000	ms	
P0-38	SE2	1st gain to 2nd gain delay time	0	0 ~ 10000	ms	
P0-39	LR	Velocity Feedback Filter	0	0 ~ 3	— —	

P1-XX Group:**Configuration---**Configuration class parameters

serial number	SCLinstruction	Features	Defaults	scope	unit	Effective mechanism
P1-00	CM	master control mode	twenty one	1,15,21	-	Effective immediately
P1-02	PM	Power-on working mode	10	8 ~ 10,13	-	
P1-03	JM	Speed Control Clamp Mode	2	1 ~ 2	-	
P1-05	GC	Command torque in internal torque mode	0	- 3000 ~ 3000	0.1%	
P1-06	CC	first torque limit	3000	0 ~ 3000	0.1%	
P1-07	CV	Torque reaches target value	0	0 ~ 3000	0.1%	
P1-08	HC	Torque limit of hardware limit homing mode	200	0 ~ 3000	0.1%	
P1-09	CL	Torque overload duration	2000	0 ~ 30000	ms	
P1-10	LD	Torque limit method	1	1 ~ 5	-	
P1-11	DR	Motor rotation direction selection	0	0,1	-	
P1-13	PR	Protocol	5	1 ~ 511	-	
P1-14	TD	response delay	2	0 ~ 20	ms	
P1-15	BR	RS-485Communication baud rate	1	1 ~ 5	-	
P1-16	DA	RS-485mailing address	32	1 ~ 32	-	
P1-17	CO	CANopenmailing address	1	1 ~ 127	-	
P1-18	CB	CANopenCommunication baud rate	0	0 ~ 7	-	
P1-19	ZR	Regenerative absorption resistor resistance	200	10 ~ 32000	Ω	
P1-20	ZC	Regenerating Absorption Resistor Power	40	1 ~ 32000	W	
P1-21	ZT	Regeneration absorption time constant	1000	0 ~ 8000	ms	
P1-24	MA	Alarm masking	4294967295	0 ~ 4294967295	-	
P1-25	CX	Second torque limit	3000	0 ~ 3000	0.1%	
P1-26	CY	Third torque limit	3000	0 ~ 3000	0.1%	
P1-27	CZ	Fourth torque limit	3000	0 ~ 3000	0.1%	
P1-28	HT	Motor stall protection time	0	0 ~ 30000	ms	
P1-29	YV	The action of the dynamic brake when it is disabled	0	0 ~ 5		
P1-30	YR	The action of the dynamic brake when an error is reported	0	0 ~ 3		
P1-31	YM	The maximum amount of dynamic braking during deceleration long action time	500	0 ~ 30000	ms	
P1-32	YN	The longest duration of dynamic braking during deceleration in error Action time	0	0 ~ 30000	ms	
P1-34	RT	Current instantaneous change value	1000	0 ~ 3000	0.1%	
P1-37	DV	Dynamic braking action speed	50	0 ~ 100	rps	
P1-38	DW	Operating voltage point of bleeder circuit	650	20 ~ 800	0.1V	
P1-39	ZS	Watchdog trigger time	500	0 ~ 10000	ms	
P1-40	ZA	Action after watchdog is triggered	1	1 ~ 16	1	

P2-XX Group:**Trajectory---**Trajectory planning

serial number	SCLOrder	Features	Defaults	scope	unit	Effective mechanism
P2-00	VM	Maximum speed	80	0 ~ 100	rps	
P2-01	AM	Servo brake deceleration	3000	0.167 ~ 5000	rps/s	
P2-02	JS	Internal speed mode target speed	10	- 100 ~ 100	rps	
P2-03	JA	Internal Velocity Mode Acceleration	100	0.167 ~ 5000	rps/s	
P2-04	JL	Internal speed mode deceleration	100	0.167 ~ 5000	rps/s	
P2-05	JT	jerk time	10	0 ~ 125	ms	
P2-06	VE	Speed in internal peer-to-peer mode	10	0.0042 ~ 100	rps	
P2-07	AC	Acceleration in internal peer-to-peer mode	100	0.167 ~ 5000	rps/s	
P2-08	DE	Deceleration in internal peer-to-peer mode	100	0.167 ~ 5000	rps/s	
P2-09	VC	Speed down in internal peer-to-peer mode	2	0 ~ 100	rps	

serial number	SCLOrder	Features	Defaults	scope	unit	Effective mechanism
P2-10	JC	Multi-speed control,the first1gear speed	2	- 100 ~ 100	rps	
P2-18	HA1	Return to origin acceleration/deceleration	100	0.167 ~ 5000	rps/s	
P2-24	HV1	The first speed of returning to the origin	10	0.0042 ~ 100	rps	
P2-25	HV2	The second speed of returning to the origin	1	0.0042 ~ 100	rps	
P2-27	HO	Return to origin offset	0	- 2147483647 ~ +2147483647	pulses	
P2-28	KJ	low pass smoothing filter	0	0 ~ 1000	ms	
P2-29	FF	interpolation filter	10	0 ~ 10	ms	
P2-30	VT	Speed limit in torque mode	80	0 ~ 100	rps	

P3-XX Group:**Encoder & Step/Dir---**Encoder and input pulse settings

serial number	SCLOrder	Features	Defaults	scope	unit	Effective mechanism
P3-04	PF	Position error alarm limit	100000	0 ~ 2147483647	pulses	
P3-05	EG	Number of pulses required per revolution	10000	200 ~ 131072	pulses/rev	
P3-12	PO	Pulse frequency division output mode	1	0 ~ 256	-	
P3-13	ON	Pulse divider output ratio numerator	10000	0 ~ 13107200	-	
P3-14	OD	Pulse frequency division output ratio denominator	131072	0 ~ 13107200	-	
P3-15	ES	Absolute encoder usage mode	1	0 ~ 1	-	

P5-XX Group:**I/O--IO**set up

serial number	SCLOrder	Features	Defaults	scope	unit	Effective mechanism
P5-00	MU1	digital input port1Features		0 ~ 46	-	
P5-01	MU2	digital input port2Features		0 ~ 46	-	
P5-02	MU3	digital input port3Features		0 ~ 46	-	
P5-03	MU4	digital input port4Features		0 ~ 46	-	
P5-12	MO1	digital output port1Features		0 ~ 34	-	
P5-13	MO2	digital output port2Features		0 ~ 34	-	
P5-14	MO3	digital output port3Features		0 ~ 34	-	
P5-24	BD	Movement waiting time after brake release	200	0 ~ 32000	ms	
P5-25	BE	after brake,Motor disable wait delay	200	0 ~ 32000	ms	
P5-27	HX	origin sensor	5	1 ~ 10	-	
P5-28	FI1	digital input filter1	1	0 ~ 8000	ms	
P5-29	FI2	digital input filter2	1	0 ~ 8000	ms	
P5-30	FI3	digital input filter3	1	0 ~ 8000	ms	
P5-31	FI4	digital input filter4	1	0 ~ 8000	ms	
P5-38	PL	Dynamic following error threshold	10	0 ~ 2147483647	pulses	
P5-39	PD	Positioning complete signal position error threshold	40	0 ~32000	pulses	
P5-40	PE	Motion judgment condition count time	10	0 ~ 30000	ms	
P5-42	ZV	Zero speed judgment threshold	0.5	0.1 ~ 2	rps	
P5-43	VR	Speed consistent fluctuation range	0.1	0 ~ 100	rps	
P5-44	VV	Judging that the speed reaches the target value	10	0 ~ 100	rps	
P5-45	TV	Torque reaches the fluctuation range	10	0 ~ 3000	0.1%	
P5-46	DG	absolute arrival position	10000	- 2147483647 ~ +2147483647	pulses	
P5-47	LP	Positive soft limit	0	- 2147483647 ~ +2147483647	pulses	
P5-48	LM	Reverse soft limit	0	- 2147483647 ~ +2147483647	pulses	
P5-49	HE	Back to origin method	1	- 4 ~ 40	-	
P5-50	EO	Emergency stop option	1	1 to 8	-	
P5-51	MS	Zero-speed clamp function in speed mode	1	0 ~ 1	-	

8.3.1 P0-XXGroup:PIDGain setting

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-00	UM	Parameter tuning mode	0	0 ~ 2	---	P	S	T	

How to set parameters.

set value	Parameter tuning mode	illustrate	Remark
0	No tuning	by settingP0-03The first rigidity class comes Set the gain value of the servo system.	Notice:in this mode,Modify onlyP0-03The first rigidity level is valid.Manually adjust other The benefit parameter is invalid.
1	auto-tuning	Perform parameter automatic stabilization,Automatically identify negative load ratio,And set the corresponding rigidity and servo System gain parameters.After auto tuning after,can be modifiedP0-03Optimized for the first rigidity level.	Notice:in this mode,Modify onlyP0-03Rigidity grade andP0-02The load inertia ratio is valid. Manual adjustment of other gain parameters is invalid.
2	Advanced tuning	After completing auto-tuning,can be adjusted Mode is set to "Advanced Tuning",at this time All gain parameters can be modified to optimize the system system response.	in this mode,All gain parameters are valid.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-01	LY	load type	0	0 ~ 10	---	P	S	T	

Set the current load type.

In auto tuning mode and advanced tuning mode,Reasonable set load type,Conducive to accurate identification and optimization of system gain parameters.

set value	Parameter tuning mode	illustrate
0	normal load	Such as:Horizontally placed screw-type loads.
1	rigid load	Such as:Stronger mechanism,Such as screw-type loads mounted horizontally on a marble base.Horizontally placed turntable, etc..
2	Flexible load	Such as:Use timing belt,belt load.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-02	NR	Load inertia ratio	0	0 ~ 100	---	P	S	T	

Current load inertia ratio.

Set the ratio of load inertia to motor rotational inertia.

While auto-tuning is in progress,The load inertia ratio of the current system can be identified in real time,When auto-tuning is over,This parameter is automatically saved

. When the load inertia ratio is set correctly,P0-05Can accurately represent the gain of the current system.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-03	KG	first rigidity class	5	1 ~ 20	---	P	S	T	

The first stiffness value of the current system.

When parameter tuning modeP0-00When set to no-tuning and auto-tuning,The higher the rigidity level,The stronger the gain of the servo system,faster response,Excessive values will cause the system to vibrate.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-04	KX	Second rigidity level	5	1 ~ 20	---	P	S	T	

second stiffness value of the current system.When gain switching is turned on,The second rigidity level will be valid under the corresponding conditions.

About gain switching,For details, please refer to7.1.6Gain switching function.

When parameter tuning modeP0-00When set to no-tuning and auto-tuning,The higher the rigidity level,The stronger the gain of the servo system,faster response,Excessive values will cause the system to vibrate.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-05	KP	first position loop gain	52	0 ~ 20000	0.1Hz	P	S	T	

Set the proportional gain of the position control.

0Indicates not to use,20000Indicates that the proportional effect is maximized. Increasing this parameter can improve the responsiveness of the system,Reduce position error,Reduce positioning time. When the proportional gain of the position loop is too small,will cause the system to respond not fast enough,Position error decreases slowly. But if the setting is too large,may cause vibration.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-07	KD	1st position loop differential time constant	0	0 ~ 30000	ms	P	S	T	

Set the position loop differential time constant for position control.

0Indicates no derivative effect,The smaller the set value,The stronger the differential term.

When the differential time constant (KD)When the set value is too large,Insufficient vibration suppression capability of the system,will be during acceleration/deceleration,Obvious oscillation occurs during uniform speed process and after stop,and showed a trend of decreasing oscillation,and eventually stabilized.

◆ When the differential time constant (KD)When the set value is reasonable,The system's ability to suppress vibration is significantly enhanced,and quickly stabilized.

◆ When the differential time constant (KD)Set value too small,Motion system will be too sensitive,Very easy to vibrate and generate noise.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-08	KE	First position loop differential filter frequency	20000	0 ~ 40000	0.1Hz	P	S	T	

Set the position loop differential low-pass filter for position control.

0Indicates no filtering effect.

PIDDifferential low-pass filtering of the differential link of the controller,The filter is a single output low pass filter,used toPIDThe differential link output of the controller is low-pass filtered. the smaller the value, The lower the filter frequency,The more obvious the filtering effect.Defaults20000Applicable to most occasions for loads with large inertia ratios,Need to increase position loop gainKF,and reduce the differential time constant of the position loopKDto get a good response. But too much gain can cause jitter,Need to reduce differential low-pass filteringKEto prevent jitter,Suppression due to differential low-pass filteringKD caused noise.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-09	KL	Speed feed forward gain	10000	- 30000 ~ 3000	0.01%	P	S	T	

The value obtained by multiplying the ratio of the speed command calculated in the internal position command and this parameter is superimposed on the speed command from the position control process.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-10	KR	Velocity feedforward filter frequency	20000	0 ~ 40000	0.1Hz	P	S	T	

Set low-pass filtering for velocity feedforward.

0Indicates no filtering effect.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-11	KF	First command speed gain	10000	- 30000 ~ 3000	0.01%	P	S	T	

The speed command from the position loop control process is multiplied by the ratio of this parameter to the system.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-12	VP	first speed loop gain	183	0 ~ 30000	0.1Hz	P	S	T	

Set the proportional gain of the speed loop.

To improve the overall response of the servo system,Need to increase the speed loop gain value.Setting the value too high will cause vibration.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-13	VI	1st speed loop integral time constant	189	0 ~ 30000	ms	P	S	T	

Set the integral time constant of the speed loop.

0Indicates no integral effect,The smaller the set value,The stronger the integral term.

under proportional gain control,Speed error may not return to zero,or it takes a long time to get back to zero.Integral time constant accumulates all errors and works with proportional gain,Smaller integration time constant (VI)The setting value can improve the response and responsiveness of the servo system,and reduce the following error. When the integration time constant (VI)When the set value is too large, System response will be slow,poor follow up.

Integration time constant (VI)Set value too small,Excessive system rigidity will cause vibration and noise of the entire servo system.This vibration and noise occurs throughout the movement,and is always oscillating,unable to stabilize.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-14	KK	Acceleration feedforward gain	3000	0 ~ 10000	0.01%	P	S	T	

Acceleration Feedforward Gain in Servo Control.

for0Indicates that the feedforward is not used,10000it means that the feedforward effect is maximized. The gain coefficient can significantly improve the dynamic response during acceleration and deceleration by giving the open-loop control current of a certain load under a certain acceleration.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-15	KT	Acceleration feedforward filter frequency	20000	0 ~ 40000	0.1Hz	P	S	T	

Low-pass filter for acceleration feedforward gain in servo control.

for0Indicates that the filter is not used,40000It means that the acceleration feedforward effect is maximized.

The filter is a single output low pass filter,Used to low-pass filter the acceleration feedforward gain output.the smaller the value,The lower the filter frequency,The more obvious the filtering effect.Defaults20000Can be used in most situations.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-16	KC	First command torque filter frequency	1099	0 ~ 40000	01Hz	P	S	T	

Filter the command torque.

The filter is a single output low pass filter,used toPIDcontroller output(That is, the reference current)low pass filtering.When setting this value, it is necessary to consider the cutoff frequency required for system operation..

the smaller the value,The lower the filter frequency,The more obvious the filtering effect.Defaults1099Can be used in most situations

used in certain situations,such as motor vibration or noticeable audible noise.You can try reducing this value,This filter low-pass filters the output of the control loop.When a system is prone to mechanism resonance,The low-pass filter cutoff frequency can be set below the resonance frequency point,This way the output of the control loop will not excite the resonance. in a large inertia load system,Increase position loop gainKPCan get good system response.But too much gain can cause jitter,This filter parameter needs to be reduced to prevent jitter and whine.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-17	UP	Second position loop gain	52	0 ~ 20000	0.1Hz	P	S	T	

Set the proportional gain of the position control.

0Indicates not to use,20000Indicates that the proportional effect is maximized. Increasing this parameter can improve the responsiveness of the system,Reduce position error,Reduce positioning time. When the proportional gain of the position loop is too small,will cause the system to respond not fast enough,Position error decreases slowly. But if the setting is too large,may cause vibration.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-19	UD	Second position loop differential time constant	0	0 ~ 30000	ms	P	S	T	

Set the position loop differential time constant for position control.

0Indicates no derivative effect,The smaller the set value,The stronger the differential term.

When the differential time constant (KD)When the set value is too large,Insufficient vibration suppression capability of the system,will be during acceleration/deceleration,Obvious oscillation occurs during uniform speed process and after stop,and showed a trend of decreasing oscillation,and eventually stabilized.

- When the differential time constant (KD)When the set value is reasonable,The system's ability to suppress vibration is significantly enhanced,and quickly stabilized.
- When the differential time constant (KD)Set value too small,Motion system will be too sensitive,Very easy to vibrate and generate noise.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-20	UE	The second position loop differential filter frequency	20000	0 ~ 40000	0.1Hz	P	S	T	

Set the position loop differential low-pass filter for position control.

0Indicates no filtering effect.

PIDDifferential low-pass filtering of the differential link of the controller,The filter is a single output low pass filter,used toPIDThe differential link output of the controller is low-pass filtered. the smaller the value, The lower the filter frequency,The more obvious the filtering effect.Defaults20000Applicable to most occasions for loads with large inertia ratios,Need to increase position loop gainKF,and reduce the differential time constant of the position loopKDto get a good response. But too much gain can cause jitter,Need to reduce differential low-pass filteringKEto prevent jitter,Suppression due to differential low-pass filteringKD caused noise.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-21	UF	Second command speed gain	10000	- 30000 ~ 3000	0.01%	P	S	T	

The speed command from the position loop control process is multiplied by the ratio of this parameter to the system.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-22	UP	Second speed loop gain	183	0 ~ 30000	0.1Hz	P	S	T	

Set the proportional gain of the speed loop.

To improve the overall response of the servo system,Need to increase the speed loop gain value.Setting the value too high will cause vibration.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-23	UI	Second speed loop integral time constant	189	0 ~ 30000	ms	P	S	T	

Set the integral time constant of the speed loop.

0Indicates no integral effect,The smaller the set value,The stronger the integral term.

under proportional gain control,Speed error may not return to zero,or it takes a long time to get back to zero.Integral time constant accumulates all errors and works with proportional gain,Smaller integration time constant (VI)The setting value can improve the response and responsiveness of the servo system,and reduce the following error.

When the integration time constant (VI)When the set value is too large,System response will be slow,poor follow up.

Integration time constant (VI)Set value too small,Excessive system rigidity will cause vibration and noise of the entire servo system.This vibration and noise occurs throughout the movement,and is always oscillating,unable to stabilize.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-24	UC	Second command torque filter frequency	1099	0 ~ 40000	01Hz	P	S	T	

Filter the command torque.

