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M54SSeries AC servo system

Pulse andRS-485Model user manual

Shanghai Anpu MOONS Automation Equipment Co., Ltd.

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customer service

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Need technical support,please contact:ama-support@moons.com.cn

1About this manual

1.1About this manual

This manual isM54SInstructions for series AC servo drives. it provides information aboutM54SInstallation of series servo units ,Configuration and basic operations. This document is intended for transportation,assembly,Prepared by qualified personnel working on and maintaining the equipment described here.

1.1.1 M54SDocumentation for series AC servo

This manual is part of a series of documents.The entire series consists of the following:

- M54SSeries AC servo drive quick installation manual.Introduces basic installation and operation of the drive.
- M54SSeries AC Servo Hardware Manual.Detailed introduction to hardware installation,Configuration and operation.
- Debugging softwareLunamanual.introduceLunaHow to use.

1.2safety

To prevent harm to people and damage to property,Only qualified personnel should perform installation.


M54SSeries AC servo products use hazardous voltages.Make sure the driver is properly grounded.

before you installM54SBefore AC Servo Products,Please read the product manual in detail. Failure to follow safe operating instructions may result in personal injury or equipment damage.

1.3Safety Signs

Safety signs identify potential personal hazards or equipment damage,Failure to follow recommended precautions and practical safe practices.

Below are reminder safety symbols used in this manual and on the drive:


Danger


High voltage hazard


ground


Be careful with high temperatures

1.4Safety Precautions

1.4.1storage

Please note the following when storing:

- Please put this drive in the packaging box,Store in dry,no dust,Avoid places exposed to direct sunlight
- The storage environment temperature is -20℃ to +65between ℃
- The storage environment humidity is10%arrive85%within range,And no condensation
- Avoid storage in corrosive gas environments

1.4.2 Installation Precautions

	◆ Do not use water vapor,corrosive gas,Use this product in flammable and explosive environments
	◆ Do not use it when there is strong vibration,Use this product in places of impact
	◆ Do not connect the servo motor directly to the main power supply
	◆ Do not use the cable immersed in water or oil
	◆ Do not squeeze,Heavy duty cable,Avoid damaging cables and causing leakage and other dangerous situations
	◆ Do not block the drive cooling holes,Avoid metal shavings and other conductive objects from entering the driver during installation.
	◆ Do not touch the rotating motor shaft directly with your hands
	◆ Do not knock the motor during installation,To avoid damaging the motor shaft or internal optical encoder
	◆ During the first trial run,First separate the coupling or belt of the mechanical equipment,Keep the motor in no-load state
	◆ Incorrect parameters will result in abnormal operation under load.
	◆ drive heat sink,motor,The temperature of the external regenerative resistor will increase during operation,please avoid touching
	◆ Do not lift the motor lead wires during transportation and installation.

1.4.3 Wiring precautions

	◆ Do not place theUVWThe motor terminal is connected to the grid power supply,It may damage the drive or cause a fire.
	◆ Please change the driver's outputUVWand servo motorUVWdirect connection,Do not pass the electromagnetic contactor in between
	◆ Please tighten the fixing screws of the power supply and motor output terminals,Otherwise it may cause fire.
	◆ Do not frequently switch the main power supply of the driver on and off.,If you really need to turn the power on and off repeatedly,Please control1minute1times or less.
	◆ Avoid bundling main circuit cables and input and output signal cables together..
	◆ Please use twisted pair shielded wires for input signal lines and encoder signal lines.
	◆ Even if the power is turned off,There will be high voltage remaining in the driver.existChargeWhen the light is on,Do not touch the power terminals
	◆ Please use the specified power supply voltage
	◆ During wiring,Please remove the terminal base from the servo drive
	◆ A 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 good grounding of the driver power supply and motor
	◆ Before powering on and running,Be sure to confirm all wiring is correct.

Precautions during trial operation

	◆ Do not touch the rotating motor shaft directly with your hands
	◆ During the first trial run,First separate the coupling or belt of the mechanical equipment,Keep the motor in no-load state
	◆ Incorrect parameters will result in abnormal operation under load.
	◆ drive heat sink,motor,The temperature of the external regenerative resistor will increase 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,Prevent the device from alarming,Fault,Whereabouts during power outage

1.5 Certification specifications

M54SSeries AC servo products follow

		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	UL1004-1
			UL 1004-6
CSAstandard		C22.2 No.274.13	CSA C22.2 No.100

1.6 Maintenance and inspection

1.6.1 Check items and cycles

The normal usage conditions of the servo are:

average annual ambient temperature:30℃,average load rate80%the following,Daily operating time20less than hours. The

items for daily inspection are as follows::

type	inspection cycle	Check item
daily inspection	daily	◆ Confirm the ambient temperature of use,humidity,dust,foreign body,Is there condensation?
		◆ Is there any abnormal vibration or noise?
		◆ voltage
		◆ Odor
		◆ Is the fan working properly?,Is there any foreign matter in the vents?
		◆ Is the connector loose?
		◆ Is there any foreign matter between the cable and connector?,Are the cable conductors exposed?
		◆ Is there any looseness in the fastening parts?

1.6.2 Replacement of parts

The components inside the servo products will wear or age.,The timing of component replacement depends on environmental conditions,Changes in usage.When replacement is needed,Please contact our company or our agent.

Except our company,Do not disassemble and repair by yourself.

parts	part	Standard replacement cycle	Remark
driver	filter capacitor	about6Year	Standard replacement cycle is for reference only. Even if the standard replacement cycle has not expired,once it happens Exceptions also need to be replaced.
	Aluminum electrolytic capacitors on circuit board	about6Year	
	Power-on buffer relay	about100,000times (depending on usage conditions)	
	Power-on snubber resistor	about20,000times (depending on usage conditions)	
	fan	2~3Year(1~310,000 hours)	
motor	Oil seal	5000Hour	
	Absolute encoder battery	Life span depends on usage conditions	

2product description

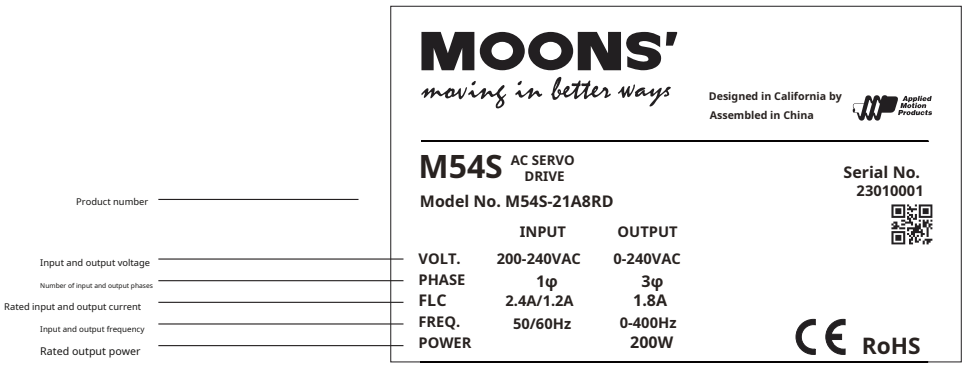
2.1Product confirmation

Please refer to the following chapters,Confirm the driver model and servo motor model. Complete operational servo,It should include the following components:

- Power-matched servo drives and servo motors
- Power extension cable for connecting the driver and servo motor (optional)
- Encoder extension cable for connecting the driver and servo motor (optional)
- used forCN1mouth to mouthPCmachineMini USBcommunication line
- used forCN2port connector (optional)
- used forCN3port connector (optional)
- used forCN4Encoder connector (optional)
- used forCN5oralSTOConnector (optional)
- used forCN6andCN7oralRJ-45Connector,Used for communication of bus products (optional)
- used forP1driver power input port and motor output portP1Connector

2.2Driver model introduction

2.2.1Drive nameplate description



2.2.2Drive model description

M54S -2 3A 0 RD - *

① ② ③ ④ ⑤ ⑥

① M54Sseries

② Input voltage *1

2 :Simplex220VAC

④ Control function category

⑤ Model category

⑥ version number

③ current

		Rated current A(rms)	Peak current A(rms)	power
*	1A8	1.8	5.4	50/100/200W
*	3A0	3	9	400W
*	4A5	4.5	15	750W
*	6A0	6	twenty one	1.0kW

* 1 Line to LineLine voltage

2.2.3 Drive specifications

1)Electrical specifications

◆ Simplex220VAC servo drive

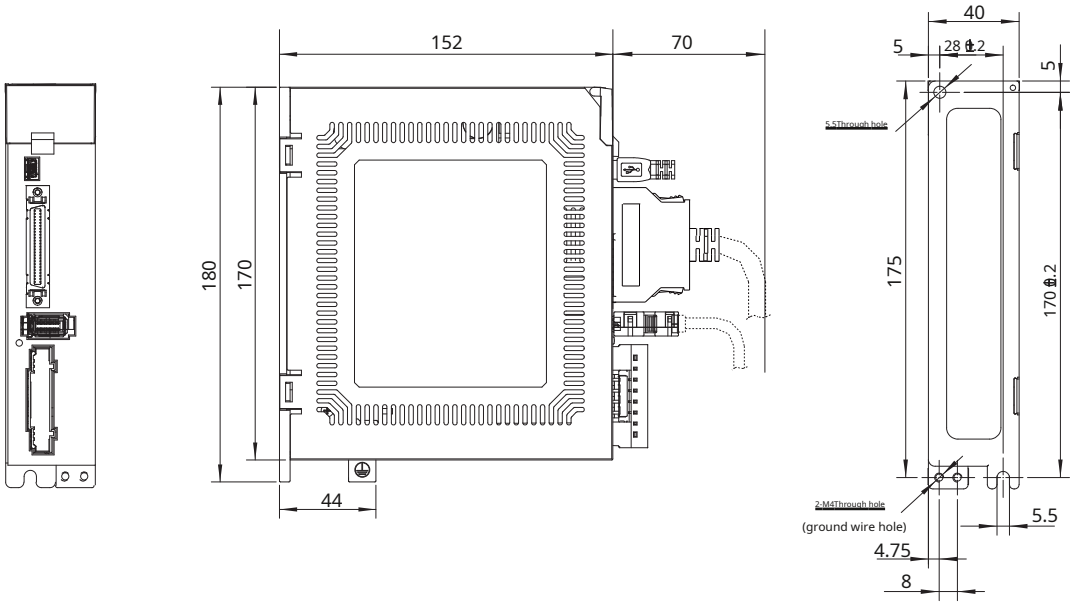
Drive model	M54S-21A8RD	M54S-23A0RD	M54S-24A5RD	M54S-26A0RD
Main circuit power supply	SimplexAC200~240V±10%,50/60Hz			
Control loop power	Take the main circuit power supply			
Continuous output currentA(rms)	1.8	3	4.5	6
Maximum output currentA(rms)	5.4	9	15	twenty one
Insulation voltage	Once to the ground:Pressure resistant1500VAC,1 minute,(leakage:20mA)(220V Input)			

2)General specifications

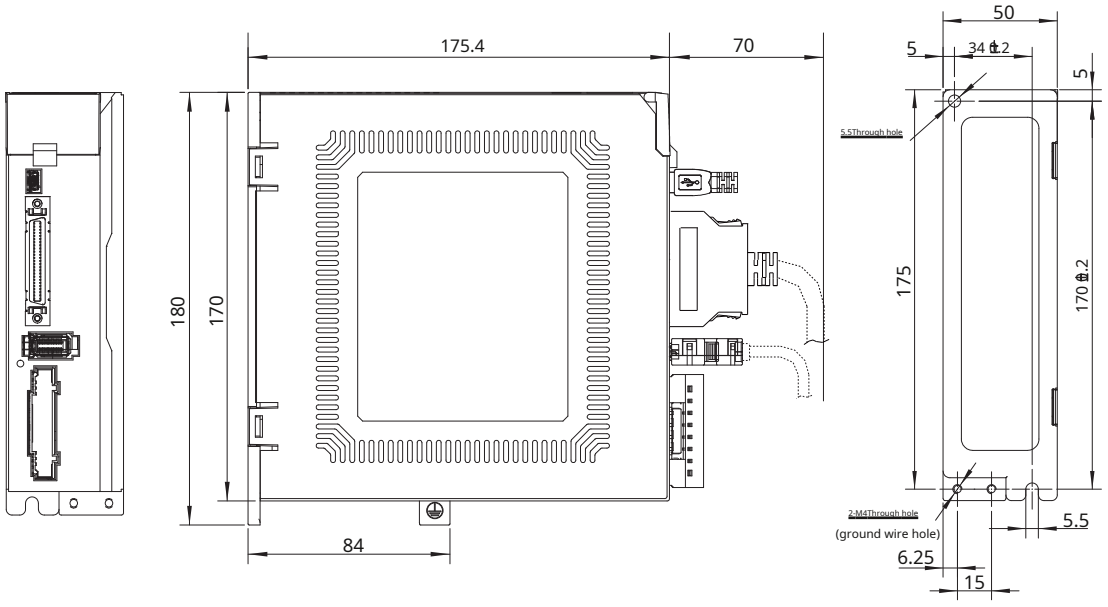
Usage environment	temperature		◆ Operating temperature:0℃ ~50℃ (if the ambient temperature exceeds45℃,Please place it in a well-ventilated place) ◆ storage temperature:-20℃ ~65℃
	humidity		Storage and use:10~85%RH,No condensation
	altitude		altitude1000mthe following
	vibration		9.8m/s2the following,10 ~ 60Hz (Unsustainable use at resonance point)
Encoder feedback			21-bitMultiturn absolute encoder
I/O	Digital signal	enter	10Optocoupler isolated universal input,commonXCOM,supportNPNorPNPinput signal,Input functions configurable via parameters, 24VDC,20mA,Maximum input frequency5KHz
		output	6Optocoupler isolated universal output,supportNPNorPNPoutput.Output functions configurable via parameters, maximum 30VDC,100mA
	Analog signal	enter	2analog input,-10~+10V,resolution12bit
	Pulse signal	enter	2pulse input (optocoupler input,Line Receiverenter): ◆ Optocoupler input:support5VLow-speed single-ended or differential signaling,24Vopen collector pulse signal,minimum pulse width1μs,Maximum pulse frequency500KHz ◆ Line Receiverenter:5VDifferential signaling,minimum pulse width0.125μs,Maximum pulse frequency4MHz
		output	4output(3roadLine Driveroutput,1open collector output) ◆ Line Driveroutput:EncoderA,B,ZFeedback differential output ◆ Open collector output:EncoderZMutually
	+24VPower output		◆ The driver can output24Vpower supply,The maximum load capacity is200mA
Communication Interface	USB		for connectionPCComputer for software debugging
	RS-485		Modbus/RTUProtocol communication
Operation panel			◆ 5action buttons (MODE, RIGHT, UP, DOWN, SET) ◆ 5Bitledshow
Regenerative resistor			No built-in regenerative resistor,Can be connected externally
control mode			1.pulse position mode2.Analog speed mode3.Analog torque mode4.Multi-speed mode5.Internal torque mode6.Internal speed mode7. Internal point-to-point position mode switches between control modes via digital input
control input signal			Servo-ON,Alarm clear,Forward/Reverse prohibition limit,Control mode switching,Gain switching,Position error counter cleared,zero speed clamp,Speed command direction control,emergency stop,Return to origin,Torque limit,rotation limit,Pulse input disabled,Multi-speed running command trigger,Multi-terminal speed selection input,implementQprogram,universal input
control output signal			Fault output (error report),Warning output (alarm),Servo-Ready,Motor brake control,Arrive at speed,Torque reached,Positioning completed, Same location,Servo-onstatus output,zero speed signal,consistent speed,speed limit,Torque consistent,Torque limited,Return to origin completed,Limit (forward rotation,reverse),Dynamic position error exceeds limit,Universal output
Protective function			Overcurrent,overvoltage,Undervoltage,overheat,Encoder feedback abnormality,overload,Speed is too high,Position error is too large,emergency stop,Forward/Reverse limit, Communication abnormality, etc.
dynamic braking			built-in

2.2.4 Drive dimensions

2.2.4.1 50W,**100W**,**200W**,**400W**model



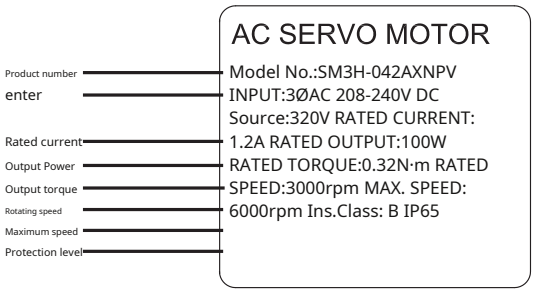
2.2.4.2 750Wmodel



Note:measurement unit:mm

2.3Motor model introduction

2.3.1Motor nameplate description



2.3.2Motor model description

SM3 H-06 1 AXNPV

2.3.wait

service motor	
SM3series	

Inertia type	
L	low inertia
M	medium inertia
H	high inertia

Base type	
04	40mm
06	60mm
08	80mm
10	100mm
13	130mm

Motor length	
1	1 Stacks
2	2 Stacks
3	3 Stacks
4	4 Stacks
5	5 Stacks
6	6 Stacks

Voltage specification	
A	220VAC

Out shaft	
N	Standard keyway.Without oil seal
V	Standard keyway.Oil seal is shipped with the product,Do not install.
K	Standard keyway.With oil seal

Connector type	
D	Push-in plastic connector,Metal back cover
P	Push-in plastic connector,Standard back cover
U	Push-in metal connector,Standard back cover

brake	
N	without brake
B	With brake(24VDC)

Encoder type	
X	21bitMulti-turn absolute magnetic encoder

2.3.4 Motor specifications and dimensions

2.3.4.1 □ 4 0 **mm**Specifications and dimensions

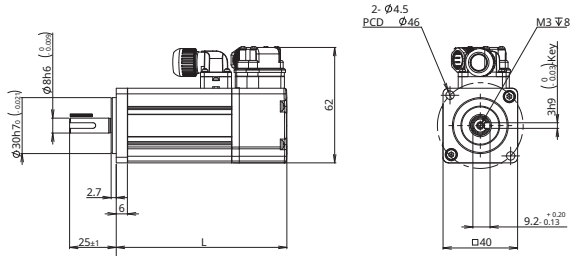
model*		SM3L-042A◇□DV	SM3H-042AX□PV
Motor specifications		low inertia	high inertia
Rated output power	watts	100	100
Rated speed	rpm	3000	3000
Maximum speed	rpm	6000	6000
Rated torque	Nm	0.32	0.32
Peak torque	Nm	0.93	1.28
Rated current	A(rms)	1.2	1.4
Peak current	A(rms)	3.8	5.7
Reaction potential constant±5%	V (rms) / K rpm	17.6	14.8
Torque coefficient ±5%	Nm/A (rms)	0.267	0.277
Moment of inertia	$Kg{\cdot}m_2$	0.043×10^{-4}	0.0702×10^{-4}
Moment of inertia - with brake	$Kg{\cdot}m_2$	0.0483×10^{-4}	0.0724×10^{-4}
Axial load	N (max.)	50	50
Radial load (shaft end)	N (max.)	60	60
weight	kg	0.55	0.55
Weight - with brakes	kg	0.8	0.8

*◇Represents the encoder type

□ Indicates whether to use brakes

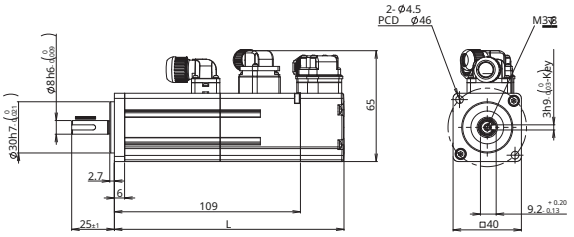
◆ Overall dimensions (unit:mm)

1)without brake



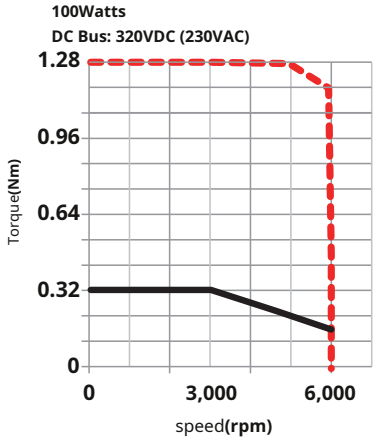
without brake	L
SM3L-042A◇NDV	91.5
SM3H-042AXNPV	84

2)with brake



Brake model	L
SM3L-042A◇BDV	134.5
SM3H-042AXBPV	114.3

◆ Torque curve



2.3.4.2 □ 6 0 **mm**Specifications and dimensions

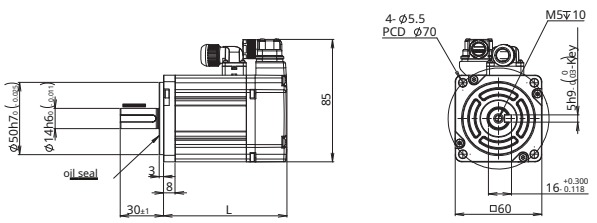
model*		SM3L-061A◇□PV	SM3L-062A◇□PV
Motor specifications		low inertia	low inertia
Rated output power	watts	200	400
Rated speed	rpm	3000	3000
Maximum speed	rpm	6000	6000
Rated torque	Nm	0.64	1.27
Peak torque	Nm	1.9	3.8
Rated current	A(rms)	1.5	2.8
Peak current	A(rms)	5.1	9.6
Reaction potential constant±5%	V (rms) / K rpm	27	28.9
Torque coefficient ±5%	Nm/A (rms)	0.427	0.454
Moment of inertia	$Kg·m_2$	$0.152×10_{-4}$	$0.243×10_{-4}$
Moment of inertia - with brake	$Kg·m_2$	$0.182×10_{-4}$	$0.274×10_{-4}$
Axial load	N (max.)	70	70
Radial load (shaft end)	N (max.)	200	240
weight	kg	1.1	1.4
Weight - with brakes	kg	1.5	1.9

*◇Represents the encoder type

□ Indicates whether to use brakes

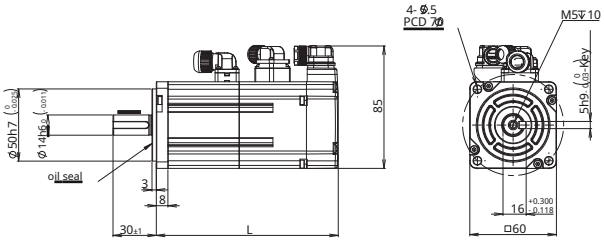
Overall dimensions (unit:mm)

1)without brake



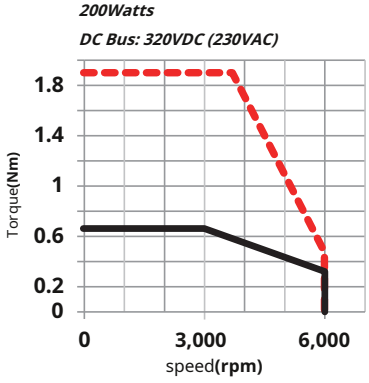
Brakeless model	L
SM3L-061A◇NPV	85.5
SM3L-062A◇NPV	104

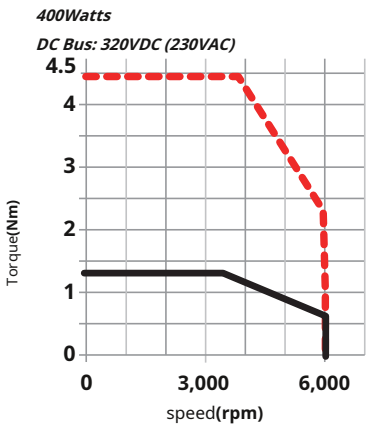
2)with brake



Brake model	L
SM3L-061A◇BPV	126
SM3L-062A◇BPV	144.5

Torque curve





Maximum peak torque

Maximum continuous torque

2.3.4.3 □ 6 0 mm Specifications and dimensions

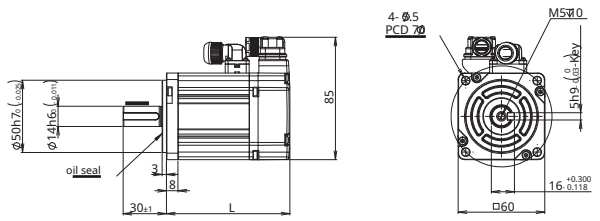
model*		SM3H-061AX□PV	SM3H- 062AX□PV
Motor specifications		high inertia	high inertia
Rated output power	watts	200	400
Rated speed	rpm	3000	3000
Maximum speed	rpm	6000	6000
Rated torque	Nm	0.64	1.27
Peak torque	Nm	2.24	4.45
Rated current	A(rms)	1.7	2.8
Peak current	A(rms)	5.9	9.8
Reaction potential constant±5%	V (rms) / K rpm	24.3	28.9
Torque coefficient ±5%	Nm/A (rms)	0.376	0.423
Moment of inertia	$Kg·m_2$	$0.31×10_{-4}$	$0.566×10_{-4}$
Moment of inertia - with brake	$Kg·m_2$	$0.32×10_{-4}$	$0.62×10_{-4}$
Axial load	N (max.)	70	70
Radial load (shaft end)	N (max.)	200	240
weight	kg	0.9	1.4
Weight - with brakes	kg	1.3	1.7

*◇Represents the encoder type

□ Indicates whether to use brakes

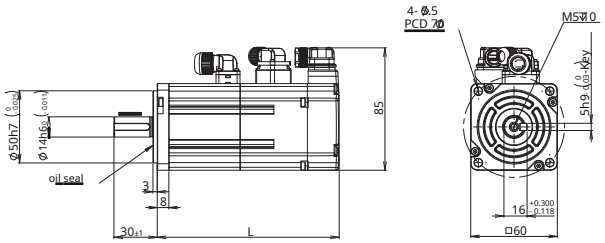
Overall dimensions (unit:mm)

1)without brake



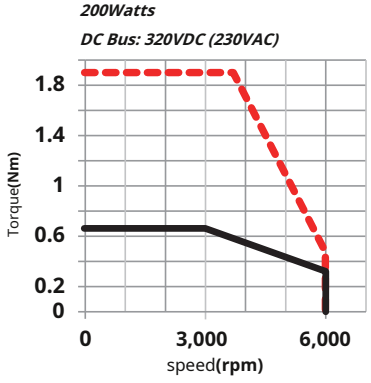
Brakeless model	L
SM3H-061AXNPV	77
SM3H-062AXNPV	97

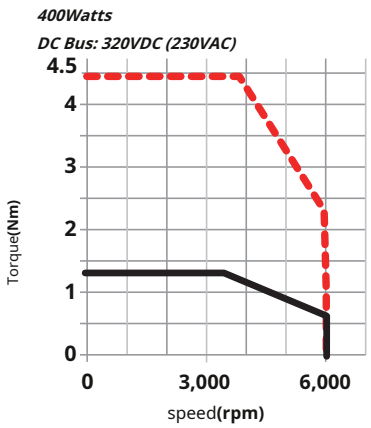
2)with brake



Brake model	L
SM3H-061AXBPV	106
SM3H-062AXBPV	126

Torque curve





Maximum peak torque

Maximum continuous torque

2.3.4.4 □ 8 0 mm Specifications and dimensions

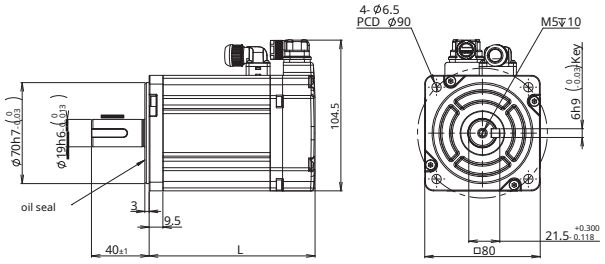
model*		SM3L-083A◇□DV	SM3H-083AX□DV
Motor specifications		low inertia	high inertia
Rated output power	watts	750	750
Rated speed	rpm	3000	3000
Maximum speed	rpm	6000	6000
Rated torque	Nm	2.4	2.4
Peak torque	Nm	6.7	8.4
Rated current	A(rms)	4.5	4.5
Peak current	A(rms)	14	16.7
Reaction potential constant±5%	V (rms) / K rpm	33.9	32.3
Torque coefficient ±5%	Nm/A (rms)	0.533	0.53
Moment of inertia	Kg·m2	0.829×10-4	1.46×10-4
Moment of inertia - with brake	Kg·m2	0.961×10-4	1.63×10-4
Axial load	N (max.)	90	90
Radial load (shaft end)	N (max.)	270	270
weight	kg	2.6	2.6
Weight - with brakes	kg	3.4	3.2