The filter is a single output low pass filter,used toPIDcontroller output(That is, the reference current)low pass filtering.When setting this value, it is necessary to consider the cutoff frequency required for system operation..

the smaller the value,The lower the filter frequency,The more obvious the filtering effect.Defaults1099Can be used in most situations

used in certain situations,such as motor vibration or noticeable audible noise.You can try reducing this value,This filter low-pass filters the output of the control loop.When a system is prone to mechanism resonance,The low-pass filter cutoff frequency can be set below the resonance frequency point,This way the output of the control loop will not excite the resonance.

in a large inertia load system,Increase position loop gainKPCan get good system response.But too much gain can cause jitter,This filter parameter needs to be reduced to prevent jitter and whine.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-33	SD	Gain switching condition selection	0	0 ~ 4	— —	P	S	T	

How to set parameters.

set value	switch mode	switch condition	handover wait time
0	fixed in the first group	fixed at the1Group	-
1	According to position error	switch to2group condition:Absolute value of position error≥ P0-34set value	P0-37
		switch back to1group condition:Absolute value of position error <P0-34set value	P0-38
2	According to the actual speed of the motor	switch to2group condition:Absolute value of actual speed≥ P0-35set value	P0-37
		switch back to1group condition:Absolute value of actual speed<P0-35set value	P0-38
3	According to the actual output torque of the motor	switch to2group condition:Absolute value of actual torque≥ P0-36set value	P0-37
		switch back to1group condition:Absolute value of actual torque<P0-36set value	P0-38
4	position arrival signal	switch to2group condition:Location reach condition is met	P0-37
		switch back to1group condition:The location arrival condition does not hold	P0-38

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-34	PN	Gain Switching Condition - Position	0	0 ~ 2147483647	Pulses	P	S	T	

Setting the judgment condition for position-based gain switching.

During position control,whenP0-33The gain parameter switching method is set to "1"Time,The judgment condition for switching is set by this parameter..

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-35	VN	Gain Switching Condition - Speed	0.000	0 ~ 100	rps	P	S	T	

Set the gain switching judgment condition based on the actual motor speed.

Location,speed,During torque control,whenP0-33The gain parameter switching method is set to "2"Time,The judgment condition for switching is set by this parameter..

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-36	TN	Gain Switching Condition - Torque	10	0 ~ 3000	0.1%	P	S	T	

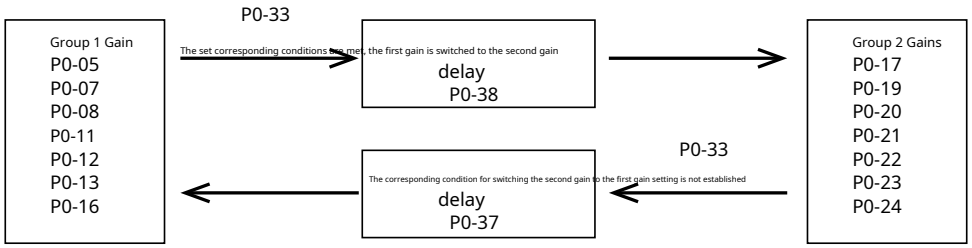
Set the gain switching judgment condition based on the actual output torque of the motor.

Location,speed,During torque control,whenP0-33The gain parameter switching method is set to "3"Time,The judgment condition for switching is set by this parameter..

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-37	SE1	Second gain switch to first gain delay time	10	0 ~ 10000	ms	P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-38	SE2	1st gain to 2nd gain delay time	10	0 ~ 10000	ms	P	S	T	

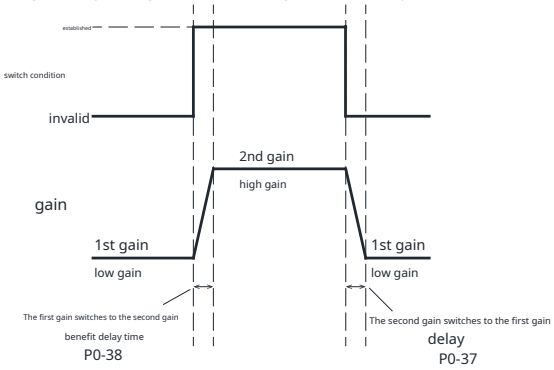
When the gain is switched,A certain time delay needs to be set.P0-37andP0-38Defines the switching time before the first and second sets of gains.



toggle transition time

As shown below,

- When the switching conditions are met,The first set of gains will go throughP0-37Gain switching rise time,Gradually switch to the second set of gains.Avoid jitter caused by immediate gain switching
- When the switching condition does not hold,The second set of gains will go throughP0-38Gain switching fall time,Gradually switch to the first set of gains.Avoid jitter caused by immediate gain switching



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-39	LR	Velocity Feedback Filter	0	0 ~ 3	— —	P	S	T	

PIDcontroller,Speed loop speed feedback low-pass filter.

set value	filter frequency
0	Do not use
1	8KHz
2	2KHz
3	1KHz

8.3.2 P1-XXGroup:Configuration---Configuration class parameters

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-00	CM	master control mode	twenty one	1,15,21	-	P	S	T	

parameterP1-00Can be used to set the master control mode of the drive.

set value	model	control signal	illustrate
1	Command torque mode	communication command	Use communication commands to control motor output torque
15	Multi-speed mode	digital input signal	internal8segment speed mode,parameterP2-10 ~ P2-17respectively set the1 paragraph to8segment velocity value
twenty one	Internal point-to-point location mode	communication command	Point-to-point position mode control using communication instructions

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-02	PM	Power-on working mode	10	8 ~ 10	-	P	S	T	

parameterP1-02It can be used to set the communication mode and working status of the drive after power-on.

set value	model
8	Power up and run onModbus/RTUmodel,Servo is automatically enabled after power-on
9	Power up and run in supportModbus/RTUcommunicationQmodel,After power-on, the servo is automatically enabled and executed Qprogram
10	Power up and run in supportModbus/RTUcommunicationQmodel,Servo not automatically enabled after power-on,Q Program does not execute automatically

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-03	JM	Speed Control Clamp Mode	2	1 ~ 2	-	P	S	T	

in speed mode,Option to control location.

set value	model	model
1	Real-time detection of position errors	When set to this mode,under speed control,Position error will be detected in real time.When the position error exceeds the parameterP3-04When the position error exceeds the set value of the limit range,A position error overrun alarm will be generated.
2	speed control only	When set to this mode,under speed control,speed control only.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-05	GC	Command torque in internal torque mode	0	- 3000 ~ 3000	0.1%	P	S	T	

When using internal torque mode/orMoudbus/RTUControlled torque mode,The target torque output by the motor can be set through this parameter. Notice:

This parameter cannot be maintained after power failure.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-06	CC	first torque limit	3000	0 ~ 3000	0.1%	P	S	T	

Set the first limit value of the motor output torque.

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-07	CV	Torque reaches target value	0	0 ~ 3000	0.1%	P	S	T	

Torque arrival signal judgment value.

Please refer to chapter**7.4.9**Torque arrives

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-08	HC	Torque limit of hardware limit homing mode	200	0 ~ 3000	0.1%	P	S	T	

Set the torque limit of the hardware limit homing method,When the actual output torque of the motor reaches this limit,Determine that the mechanical hard limit has been encountered.

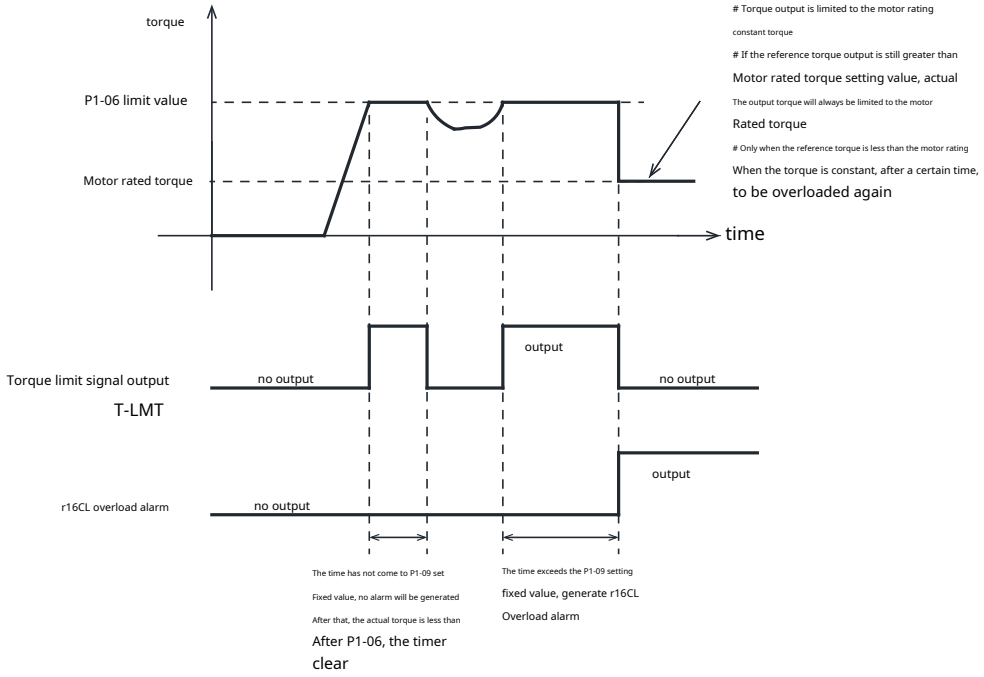
◆ Function introduction of hard limit return-to-origin method

Hard limit return-to-origin method:That is, there is no need to install the origin sensor in the mechanical part.,Just install the mechanical stop on the mechanical part,Return to the origin by hitting the mechanical stop. Please refer to chapter**7.10**Origin return function

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-09	CL	Overload torque duration	0	0 ~ 30000	ms	P	S	T	

Servo motor has the ability to provide overload torque,The torque limit value has parameters by defaultP1-06(first torque limit value) setting.This parameter sets the duration of torque overload.

- When the overload time exceeds this set value,will produce "r16CL"Overload alarm.
- Too large set value,Overloading for a long time can easily cause the motor to overheat and damage.
- During torque control,This function does not work.
- The set value is "0"Time,does not produce "r16CL"Overload alarm,Servo motor provided2second overload output capability.



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-10	LD	Torque limit method	1	1 ~ 5	ms	P	S	T	

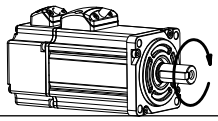
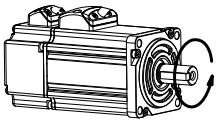
parameterP1-10Defined5torque limit,The restrictions are as follows.

set value	Forward	reverse
0	registerY	registerZ
1	parameterP1-06	
2	parameterP1-06	parameterP1-26
3	TQ-LMTWhen the input is valid:P1-06	
	TQ-LMTWhen the input is invalid:P1-26	
5	TQ-LMTWhen the input is valid:P1-06	TQ-LMTWhen the input is valid:P1-25
	TQ-LMTWhen the input is invalid:P1-27	TQ-LMTWhen the input is invalid:P1-27

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-11	DR	Motor rotation direction setting	0	0,1	-	P	S	T	

Set the relationship between the command direction and the motor rotation direction:

set value	turn around	illustrate
0	 Clockwise for the forward direction	When the command direction is the positive direction,The direction of motor rotation is from The front end of the motor is viewed in a clockwise direction
1	 counterclockwise for the forward direction	When the command direction is the positive direction,The direction of motor rotation is from The front end of the motor is viewed counterclockwise

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-12	IF	SCLCommand data format	H	D,H	-	P	S	T	

useSCLwhen instructed,data format used

set value	model
D	10base
H	16base

For example to read the current position of the encoder "IP"instruction.Suppose the current position is10base:20000.If this parameter is set to "H"Time,IPThe return value of will be used 16base, which isIP4E20.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-13	PR	Protocol	5	1 ~ 511	-	P	S	T	

Use the configuration value binary low8bits to define the communication protocol for serial communication,The corresponding definitions are as follows:

Bit 0 =By default this bit is valid,SCLmodel
Bit 1 =return with address
Bit 2 =Whether to always respond back
Bit 3 =whether to use checksums
Bit 4 =Is itRS485communication Bit
5 = 3Bit Data Register Addressing
Bit 6 =Checksum type used
Bit 7 = MODBUSType drive data to use big endian or little endian Bit 8 = RS-485
Communication four-wire and two-wire switching

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-14	TD	response delay	2	0 ~ 20	ms	P	S	T	

The response delay when the driver replies to the command from the host computer.usually using2wiredRS485necessary when communicating.Because the same set of wires is used to receive and send data,When receiving and sending data, a response delay must be added to ensure normal communication.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-15	BR	RS-485Communication baud rate	1	1 ~ 5	-	P	S	T	

The baud rate that takes effect after power-on in serial communication.The value will be saved immediately after being configured but will not take effect immediately,It will not take effect until the next power on,So the host computer software can configure this value at any time.

set value	rate
1	9600bps
2	19200bps
3	38400bps
4	57600bps
5	115200bps

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-16	DA	RS-485Communication node address	32	1 ~ 32	-	P	S	T	
existModbus/RTUin communication mode,Set the node address of the drive									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-17	CO	CANopenCommunication node address	1	1 ~ 127	-	P	S	T	
existCANopenin communication mode,Set drive node address									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-18	CB	CANopenCommunication baud rate	0	0 ~ 7	-	P	S	T	

when set on the driveCANopenThe DIP switch of the communication baud rate is set toOFFTime,Set by this parameterCANopenCommunication baud rate,The value will be saved immediately after being configured but will not take effect immediately,It will not take effect until the next power on,So the host computer software can configure this value at any time.

set value	rate
0	1 Mbps
1	800 kbps
2	500 kbps
3	250 kbps
4	125 kbps
5	50 kbps
6	20 kbps
7	12.5 kbps

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-19	ZR	Regenerative absorption resistor resistance	200	10 ~ 32000	Ω	P	S	T	

Set the resistance value of the regenerative energy absorption resistor,The driver calculates the bleeder power on the regeneration resistor according to the current bleeder voltage and resistance value . The default value is the resistance value of the regenerative energy absorption resistor built into the driver. When using external regenerative energy absorption resistor value,A reasonable value must be set.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-20	ZC	Regenerating Absorption Resistor Power	40	1 ~ 32000	W	P	S	T	

Set the heat dissipation power of the regenerative energy absorption resistor.The driver calculates the power used on the regeneration resistor according to the current discharge power on the regeneration resistor and its dissipated power,Avoid damage to regenerative energy absorbing resistors.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-21	ZT	Regeneration absorption time constant	1000	0 ~ 8000	ms	P	S	T	

The regenerative resistor's sustainable discharge time under the discharge voltage.

About the use of regenerative energy absorption resistors,Please refer to chapter4.7P2-Regenerative energy absorption resistor wiring method

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-24	MA	Alarm masking	4294967295	0 ~ 4294967295	-	P	S	T	

When the drive produces some minor warning messages,The bit corresponding to this parameter can mask the corresponding warning message.ledAlarm display function,The blocked warning message will no longer be displayed in the2indivual7The segment digital tube flashes and displays.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-25	CX	Second torque limit	3000	0 ~ 3000	0.1%	P	S	T	

Set the second limit value of motor output torque.

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-26	CY	Third torque limit	3000	0 ~ 3000	0.1%	P	S	T	

Set the third limit value of motor output torque.

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-27	CY	Fourth torque limit	3000	0 ~ 3000	0.1%	P	S	T	

Set the fourth limit value of motor output torque.

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-28	HT	Motor stall protection time	0	0 ~ 30000	ms	P	S	T	

In position mode or in position-based velocity mode,Stalled rotor will cause the drive to always output the rated torque of the motor.Stalling for a long time will cause the motor to overheat. This parameter sets the protection time of the motor stall,When the actual output current of the motor is equal to the rated current of the motor,and the time exceeds the setting of this parameter.will producer37ST(Motor stall alarm),The motor will be disabled.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-29	YV	The action of the dynamic brake when it is disabled	0	0 ~ 5	- - -	P	S	T	

ServoOFFTime,The action of dynamic braking is passed through the parameterP1-29set up,The longest action time during deceleration passes the parameterP1-31set up,Please refer to the table below. The deceleration process is when dynamic braking is in effect,The actual speed of the motor is decelerated from the speed when it is valid to the parameterP5-42Within zero speed threshold,or the deceleration time reachesP1-31set time.

value	illustrate	
	deceleration process	after stop
0	with parametersP2-01set deceleration	maintain free movement
1	with parametersP2-01set deceleration	dynamic braking action
2	free movement	maintain free movement
3	free movement	dynamic braking action
4	dynamic braking action	maintain free movement
5	dynamic braking action	dynamic braking action

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-30	YR	The action of the dynamic brake when an error is reported	0	0 ~ 3		P	S	T	

When the servo reports an error,The action of dynamic braking is passed through the parameterP1-30set up,The longest action time during deceleration passesP1-32set up,Please refer to the table below. The deceleration process is when dynamic braking is in effect,The actual speed of the motor is decelerated from the speed when it is valid to the parameterP5-42Within zero speed threshold,or the deceleration time reachesP1-31set time.

value	illustrate	
	deceleration process	stop
0	free movement	maintain free movement
1	free movement	dynamic braking action
2	dynamic braking action	maintain free movement
3	dynamic braking action	dynamic braking action

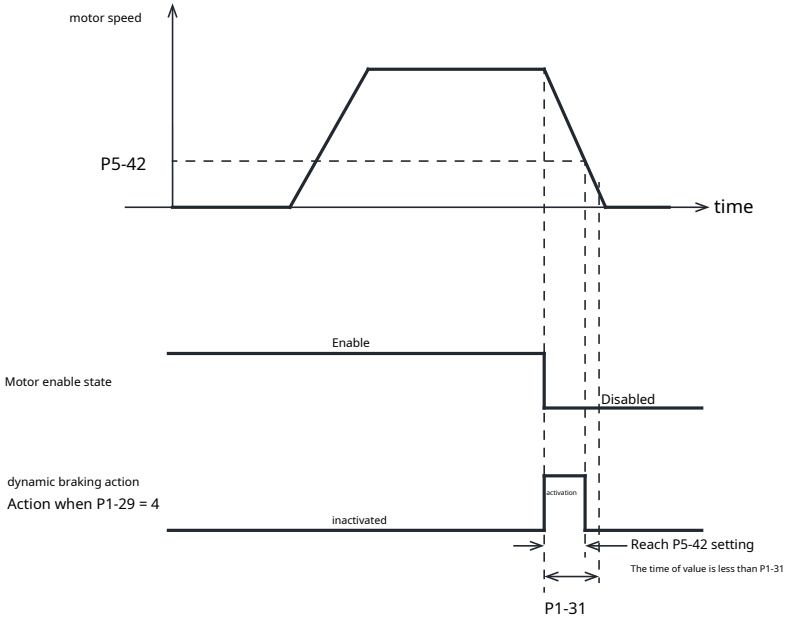
parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-31	YM	The longest duration of dynamic braking during deceleration with disabling Action time	500	0 ~ 30000	ms	P	S	T	F

This parameter sets the servoOFFTime,The longest action time of dynamic braking during deceleration.

The deceleration process is when dynamic braking is in effect,The actual speed of the motor is decelerated from the speed when it is valid to the parameterP5-42Within zero speed threshold,or the deceleration time reachesP1-31set time .

● When the deceleration time exceedsP1-31settings,Even if the actual speed of the motor is still greater than P5-42,Dynamic Braking will no longer work.

The picture below is whenP1-29 = 4Schematic diagram of dynamic braking.