*◇Represents the encoder type

□ Indicates whether to use brakes

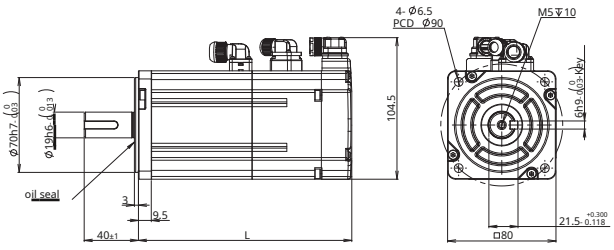
◆ Overall dimensions (unit:mm)

1)without brake



Brakeless model	L
SM3L-083A◇NDV	115
SM3H-083AXNPV	101

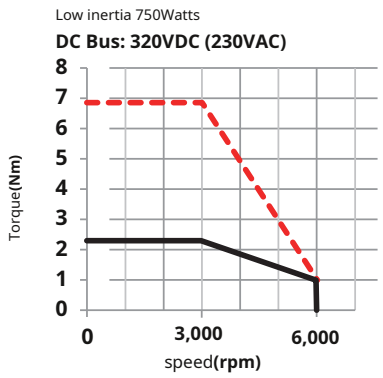
2)with brake



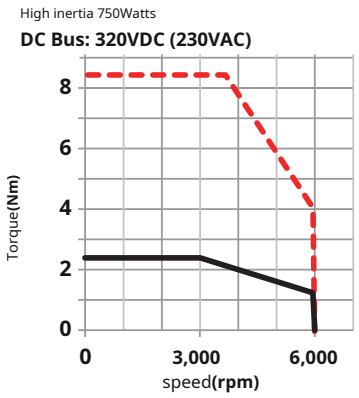
Brake model	L
SM3L-083A◇BDV	157.5
SM3H-083AXBPV	132

◆ Torque curve

Low inertia 750Watts



High inertia 750Watts



Maximum instantaneous torque

Maximum continuous torque

2.3.5Motor specifications and dimensions——130mmMachine base

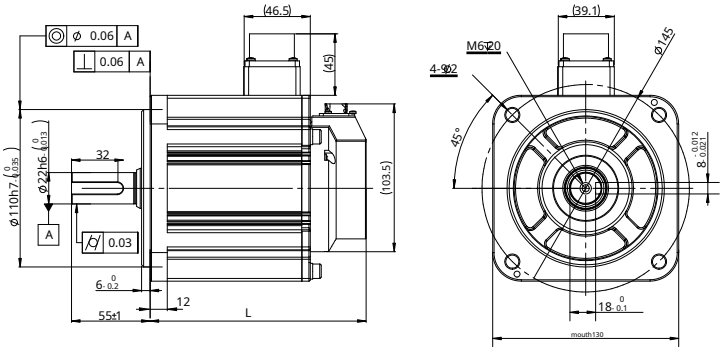
■ 130mmSpecification

model		SM3M-132AX□UV	SM3H-133AX□UV
Rated output power	watts	1000	850
Rated speed	rpm	2000	1500
Maximum speed	rpm	3000	3000
Rated torque	Nm	4.77	5.39
Peak torque	Nm	14.3	16.2
Rated current	A(rms)	5.4	6
Peak current	A(rms)	16.9	19
Reaction potential constant±5%	V (rms) / K rpm	55.3	55.3
Torque coefficient ±5%	Nm/A (rms)	0.891	0.891
Winding resistance (Line-Line)	Ohm±10%@20°C	0.66	0.66
Winding reactance (Line-Line)	mH (typ.)	5.4	5.4
Moment of inertia	Kg·m2	13×10-4	13×10-4
Moment of inertia - with brake	Kg·m2	15.2×10-4	15.2×10-4
Axial load	N (max.)	196	196
Radial load (shaft end)	N (max.)	490	490
weight	kg	6.2	6.2
Weight - with brake	kg	8.5	8.5

□ Indicates whether with brake

◆ Overall dimensions (unit:mm)

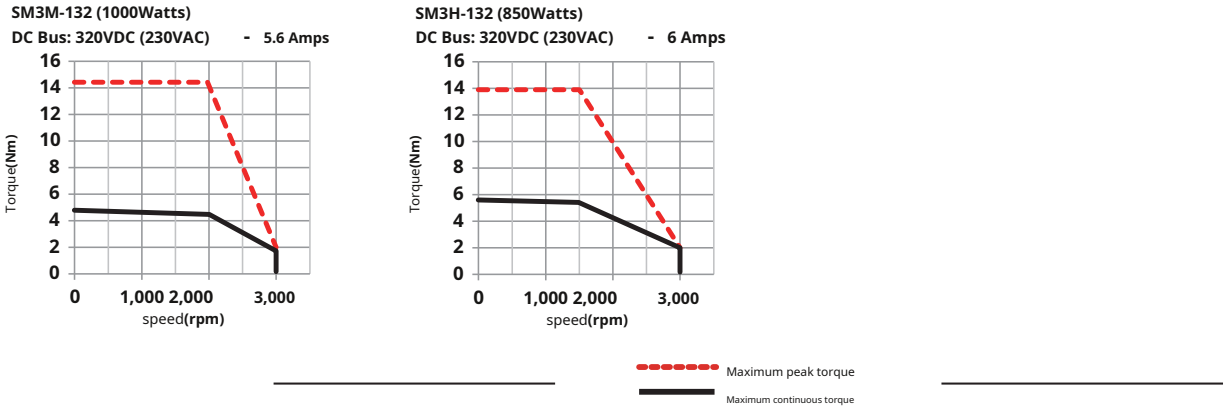
1)without brake



Brakeless model	L
SM3M-132AXNUV	137
SM3M-133AXNUV	137

Model with brake	L
SM3M-132AXBUV	170
SM3M-133AXBUV	170

◆ Torque curve



2.4 General regulations for motors

2.4.1 General specifications

Insulation level	Class F (155℃)
Protection level	IP65(Except shaft penetration part)
Installation conditions	Install indoors, avoid direct sunlight, corrosive and flammable gases
ambient temperature	Operating temperature:0℃-40℃; storage temperature: -20℃ -60℃
humidity	Storage and use:20-85%RH (No condensation)
altitude	altitude1000mthe following
vibration	49m/s₂the following,10-60Hz (Unsustainable use at resonance point)

2.4.2 Motor encoder specifications

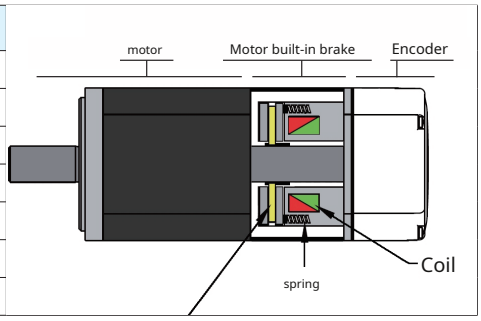
project	content
motor model	SM3*-****X***
voltageVCC	DC 4.5V~5.5V (Typ 5V)
External battery voltage	DC 3.3~5.5V (Typ 3.6V)
voltageVCCCurrent consumption	Type 160mA
External battery current consumption	Type 15μA
1Number of revolution pulses	2097152 (21-bit)
Multi-turn gyrometer quantity	65536 (16-bit)
way of communication	Half-duplex acyclic serial communication
Communication rate	4Mbps
Operating temperature	0~85℃

2.5 Brake specifications

The motor brake is used to prevent the motor from rotating when the brake is powered off..The most common use is when the motor is used to control a vertical load,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 servo motor with brake.

The brake is powered on,The armature is adsorbed,brake pad release,The motor can run normally;When the brake is de-energized,The armature will release, The brake pads are locked,The motor cannot rotate normally.

Machine base series	40mm	60mm	80mm	130mm
static friction torqueNm	0.32	1.5	3.2	18.5
Rated voltageVDC	twenty four			
Power consumptionW(20℃)	6.3	7.2	9.6	24.3
currentA	0.26	0.3	0.4	1.05
braking time	Standard air gap,20℃<70ms			
release time	<25ms			
Release voltage	18.5VDC max.(at 20℃)			



in normal operation,Do not use the motor's brake to slow down the motor,Will cause damage to the brake.

2.6Servo driver and motor selection reference information table

server Driver				
50pin I/OConnector				
EtherCAT		M54S-21A8RD	M54S-23A0RD	M54S-24A5RD
Matching motor				
motor Frame & Power				
		40Machine base,100W	-	-
		60Machine base,200W	60Machine base,400W	-
		-	-	80Machine base,750W
low inertia	without brake	SM3L-042AXNDV SM3L-061AXNPV	SM3L-062AXNPV	SM3L-083AXNPV
	with brake	SM3L-042AXBDV SM3L-061AXBPV	SM3L-062AXBPV	SM3L-083AXBPV
high inertia	without brake	SM3H-042AXNPV SM3H-061AXNPV	SM3H-062AXNPV	SM3H-083AXNPV
	with brake	SM3H-042AXBPV SM3H-061AXBPV	SM3H-062AXBPV	SM3H-083AXBPV

2.7Peripheral supporting cables and connector accessories

2.7.1Servo motor matching cables

motor model1*	describe	normal type model	Bending resistant type model2*	length (rice)
SM3L-041AX□D△ SM3L-042AX□D△ SM3L-061AX□P△ SM3L-062AX□P△ SM3L-083AX□P△ SM3L-084AX□P△ SM3H-041AX□P△ SM3H-042AX□P△ SM3H-061AX□P△ SM3H-062AX□P△ SM3H-083AX□P△	Encoder line For absolute value systems With battery	2639-0100	2639-0100-C10	1
		2639-0200	2639-0200-C10	2
		2639-0300	2639-0300-C10	3
		2639-0400	2639-0400-C10	4
		2639-0500	2639-0500-C10	5
		2639-0800	2639-0800-C10	8
		2639-1000	2639-1000-C10	10
		2639-1500	2639-1500-C10	15
		2639-2000	2639-2000-C10	20
	Encoder line For incremental systems	2640-0100	2640-0100-C10	1
		2640-0200	2640-0200-C10	2
		2640-0300	2640-0300-C10	3
		2640-0400	2640-0400-C10	4
		2640-0500	2640-0500-C10	5
		2640-0800	2640-0800-C10	8
		2640-1000	2640-1000-C10	10
		2640-1500	2640-1500-C10	15
		2640-2000	2640-2000-C10	20
	Motor power line	1645-0100	1645-0100-C10	1
		1645-0200	1645-0200-C10	2
		1645-0300	1645-0300-C10	3
		1645-0400	1645-0400-C10	4
		1645-0500	1645-0500-C10	5
		1645-0800	1645-0800-C10	8
		1645-1000	1645-1000-C10	10
		1645-1500	1645-1500-C10	15
		1645-2000	1645-2000-C10	20
SM3L-041AXBD△ SM3L-042AXBD△ SM3L-061AXBP△ SM3L-062AXBP△ SM3L-083AXBP△ SM3L-084AXBP△ SM3H-041AXBP△ SM3H-042AXBP△ SM3H-061AXBP△ SM3H-062AXBP△ SM3H-083AXBP△	Motor brake wire	1646-0100	1646-0100-C10	1
		1646-0200	1646-0200-C10	2
		1646-0300	1646-0300-C10	3
		1646-0400	1646-0400-C10	4
		1646-0500	1646-0500-C10	5
		1646-0800	1646-0800-C10	8
		1646-1000	1646-1000-C10	10
		1646-1500	1646-1500-C10	15
		1646-2000	1646-2000-C10	20

1* □Indicates whether to have a brake△Indicates whether the oil seal is installed 2*Bending

resistant type -C10 1000Thousands of times

Bending test conditions:bending radius50mm,frequency40times/minute,journey1000mm

2.7.2Drive connector kit

name	model	illustrate
I/OConnector	MSOP-CN214P	CN2,14pinspring typeI/OConnector
Motor encoder connector	MSOP-CN310P	CN3,Drive side motor encoder connector
STOFunctional connector	MSOP-CN506P	CN5,6pinspring typeSTOConnector
Drive Connector Kit	MSOP-P109P	P1power connector,Adjustment handle

2.7.3Absolute Value Battery Kit

name	model	illustrate
Battery	MSOP-BA01	Use of motors with battery-type absolute encoders
Batteries and battery boxes	MSOP-BAKIT01	

2.7.4Communication cable

name	model	Length(meter)	illustrate
USBConfiguration line	2620-150	1.5	CN1,Servo drive andPCCommunication configuration line
IN(CN7)/OUT(CN6) communication line	2012-030	0.3	twisted pair,No shielding layer,Servo drive and controller communication cable,Servo drive communication cable between
	2012-300	3	
	2013-030	0.3	twisted pair,With shielding layer,Servo drive and controller communication cable,Servo drive communication cable between
	2013-300	3	

2.7.5Regenerative energy absorption resistor

model	Specification	illustrate
REG100W120R	100watt,120Europe	Back electromotive force absorption resistor
REG200W120R	200watt,120Europe	
REG300W120R	300watt,120Europe	

2.7.6 EMIfilter

model	Specification	illustrate
MSOP-EMI020	250VAC,20A	Driver AC input sideEMIfilter

3Install

3.1Storage conditions

Please note the following when storing:

- Please put this drive in the packaging box,Store in dry,no dust,Avoid places exposed to direct sunlight
- The storage environment temperature is -20℃ to +65between ℃
- The storage environment humidity is10%arrive85%within range,And no condensation
- Avoid storage in corrosive gas environments

3.2Installation conditions

The environmental conditions for using the driver of this product are:

1)The temperature is0℃ ~50℃.If the ambient temperature exceeds45When the temperature is above ℃,Please place it in a well-ventilated place.For long-term operation, it is recommended to45℃ The ambient temperature below,To ensure the reliable performance of the product.

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

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

4)vibration9.8m/s2the following

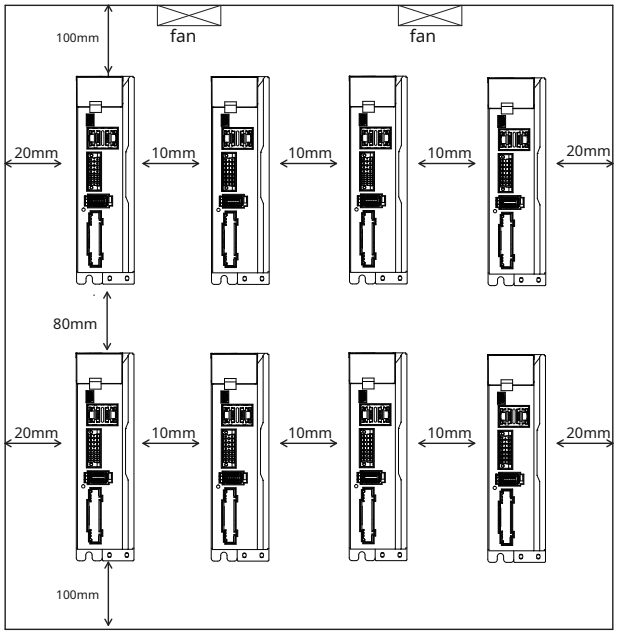
5)Do not use in corrosive gases,Flammable gas,Use this driver near combustible materials

6)Please install the driver in an indoor electrical control box that is free from water and direct sunlight.

7)Please avoid using this drive in places with dust

3.3Driver installation-space

- When installing the driver,Please reserve enough space on the top, bottom, left and right of the drive,Ensure good circulation cooling effect.
- Do not block the drive’s cooling holes.
- To ensure the temperature inside the electrical control box,It is recommended to install a cooling fan in the electrical control box.
- Please connect the driver to a good ground when installing.

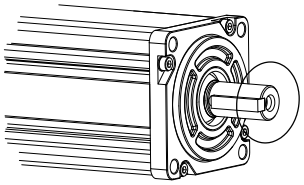


3.4Precautions for motor installation

3.4.1Encoder and bearing protection

- To prevent damage to the encoder and bearings,Please do not knock the motor body and shaft during installation.

- It is recommended to use a coupling designed specifically for servo motors,It provides some cushioning during deflection or deflection
- When installing the coupling,Please wipe clean the anti-rust oil on the motor shaft end
- When using keyway,Please use the standard key in the motor packaging 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

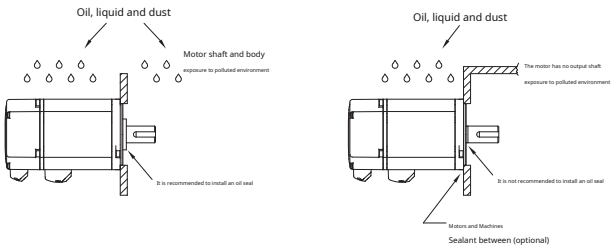


- When removing the pulley,Please use professional tools such as pulley remover,To prevent bearing damage
- When connecting the shaft,Please ensure required concentricity is achieved.If the concentricity is not good,The vibrations produced can damage bearings and encoders.
- The load exerted on the motor in the axial or radial direction,Do not exceed the range specified in the specifications,Please refer to the specification sheet of each servo motor.
- The material of the servo motor output shaft is not rust-proof.,Although grease has been used for anti-rust protection before leaving the factory,,But if the storage time exceeds six months,To ensure that the motor shaft is protected from rust,Please check the condition of the motor shaft regularly every three months and replenish appropriate anti-rust grease in a timely manner..

3.4.2Precautions for motors operating in oil and water environments

- Do not use oil,Water enters the inside of the motor
- Do not place cables in water or oil
- Because the motor shaft penetration part and the motor lead wire are notIP65Protective design,Please ensure that no water or oil enters the inside of the motor from such parts
- Motor industrial grade skeleton oil seal can block pollutants (oil,impurities) to extend motor life.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 certain resistance and torque loss to the rotation of the motor shaft.,It is recommended to derate the motor.

- In applications involving liquids,Please install the motor wiring port downwards



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

3.4.3wiring

- If using cable chains,Please use ultra-flexible cable.and make sure there is100mmThe bending diameter above
- Do not twist the cable
- When moving the motor,Do not pull on the cable
- Do not use the same conduit for the main circuit cable and the input/output signal cable/encoder cable.,Don't tie it together either.When wiring,Main circuit cables and input/output signal cables/encoder cables should be spaced apart30cmabove.

3.4.4 Motor temperature rise

Servo motors are rated when mounted on a standard heat sink and at an ambient temperature of40Ratings allowed for continuous operation at ℃.When installing the servo motor in a small device,Due to the reduced heat dissipation area of the servo motor,Temperatures may therefore rise significantly.

The standard heat sink dimensions of servo motors are as follows::

Motor frame size	power	Heat sink size
40mm	50W,100W	200*200*6Aluminum
60mm	200W,400W	250*250*6Aluminum
80mm	750W	250*250*6Aluminum
	1kW	300*300*12Aluminum
100mm	1Kw ~ 3Kw	300*300*12Aluminum
130mm	1Kw ~ 3Kw	400*400*20Made of iron

If the installation environment makes it difficult to use a large radiator,Or work in ambient temperatures exceeding specification requirements. You need to follow the following requirements:

- Do not operate at rated power,Choose a motor with more power than actually needed1~2twice the motor.
- Reduce the acceleration and deceleration of the work cycle,to reduce motor load.
- reduce workDuty Cycle.
- Use cooling fans or other methods for external forced air cooling of the servo motor
- When using a motor with an oil seal,The oil seal will cause certain resistance and torque loss to the rotation of the motor shaft.,And heat is generated due to the friction between the two,The required load torque needs to be the rated torque of the motor70%

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

4Wiring

4.1electromagnetic compatibility(EMC)

⚠	M54SHigh-speed switching components are used inside the servo drive,High-frequency or low-frequency interference will occur during normal operation.,and interfere with peripheral devices through conduction or radiation.
	There is also a low voltage unit inside the servo drive,Most likely affected by noise interference from drive peripherals. Interfered signals may cause devices to behave in unexpected ways.

Follow the electromagnetic compatibility regulations described in this manual when installing and wiring,This product can comply with the following specifications:

EN 61800-3

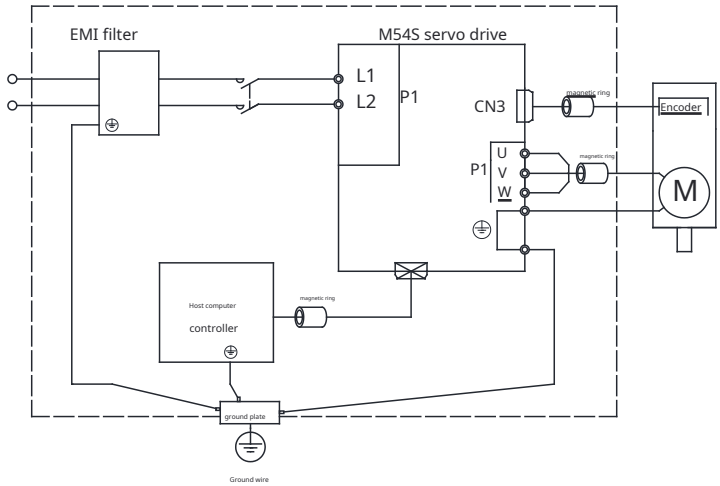
To prevent mutual electromagnetic interference between the servo drive and its peripheral equipment,The following countermeasures can be taken based on.

- On the power input side, match the appropriateEMINoise filter.
- Please make sure the driver and motor are well grounded,And it is best to use a ground wireAWG10The above cables.
- Do not use the same conduit for the main circuit cable and the input/output signal cable/encoder cable.,Don't tie it together either.When wiring,Main circuit cables and input/output signal cables/encoder cables should be spaced apart30cmabove.
- Please use twisted pair wires or multi-core twisted pair shielded wires for input and output signal cables and encoder cables..
- The input and output signal cable length is3mthe following,The encoder cable is in20mthe following.
- Do not use welding machines,Electrical discharge machines, etc. use the same power supply.Even if it is not the same power supply,When there is a high frequency generator nearby, Please connect a noise filter to the input side of the main circuit power cable and control power cable..

4.1.1 EMINoise filtering

Noise filters are installed correctly,Interference can be minimized.RecommendedMOONS'recommendedEMIfilter,in order to maximize the inhibitory effect.

The following are recommendedEMCProtection wiring diagram.



In addition to installation and wiring according to the contents of the manual,Also need to pay attention:

1)When using metal mounting backplate,Remove paint layer from contact surfaces

2)servo drive andEMIThe filter is mounted on the same metal backplane

3)as short as possibleEMIWiring length between filter and servo drive

4)Please route the input and output wires separately.,Don't bundle them together

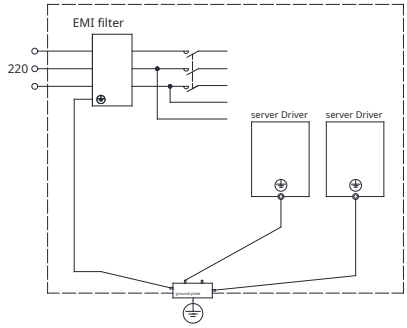
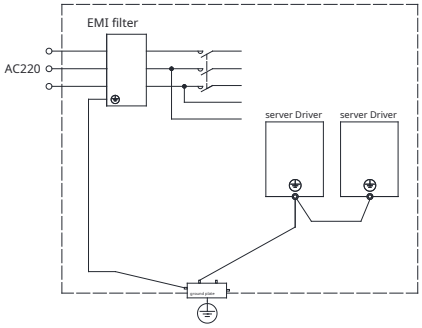
5)The noise filter must be well grounded

6)driver input,Output signal cable,For power lines, please install the ferrite magnetic ring as shown in the picture above to obtain betterEMCEffect

4.1.2 Grounding treatment

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

- Must be grounded at a single point in parallel

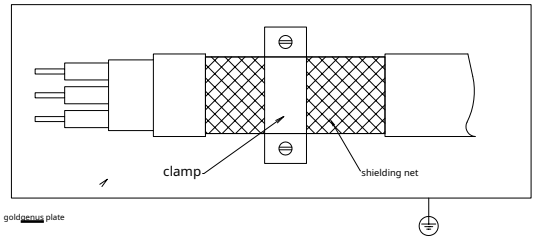
Correct grounding	wrong ground
	

- Power extension cable between driver and motor,Use shielded cables
- The shielding network of the motor power line must be grounded and connected to the ground terminal of the driver

4.1.3 Shielding treatment of motor cables

Choose motor wires with shielding nets and properly installed installation shielding nets.,can get betterEMCeffect and suppression of interference effects.Please note the following points:

- Use shielded cables (it is better if there is a double isolation layer)
- The shielding nets at both ends of the motor cable must be grounded with the shortest distance and the largest contact area.,Use clamps to fix the shielding nets at both ends of the motor cable to the metal plane as shown below.,Please see the connection method below.
- The protective paint needs to be removed where the clamp is fixed to the metal surface.,to ensure good contact,Please see the picture below.

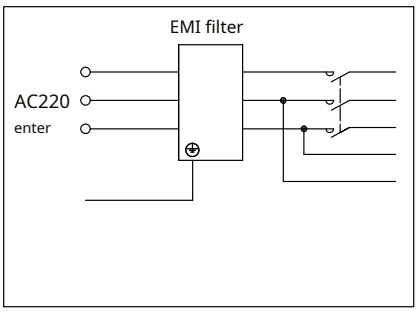
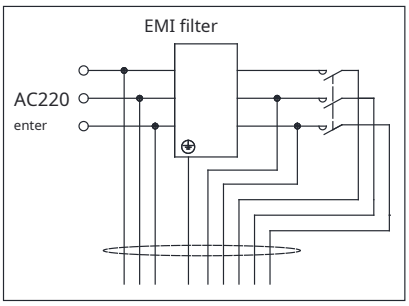


4.1.4 EMI Recommended models of noise filters

When the servo drive is running normally,will produce electromagnetic interference.To prevent interference with external sensitive equipment,Choose appropriateEMINoise filter,Interference can be minimized

Notice:

- Please select a noise filter that matches the driver power
- Please route the power input wire and output wire separately.Do not enter,Bundle the output wires together and put them in the same wire trough.

Correct routing	Wrong wiring
	

The following noise filters can be selected.

MOONS'Optional models	Specification	manufacturer	describe
MSOP-EMI020	250VAC,20A	LCR	EMINoise filter

■ Other recommended models

Drive model	Main circuit power supply	manufacturer	Filter model
M54S-21A8RD	Simplex	TYCO	3ET1
M54S-23A0RD		TYCO	6ET1
M54S-24A5RD		TYCO	6ET1
M54S-26A0RD		TYCO	10ET1

4.1.5ferrite magnetic ring

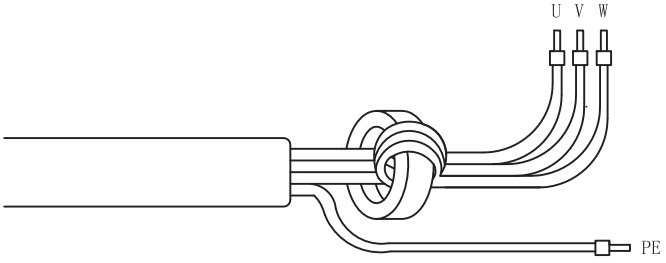
Ferrite magnetic ring, also referred to as magnetic ring,Can effectively absorb radiation interference from wire beams.