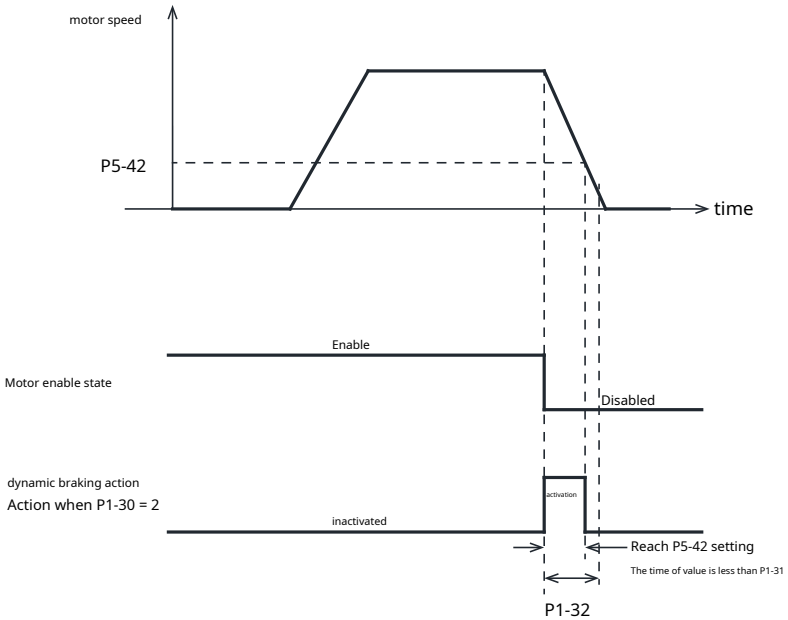
parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-32	YN	The longest movement of the dynamic brake during an errored deceleration working time	0	0 ~ 30000	ms	P	S	T	F

This parameter sets the servo after an error is reported,The longest action time of dynamic braking during deceleration.

The deceleration process is when dynamic braking is in effect,The actual speed of the motor is decelerated from the speed when it is valid to the parameterP5-42Within zero speed threshold,or the deceleration time reachesP1-32set time .

● When the deceleration time exceedsP1-32settings,Even if the actual speed of the motor is still greater than P5-42,Dynamic Braking will no longer work.

The picture below is whenP1-30 = 2Schematic diagram of dynamic braking.



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-34	RT	Current instantaneous change value	1000	00 ~ 3000	0.1%	P	S	T	
The first speed value in multi-speed mode About multi-speed control,Please refer to chapter**7.2.13**Multi-stage speed control mode									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-37	DV	Dynamic braking action speed	50	0 ~50	rps	P	S	T	
The first speed value in multi-speed mode About multi-speed control,Please refer to chapter**7.2.13**Multi-stage speed control mode									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-38	DW	Operating voltage point of bleeder circuit	650	200 ~ 850	0.1V	P	S	T	
The first speed value in multi-speed mode About multi-speed control,Please refer to chapter**7.2.13**Multi-stage speed control mode									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-39	ZS	Watchdog trigger time	500	0 ~ 10000	ms	P	S	T	
The first speed value in multi-speed mode About multi-speed control,Please refer to chapter**7.2.13**Multi-stage speed control mode									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P1-40	ZA	Action after the watchdog is triggered	1	1 ~ 16	— —	P	S	T	
The first speed value in multi-speed mode About multi-speed control,Please refer to chapter**7.2.13**Multi-stage speed control mode									

8.3.3 P2-XXGroup:Trajectory---Trajectory planning

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-00	VM	Maximum speed	80	0 ~ 100	rps	P	S	T	F
Set the maximum running speed of the motor. When the actual speed of the motor exceedsP2-00When setting the value,will producer12OV(Motor stall alarm).									

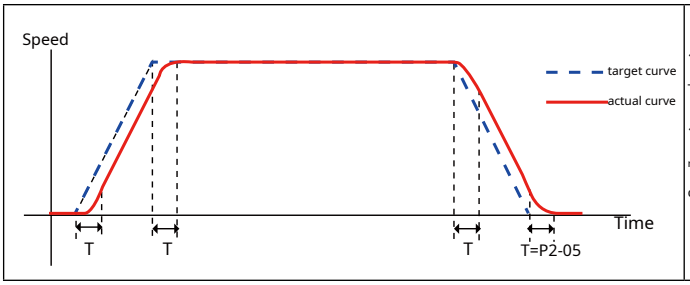
parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-01	AM	Servo brake deceleration	3000	0.167 ~ 5000	rps/s	P	S	T	F
Maximum allowed acceleration/deceleration in motion.When the set acceleration/deceleration is greater than the set maximum value,The actual running acceleration/deceleration will be limited to the maximum value. Simultaneously,This value is also the maximum braking deceleration value after the emergency stop command or hitting the limit switch..									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-02	JS	Internal speed mode target speed	10	- 100 ~ 100	rps	P	S	T	
Target speed value for internal speed mode.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-03	JA	Internal Velocity Mode Acceleration	100	0.167 ~ 5000	rps/s	P	S	T	
Acceleration value for internal velocity mode.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-04	JL	Internal speed mode deceleration	100	0.167 ~ 5000	rps/s	P	S	T	
Deceleration value of internal speed mode.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-05	JT	jerk time	10	0 ~ 125	ms	P	S	T	F
parameterP2-05Jerk time in internal trajectory mode(Location,speed,torque),Analog position,Analog speed,Analog torque,Or take effect when the communication command is controlled. The effect of jerk smoothing on the input command is as follows.									



◆ The acceleration filter will cause a certain delay to the command T,But it will not affect the final positioning accuracy

◆ P2-05The larger the time constant,The smoother effect is more obvious, Command response delay will also increase,should be based on the actual application condition,Set a reasonable filter time constant

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-06	VE	Speed in internal peer-to-peer mode	10	0.0042 ~ 100	rps	P	S	T	F
Target speed command in point-to-point command position mode.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-07	AC	Acceleration in internal peer-to-peer mode	100	0.167 ~ 5000	rps/s	P	S	T	F
Acceleration value in point-to-point command position mode.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-08	DE	Deceleration in internal peer-to-peer mode	100	0.167 ~ 5000	rps/s	P	S	T	F
Deceleration value in point-to-point command position mode.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-09	VC	Speed down in internal peer-to-peer mode	2	0 ~ 100	rps	P	S	T	F
Internal position mode with point-to-point positioning control with variable speed,This parameter is used to set the speed value of the second segment.									

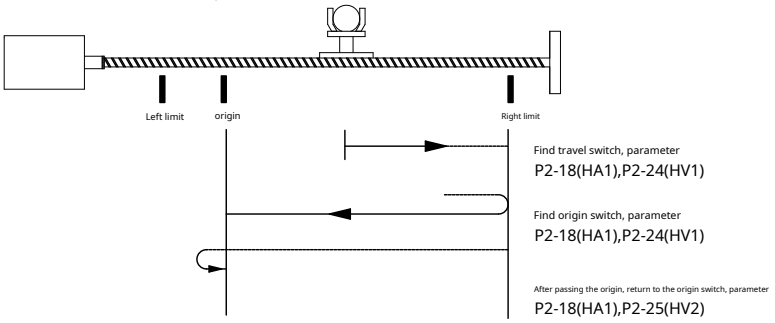
parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-18	HA1	Return to origin acceleration/deceleration	100	0.167 ~ 5000	rps/s	P	S	T	
This parameter is set in the back-to-origin function mode,Acceleration value at startup and deceleration value at deceleration.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-24	HV1	The first speed of returning to the origin	10	0.0042 ~ 100	rps	P	S	T	
This parameter is set in the back-to-origin function mode,The running speed of the first stage of returning to the origin.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-25	HV2	The second speed of returning to the origin	1	0.0042 ~ 100	rps	P	S	T	
This parameter is set in the back-to-origin function mode,The running speed of the second stage of returning to the origin.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-27	HO	Return to origin offset	0	- 2147483647 ~ +2147483647	pulses	P	S	T	

This parameter is set in the back-to-origin function mode,Offset value of origin.

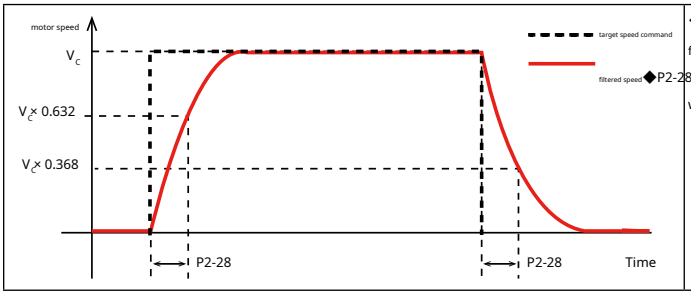


P2-18,P2-24,P2-25,P2-27The parameter is the configuration parameter of the built-in homing function of the drive,Detailed functions about homing,Please refer to7.**10**Origin return function

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-28	KJ	low pass smoothing filter	0	0 ~ 1000	ms	P	S	T	

parameterP2-28Low-pass smoothing filter can be active in the control mode used,E.g:Internal track mode(Location,speed,torque),Analog position,Analog speed,Analog torque, Communication command control, etc..

The smoothing effect of the low-pass filter on the input command is as follows.



◆ The low-pass smoothing filter will cause a certain delay to the instructionT,But it will not affect the final positioning accuracy

◆P2-28The larger the time constant,The smoother effect is more obvious,command response delay will also increase,should be based on the actual application,Set a reasonable filter time constant

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P2-30	VT	Speed limit in torque mode	80	0 ~ 100	rps	P	S	T	

When this parameter is set in torque mode,When the speed limit source is the internal speed value,The maximum speed of the motor.

Speed limit in detailed torque mode,Please refer to**7.4.3**Speed limit in torque mode

8.3.4 P3-XXGroup:Encoder & Step/Dir---Encoder and input pulse settings

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P3-04	PF	Position error alarm limit	100000	0 ~ 2147483647	pulses	P	S	T	

The threshold of position error overrun error.

When the deviation between the target position and the actual position fed back by the encoder exceeds the threshold during the movement,Error overrun error will be generated,driverledThe display panel will show error code 10 .

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P3-05	EG	Number of pulses required per revolution	10000	200 ~ 131072	pulses/ rev	P	S	T	

Set the number of pulses per revolution of the motor.

when parameterP3-16 = 1Time,This parameter setting is invalid.The number of pulses required for each revolution of the motor is set by the motor gear ratio,i.e. by the parameterP3-00Electronic gear ratio numerator and P3-01 Motor gear ratio denominator.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P3-12	PO	Encoder frequency division output setting	1	0 ~ 256	-	P	S	T	

parameterP3-12Source for input to output pulse,output pulse phase,ZSet the pulse output polarity type.eachbitThe corresponding functions of the bits are as follows.

parameterP3-03Input pulse setting							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	0	ZPulse output polarity 0:positive polarity 1:negative polarity	Forward rotationA,BPhase relationship 0:AleadB 90° 1:BleadA 90°	output pulse source bit1=0,bit0=1:Motor encoder	

bit 0andbit 1:output pulse source
bit 2:Forward rotationA/BPhase relationship bit 3:ZPulse output polarity bit3 ~ bit16:reserve,set as0.

◆ output source setting

The pulse frequency division output function supports the output of the following three signal sources through the frequency division function

set value	illustrate
bit1=0,bit0=1	Motor encoder

Notice:

When the signal source is external pulse command,parameterP3-13and parametersP3-14invalid,Command pulse does not do any processing,directby-passoutput.P3-12ofbit2bit andbit3 bit setting will also be invalid.

◆ Forward rotation**A/B**Phase relationship

When setting forward rotation,of external second encoder

set value	illustrate
0	AleadB 90°
1	BleadA 90°

◆ **Z**Pulse output polarity

set upZPolarity of the phase pulse

set value	illustrate
0	rising edge
1	falling edge

For detailed pulse output frequency division settings, please refer tochapter**7.6**Encoder frequency division output function

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P3-13	ON	Numerator of encoder output distribution ratio	10000	0 ~ 13107200	-	P	S	T	

Set the encoder frequency division output numerator

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P3-14	OD	Denominator of the encoder output distribution ratio	131072	0 ~ 13107200	-	P	S	T	

Set the denominator of the encoder frequency division output.

When the source of the output pulse selects the motor encoder or the second encoder,By setting the numerator and denominator of the encoder's frequency division output gear ratio,The number of pulses output per motor revolution can be set.

$$\text{Number of output pulses per revolution} = \frac{\text{P3-13 Pulse frequency division output ratio numerator}}{\text{P3-14 Pulse frequency division output ratio denominator}} \times 65535$$

Notice:

- P3-13The frequency division ratio numerator needs to be less thanP3-14divider ratio denominator
- whenP3-13Divider ratio numerator>P3-14When dividing the ratio to the denominator,The number of pulses output by one rotation of the motor (A/BMutually4After frequency doubling) =P3-13

For detailed pulse output frequency division settings, please refer tochapter**7.6**Encoder frequency division output function

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P3-15	ES	Absolute encoder setting	1	0 ~ 3	-	P	S	T	

Set the use mode of the motor absolute value encoder:

set value	illustrate	Remark
0	Incremental encoder	Use as incremental encoder,At this time, if no external battery,Also does not generate multiple lap lost alarms
1	Single-turn absolute encoder	Feedback the absolute position of the motor within one revolution

8.3.5 P5-XXGroup:IOset up

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-00	MU1	Digital input port1Features		0 ~ 46		P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-01	MU2	Digital input port2Features		0 ~ 46		P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-02	MU3	Digital input port3Features		0 ~ 46		P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-03	MU4	Digital input port4Features		0 ~ 46		P	S	T	

parameterP5-00 ~ P5-03Set the digital input ports in sequenceX1 ~ X4function. The functions and logic that can be assigned to the input signal are as follows

Signal name	shorthand notation	Set value and effective logic	
		Closedvalid when	Openvalid when
Universal input	GPIN	0	-
Servo enable	S-ON	1	2
Alarm clear	A-CLR	3	4
Forward rotation prohibition limit	CW-LMT	5	6
Reverse prohibition limit	CCW-LMT	7	8
control mode switch	CM-SEL	9	10
Gain switching	GAIN-SEL	11	12
emergency stop	E-STOP	13	14
Return-to-origin start	S-HOM	15	16
Torque limit input	TQ-LMT	19	20
Zero speed clamp input	ZCLAMP	twenty one	twenty two
Multi-speed start	SP-STA	33	34
speed command direction	SPD-DIR	35	36
Speed limit input	V-LMT	37	38
Origin switch signal input	HOM-SW	39	40
implementQprogram	START-Q	45	46

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-12	MO1	Digital output port1Features		0 ~ 34		P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-13	MO2	Digital output port2Features		0 ~ 34		P	S	T	

parameterP5-12 ~ P5-13Set the digital output ports in sequenceY1 ~ Y2function. The functions and logic that can be assigned to the output signal are as follows:

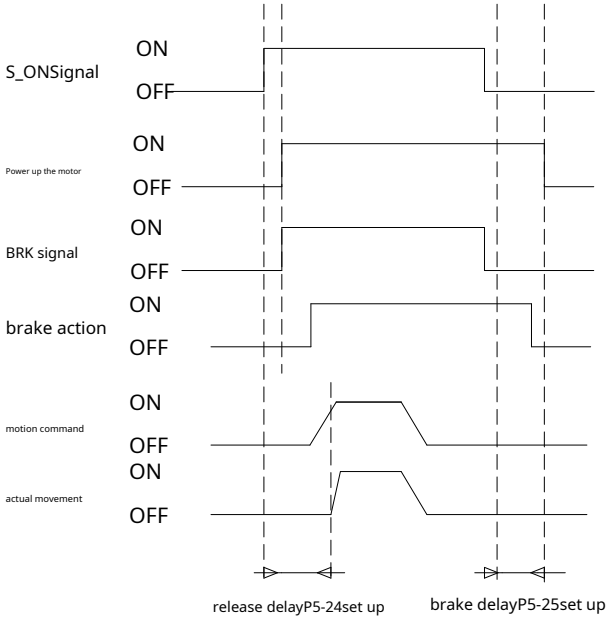
Signal name	shorthand notation	Logic and set value when output signal is valid	
		Output when the signal is valid Closed	Output when the signal is valid Open
Universal output	GPOUT	0	-
fault output(report an error)	ALM	1	2
warning output(Call the police)	WARN	3	4
Brake release output	BRK	5	not support
Servo-onStatus output	SON-ST	7	8
Positioning complete output	IN-POS	9	10
Dynamic position error overrun	DYM-LMT	11	12
Torque reaches output	TQ-REACH	13	14
Output during torque limit	T-LMT	15	16
Speed consistent output	V-COIN	17	18
speed reaches output	AT-SPD	19	20
Output in speed limit	V-LMT	twenty one	twenty two
Servo Readyoutput	S-RDY	twenty three	twenty four
Return-to-origin completion signal	HOMED	25	26
same location	P-COIN	31	32
Zero speed signal	Z-SPD	33	34
Torque consistent output	T-COIN	35	36

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-14	MO3	Digital output port3Features		0 ,5		P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-24	BD	Movement waiting time after brake release	200	0 ~ 32000	ms	P	S	T	
Set the time to wait for the first movement after the drive is enabled,Used to ensure that the brake release output pin has successfully released the motor brake.									

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-25	BE	after brake,Motor non-enable wait delay	200	0 ~ 32000	ms	P	S	T	

P5-24Defines the time to wait for the first movement after the drive is enabled(in milliseconds),before the start of an exercise,The brake must be released, Therefore, this parameter sets the delay required to start the next movement after the drive is enabled.The delay is only effective when the brake output function is active. Notice:Since this parameter sets the delay required for the first movement after the drive is enabled,Therefore, there will be a delay in the actual movement,If sensitive to this delay,without using the brake function,can beP5-24Set as0ms,Or do not configure the "motor brake release output" function for the output pins. P5-25The parameter determines the delay time from when the drive receives the disabling request to the actual disabling of the drive.This delay time ensures that the output pin controls the motor brake braking.



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-27	HX	origin sensor	4	1 ~ 4	-	P	S	T	

This parameter shows the input pin of the origin sensor.in use,The "Origin Sensor Input" function needs to be configured through the digital input port.

Display value	digital input pin
1	X1
2	X2
. . .	And so on

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-28	FI1	Digital input port1filter	2	0 ~ 8000	ms	P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-29	FI2	Digital input port2filter	2	0 ~ 8000	ms	P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-30	FI3	Digital input port3filter	2	0 ~ 8000	ms	P	S	T	

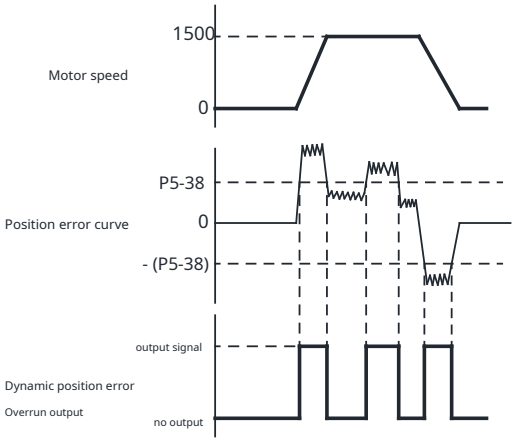
parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-31	FI4	Digital input port4filter	2	0 ~ 8000	ms	P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-38	PL	Dynamic following error threshold	10	0 ~ 2147483647	pulses	P	S	T	

in location mode,P5-38Parameter setting the judgment condition of dynamic position error overrun output.