Magnetic rings have different impedance characteristics at different frequencies,Generally, the impedance is very 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.,Solve 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 signals through the magnetic ring,Convert high frequency components into heat loss,This creates a low-pass filter,Produce greater attenuation of high-frequency noise,The impedance of useful signals at low frequencies can be ignored,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.,Thereby enhancing the use effect of the magnetic ring.However, too many turns will cause excessive losses and cause the temperature of the magnetic ring to rise too high..The recommended threading method and number of turns are as follows:

signal line	Wind the necessary number of turns on the magnetic ring. (2-3lock up)
Motor wire	Move the motorU/V/WThe phase winds around the magnetic ring2-3lock up. The ground wire and shielding net cannot be wound into the magnetic ring.
Encoder line	Wind the necessary number of turns on the magnetic ring. (2-3lock up)

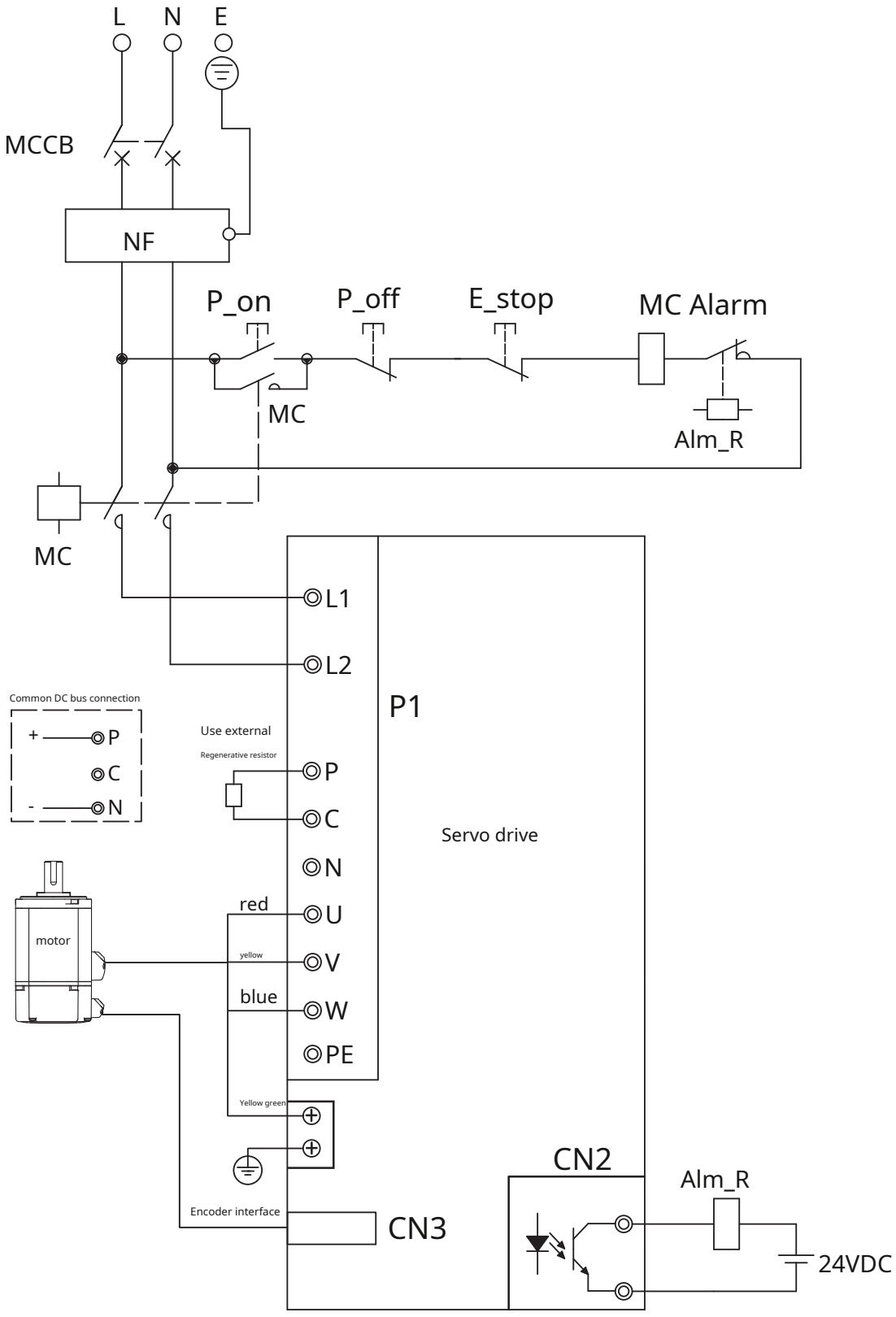


Recommended models of magnetic rings

MOONS'Optional models	Manufacturer model	manufacturer
MSOP-MR3035	ZCAT3035-1330	TDK

4.2 External main circuit wiring

4.2.1 Main circuit wiring diagram



4.2.2 Driver terminal description

<table>
<tr><th>type</th><th>name</th><th colspan="3">illustrate</th></tr>
<tr><td>P1</td><td>L1,L2</td><td colspan="3">Control electricity and power circuit power supply,Connect single-phase AC power</td></tr>
<tr><td rowspan="6">P1</td><td rowspan="4">U,V,W</td><td colspan="3">Motor connection terminal</td></tr>
<tr><td>Terminal mark</td><td>Thread color</td><td>illustrate</td></tr>
<tr><td>U</td><td>red</td><td rowspan="3">Motor three-phase power supply</td></tr>
<tr><td>V</td><td>yellow</td></tr>
<tr><td>W</td><td>blue</td></tr>
<tr><td rowspan="2">P,C,N</td><td>Multiple drives share the same DC bus</td><td colspan="2">PConnect to the positive pole of the power supply,NConnect to the negative pole of the power supply</td></tr>
<tr><td>Use external regenerative resistor</td><td colspan="2">The resistor is connected toPandCbetween</td></tr>
<tr><td>CN1</td><td>Mini USBinterface</td><td colspan="3">Connect toPCmachine</td></tr>
<tr><td>CN2</td><td>I/Oconnect</td><td colspan="3">Input and output signal connector</td></tr>
<tr><td>CN3</td><td>Encoder interface</td><td colspan="3">Motor encoder connection port</td></tr>
<tr><td>CN5</td><td>STOinterface</td><td colspan="3">Safe torque stop function connector</td></tr>
<tr><td>CN6</td><td>RS-485interface
(onlyRS-485(Models available)</td><td colspan="3">RS-485modelRS-485Communication Interface</td></tr>
<tr><td>CN7</td><td>RS-485interface
(onlyRS-485(Models available)</td><td colspan="3">RS-485modelRS-485Communication Interface</td></tr>
</table>

4.2.3 Please pay attention to the following when wiring

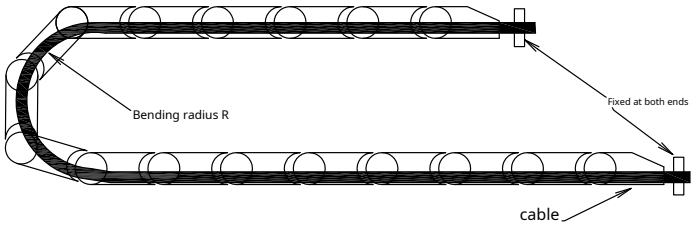
- Please make sure the driver and motor are well grounded,And it is best to use a ground wireAWG10The above cables.
- Grounding must be a single point grounding.
- examineL1,L2Is the wiring correct?,and connect to the correct voltage.
- make sureU,V,WThe order is red,yellow,blue,Wrong sequence will cause the motor to not rotate or rotate randomly..
- It is recommended that the driver power supply passes through an isolation transformer and filter,To ensure safety and anti-interference ability.
- An emergency stop circuit must be provided,Make sure that when there is a fault,Can cut off the power immediately.
- There is a large-capacity capacitor in the servo drive,Even after power outage,High pressure will remain,After power outage5Do not touch the exposed parts of the drive and motor terminals within 10 minutes.
- Do not use the same conduit for the main power cable and the input/output signal cable/encoder cable.,Don't tie it together either.When wiring,Main power cables and input/output signal cables/encoder cables should be spaced apart30cmabove.Too close a distance may cause malfunction.
- Please use twisted pair wires or multi-core twisted pair shielded wires for input and output signal cables and encoder cables..
- The maximum wiring length of the input/output signal cable is3m,The maximum wiring length of the encoder cable is20m.

4.2.4 Precautions for using drag chain cables

When the motor cable needs to be moved or when the cable is installed in a drag chain,Please use special flexible and bend-resistant cables.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 choose cables that meet the required bending resistance
- Cable bending radiusRGenerally in the outer diameter of the cable10more than times
- Avoid pulling on cables,When wiring inside the drag chain,Do not fasten or tie,To prevent the cable from being pulled due to insufficient bending radius during bending
- Please bundle the cables at both ends of the drag chain and where the mechanical parts are fixed.



- Wiring within drag chain,Not too dense,Make sure the cable occupies less than60%
- Avoid mixing cables with extremely different outer diameters,If you really need hybrid cabling,Please set up the baffle

4.2.5 Recommended wire

- It is recommended to use pressure-resistant for the main circuit600V,75Insulated wires above ℃
- Be sure to choose wires that use the corresponding current,Prevent wires from overheating

4.2.5.1 Recommended wire

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

Drive and matching servo motor		Rated power (W)	Wire diameter(AWG)					
			ConnectorP1			ConnectorCN3	- -	
			L1/L2	U/V/W	P,C	Encoder	brake	Ground wire
M54S-21A8RD M54S-23A0RD	SM3L-042AX□D△	100	2.0mm^2 (AWG14)	0.75~2.0mm^2 (AWG14 ~ 18)	1.25~2.0mm^2 (AWG14 ~ 16)	0.2mm^2 (AWG24)	0.5mm^2 (AWG20)	2.0~5.3mm^2 (AWG10 ~ 14)
	SM3H-042AX□P△							
	SM3L-061AX□P△	200						
	SM3H-061AX□P△							
M54S-23A0RD	SM3L-062AX□P△	400						
	SM3H-062AX□P△							
M54S-24A5RD	SM3L-083AX□P△	750						
	SM3H-083AX□P△							
M54S-26A0RD	SM3L-084AX□P△	1000	2.0mm^2 AWG14	2.0~3.5mm^2 AWG12~14	2.0~3.5mm^2 AWG12~14			
	SM3L-102AX□P△							
	SM3M-132AX□P△							
	SM3H-132AX□P△	850						

□Indicates whether to use brakes,△Is the oil seal installed?

4.2.5.2 Crimp terminal

Please use insulated pin terminals for the power connector.

◆ Pin type	◆ Sleeve type	◆ Parallel terminal:Applicable when two wires are merged into one terminal
		

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

  Wire type for the connector:AWG14~AWG18 Applicable

  wire outer diameter for connector:ø2.1~4.2mm

4.2.6 Ground terminal

- for betterEMCEffect,please use5.3mm2/AWG10Special copper conductor cable
- please useOtype cold press terminal
- Ground terminal tightening torque

Drive model	Ground screw	
	Specification	Tightening torque
M54S-21A8** M54S-23A0** M54S-24A5** M54S-26A0**	M4	1.4 Nm

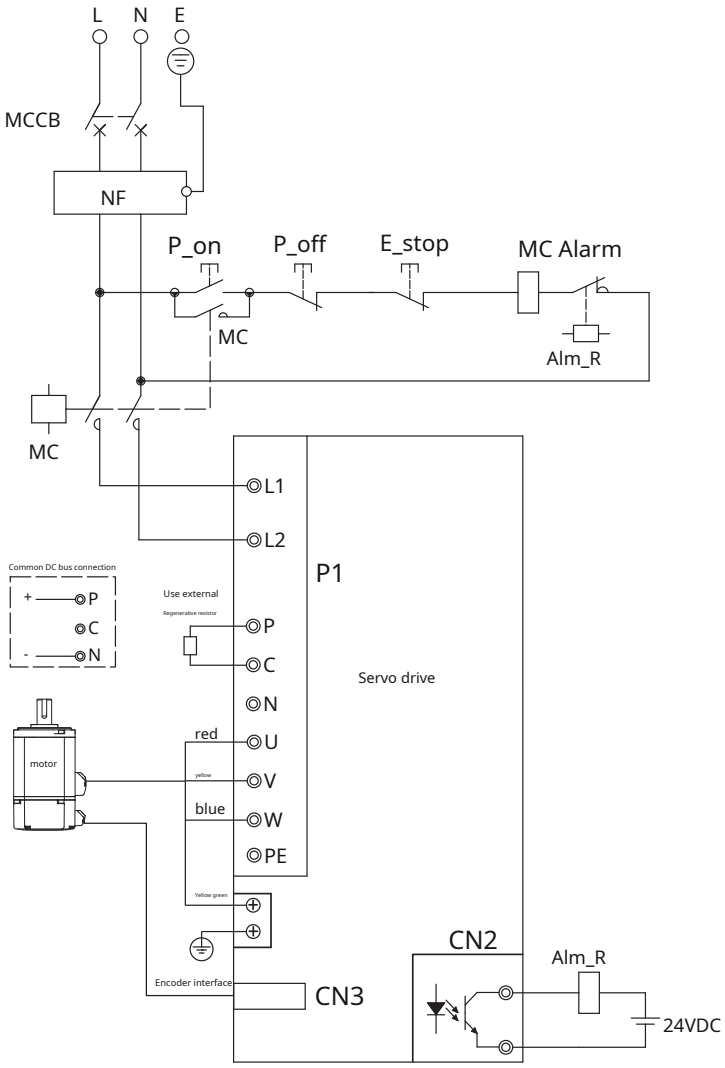
Notice:

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

4.3 P1--Driver power wiring method

M54SSeries AC servo drive power supplies support single-phase220VACConnection.

■ AC220VSingle phase connection method



In the picture:

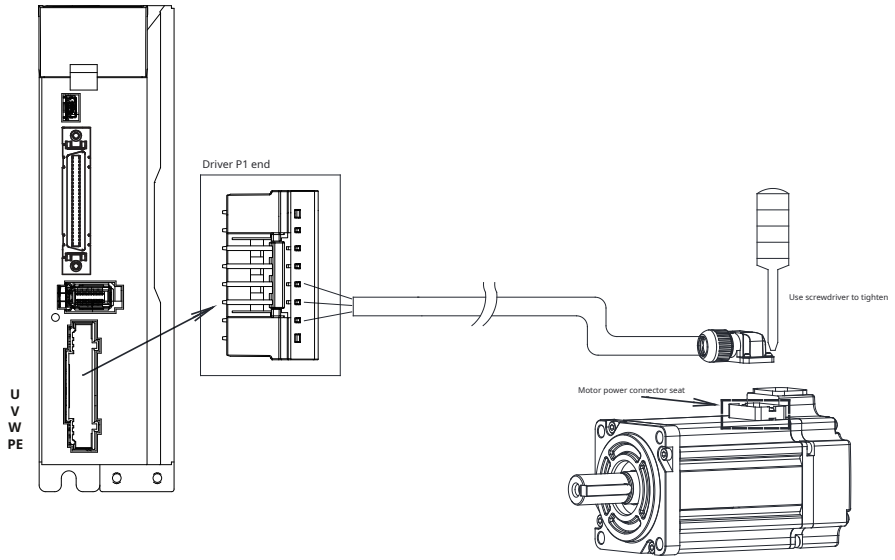
name	illustrate		name	illustrate
MCCB	breaker		E_stop	emergency stop switch
NF	EMIfilter		MC	AC contactor
P_on	Power Onswitch		Alm_R	Driver alarm relay
P_off	Power Offswitch		Alarm	Driver alarm relay normally closed contact

■ Peripheral equipment capacity for wiring

driver	Voltage specifications (VAC)	motor Rated output power (W)	Drive power capacitykVA (at rated load)	breaker Rated current (A)	contactor Rated current (A)
M54S-21A8RD	Simplex220	100	0.4	6	9A (3P+1a)
		200	0.5		
M54S-23A0RD		400	0.9	10	
M54S-24A5RD		750	1.3	16	
M54S-26A0RD		1000	1.5	20	

4.4 P2--How to connect the driver and motor power lines

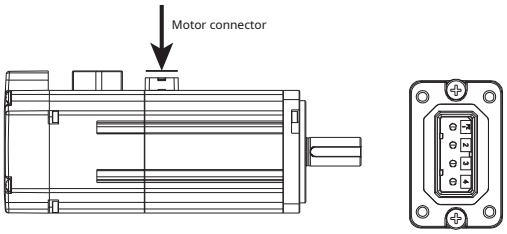
4.4.1Driver and motor power line connection block diagram



4.4.2Motor power line connector definition

4.4.2.1 80mmPin definitions of motor power connectors at the base and below

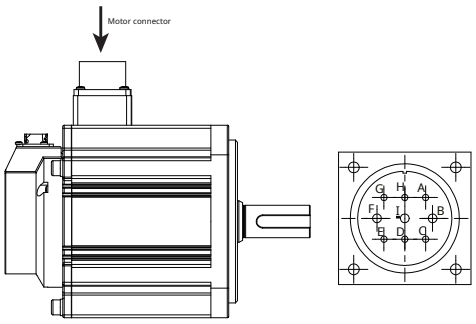
motor model	PIN.No	name	definition
SM3L-042AX□D△ SM3L-061AX□P△	1	PE	Motor ground wire
SM3L-062AX□P△ SM3L-083AX□P△ SM3L-084AX□P△	2	U	UMutually
SM3H-041AX□P△ SM3H-042AX□P△	3	V	VMutually
SM3H-061AX□P△ SM3H-062AX□P△ SM3H-083AX□P△	4	W	WMutually



□Indicates whether to use brakes,△Is the oil seal installed?

4.4.2.2 130mm Base motor power connector pin definition

motor model	PIN.No	name	definition
SM3L-102AX□U△ SM3M-132AX□U△ SM3H-132AX□U△	A	PE	Motor ground wire
	F	U	UMutually
	I	V	VMutually
	B	W	WMutually
	C	Brake 1	Motor holding brake1
	D	Brake 2	Motor holding brake2

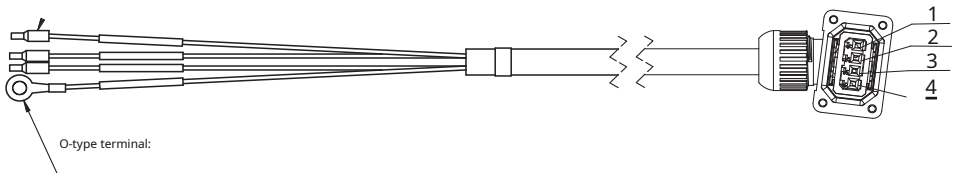


□indicates whether to use brakes,△Is the oil seal installed?

4.4.3 Power line wiring definition

4.4.3.1 80mm Definition of wiring of motor power lines at the base and below

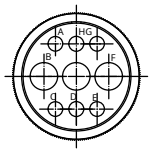
Terminal: E1006(K S)



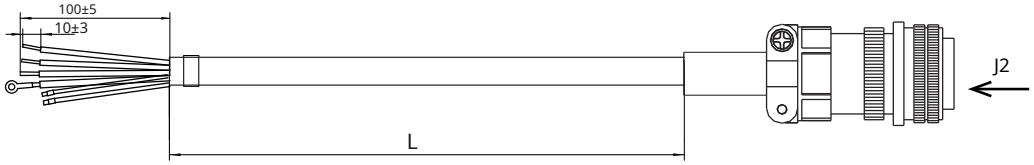
drive side	Signal	color	Motor side mating connector
			DGFA4S-B1-00A(H)
3	U	red	2
2	V	yellow	3
1	W	blue	4
Ground screw	PE	yellow/green	1

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

4.4.3.2 100mm Definition of connection of machine base and upper motor power line



J2 right view

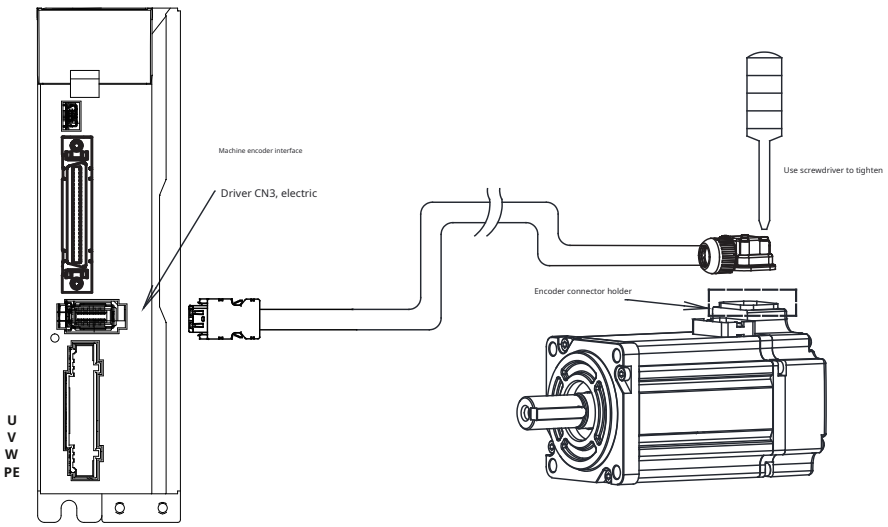


drive side	Signal	color	Motor side mating connector
3	U	red	F
2	V	yellow	I
1	W	blue	B
PE	FG	yellow/green	A
	Brake 1	red	C
	Brake 2	black	D

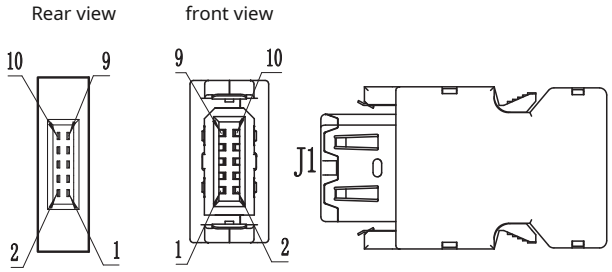
Notice:make sure**U**,**V**,**W**The order is red,yellow,blue,Wrong sequence will cause the motor to not rotate or rotate randomly.

4.5 CN3--How to connect the driver and motor encoder lines

4.5.1Driver and motor encoder line connection block diagram



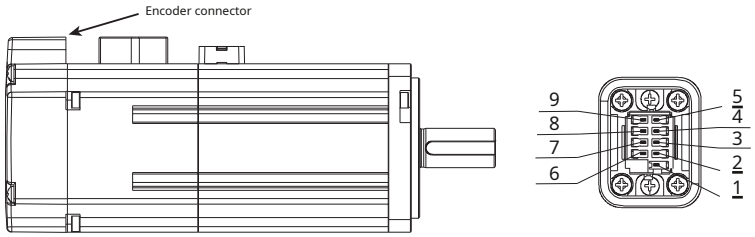
4.5.2 CN3-Encoder interface definition



pin	name	definition
1	Encoder +5V	Encoder power supply+5V
2	GND	Encoder power ground
7	CLK-	CLK-Signal
8	CLC+	CLC+Signal
9	SD-/DATA-	SD-Signal,orDATA-Signal
10	SD+/DATA+	SD+Signal,orDATA+Signal
SHELL	Shield	shield

4.5.3 Motor encoder connector specifications

4.5.3.1 80mm Pin definitions for motor encoder connectors at base and below

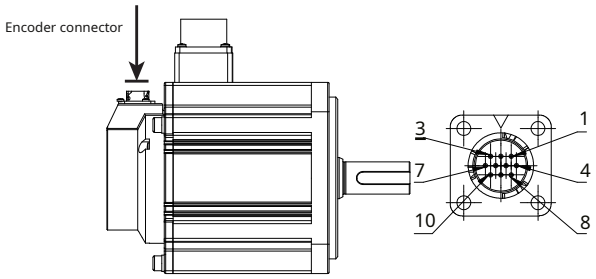


motor model	PIN.No	name	definition
SM3L-042AX□D△	1	Shield	
SM3L-061AX□P△	2	- -	- -
SM3L-062AX□P△	3	VCC	Encoder power supply5V
SM3L-083AX□P△	4	VBAT	Absolute encoder battery positive pole
SM3L-084AX□P△	5	SD+	Encoder communication data+
SM3H-041AX□P△	6	- -	- -
SM3H-042AX□P△	7	VCC_GND	Encoder power ground
SM3H-061AX□P△	8	VBAT_GND	Absolute encoder battery negative pole
SM3H-062AX□P△	9	SD-	Encoder communication data-
SM3H-083AX□P△			

□Indicates whether to use brakes,△Is the oil seal installed?

Notice:Do not make any connections to undefined pins

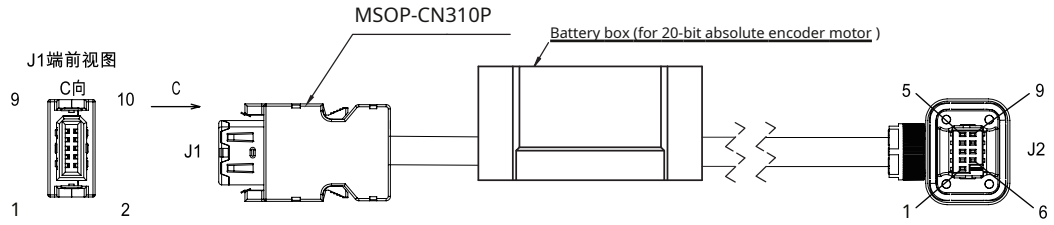
4.5.3.2 130mm Pin definitions of motor encoder connectors on base and above



motor model	PIN.No	name	definition
SM3L-102AX□U△ SM3M-132AX□U△ SM3H-132AX□U△	1	VCC	Encoder power supply5V
	2	VCC_GND	Encoder power ground
	3	SD+	Encoder communication data+
	4	SD-	Encoder communication data-
	5	VBAT+	Absolute encoder battery positive pole
	6	VBAT_GND	Absolute encoder battery negative pole--
	10	Shield	Shield ground
	7,8,9	NC	- - -

4.5.4 Encoder extension cable definition

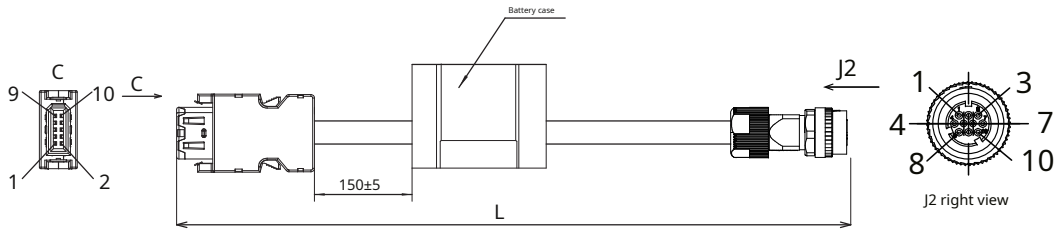
4.5.4.1 80mm Definition of wiring for motor encoder lines at base and below



Applicable motor encoder type	drive side J1terminal	Battery	Signal	color	Motor side J2terminal
-Xtype:21bitAbsolute value magnetism	1	- -	VCC	red	3
	2	- -	VCC_GND	black	7
	- -	battery positive	VBAT	green	4
	- -	Battery negative pole	VBAT_GND	orange	8
	9	- -	SD-	blue black	9
	10	- -	SD+	blue	5
	- -	- -	Shield		1

Notice:Do not make any connections to undefined pins

4.5.4.2 100mm Definition of wiring for motor encoder lines on base and above



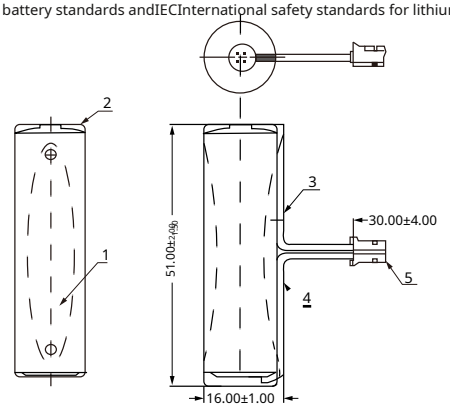
Applicable motor encoder type	drive side J1terminal	Battery	Signal	color	Motor side J2terminal
-Xtype:21bitAbsolute value magnetism	1	- -	VCC	red	1
	2	- -	VCC_GND	black	2
	- -	battery positive	VBAT	yellow	5
	- -	Battery negative pole	VBAT_GND	Yellow and black	6
	9	- -	SD-	blue black	3
	10	- -	SD+	blue	4
	- -	- -	Shield		10

Notice:Do not make any connections to undefined pins

4.5.5 Absolute encoder battery

M54Sseriestwenty oneWhen the absolute value encoder motor is used in a multi-turn absolute value system,It is necessary to use battery power to record multiple lap data when the driver is powered off.,After powering on, the driver calculates the absolute position of the mechanical load through the absolute position of the encoder.,No need to repeat mechanical origin return operation.

When using our company's encoder cable with battery box,Built-in battery in battery boxMSOP-BA01,conform toULLithium battery standards andIECInternational safety standards for lithium batteries,Please refer to the picture below for battery dimensions..



■ battery replacement

Batteries that have been used for a long time are at risk of electrolyte leakage,It is recommended to replace the battery every two years.It is recommended to replace the battery while the drive is powered on,Otherwise, after removing the battery,The absolute value position of the motor encoder is lost due to no power supply..

■ Battery selection

Please refer to the information in the table below to choose the battery of appropriate specifications..