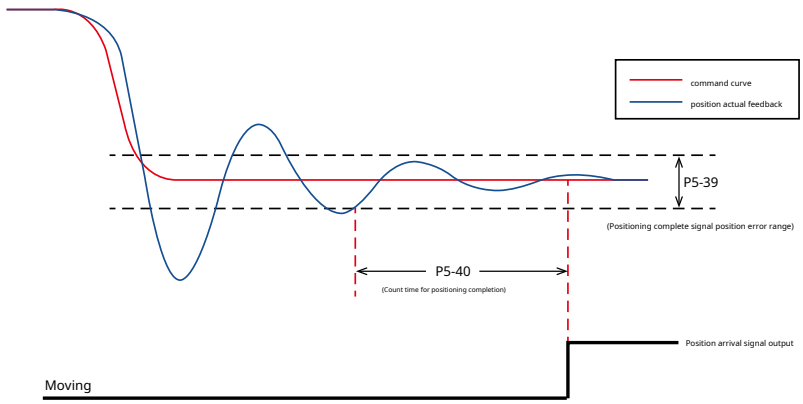
◆ Dynamic position error overrun output judgment conditions:

Dynamic position error refers to the motor in the process of running,The difference between the actual position of the motor and the command position is greater thanP5-38(in-position signal position threshold),output this signal. The figure below is the set value of11,That is, the error exceedsP5-38set up,output signal,The output state isClosedschematic diagram of.



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-39	PD	Positioning complete signal position error range	40	0 ~32000	pulses	P	S	T	

in location mode,P5-39The parameter sets the judgment condition of the positioning completion signal output.



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-40	PE	Motion judgment condition count time	10	0 ~ 30000	ms	P	S	T	

Motion judgment condition detection time width.

For details, please refer to the corresponding chapter

7.2.8Positioning complete signal

7.3.8speed reaches output

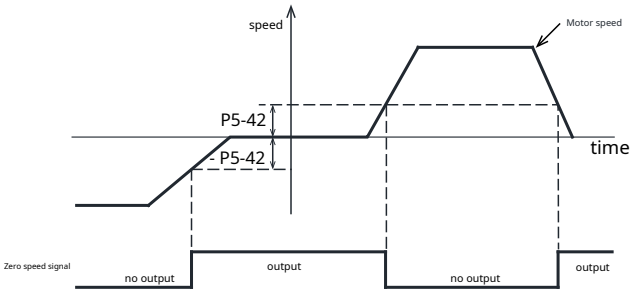
7.3.9Speed coincidence signal

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-42	ZV	Zero speed judgment threshold	0.5	0.1 ~ 2	rps	P	S	T	

P5-42Parameter setting to judge whether the motor has zero speed.

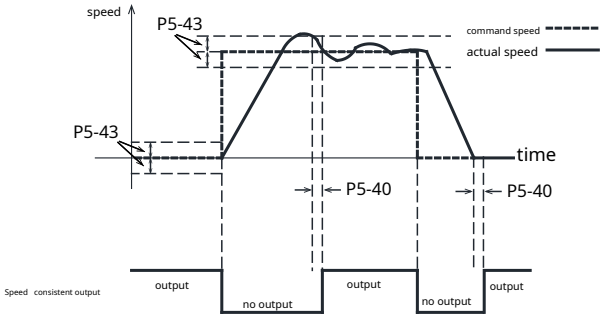
When the absolute value of the actual speed of the motor is less thanP5-42(zero speed judgment threshold),Servo drive outputs zero speed signalZ-SPD.The opposite of,If the absolute value of the actual speed of the motor is greater than this value,then no zero speed signal is outputZ-SPD.

The judgment of the zero-speed signal is not affected by the control mode and servo state.Therefore, this signal can also be used as the motor is running (Moving)Signal.



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-43	VR	Speed Consistent Fluctuation Threshold	0.1	0 ~ 100	rps	P	S	T	

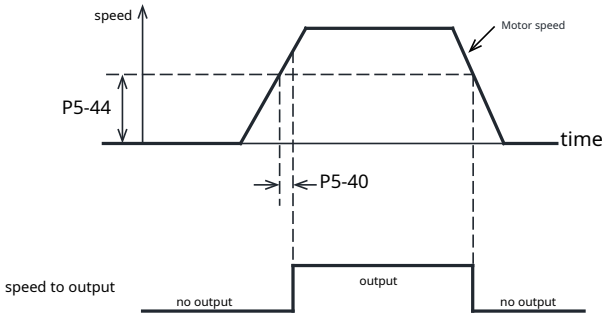
in speed mode,When the difference between the filtered motor actual speed and the commanded speed, that is, the speed error isP5-43(When the speed coincidence fluctuation threshold) is within the range setting,and the time is satisfied P5-40(positioning completion count time),Then it is determined that the actual speed of the motor is consistent with the command speed,Output speed coincidence signalV-COIN. If the filtered velocity error does not exceed P5-43(speed consistent fluctuation threshold),The speed consistent signal will not be outputV-COIN



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-44	VV	Judging that the speed reaches the target value	10	0 ~ 100	rps	P	S	T	

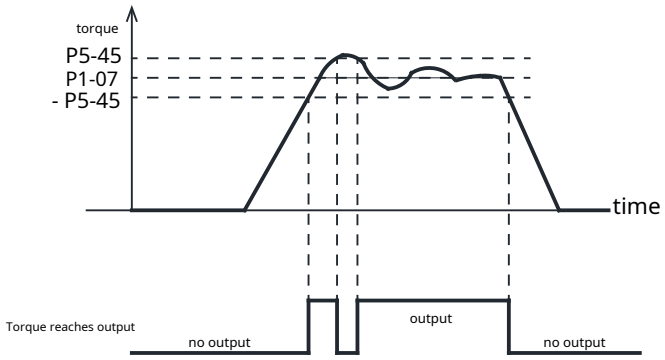
in speed mode,When the actual speed of the filtered motor exceedsP5-44(speed reaches the threshold),and time exceedsP5-40(positioning completion count time),will output the speed arrival signalAT-SPD.

If the actual speed of the filtered motor does not exceedP5-44(speed reaches the threshold),then the speed arrival signal is not outputAT-SPD



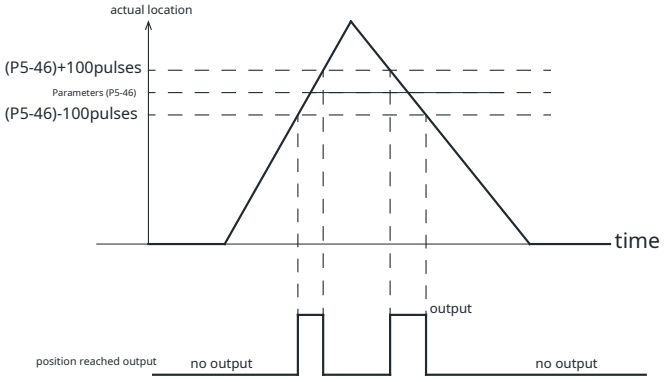
parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-45	TV	Torque reaches the fluctuation range	10	0 ~ 3000	0.1%	P	S	T	

When the absolute value of the actual output torque of the motor exceeds the torque reaching thresholdP1-07,and the torque ripple isP5-45within the set range,will output the torque arrival signalTQ-REACH. If the absolute value of the actual output torque of the motor does not exceed or is less thanP1-07,Then the torque arrival signal is not outputTQ-REACH. This function applies to all control modes,as location, speed,torque etc.. Use torque arrival signalTQ-REACHTime,Digital output pins need to be assigned this function.



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-46	DG	absolute position	10000	- 2147483647 ~ +2147483647	pulses	P	S	T	

When the actual position of the motor is equal to the parameterP5-46When setting,match the outputP-COINSignal.The fluctuation range is±100pulses. .



parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-47	LP	Positive soft limit	0	- 2147483647 ~ +2147483647	pulses	P	S	T	

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-48	LM	Reverse soft limit	0	- 2147483647 ~ +2147483647	pulses	P	S	T	

parameterP5-47 ~ P5-48Set the software limit value inside the drive in turn. When the motor is moving forward,Current position equals or exceedsP5-47When setting the value,produce 15 Forward rotation prohibition limit alarm

When the motor moves in reverse,Current position equals or exceedsP5-48When setting the value,produce 14 Reverse prohibition limit alarm

Notice:

◆ When the encoder type is incremental encoder,After the drive is powered on,parameterP5-47andP5-48can be set and the software limit can work normally,But can not save power.After power cycle,parameters are restored to their default values"0"

◆ When the encoder type is absolute value encoder,parameterP5-47andP5-48can be set,Can also be saved when power off.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-49	HE	Back to origin method	1	- 4 ~ 40	-	P	S	T	

How to set back to origin.

For details on how to return to the origin, please refer to the chapter**7.10**Origin return function

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-50	EO	Emergency stop option	5	1 to 8	-	P	S	T	

Set the emergency stop mode when emergency stop is triggered by digital input.

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P5-51	MS	Zero-speed clamp function in speed mode	0	0 ~ 1	-	P	S	T	

set in speed mode,is triggered by a digital input signal,Or automatically enter the zero-speed clamp state by judging the motor running state.

0:Triggered by digital input signal to enter zero-speed clamp state **1**:Automatically

enter the zero-speed clamping state by judging the running state of the motor

9.1List of drive alarms

When an alarm occurs in the drive,on the driveledThe digital tube flashes to display the alarm code,The alarm codes are defined as follows:

Display content	illustrate	type of alert	Drive status after alarm	resettable
01	Drive over temperature alarm	report an error	Servo off	Yes
02	Internal voltage alarm	report an error	Servo off	no
03	Drive overvoltage alarm	report an error	Servo off	Yes
04	overcurrent	report an error	Servo off	Yes
05		report an error	Servo off	Yes
06		report an error	Servo off	Yes
09	Encoder signal error	report an error	Servo off	no
10	Position error overrun	report an error	Servo off	Yes
11	Drive low voltage alarm	report an error	Servo off	Yes
12	Stall Alarm	report an error	Servo off	Yes
13	Forward rotation prohibition limit and reverse rotation prohibition limit	warn	do not change the current state,Motor does not spin	Yes
14	Reverse prohibition limit	warn	do not change the current state,The motor cannot continue to reverse	Yes
15	Forward rotation prohibition limit	warn	do not change the current state,The motor cannot continue to rotate forward	Yes
16	drive overload	warn	do not change the current state	Yes
17	Communication exception	warn	do not change the current state	Yes
18	Failed to save parameters	warn	do not change the current state	Yes
20	Safe torque off	warn	Servo off	Yes
21	Regeneration potential release failure warning	report an error	Servo off	Yes
22	Undervoltage warning	warn	do not change the current state	Yes
23	noneQprogram warning	warn	do not change the current state	Yes
24	Command the motor to rotate when it is not enabled alarm	warn	do not change the current state	Yes
25	Drive internal voltage error	report an error	Servo off	no
26		report an error	Servo off	no
27	emergency stop	warn	Motor decelerates to stop	Yes
30	memory error	report an error	Servo off	Yes
34	Motor overtemperature	report an error	Servo off	Yes
35	Drive processor overtemperature	report an error	Servo off	Yes

Display content	illustrate	type of alert	Drive status after alarm	resettable
	Motor stall	report an error	Servo off	Yes
	Back-to-origin parameter configuration error	warn	do not change the current state	Yes
	Motor Collision Alarm	report an error	Servo off	Yes
	Encoder communication error	report an error	Servo off	no
	I/OSignal function multiplexing	warn	do not change the current state	no
	Bus watchdog trigger	warn	do not change the current state	no

9.2Driver Alarm Causes and Solutions

Display content	illustrate	Alarm reason	Approach	Elimination method
01	drive over temperature	drive heatsink,temperature of power components more than the specified value. 1.Ambient temperature is too high 2.The operating temperature of the driver exceeds the specified value; 3.overload,Exceeds the rated load of the drive and is used continuously	1.Reduce drive operating temperature and improve cooling conditions; 2.boost drive,motor capacity,Extend acceleration and deceleration time,reduce load. 3.Replace the fan or send in the servo drive for repair	Alarm clear
02	Internal voltage error	The internal voltage of the driver is lower than the normal value	Check the voltage of the power supply,If there is still a problem, please replace the driver device.	Alarm clear
03	Drive overvoltage	Drive DC bus voltage is too high,higher than 80VDC 1.The power supply voltage exceeds the allowable input voltage range surround; 2.Regenerative discharge resistor disconnected; 3.External regenerative discharge resistor does not match,resulting in inability to absorb regeneration potential; 4.drive failure(circuit failure).	1.Check the input voltage; 2.Check whether the external absorption resistor is set properly; 3.Detect the resistance value of the external absorption resistor,if∞broken or damaged,Please replace the external absorption resistor; 4.If the above does not solve the problem,Please replace the drive.	Alarm clear
04 05 06	overcurrent	1.drive failure; 2.Motor cableU,V,Wshort circuit; 3.Motor burned out; 4.Poor motor cable contact; 6.heavy load,Effective torque exceeds rated torque, Continuous operation for a long time; 7.Poor gain adjustment causes oscillation,vibration. Motor vibrates,abnormal sound; 8.machinery is hit,Sudden heavier load, twist entanglement; 9.Electromagnetic brake is in action; 10.in multiple mechanical wiring,Incorrect connection of motor cable to other axis,wrong wiring.	1.Remove the motor cable,Turn on the servo,If the failure still occurs,you need to replace the drive with a new one; 2.Check motor cable connectionsU,V,Wshort circuit, Whether the connector wire has burrs, etc.,Correctly connect the motor cable; 3.Check motor cablesU,V,WIs the order correct,U- red ,V-yellow,W-blue; 4.Check the motor cableU,V,WInsulation resistance to motor ground, When the insulation is bad, please replace it with a new one machine; 5.Increase the power of the motor.Extend acceleration and deceleration time, reduce load; 6.Check the motor connectionU,V,WWhether the connector plug of the,if loose,fall off,should be tightened; 7.Whether the gain parameters are properly debugged; 8.Measure the voltage at the brake terminals; 9.Connect the motor cable,The encoder cables are correctly connected to their corresponding axes.	Alarm clear
09	Encoder not connected	Motor encoder not connected	1.Make sure the encoder cable is connected to the driver correctly 2.Replace the encoder cable 3.power cycle,If there is still a problem, please replace the motor	power cycle clear
10	Position error overrun	Position error exceeds parameterP3-04(PF)middle "Position error alarm limit" setting	1.Check parametersP3-04(PF)"Whether the "Position error alarm limit" setting is too small; 2.Whether the gain parameters are properly debugged; 3.Whether the motor selection matches the actual load and whether the acceleration and deceleration is too big; 4.Whether an unreasonable torque limit is used; 5.The mechanical part of the motor drive is stuck,Motor stall 6.Is the motor power cable connected correctly?,When there are multiple motors,Is the power cable connected to the correct drive.	Alarm clear
11	Drive low voltage Call the police	DC bus voltage too low,lower than18VDC 1.low power supply.Instantaneous power failure; 2.Insufficient power supply capacity,Affected by inrush current when the main power is turned on,resulting in supply voltage under drop; 3drive failure(circuit failure).	Measuring input voltage 1.Improve power supply voltage capacity,Replace the power supply; 2.Connect the power correctly; 3.If the above does not solve the problem,Please replace the drive.	Alarm clear
12	Speed exceeds limit	Motor speed exceedsP2-00limit value of	Check whether the motor speed command is within a reasonable range 1.Avoid excessive speed commands; 2.When overshoot occurs due to poor gain adjustment,Please adjust the gain; 3.Connect the encoder cable correctly according to the wiring diagram; 4.Check motor cablesU,V,WIs the order correct.	Alarm clear
13	Forward and reverse rotation prohibition stop limit	1.Forward rotation prohibition limit and reverse rotation of digital input Turn inhibit limit is triggered 2.in the absolute value system,The actual position of the motor hits the forward and reverse software limit	1.External limit switch has been triggered; 2.The limit input function setting is incorrect,Please refer to7.1.5Forward and reverse limit chapter. 3.in the absolute value system,The software limit setting is unreasonable	Automatically after disengagement clear
14	Reverse prohibition limit	1.Reverse limit function trigger 2.in the absolute value system,The actual position of the motor hits the reverse software limit		
15	Forward rotation prohibition limit	1.Forward rotation prohibit limit function trigger 2.in the absolute value system,The actual position of the motor hits the positive software limit		Automatically after disengagement clear

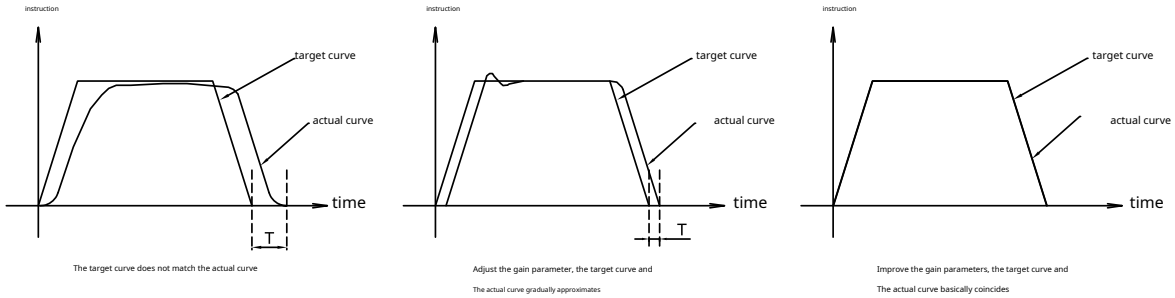
Display content	illustrate	Alarm reason	Approach	Elimination method
16	drive overload	The output current of the driver reaches the rated speed of the motor momentP1-06settings,and lasts longer than P1-09set value of 1.heavy load,Effective torque exceeds rated torque, Continuous operation for a long time; 2.Poor gain adjustment causes oscillation, vibration, Motor vibrates,abnormal sound; 3.machinery is hit,Sudden heavier load, twist entanglement.	1.Whether the gain parameters are properly debugged; 2.Whether the motor selection matches the actual load and whether the acceleration and deceleration is too big; 3.Check motor cablesU,V,WIs the order correct.U- red ,V-yellow,W-blue; 4.enlarge the drive,motor capacity,Extend acceleration and deceleration time,reduce load.	less than the motor rating at constant current auto clear
17	Communication exception	Check the communication when the drive is connected to the host computer mistake	1. LunaThe software is trying to establish communication with the drive(This is a normal alarm) 2.Check the communication line and communication address,Is the baud rate set correctly?	After the communication is normal auto clear
18	Failed to save parameters	Failed to save parameters	Please try saving again	auto clear
20	Safe torque off stop	Safe torque offSTOfunction is activated, secure input1or secure input2The input optocoupler of at least one of theOpen.	Confirm safe input1,2The input wiring status of the input wiring or the setting of the safety sensor is triggered.	STOenter Automatic after normal clear
21	Regeneration potential absorption failure warning	The regeneration energy exceeds the regeneration absorption resistance can capacity. 1.Due to the large load inertia, the energy,cause the bus voltage to rise,Insufficient energy absorption of the regenerative absorption resistor causes an abnormality Detection value rises; 2.Motor speed is too high,Cannot fully absorb regenerative energy within the specified deceleration time.	1.External regenerative discharge resistor does not match,resulting in inability to absorb regeneration potential; 2.Reduce the running speed of the equipment and increase the acceleration and deceleration time. 3.Reference section4.7 REG-Regenerative energy absorption resistor wiring method	Alarm clear
22	Undervoltage warning	Drive undervoltage,lower than20VDC 1.low power supply,Instantaneous power failure; 2.Insufficient power supply capacity,Affected by inrush current when the main power is turned on,resulting in supply voltage under drop; 3drive failure(circuit failure)	Check the input voltage 1.Improve power supply voltage capacity,Replace the power supply; 2.Connect the power correctly,Please refer to4.3 Main-Driver power wiring method; 3.Check the driveMainTerminals and Voltage Inputs 4.If the above does not solve the problem,Please replace the drive.	Alarm clear, When the voltage is normal auto clear
23	noneQprogram warning	The drive runs onQin mode,but noQThe program runs	1.Check if there isQprogram; 2.Check if the working mode is correct; 3.an examinationQWhether the program is written incorrectly,Can't run in a loop.	Alarm clear
24	When the motor is not enabled command it to operate Call the police	When the motor is not enabled,receive operation instruction	Please enable the motor first,Re-send the operation command	Alarm clear auto clear
25 / 26	Internal voltage error	The internal voltage of the driver is lower than the normal value	Check the voltage of the power supply,If you have any questions, please contact the manufacturer Tie.	power cycle clear
27	emergency stop	Digital input emergency stop function is triggered	1.Confirm the emergency stop input switch 2.Confirm whether the emergency stop input logic setting is reasonable	emergency stop When the entry is released from auto clear
30	memory error	Abnormal internal memory of the drive	If it cannot be cleared after powering on again,Please contact the manufacturer.	power cycle clear
34	Motor overtemperature	The drive detects that the motor temperature exceeds the allowable value	1.Check if the ambient temperature where the motor is located is too high 2.Reduce the ambient temperature of the motor and improve the cooling conditions; 3.boost drive,motor capacity,When extending acceleration and deceleration between,reduce load. 4.Whether the motor is rubbed by the load 5.When using a motor with an oil seal,Please derate.The output torque of the motor should be equal to the rated torque of the motor70% 6.The temperature rise and torque of the motor is the motor installed in the standard cooling measured on board,When the motor mounting plate is small,To prevent motor overheating,Please derate 7.The motor temperature is normal and cannot be cleared by re-powering,Please replace the motor	power cycle clear
35	drive processor over temperature	Drive processor temperature is too high	1.Detect whether the temperature of the drive installation environment is too high 2.Reduce the ambient temperature of the drive and improve the cooling conditions 3.The drive needs to be mounted on a metal backplane with good heat dissipation 4.boost drive,motor capacity,Extend acceleration and deceleration time,reduce load. 5.Replace the fan or send in the servo drive for repair 6.Alarm after drive heatsink temperature is normal and power cycle still exist,Please replace the drive	Alarm clear