Battery selection specifications	Projects and units	Rating			illustrate
		minimum value	Typical value	maximum value	
Output specifications 3.6V,2.7Ah	External battery voltage (V)	3.3	3.6	5	Standby working time
	Battery fault voltage (V)	— —	2.8	— —	
	Battery alarm voltage (V)	— —	3.2	— —	
	Circuit current consumption (μA)	— —	2	— —	During normal working
		— —	10	— —	Standby working time,axis stationary
		— —	30	— —	Standby working time,axis rotation
	Operating environment (℃)	0	— —	40	The same as the motor ambient temperature requirements
	Storage environment(℃)	- 20	— —	60	To

■ Battery usage precautions

1,Correctly connect the positive pole,negative electrode.

2,If a battery that has been used for a long time or a battery that has become unusable is installed in the machine,Liquid leakage may occur,Not only will it corrode surrounding components,And there are risks such as short circuit,It is recommended to replace it regularly(reference period:It is recommended to replace it every two years). 3,It is prohibited to disassemble the battery,To avoid electrolyte scattering and affecting personal safety. 4,Do not throw batteries into fire,To avoid the risk of explosion. 5,Battery is positive,It is strictly prohibited to short circuit between negative poles

6,Do not charge the battery.

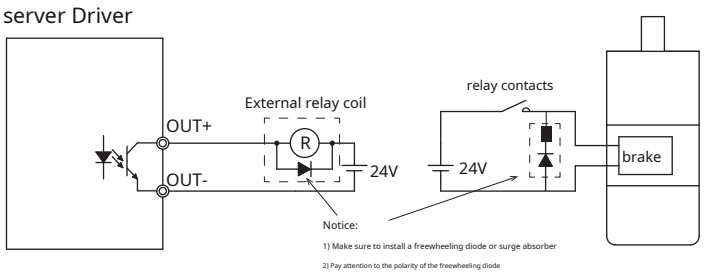
7,It is prohibited to weld directly on the battery surface,Batteries with pre-installed solder pins or leads should be used. 8,Please discard the replaced battery according to local regulations..

4.6 Motor connection method with electromagnetic brake

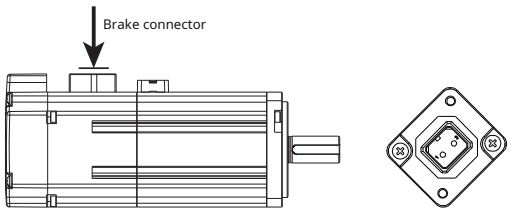
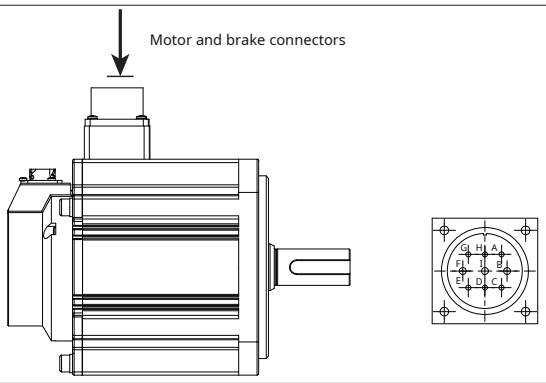
Servo motors are used in loads such as vertical axes,When the motor is not enabled or powered off,In order to prevent the mechanical mechanism driven by the motor from falling due to gravity and other reasons,Requires servo motor with electromagnetic brake.

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

4.6.1 Connection diagram



Motor sidePINfoot definition

motor model	PIN.No	name	definition	
SM3L-042AXBD△ SM3L-061AXBP△ SM3L-062AXBP△ SM3L-083AXBP△ SM3L-084AXBP△	1	24V	Brake power+	
SM3H-041AXBP△ SM3H-042AXBP△ SM3H-061AXBP△ SM3H-062AXBP△ SM3H-083AXBP△	2	0V	Brake power -	
SM3L-102AX□U△ SM3M-132AX□U△ SM3H-132AX□U△	C	24V	Brake power+	
	D	0V	Brake power -	

4.6.2 Precautions for using brake motor

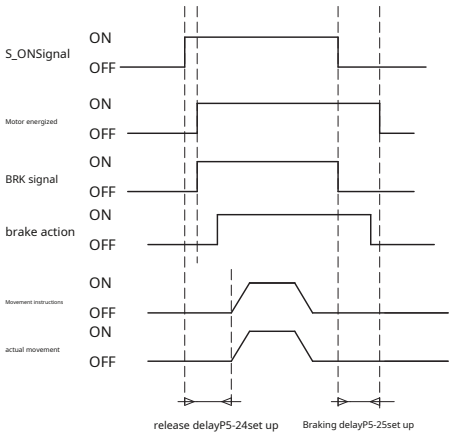
- The signal from the driver controlling the brake cannot directly drive the motor's brake.,Must be provided externally24VPower supply and external relay.It's best not to interact withIOsignal sharing24Vpower supply,Prevent damage from surge voltage caused by motor brake actionIOcircuit
- The digital output signal of the driver is an optocoupler output,maximum30VDC,100mA.When controlling inductive loads such as relays,Be sure to install a freewheeling diode or surge absorber,Otherwise, the output pin circuit of the driver will be damaged.,As a result, the signal cannot be output normally
- The electromagnetic brake is normally closed,When the brake is not supplied with power,Motor shaft cannot rotate
- Electromagnetic brake has no polarity requirements
- When the brake is braking/releasing,will make a clicking sound,Will not affect use
- Recommended Use0.5mm$_2$(AWG16)The above cables,Prevent voltage drop caused by too thin cables.

◆ Brake specifications are as follows:

Motor Power	Holding torque Nm	Continuous current when released A	Continuous power consumption when released W@20℃	Rated voltage VDC	release time ms	Release voltage VDC	braking time ms
50W	0.32	0.26	6.3	24V±10%	40	15	20
100W	0.32	0.26	6.3		40	15	20
200W	1.5	0.3	7.2		40	15	20
400W	1.5	0.3	7.2		40	15	20
750W	3.2	0.4	9.6		70	15	25
1000W	3.2	0.4	9.6		70	15	25
850W~1kW	18.5	1.05	24.3		120	16	60

4.6.3 Brake action timing

Because the brake has an action delay when releasing and braking,To avoid damage to the brake,Need to pay attention to the timing of actions during use.



Release delay and brake delay times are availableLunasoftware to set.Or by modifying the parametersP5-24and parametersP5-25to set.

4.7 P2-Regenerative energy absorption resistor wiring method

When the motor's torque direction and speed direction are opposite,The motor is in a power generation-like mode,The external energy is converted into voltage by the motor end and fed back to the driver.,causing the driver bus voltage to increase,The energy in this process is called regenerative energy.For example, when the motor is decelerating.Excessive bus voltage will damage the driver,Therefore, when the bus voltage is higher than a certain limit,A regenerative energy absorption resistor must be used to consume this part of the voltage,Otherwise, the driver will generate an overvoltage alarm..

M54SSeries servo drives750WModels and above have built-in regenerative energy absorption resistors.,All models can be connected to external snubber resistors,The relevant specifications of the built-in regenerative resistor are as follows::

driver(kW)	Built-in snubber resistor		External snubber resistor
	Resistance (Ohm)	Built-in power absorption resistor P_R(Watt)	Minimum resistance (Ohm)
M54S-21A8**	-	-	40
M54S-23A0**	-	-	40
M54S-24A5**	50	50	100
M54S-26A0**	50	50	100

4.7.1 How to calculate regenerative energy

A.reciprocating motion

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

. The energy during deceleration is divided into two parts:

A)The energy generated when the motor decelerates

B)Energy generated when external load decelerates

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

1)Calculate the energy of the motor during deceleration E_M

The following table isM54SSeries servo motors without external load,from3000rpmslow down to0rpm,energy generated.

Motor series	Motor Power (W)	Servo motor model	Rotor inertia J_M (10^{-4}Kg·m^2)	3000rpmslow down to0rpm energy generated E_M(J)	Maximum energy absorbed by driver capacitor E_C(J)
low inertia	100	SM3L-042A****	0.043	0.21	8.7
	200	SM3L-061A****	0.152	0.75	8.7
	400	SM3L-062A****	0.243	1.20	13
	750	SM3L-083A****	0.856	4.22	27
	1000	SM3L-084A****	1.07	5.27	27
high inertia	100	SM3H-042A****	0.655	3.23	8.69
	200	SM3H-061A****	1.37	6.75	13.04
	400	SM3H-062A****	13.9	68.52	40.6
	750	SM3H-083A****	19.4	95.64	40.6
	850	SM3H-132A****	23.3	114.86	40.6

2)Calculate the energy generated by the deceleration of the dragged load**E** **L**

Assume that the inertia of the load is the inertia of the motorNtimes,Then the dragged load is from3000rpmslow down to0rpmhour,The energy generated is:

$$E_L = N \times E_M$$

ifE +E < E,That is, during the deceleration process,The energy generated by the motor and the driven load is less than the energy that the driver capacitor can absorb.,There is no need to worry about the problem of regenerative energy absorption.

3)Calculate the average power required for the regenerative energy absorption resistor**P** **AV**

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

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

4)judge

when$P_{AV} < P_R$,That is, the total power generated during deceleration is less than the power of the regenerative energy absorption resistor built into the driver.,There is no need for external power absorption block.

when$P_{AV} > P_R$,That is, the total power generated during deceleration is greater than the power of the regenerative energy absorption resistor built into the driver.,An external power absorber is required block,In order to reasonably control the temperature rise of the external absorption resistor,The minimum resistor power is$P_{AV}/0.5$.

◆ Calculation example:

Select400WofSM3L-062A****,The load inertia is the motor inertia15times,hypothesist$_{dec}$(Deceleration time + interval between two decelerations time) for0.5s,Every movement is made up of3000rpmslow down to0rpm,Then the required power of the absorption resistor is calculated as:

$E_M = 1.2J, E_C = 13.04J$

$E_L = N \times E_M = 15 \times 1.2 = 18J$

$P_{AV} = (1.2+18-13.04) / 0.5 = 12.32Watt$

because400Wdrive,Built-in snubber resistor power$P_R$for40W,Therefore there is no need to connect an external snubber resistor.

B.External load torque drag motor,Motor continues negative power output

In most applications, the motor is doing positive work,That is, the torque output direction of the motor is consistent with the direction of rotation..in some special applications,The torque output direction of the motor will be opposite to the speed direction.,At this time, external energy will be fed back into the driver.Such as vertical downward movement of large loads,In order to meet the position requirements and speed requirements of the servo system,The motor will output an opposite force to overcome the gravity of the external load.long running time,The bus capacitor is full, Unable to continue absorbing regenerative energy,At this time, a regenerative resistor is needed to absorb these energy,The power calculation formula is as follows:

$$P_T = 2\pi T_M N_M$$

in:

T_M The torque output by the motor,unitNmNm is the speed

N_M output by the motor,unitrpsrevolutions per second

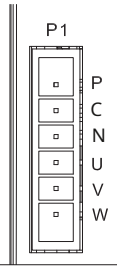
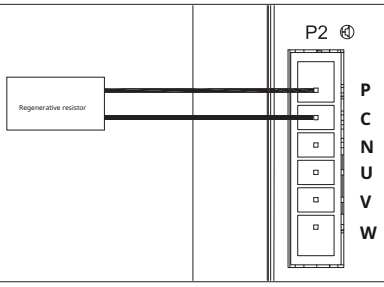
◆ Calculation example:

The torque output direction of the motor will be opposite to the speed direction.,When the motor output torque is0.6Nm,Torque2400rpm,At this time the power is: P =2 x 3.14 x 0.6 x 2400 / 60= 150.72Watt

At this time, an external snubber resistor is required,The minimum power is150.72watt.In order to reasonably control the temperature rise of the external absorption resistor,Select the minimum value for power 300watt.

4.7.2 Wiring method

in some applications,When the internal absorption resistor cannot absorb the regenerated electromotive force,To prevent driver overvoltage alarm,An external absorption resistor with higher power is required.

When using the driver's internal regenerative resistor	When using an external regenerative resistor
Please drive sideP1ConnectorP,CPort disconnected	Please connect the regeneration resistor toPandCsuperior
	

4.7.3 Drive setting parameters

The relevant parameters are as follows:

parameter	instruction	name	Numeric range	default value	unit	describe
P1-19	ZR	Regenerative absorption resistor value	10~32000	200	Ohm	Set the resistance value of the regenerative energy absorption resistor
P1-20	ZC	Regenerative absorbed 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	Set the continuous 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,Causes the drive to overvoltage,Alarms such as failure to absorb regenerative energy

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

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

4.8CN1 Host computer communication line

CN1port for drives withPCcommunication between machines.useLunasoftware,Control mode can be set,Change parameters,Online automatic tuning and other operations.

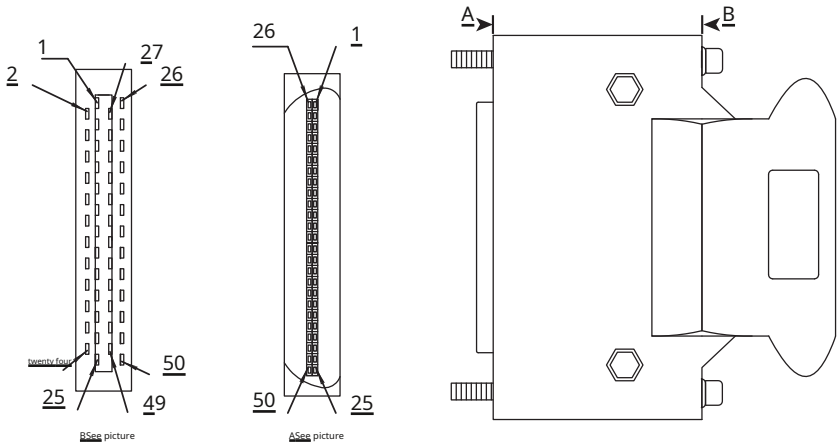
pin	logo	Function
1	+5V	USBpower supply
2	D-	data-
3	D+	Data+
4	—	reserve
5	GND	power ground

4.9CN2Input and output signal wiring

M54Sseries of AC servo drivesCN2port is used to connect input and output signals, use50pinhigh-density connectors.