Display content	illustrate	Alarm reason	Approach	Elimination method
	Motor stall	Operates in non-torque mode,When the motor is locked more thanP1-28set time	1.Check whether the mechanical parts driven by the motor are stuck 2.Check if the electromagnetic brake is open	Alarm clear
	Return to origin parameters Configuration error	Origin return parameter configuration error 1.Use back-to-origin method with limit signal, Limit Signal not configured 2.Use back-to-origin method with origin signal, origin Signal not configured	Check whether the origin return parameters are fully configured	Alarm clear
	Motor Collision Alarm	The servo system detects that the motor current is abnormal mutation 1.Motor-driven loads with other fixed negatives load collision 2.Servo gain setting is unreasonable,gain is too large 3.motorUVWPhase sequence error,Motor Speed	1.Check the motorUVWPhase sequence 2.Check whether the servo gain parameters are reasonable 3.Check the load	Alarm clear
	Encoder communication abnormal	Servo system detected with servo motor encoder The communication is abnormal 1.Coded wires are not wired as correctly defined 2.There is no connection code between the drive and the motor device line 3.The encoder wire is in poor contact or disconnected 4.Interference causes abnormal encoder communication 5.Encoder damaged	1.Check that the encoder wiring is according to the correct definition 2.Check the connection between the encoder cable and the driver and motor 3.Make sure the motor and driver are well grounded 4.The encoder cable uses a twisted pair with good anti-interference ability shielded wire 5.Replace the motor and encoder wiring harnesses respectively,Check if the motor is abnormal	power cycle clear
	I/OSignal function multiplex	1.existQused in the programI/OThe function of the signal is a non-generic function 2. SCLused in the commandI/OThe function of the signal is a non-generic function	1.relatedI/OSignal function configured as a generic function 2.The use function is a general functionI/OSignal	Alarm clear
	bus watchdog trigger	After the bus watchdog function is enabled 1.within the set time,The drive did not receive the specified message	1.an examinationCANopenWhether the communication line is well connected 2.Check that the time set in the drive to detect a specific message is no too short 3.Check whether the time when the controller side sends a specific message too long	Alarm clear

10Servo gain tuning

Servo gain tuning is a function to optimize the response of the servo unit.

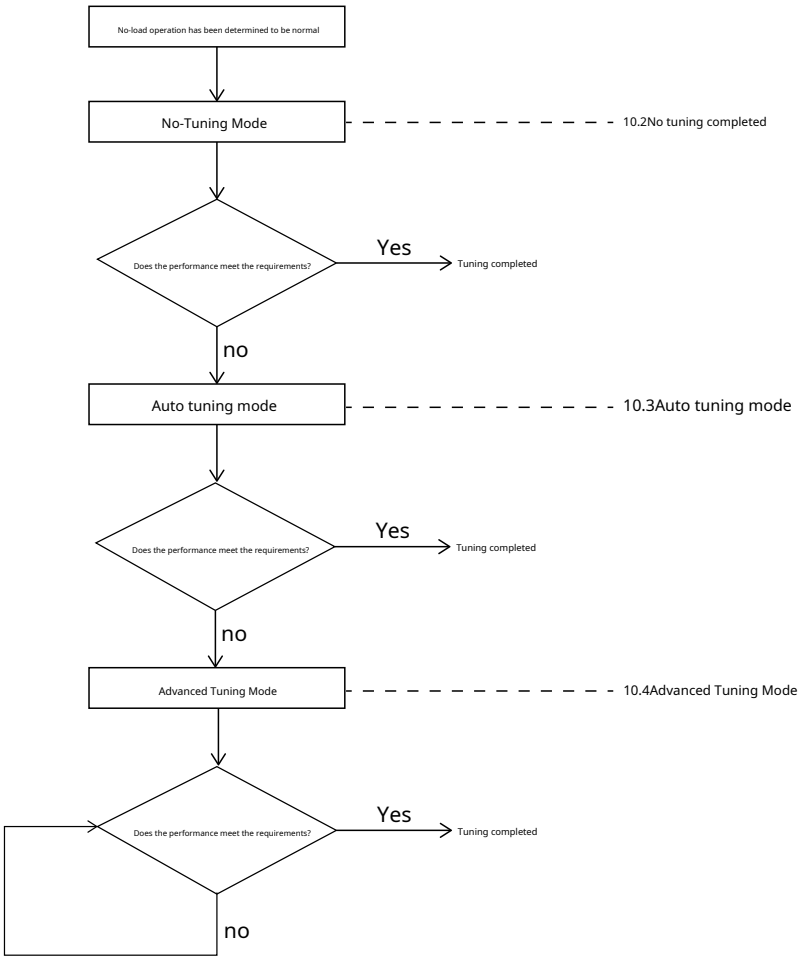
For commands from the host system,The drive needs to drive the motor on command as precisely as possible without delay as much as possible.To make the motor action closer to the command,Maximize mechanical properties,thus requiring a gain adjustment.



10.1Servo debugging process and mode introduction

10.1.1Servo debugging flow chart

The servo debugging flow chart is as follows,Before starting servo debugging,Make sure that the servo system follows the chapter6test run,works fine.



10.1.2Introduction to parameter tuning mode

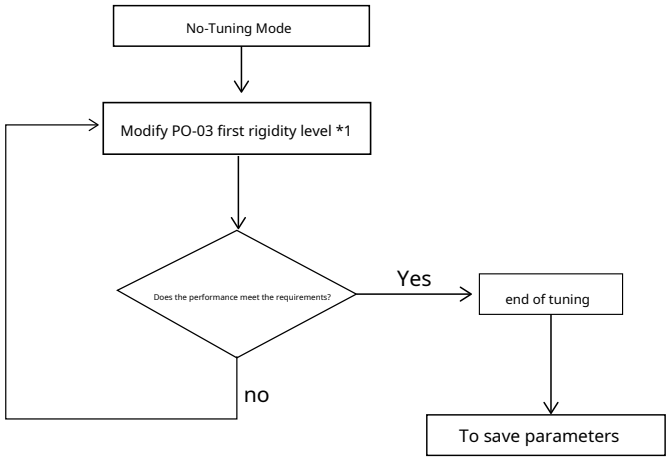
Servo parameter setting has multiple modes to choose from,by parameterP0-00set up.

parameterP0-00 set value	Parameter tuning mode	Manually modify valid parameters	introduce
0	No tuning	P0-03first rigidity class P0-04Second rigidity level	In "No Tuning Mode",The servo system is in a relatively stable but less rigid state,Inertia ratio at this timeP0-02Force to default0and cannot be modified. Try to choose an initial stiffness that allows the servos to move properly,and gradually adjust the rigidity level,Make the servo rigidity meet the application requirements.
1	auto-tuning	P0-03first rigidity class P0-04Second rigidity level P0-02Load inertia ratio	In "auto-tuning mode",The servo system will automatically recognize the external load inertia ratio,Automatic selection of suitable rigidity class,and automatically adjust the following (Manual modification is invalid): ◆ gain(position ring,speed ring) ◆ filter(Torque filter) ◆ Vibration suppression and other parameters
2	Advanced tuning	P0-05,P0-07 P0-08,P0-11 P0-12,P0-13 P0-16 P0-17,P0-19 P0-20,P0-21 P0-22,P0-23 P0-24 P0-25,P0-27 P0-28,P0-29 P0-30,P0-31 P0-32	In "Advanced Tuning Mode",Users can according to their needs,Manually set all gain parameters of each loop of servo control

10.2No-Tuning Mode

"Tuning-free mode" is the default mode when the servo leaves the factory,The servo system is in a relatively stable but less rigid state,Install and run, Meets most application requirements.

Try to choose an initial stiffness that allows the servos to move properly,and gradually adjust the rigidity level,Make the servo rigidity meet the application requirements.



Note that in this mode:

◆ Inertia ratioP0-02Force to default0and cannot be modified.

◆ Modification of other gain parameters is invalid.

◆ When the gain is switched,The second group of rigidity levelsPO-04efficient

10.3Auto tuning mode

In "auto-tuning mode",The servo system will automatically recognize the external load inertia ratio,Automatic selection of suitable rigidity class,Automatic optimization adjusts the following,

- gain(position ring,speed ring)
- filter(Torque filter)

During auto-tuning,The parameters in the table below will change automatically.After auto-tuning is complete,Parameters are automatically stored in the drive.

parameter	name	Whether manual modification is valid in auto-tuning mode
P0-02	Load inertia ratio	Yes
P0-03	first rigidity class	Yes
P0-05	first position loop gain	no
P0-07	1st position loop differential time constant	no
P0-08	First position loop differential filter frequency	no
P0-09	Speed feed forward gain	no
P0-10	Velocity feedforward filter frequency	no
P0-11	First command speed gain	no
P0-12	first speed loop gain	no
P0-13	1st speed loop integral time constant	no
P0-14	Acceleration feedforward gain	no
P0-15	Acceleration feedforward filter frequency	no
P0-16	First command torque filter frequency	no

10.3.1Auto-tuned motion profile conditions

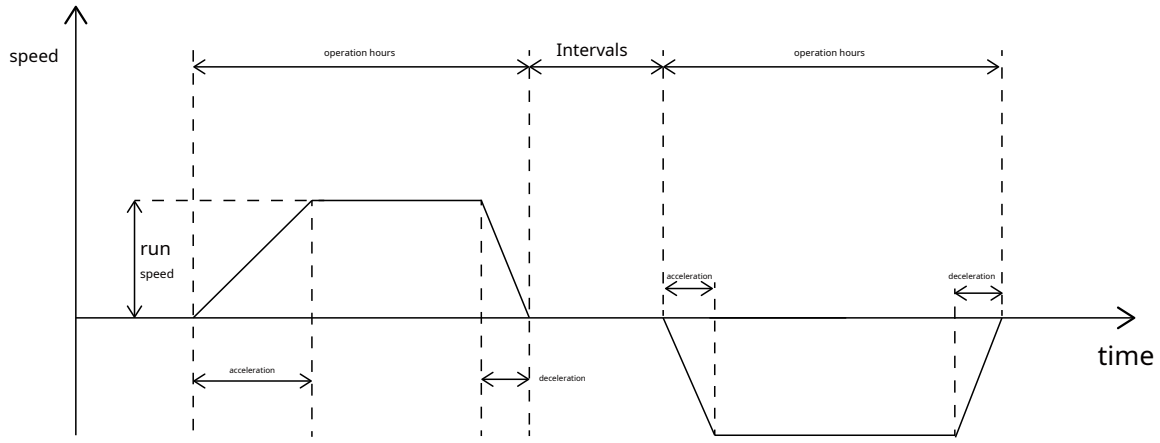
In order to accurately complete the automatic tuning of parameters,It is necessary to set a reasonable motion trajectory,Include enough itinerary,running speed,operation hours,Acceleration and deceleration and the interval time between two movements.

operation hours:more than the0.5Second

running speed:more than the180rpm

Acceleration and deceleration:more than the

30rps/s Intervals:more than the1.5Second

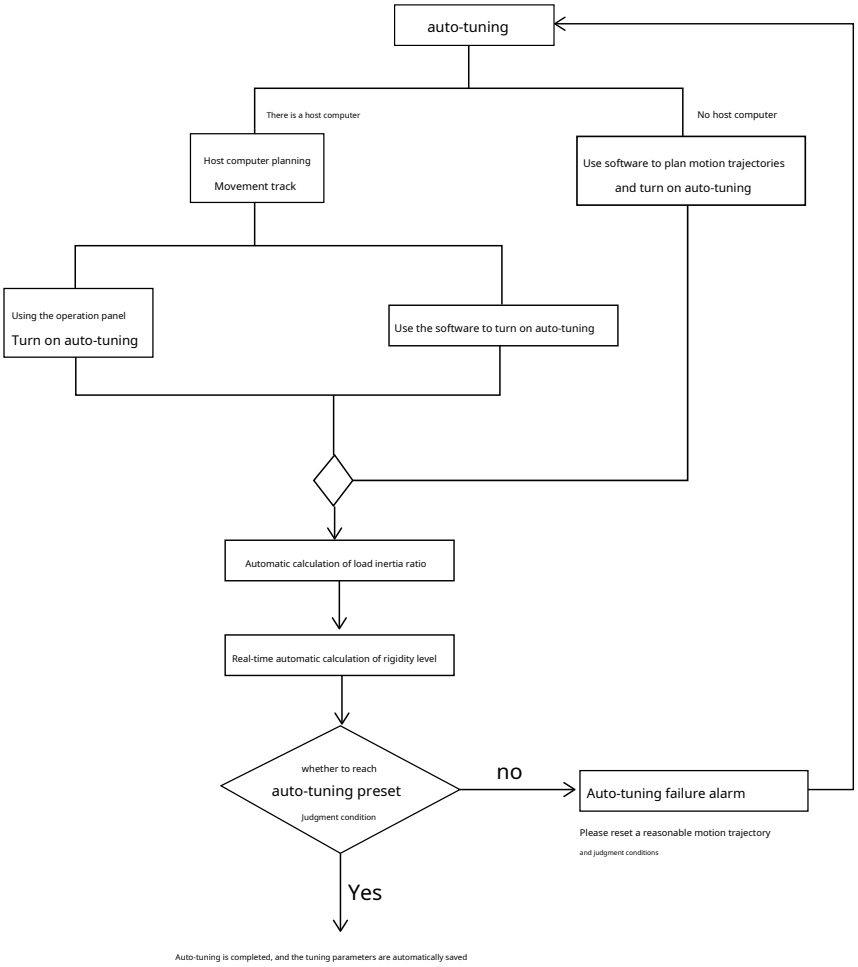


Before starting auto-tuning,P0-03Rigidity grades are recommended to be5.

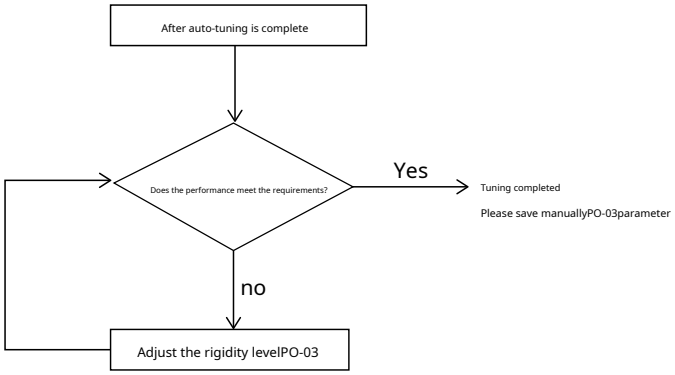
10.3.2Auto-Tuning Flowchart

Users can passLunaSoftware or the operation panel on the drive for automatic parameter tuning and debugging. The flow

chart of automatic tuning is as follows



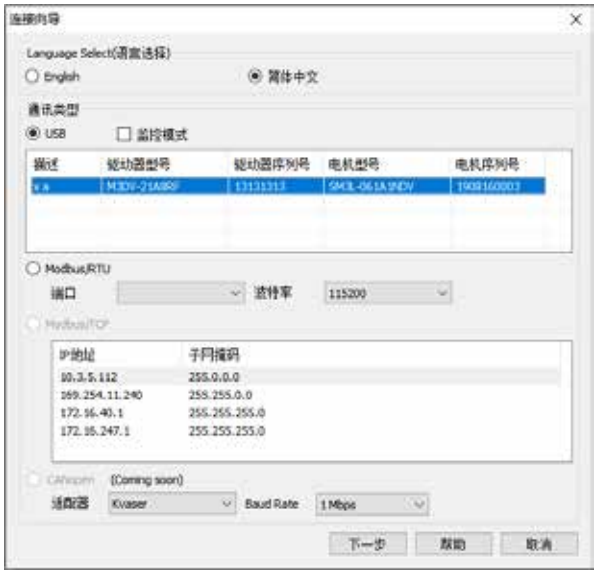
After auto-tuning,Parameters can continue to be usedP0-03,P0-04Adjust the response and stiffness of the servo system.



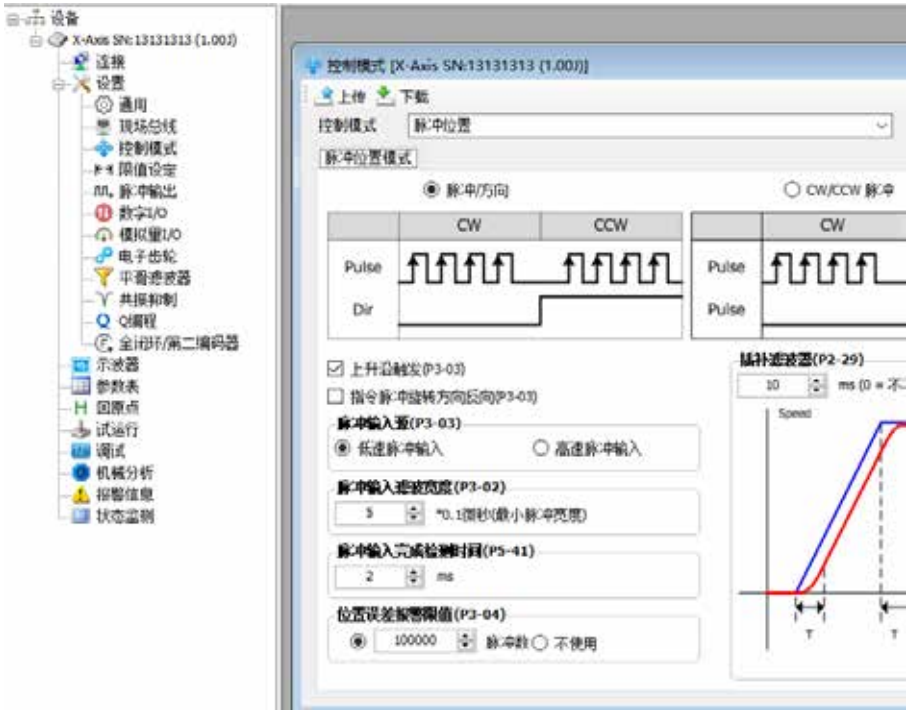
10.3.3Start auto-tuning--software operation on

Recommended UseLunaThe software starts parameter auto-tuning,Proceed as follows.

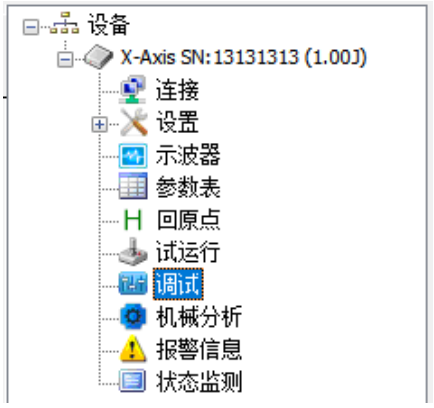
step one:Use the connection wizard----select the drive to be connected----click "Next" to establish communication with the drive



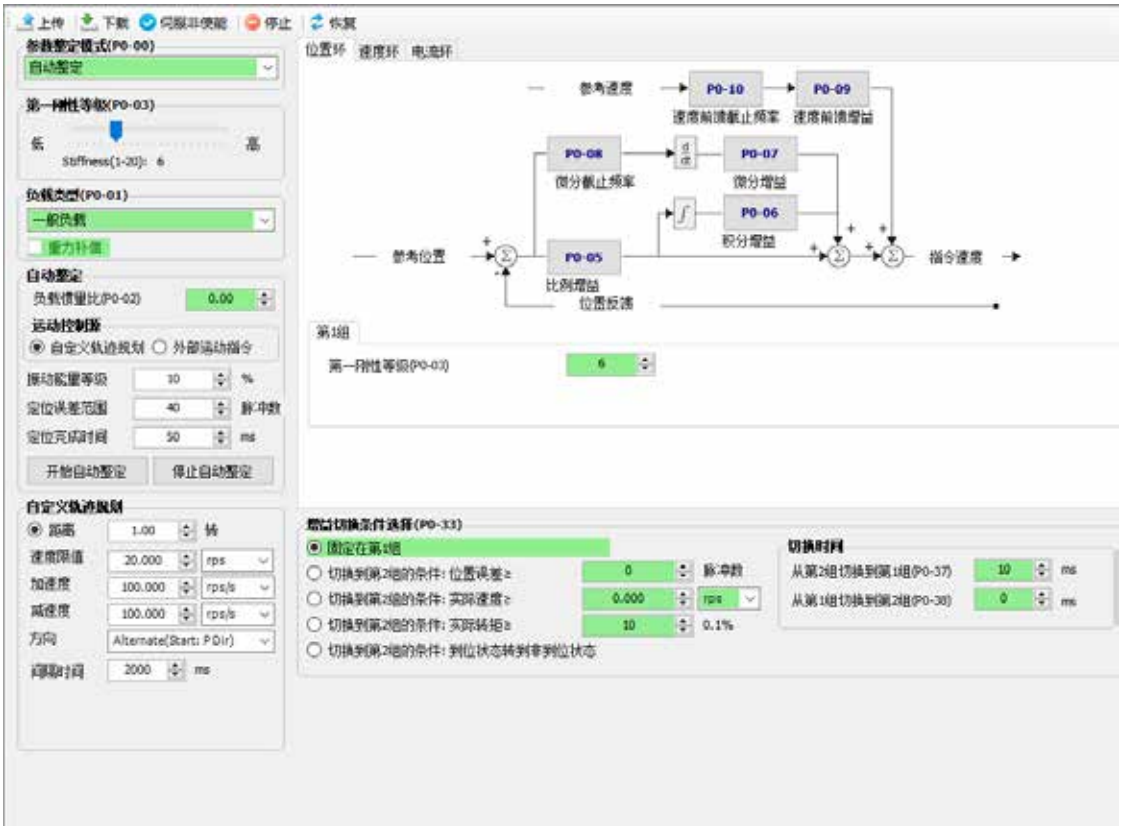
Step 2:The control mode is set to position control



Step 3:Select the "Debug" function in the tree interface on the left



Step 4:in the debug interface,Set parameter tuning mode to "Auto tuning"



1)first rigidity class:

Set an appropriate first rigidity level (P0-03),When running for the first time,The general recommended value is "5"

2)load type

According to the current load,Select the corresponding load type

load type	illustrate
normal load	Suitable for most loads except belt loads
rigid load	Mechanically rigid horizontal turntable,Ball screw etc.
Flexible load	suitable for belts,Less rigid loads such as chains

3)Load inertia ratio

If the current load inertia ratio is known,Then input to "Load inertia ratio (P0-02)"middle,Can improve system rigidity,Speed up auto-tuning. If you do not know the current load inertia ratio,you don't need to fill in,The system will automatically identify the load inertia ratio.

4)motion control source

Custom Trajectory Planning:Generate trajectories using the software's "Custom Trajectory Planning"

External motion command:Select this when using the host computer to send the motion track

5)Autotuning Limitations

Vibration Capability Level:After setting auto tuning,The maximum torque vibration value that the servo system needs to meet;The larger the set value,The higher the system rigidity after auto-tuning.

Positioning error range:After setting auto tuning,The maximum position following error value that the servo system needs to meet;The smaller the set value,The higher the system rigidity after auto-tuning.

Positioning completion time:After setting auto tuning,The longest settling time required by the servo system to complete the positioning;The smaller the set value,The higher the system rigidity after auto-tuning

The above parameters generally do not need to be set,Use the software's default values. Modifying the above parameters can optimize the results of auto-tuning,However, a value that is too extreme will cause the tuning effect to deteriorate.,System oscillates and is unstable.

Step 5,Start auto-tuning

After the above configuration selection is completed,Click the "Start Auto-Tuning" button to start parameter auto-tuning.User can choose from external motion commands or use custom trajectory planning on the software.

Exercise conditions need to be met:

operation hours:more than the0.5Second

running speed:more than the180rpm

Acceleration and deceleration:more than the

30rps/s Intervals:more than the1.5Second

1)Using external motion commands

Click the "Start Autotune" button,Use the host computer to send motion commands directly.

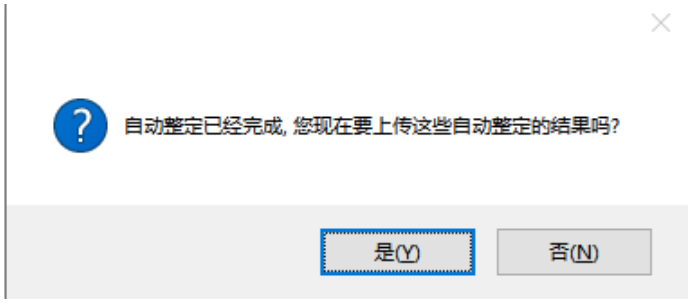
2)Custom Trajectory Planning

Users can also use custom trajectory planning.

Set a reasonable motion trajectory according to the above motion conditions,Click the "Start Autotune" button.

3)Complete auto-tuning

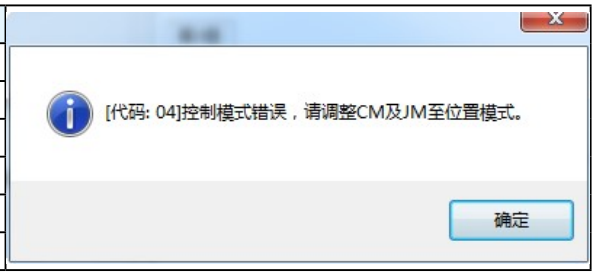
After completion, the following dialog box prompts,After confirming the upload,It can be seen that the first rigidity level and the load inertia ratio have been updated.



4)Error message

If the tuning cannot be completed normally, the following error message box will appear,represent

error code	reason
01	Positioning time timed out,It is recommended to increase the initial stiffness
02	Exercise interval is too short,It is recommended to increase the waiting time
03	Rigidity is minimized during tuning,It is recommended to gradually increase the vibration energy level
04	control mode error,Please adjust the control mode to position mode
05	Servo not enabled,Please turn on the servo enable state
06	Tuning mode error,Please switch to auto tuning mode



10.4Advanced Tuning Mode

Advanced tuning mode is suitable for the following situations:

1)When auto-tuning never completes

2)After auto tuning,by adjustingP0-03rigid andP0-02Inertia ratio,The response of the servo system is still not satisfactory 3)Fully understand the characteristics of the parameters of each control loop of the servo,You can decide the servo gain parameters by yourself

Servo gain can be fine-tuned with advanced tuning,Meet the higher rigidity of servo system,Faster response time and minimum settling time.

10.4.1Introduction to Advanced Tuning Mode

Servo gain is controlled by multiple parameters,E.g:Load inertia ratio,Rigidity class,Position loop gain,Position loop differential time constant,Position loop differential filter frequency,Speed feed forward gain,Velocity Feedforward Filtering,Command speed gain,Speed loop gain,Speed loop integral time constant,Torque filter frequency,and the controller output filter coefficient(KC).

So-calledPIDParameter tuning is to meet the performance requirements of the motion system by debugging these parameters.In general,The rigidity of the machine can improve the responsiveness by increasing the servo gain.But for machines with low rigidity,When increasing the servo gain,may vibrate,thus failing to improve responsiveness

1)After the tuning mode is switched from "Auto tuning" to "Advanced tuning",Will inherit the parameter value after auto-tuning is completed,After the adjustment is completed, it needs to be manually saved.

2)Directly switch from "no tuning mode" to "manual tuning mode",Will inherit the parameter values of the tuning-free mode,Need to manually adjust the appropriate inertia ratioP0-02.

10.4.2Parameters in Advanced Tuning Mode

parameter	instruction	name	type
P0-01	LY	load type	
P0-02	NR	Load inertia ratio	
P0-03	KG	first rigidity class	first set of gains
P0-04	KX	Second rigidity level	
P0-05	KP	first position loop gain	
P0-07	KD	1st position loop differential time constant	
P0-08	KE	First position loop differential filter frequency	
P0-09	KL	Speed feed forward gain	
P0-10	KR	Velocity feedforward filter frequency	
P0-11	KF	First command speed gain	first set of gains
P0-12	VP	first speed loop gain	
P0-13	VI	1st speed loop integral time constant	
P0-14	KK	Acceleration feedforward gain	
P0-15	KT	Acceleration feedforward filter frequency	
P0-16	KC	First command torque filter frequency	first set of gains
P0-17	UP	Second position loop gain	When using gain switching second set of gains
P0-19	UD	Second position loop differential time constant	
P0-20	UE	The second position loop differential filter frequency	
P0-21	UF	Second command speed gain	
P0-22	UV	Second speed loop gain	
P0-23	UG	Second speed loop integral time constant	
P0-24	UC	Second command torque filter frequency	
P0-39	LR	Velocity Feedback Filter	

Notice:

1)When using gain switching,The second group of gains is valid.

10.4.3Servo system parameter description

The servo system consists of a current loop,speed ring,Position ring composition,The more inner loop,The more it needs to improve its responsiveness.If this principle is not followed, will cause poor response or vibration.

When you need to improve your response

1)Increase rigidity level

2)Increase position loop gain

3)Increase speed loop gain

4)Decrease speed loop integral time parameter

system overshoot,vibration

1)Reduce rigidity level

2)Decrease position loop gain

3)Decrease speed loop gain

4)Decrease speed loop integral time parameter

5)Reduce torque filter frequency

6)Appropriately adjust the differential filter frequency

If you change a parameter,Other parameters also need to be readjusted.Please don't make big changes to just one parameter.generally with5%left and right as a rough standard,Slightly adjust each servo gain.Procedure for changing servo parameters,Generally, please observe the following.

10.4.3.1Gain parameter of position loop:

◆ Position loop gain

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-05	KP	first position loop gain	52	0 ~ 20000	0.1Hz	P	S	T	

Set the proportional gain of the position control.Increasing this parameter can improve the responsiveness of the system,Reduce position error,Reduce positioning time. 0 Indicates not to use,20000Indicates that the proportional effect is maximized. When the proportional gain of the position loop is too small,will cause the system to respond not fast enough,Position error decreases slowly. But if the setting is too large,may cause positioning overshoot or machine vibration. Generally speaking,The position loop gain cannot be greater than the speed loop gain.

◆ Position loop differential gain

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-07	KD	1st position loop differential time constant	0	0 ~ 30000	ms	P	S	T	

Set the position loop differential time constant for position control.

0Indicates no derivative effect,The smaller the set value,The stronger the differential term.

When the differential time constant (KD)When the set value is too large,Insufficient vibration suppression capability of the system,will be during acceleration/deceleration,Obvious oscillation occurs during uniform speed process and after stop,and showed a trend of decreasing oscillation,and eventually stabilized.

When the differential time constant (KD)When the set value is reasonable,The system's ability to suppress vibration is significantly enhanced,and quickly stabilized. When the differential time constant (KD)Set value too small,Motion system will be too sensitive,Very easy to vibrate and generate noise. When the system vibrates,The differential time constant can be adjusted appropriately,The recommended starting value is2000.

10.4.4Gain parameter of speed loop

◆ Speed loop gain

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-12	VP	first speed loop gain	183	0 ~ 30000	0.1Hz	P	S	T	

Parameters for setting the responsiveness of the speed loop.The larger the set value,The faster the speed loop responds.

To improve the overall response of the servo system,without causing system vibration,Need to increase the speed loop gain value.Setting the value too high will cause vibration.

The gain of the velocity loop must be larger than that of the position loop4 ~ 6times.But when the gain of the position loop is larger than that of the speed loop,can cause vibration or positioning overshoot.

◆ Speed loop integral time constant

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-13	VI	1st speed loop integral time constant	189	0 ~ 30000	ms	P	S	T	

Set the integral time constant of the speed loop.

0Indicates no integral effect,The smaller the set value,The stronger the integral term.

under proportional gain control,Speed error may not return to zero,or it takes a long time to get back to zero.Integral time constant accumulates all errors and works with proportional gain,Smaller integration time constant (VI)The setting value can improve the response and responsiveness of the servo system,and reduce the following error.

When the integration time constant (VI)When the set value is too large,System response will be slow,poor follow up.

Integration time constant (VI)Set value too small,Excessive system rigidity will cause vibration and noise of the entire servo system.This vibration and noise occurs throughout the movement,and is always oscillating,unable to stabilize.

10.5resonance suppression

Mechanical systems have inherent resonant frequencies,Servo system may run at mechanical resonance point,cause increased noise.

M3Series Servo provides4Types of Mechanical Resonance Suppression Functions:

1)Torque filter frequency

2)4Group Resonance Suppression Notch

3)End Vibration Suppression

4)External disturbance rejection

10.5.1Torque filter frequency

parameter	instruction	name	Defaults	scope	unit	Related Patterns			
P0-16	KC	First command torque filter frequency	1099	0 ~ 40000	01Hz	P	S	T	

Filter the command torque.the smaller the value,The lower the filter frequency,The more obvious the filtering effect

. Defaults1099Can be used in most situations

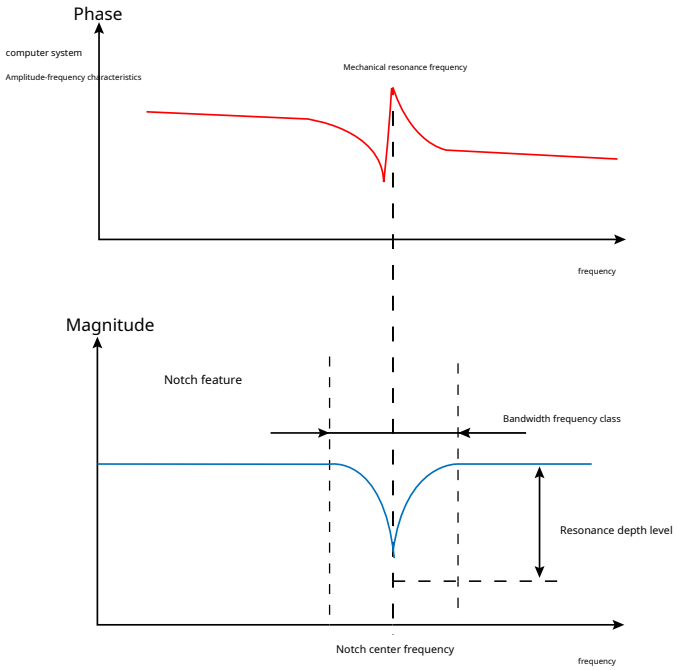
The filter is a single output low pass filter,used toPIDcontroller output(That is, the reference current)low pass filtering.When setting this value, it is necessary to consider the cutoff frequency required for system operation..

used in certain situations,such as motor vibration or noticeable audible noise.You can try reducing this value,This filter low-pass filters the output of the control loop.

When a system is prone to mechanism resonance,The low-pass filter cutoff frequency can be set below the resonance frequency point,This way the output of the control loop will not excite the resonance.

10.5.2Resonance Suppression Notch

Resonance for mechanical high frequencies,Notch filters reduce the gain at specific frequencies by,Suppress mechanical resonance.Mechanical Analysis via Open Loop,The resonance frequency of the mechanical system can be detected.



supply4group notch filter,Each notch filter has three parameters,respectively:

- Resonance frequency
- Bandwidth frequency class
- Resonance depth level

The first and second groups are user-defined notch filters,All parameters need to be set by the user.The third and fourth groups can be used to manually set the parameters of the notch filter,Can also be set as an adaptive notch filter,At this time, the parameters are detected by the drive in real time and automatically set.

10.5.2.1Adaptive Notch Filter

When a system resonance is suspected,When a notch filter is required,It is recommended to use an adaptive notch filter first.

◆ Scope of application and precautions:

- Applicable to control modes other than torque mode.

◆ The following conditions may affect the normal operation of the adaptive notch filter:

- The resonance frequency is lower than the speed loop gain3times
- 2less than one resonance point100HzCase

◆ Steps for usage

1)existLunaThe Resonance Suppression interface of the software,Set the "Resonance Suppression Filter"3”The method is changed to "Adaptive",Turn on an adaptive filter

2)system runtime,Vibration will be automatically detected and run immediately.If a new resonance occurs,Optionally enable the "Resonance Suppression Filter"4”

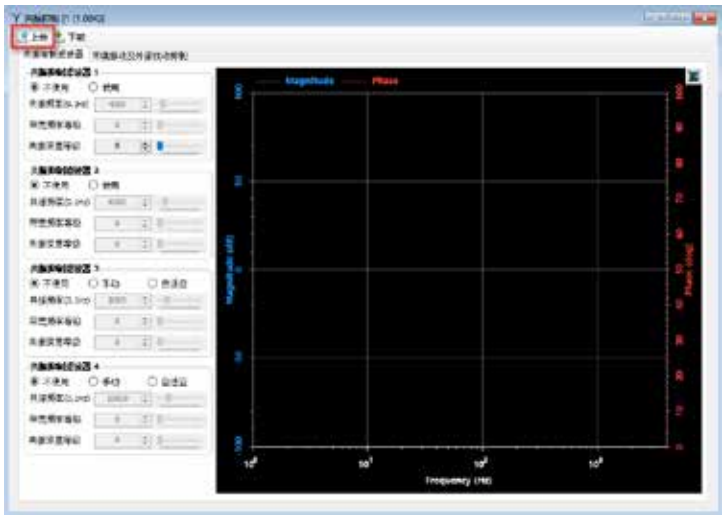
3)system runtime,The third and fourth groups of notch filter parameters are automatically updated,but not displayed in the software interface.The current resonance frequency point can be viewed through the software

4)system runtime,The third and fourth groups of notch filter parameters are automatically updated,but not autosave.After the servo system is powered on again,The system is enabled and running,The parameters will be automatically updated again.

This setting can prevent abnormal operation during servo system operation.,Causes the notch filter parameter to be updated with the wrong value,intensifies the vibration.

◆ Software setting method of adaptive notch filter

first step:in the tree list on the left,Turn on Resonance Suppression,Click the "Upload" button in the resonance suppression interface



second step:Set the "Resonance Suppression Filter"3”The method is changed to "Adaptive",Click to download

third step:After the download is complete,The drive will automatically detect vibration and run immediately.

10.5.3Setting the notch filter manually

Analyze resonance frequencies

Setting the notch filter manually,Need to measure the actual frequency at which resonance occurs,can useLuna"Mechanical Analysis" function in the software.

Analysis type:

Analysis type	Applicable load	principle	Precautions
Mechanical open loop (Mechanical Open-loop)	horizontal load	Analyzing Resonance of Servo Systems in Torque Mode.because not Loop containing servo controller,Therefore, it can be used to analyze The true resonant frequency of the entire system,can even detect Vibration caused by unreasonable parameter settings	Mechanical open loop analysis,The drive needs to be in Disabled state,Therefore, it cannot be applied to vertical straight load
Speed closed loop (Velocity Closed-loop)	horizontal load vertical load	Analyzing Resonance of Mechanical Systems in Command Velocity Mode.this When the servo control loop participates in the work.When using, make sure that the The control parameters of the service are set reasonably.	◆ The control mode of the drive needs to be in Command speed mode,which isP1-00The set value is10. ◆ When performing a velocity closed-loop analysis,The driver needs to be enabled ◆ for vertical loads,When the drive is in the enabled state, it is necessary to ensure that the mechanical Protection against falling.

10.5.3.1Use mechanical open loop (Mechanical Open-loop)How to analyze the resonance frequency

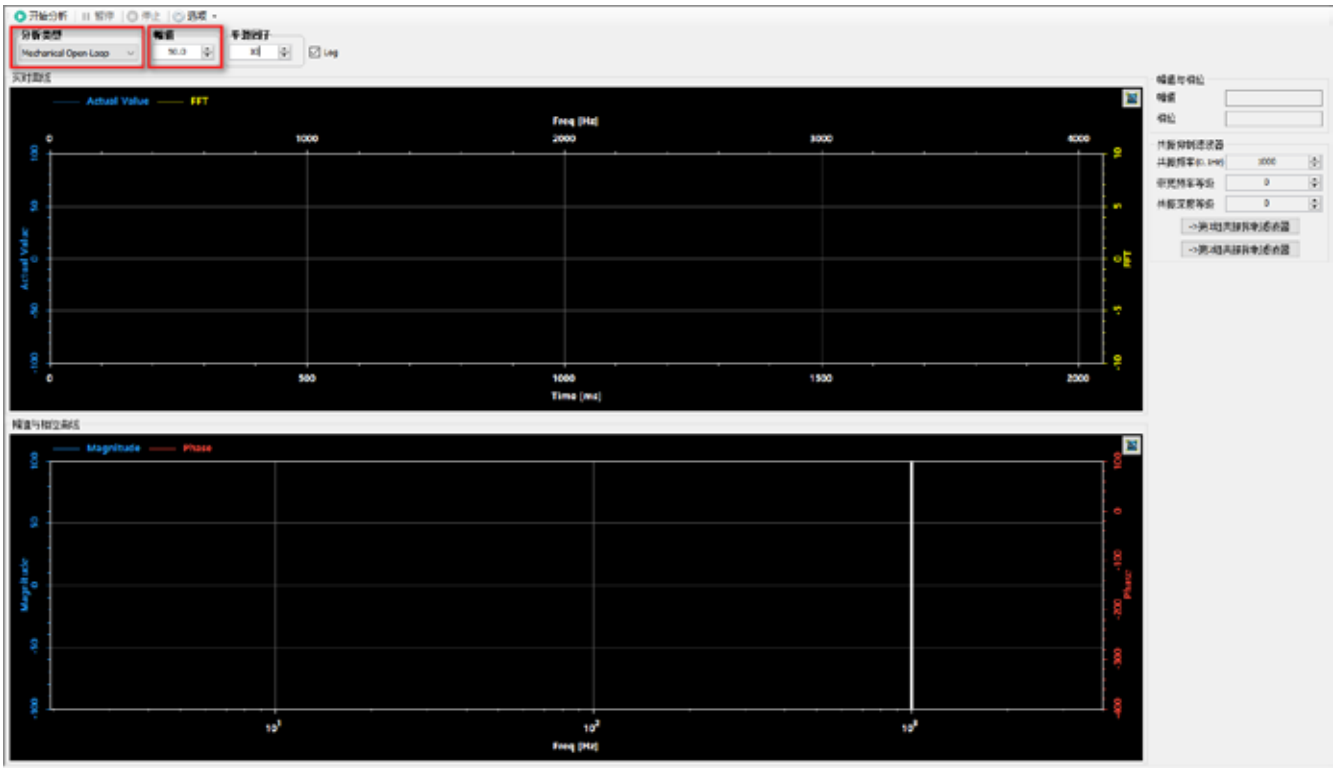
◆ first step

Before performing a mechanical open-loop analysis,need to ensure

- The drive has been commissioned in accordance with Chapter 6,Servo system works fine.
- Servo system has completed parameter tuning
- Make sure the drive is not enabled

◆ second step

Choose the right amplitude,Let the system vibrate,Note that excessive amplitude may cause mechanical movement.



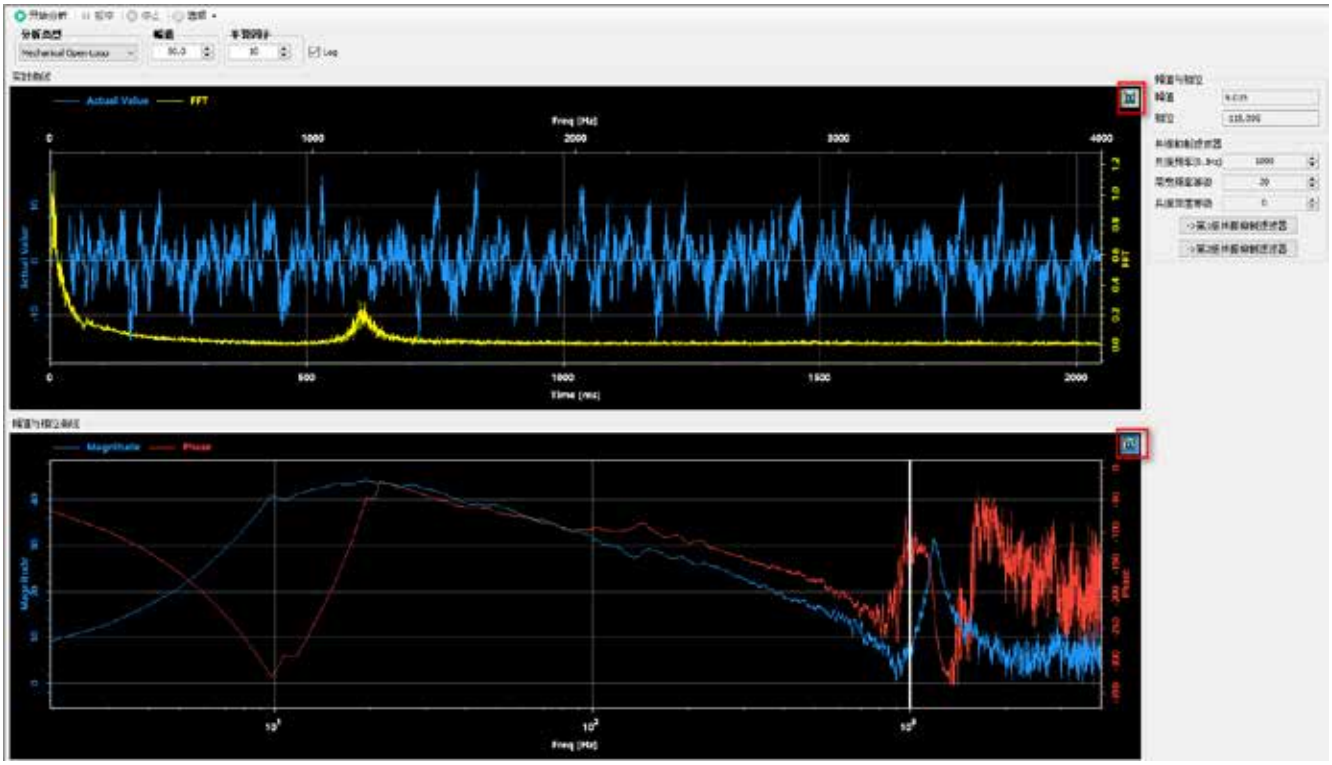
smoothing factor:

Display the curve smoothly,Easy to analyze the frequency point of vibration.The larger the value,the smoother the curve.

◆ third step

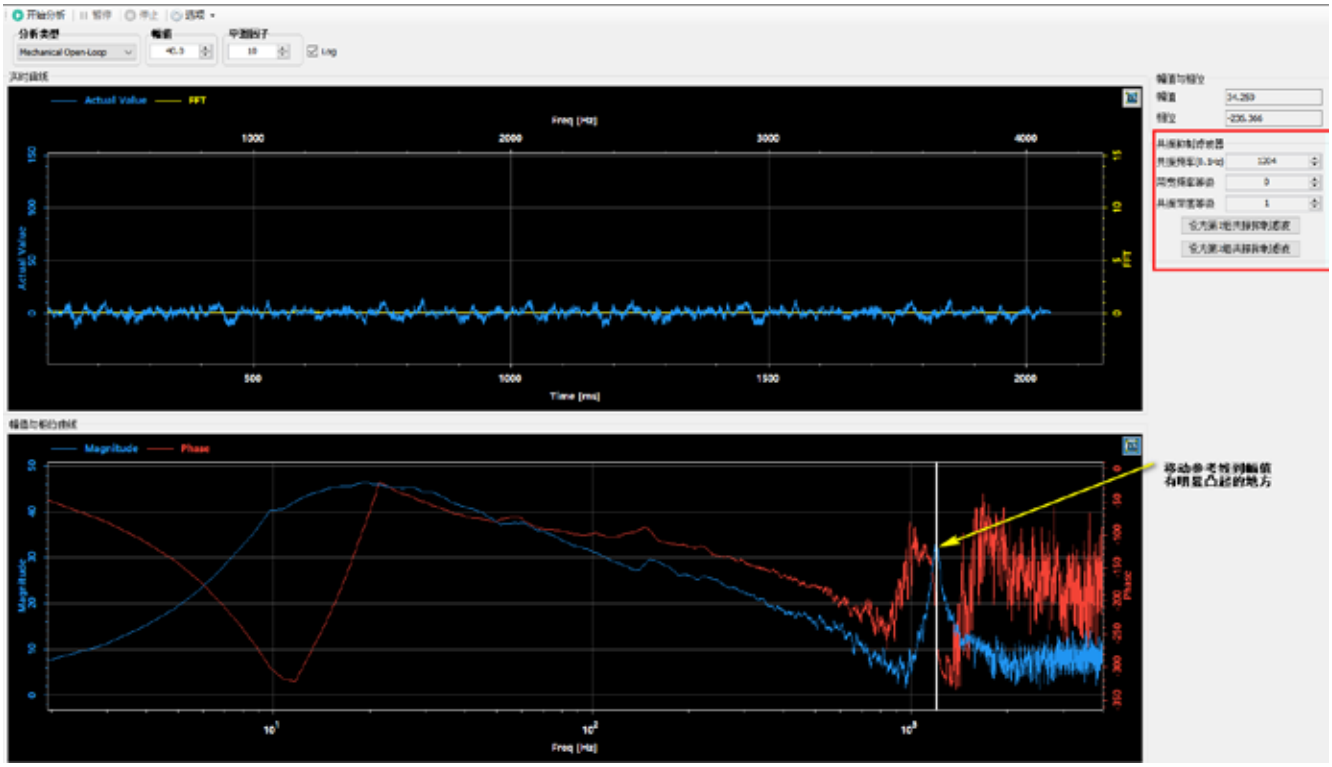
Click the "Start Analysis" button,Servo system starts mechanical open loop analysis,and display the resulting curve.

Click the icon in the upper right corner of the drawing area,Display curves can be optimized.



◆ the fourth step

Move the reference line in the "Amplitude and Phase Curve" to the amplitude curve(The blue curve in the figure below)Where there are abnormal protrusions

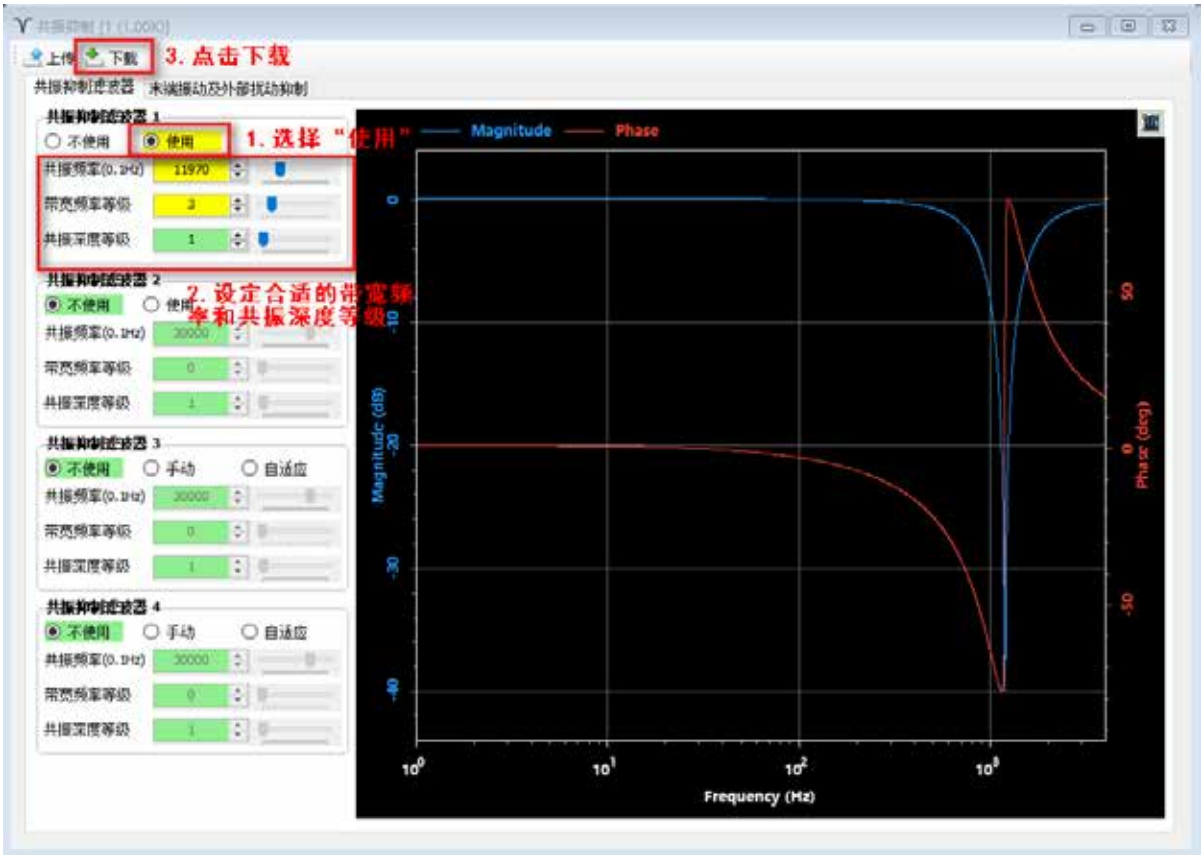


The resonance suppression filter in the red area will display the resonance frequency of the current reference line in real time.

Click "Set as1group resonance suppression filter" or "set to1Group Resonance Suppression Filter" sets the resonance frequency to the resonance suppression filter1 or resonance suppression filter2The resonance frequency point of.

◆ the fifth step

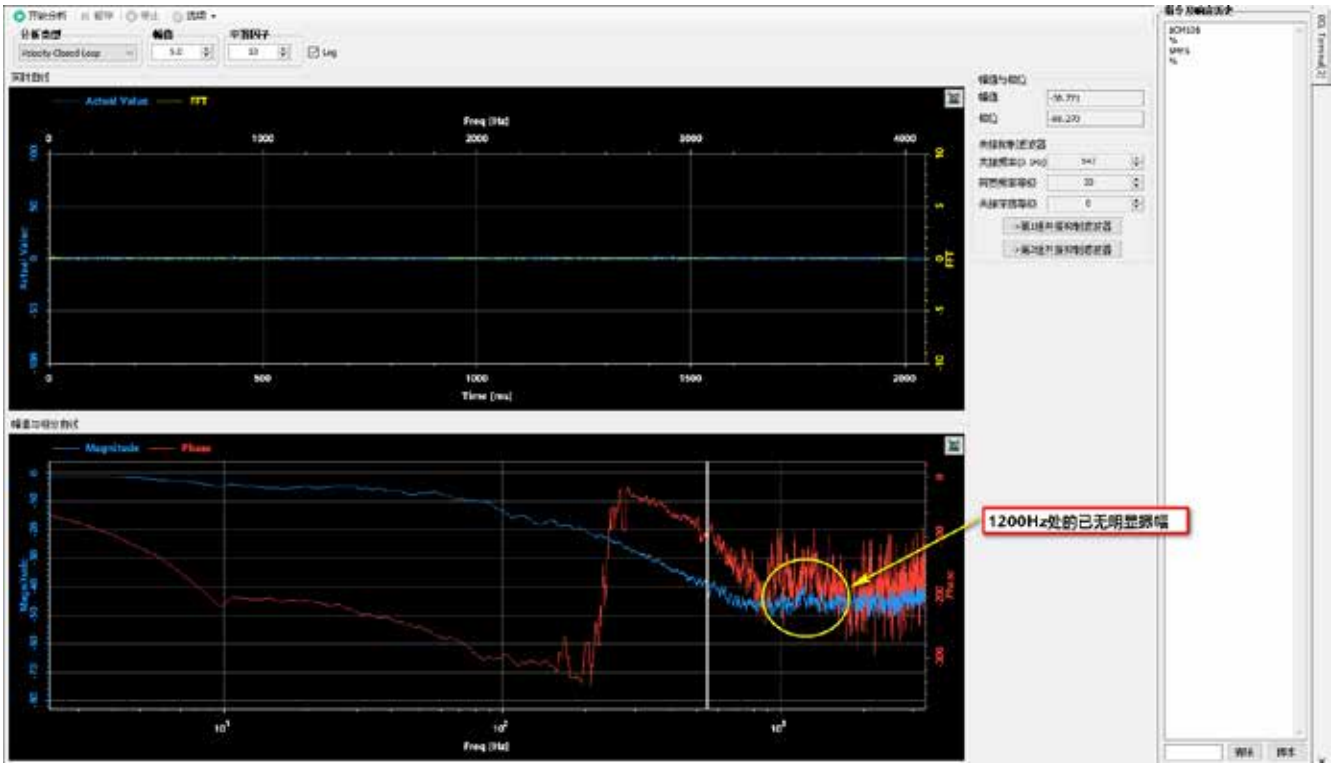
at the resonance suppression interface,Select "Use" to enable the corresponding resonance suppression filter,Set appropriate "bandwidth frequency level" and "resonance depth level",After clicking "Download",The set resonance suppression notch filter will start to work.



Notice:

Mechanical Open Loop Analysis of Loops Excluding Servo Controllers,Therefore, even if the vibration suppression filter is set,When performing a mechanical open-loop analysis again,can still detect the vibration frequency.If you want to see the curve after setting vibration suppression,Can use "speed closed loop" to analyze and view.

Below is the result viewed using the Velocity Closed Loop analysis.



10.5.3.2Use machine speed closed loop (Velocity Closed-loop)How to analyze the resonance frequency

◆ first step

Before performing velocity closed loop analysis,need to ensure

- The drive has been commissioned in accordance with Chapter 6,Servo system works fine.
- Servo system has completed parameter tuning
- The control mode of the driver is:Command speed mode
- drive is enabled
- For vertical shaft loads,It is better to use a motor with a brake,Avoid accidental load drop

◆ second step

1)Choose the right amplitude,Let the system vibrate,Note that excessive amplitude may cause mechanical movement.

2)Open "Tools" menuSCLterminal"

3)existSCLType in the input box of the terminalCM10,Set the control mode of the drive to:Command speed mode 4

)enable driver

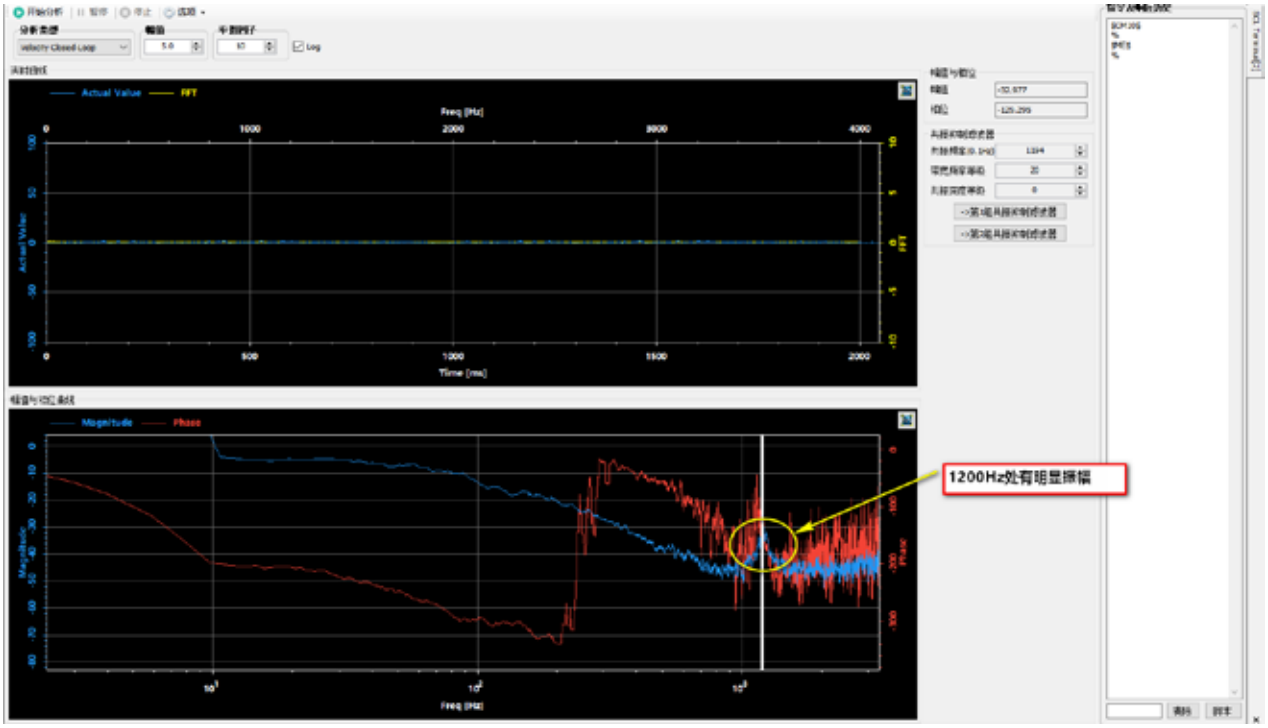
◆ third step

1)Click the "Start Analysis" button,Servo system start speed closed-loop analysis,and display the resulting curve.

2)Click the icon in the upper right corner of the drawing area,Display curves can be optimized.

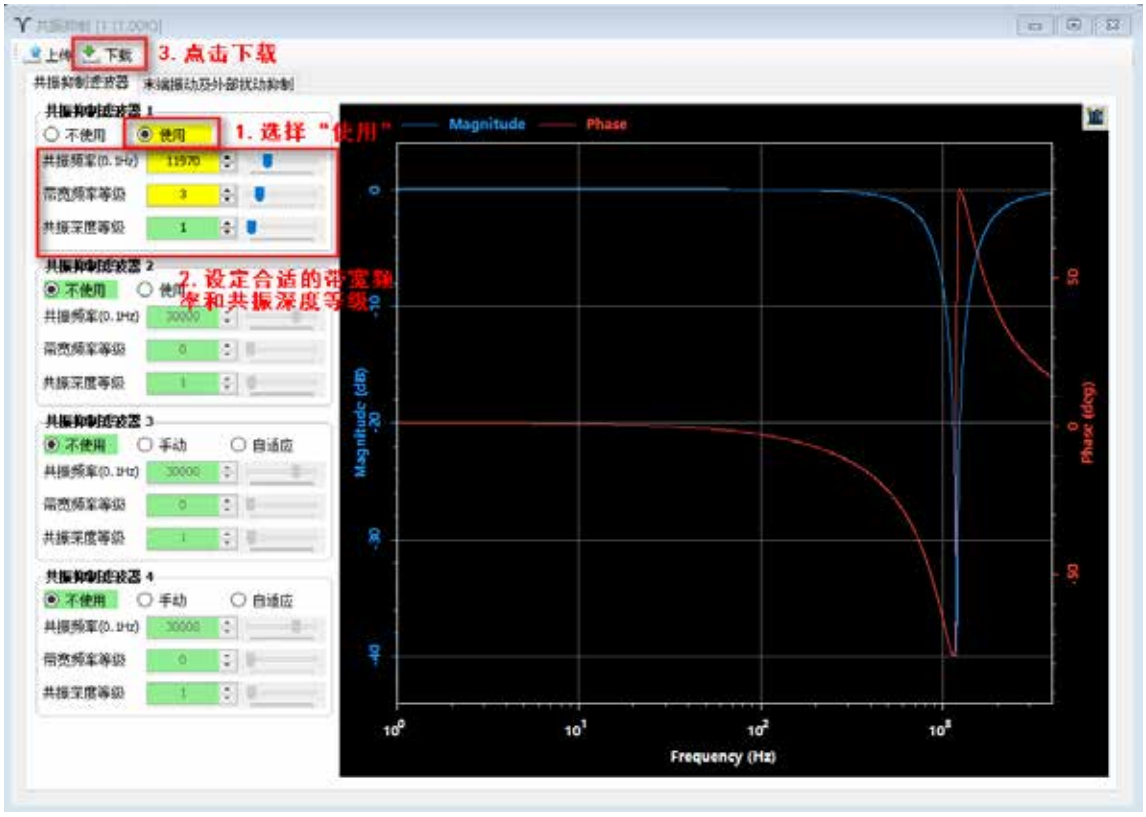
3)Move the reference line in the "Amplitude and Phase Curve" to the amplitude curve(The blue curve in the figure below)Where there are abnormal protrusions

Pictured below1200HzVibration is obvious,Click "Set as1group resonance suppression filter" or "set to1Group Resonance Suppression Filter" sets the resonance frequency to the resonance suppression filter1or resonance suppression filter2The resonance frequency point of.



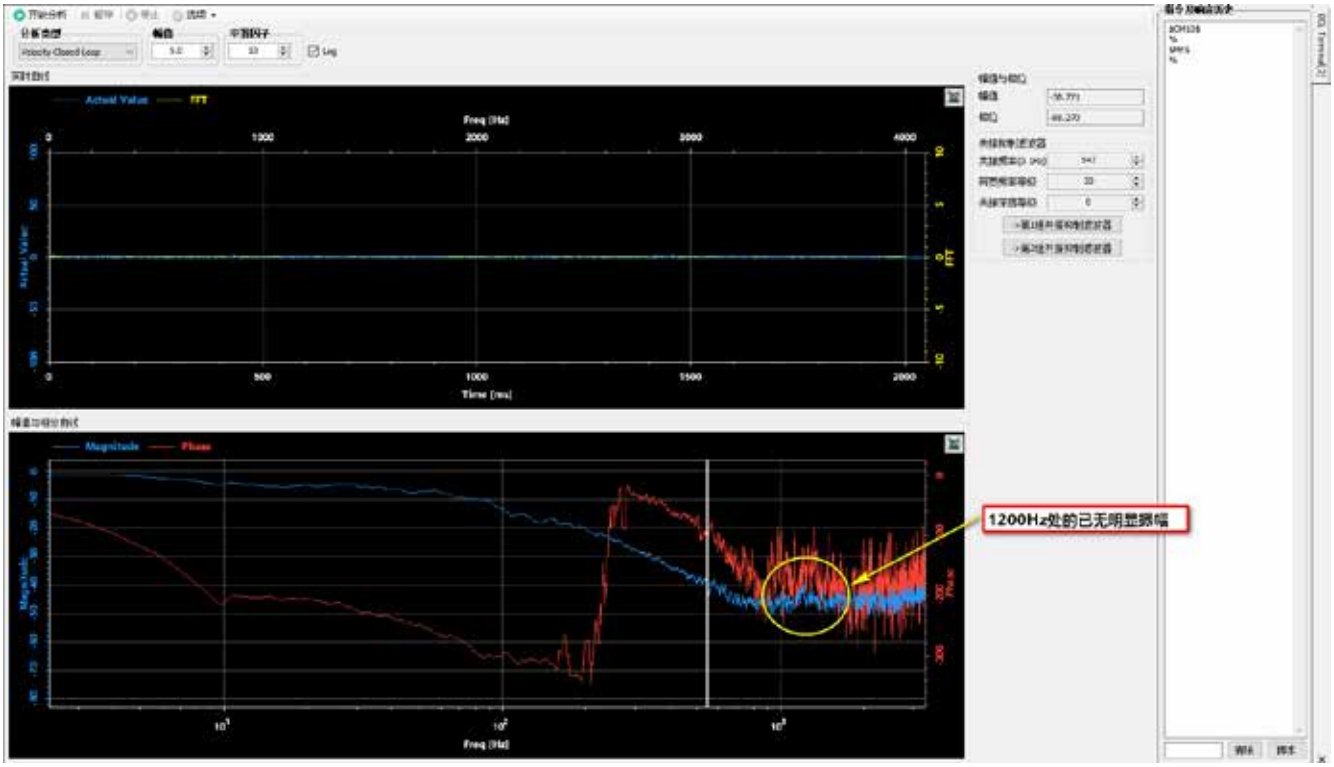
◆ the fourth step

at the resonance suppression interface,Select "Use" to enable the corresponding resonance suppression filter,Set appropriate "bandwidth frequency level" and "resonance depth level",After clicking "Download",The set resonance suppression notch filter will start to work.



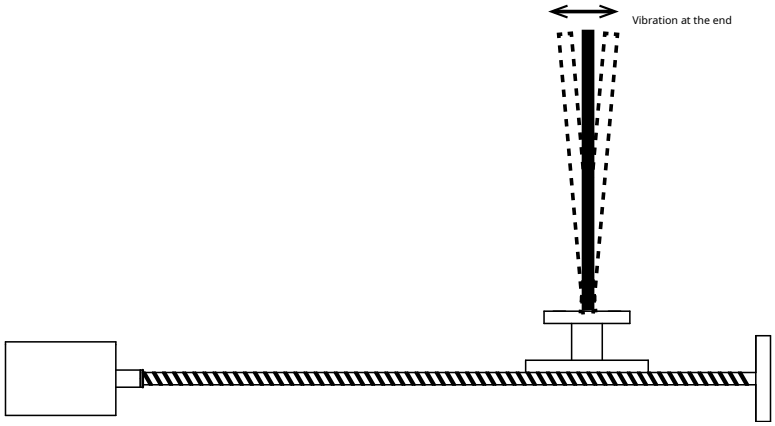
the fifth step

Suppressed results using the Velocity Loop analysis again.



10.6End Vibration Suppression

As shown below,The end of the mechanical load due to the longer length,It is easy to generate low frequency vibration when running and stopping,This vibration tends to be lower in frequency ,generally in100Hzwithin,But it will affect the positioning accuracy and settling time of the end.

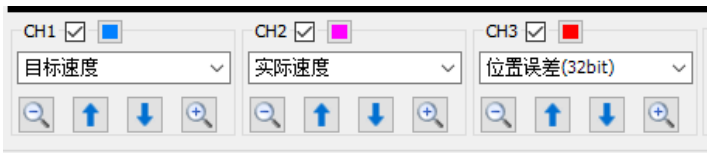


The use of end vibration suppression can better suppress such vibrations,Thereby improving the positioning accuracy of the mechanical system and shortening the positioning and setting time.

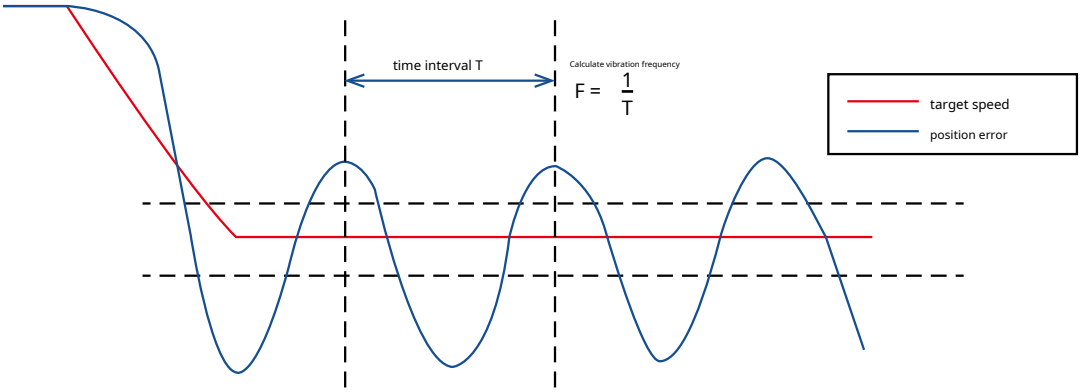
Setting method:

◆ first step:Analysis frequency

useLunaThe oscilloscope function of the software,Observe the curves of "target speed" and "position error" during the motor stop phase.

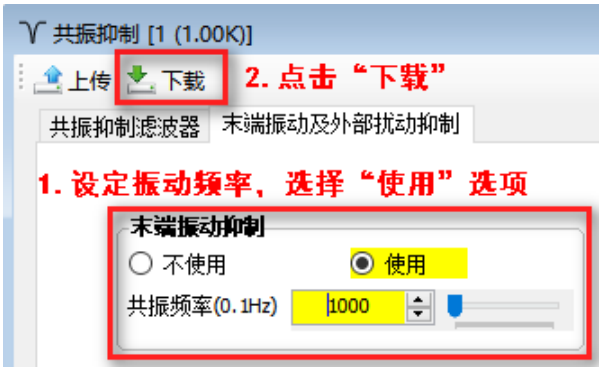


As shown below,After analyzing the target velocity is zero,Frequency of position error fluctuations.



◆ second step:Set and enable end vibration suppression

existLunaSelect the "Resonance Suppression" function from the tree menu on the left side of the software,Click "End Vibration and External Disturbance Suppression",Enter the vibration frequency measured in the first step and check "Use",After downloading to the drive,End vibration suppression will take effect



◆ Notice:

- ◆ Wrong vibration frequency will cause the end vibration suppression effect to become worse,even intensified vibrations
- ◆ only at1-300HzThe vibration frequency within the can be well suppressed
- ◆ Vibration due to reasons other than mechanical ends,This feature may not work properly

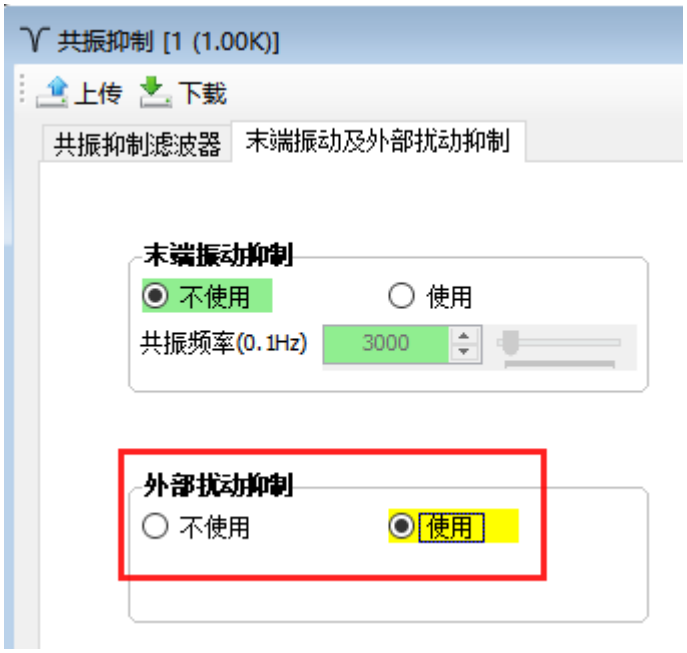
10.7External disturbance rejection

Servo system is disturbed by external factors,For example, sudden changes in load or sudden changes in external forces such as friction due to mechanical problems,cause system instability,produce abnormal vibration.

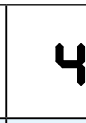
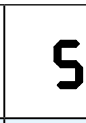
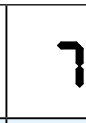
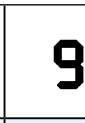
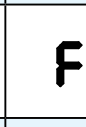
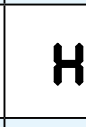
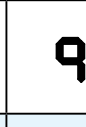
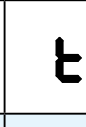
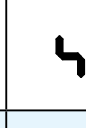
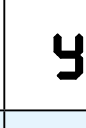
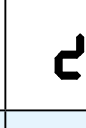
External disturbance rejection function eliminates such disturbances,and improve system responsiveness.

Instructions

existLunaSelect the "Resonance Suppression" function from the tree menu on the left side of the software,Click "End Vibration and External Disturbance Suppression",Check "Use" in External Disturbance Suppression,After downloading to the drive,End Disturbance Suppression will take effect.



appendix1:ledDisplay character comparison table

									
1	2	3	4	5	6	7	8	9	10
									
A	B	C	D	E	F	G	H	I	J
									
K	L	M	N	O	P	Q	R	S	T
									
U	V	W	X	Y	Z				

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