4.9.1 CN2Input and output signal specifications

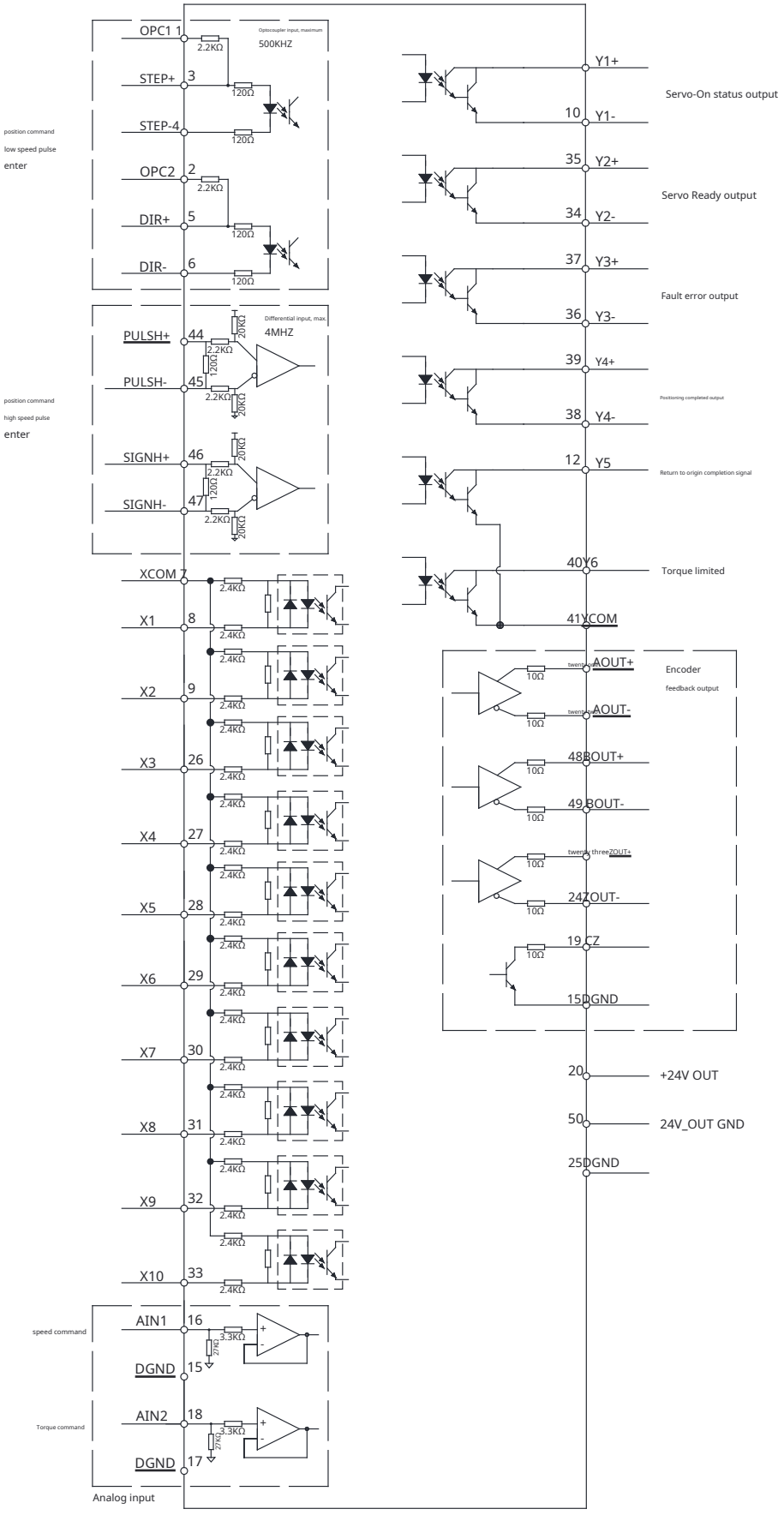
CN2The connector appearance is as follows:



The input and output signal specifications are as follows::

	Classification	describe
Digital signal	enter	10Optocoupler isolated universal input,commonXCOM,supportNPNorPNPinput signal,Input functions configurable via parameters,24VDC,20mA,Maximum input frequency5KHz
	output	6Optocoupler isolated universal output,supportNPNorPNPoutput.Output functions configurable via parameters, maximum 30VDC,100mA
Analog signal	enter	2road-10~+10VAnalog input,resolution12bit
Pulse signal	enter	2pulse input (optocoupler input,Line Receiverenter): ◆ Optocoupler input:support5VLow-speed single-ended or differential signaling,24Vopen collector pulse signal,minimum pulse width1μs,Maximum pulse frequency 500KHz ◆ Line Receiverenter:5VDifferential signaling,minimum pulse width0.125μs,Maximum pulse frequency4MHz
	output	4output(3roadLine Driveroutput,1open collector output) ◆ Line Driveroutput:EncoderA,B,ZFeedback differential output ◆ Open collector output:EncoderZMutually
+24VPower output		The driver can output24Vpower supply,The maximum load capacity is200mA

4.9.2 CN2 Input and output signal pin block diagram



4.9.3 CN2Input and output pin definitions

Pin number	Signal	illustrate	Pin number	Signal	illustrate	Pin number	Signal	illustrate
1	OPC1	Open collector input pull-up1	18	AIN2	Analog input2	35	Y2+	Digital output2+
2	OPC2	Open collector input pull-up2	19	OCZ	EncoderZSignal open collector pole output	36	Y3-	Digital output3-
3	STEP+	Position command pulse input+	20	+24V OUT	+24VPower output	37	Y3+	Digital output3+
4	STEP-	Position command pulse input-	twenty one	AOUT+	Encoder outputA+	38	Y4-	Digital output4-
5	DIR+	Position command pulse direction+	twenty two	AOUT-	Encoder outputA-	39	Y4+	Digital output4+
6	DIR-	Position command pulse direction-	twenty three	ZOUT+	Encoder outputZ+	40	Y6	Digital output6
7	XCOM	Digital input common point	twenty four	ZOUT-	Encoder outputZ-	41	YCOM	Digital output common point
8	X1	digital input1	25	DGND	digitally	42	N/C	N/C
9	X2	digital input2	26	X3	digital input3	43	N/C	N/C
10	Y1-	Digital output1-	27	X4	digital input4	44	PULSH+	High-speed position command pulse input+
11	Y1+	Digital output1+	28	X5	digital input5	45	PULSH-	High-speed position command pulse input-
12	Y5	Digital output5	29	X6	digital input6	46	SIGNH+	High-speed position command pulse direction+
13	DGND	digitally	30	X7	digital input7	47	SIGNH-	High-speed position command pulse direction-
14	DGND	digitally	31	X8	digital input8	48	BOUT+	Encoder outputB+
15	DGND	digitally	32	X9	digital input9	49	BOUT-	Encoder outputB-
16	AIN1	Analog input1	33	X10	digital input10	50	24V_OUT GND	24V_OUTofGND
17	DGND	digitally	34	Y2-	Digital output2-	-		

4.9.3.1position pulse signal

◆ low speed pulse signal**(**or open collector pulse input**)**

CN2-Pin number	Signal name		illustrate	Wiring
1	OPC1	Pulse signal input	◆ whenP3-03ofbit4set as"0"hour,Choose to use this position command input port ◆ Optocoupler input,support: 1)open collector pulse signal.5Vor24VDC 2)Low-speed differential pulse input,support5VDC ◆ The maximum pulse input frequency is500KHz. ◆ Support pulse & direction signals,CW/CCWSignal,A/Borthogonal signals ◆ use24Vopen collector pulse signal when,Need to useOPC1andOPC2 Hardware pull-up.	See chapter4.9.4 A1
3	STEP+			
4	STEP-			
2	OPC2	Pulse direction signal input		
5	DIR+			
6	DIR-			

◆ high speed pulse signal**(Line Driver**Dedicated to pulse input**)**

CN2-Pin number	Signal name		illustrate	Wiring
44	PULSH+	Pulse signal input	◆ whenP3-03ofbit4set as"1"hour,Choose to use this position command input port ◆ Differential input (Line Driver),Suitable for high-speed pulse signals with differential output, support5VDC,The maximum pulse input frequency is4MHz. ◆ Support pulse & direction signals,CW/CCWSignal,A/Borthogonal signals	See chapter4.9.4 A2
45	PULSH-			
46	SIGNH+	Pulse direction signal input		
47	SIGNH-			

4.9.3.2 Analog input signal

With two analog signal inputs.

CN2-Pin number	Signal name		illustrate	Wiring
16	AIN1	Analog signal input	Analog speed command -10V ~ +10V,express-3000 ~ +3000rpm,The setting range can be changed through parameters	See chapter4.9.6 A3
18	AIN2		Analog torque command in analog torque mode -10~+10V,express -100% ~ +100%motor torque output	
13,14 15,17,25	DGND		Reference ground for analog input signals	

4.9.3.3 Encoder frequency division output signal

The encoder frequency division output function is to convert the feedback signal of the motor encoder toA,B,Zway differential output,The number of pulses per revolution and pulse output frequency division ratio can be set through parameters..

CN2-Pin number	Signal name		illustrate	Wiring
twenty one	AOUT+	Encoder signal Pulse output	Convert the encoder feedback signal toA,B,ZThe method of differential output can set the number of pulses per revolution and the pulse output frequency division ratio through parameters.	See chapter4.9.7
twenty two	AOUT-			
48	BOUT+			
49	BOUT-			
twenty three	ZOUT+			
twenty four	ZOUT-			
19	OCZ		Set the encoder'sZThe signal is output as an open collector	
13,14 15,17,25	DGND		OCZoutput place	

4.9.3.4 Digital input signal

M54SSeries AC servo drives50PinHigh-density connector models feature10digital input signal.Each digital input signal can be configured for a specific function through parameters,and input level logic.

◆ specific function signal,For example, alarm clearing,Limit sensor input,Touch ProbeSignal input, etc..

◆ Universal input signal,as a universal input signal,no specific function

					Factory default		
CN2- Pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	enter logic * 1	default value
8	X1	digital input1	P5-00	MU1	CCW-LMT	Closed	7
9	X2	digital input2	P5-01	MU2	CW-LMT	Closed	5
26	X3	digital input3	P5-02	MU3	A-CLR	Closed	3
27	X4	digital input4	P5-03	MU4	S-ON	Closed	1
28	X5	digital input5	P5-04	MU5	C-CLR	Closed	17
29	X6	digital input6	P5-05	MU6	CM-SEL	Closed	9
30	X7	digital input7	P5-06	MU7	GPIN	Closed	0
31	X8	digital input8	P5-07	MU8	GPIN	Closed	0
32	X9	digital input9	P5-08	MU9	GPIN	Closed	0
33	X10	digital input10	P5-09	MUA	GPIN	Closed	0
7	XCOM	digital inputCOMend	-	-	Xinput common		

Note:

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

CLOSED:The driver digital input circuit forms a loop,Current flows into or out of the input pin,The driver receives the input signal

OPEN: The driver digital input circuit does not form a loop,No current flows into or out of the input pin,The driver does not receive an input signal

2.Please refer to the input signal wiring method.:**4.9.5 CN2**digital input,Output signal wiring instructions

4.9.3.5 Assignable functions to input signals

The functions and logic comparison table that can be assigned to the input signal are as follows:.parameterP5-00arriveP5-09Digital input definedX1arriveX10function,Write the values corresponding to the functions in the table below into the above parameters to set the digital input functions..

Signal name	abbreviation symbol	Setting values 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 switching	CM-SEL	9	10
Gain switching	GAIN-SEL	11	12
emergency stop	E-STOP	13	14
Return to origin start	S-HOM	15	16
Position error counter clear input	C-CLR	17	18
Torque limit input	TQ-LMT	19	20
Zero speed clamp input	ZCLAMP	twenty one	twenty two
Pulse input prohibition input	INHP	25	26
Multi-terminal speed selection input1	SPD1	27	28
Multi-terminal speed selection input2	SPD2	29	30
Multi-terminal speed selection input3	SPD3	31	32

Signal name	abbreviation symbol	Setting values and effective logic	
		Closedvalid when	Openvalid when
Torque and speed start	SP-STA	33	34
Speed command direction	SPD-DIR	35	36
Speed limit input	V-LMT	37	38
Origin sensor input	HOM-SW	39	40
implementQprogram	START-Q	45	46

4.9.3.6 Digital output signal

M54SSeries AC servo drives50PinHigh-density connector models feature6digital output signal.Each output signal can be configured for a specific function through parameters,and output level logic.

					Factory default		
CN2- Pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	Output logic * 1	default value
11	Y1+	Digital output1+	P5-12	MO1	SON-ST	Closed	7
10	Y1-	Digital output1-					
35	Y2+	Digital output2+	P5-13	MO2	S-RDY	Closed	twenty three
34	Y2-	Digital output2-					
37	Y3+	Digital output3+	P5-14	MO3	FLT	Closed	1
36	Y3-	Digital output3-					
39	Y4+	Digital output4+	P5-15	MO4	IN-POS	Closed	9
38	Y4-	Digital output4-					
12	Y5	Digital output5	P5-16	MO5	HOMED	Closed	25
40	Y6	Digital output6	P5-17	MO6	T-LMT	Closed	15
41	YCOM	digital outputCOMend	-		Y5,Y6Output common terminal		

Note:

1.The output pin level logic is as follows:

CLOSED:Driver digital output circuit forms loop,Current flows into or out of the pin,That is, the driver output signal

OPEN: The driver digital output circuit does not form a loop,No current flows into or out of the pin,That is, the driver does not output a signal

2.Please refer to the output signal wiring method.:**4.9.7 CN2**digital input,Output signal wiring instructions**(**50PinHigh-density connector models**)**

4.9.3.7 Assignable functions for output signals

The functions and logic comparison table that can be assigned to the output signal are as follows:.parameterP5-12 ~ P5-17Digital output definedY1arriveY6function,Write the values corresponding to the functions in the table below into the above parameters to set the digital output function..

Signal name	abbreviation symbol	Logic and setting value when the output signal is valid	
		Output when the signal is valid Closed	Output when the signal is valid Open
Universal output	GPOUT	0	
fault output	FLT	1	2
Warning output (alarm)	WARN	3	4
Motor brake release output	BRK	5	not support
Servo-onstatus output	SON-ST	7	8
Positioning completed output	IN-POS	9	10
Dynamic position following output	DYM-LMT	11	12
Torque reaches output	TQ-REACH	13	14
Torque limit output	T-LMT	15	16
Consistent speed 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
Limit (forward rotation)	SLCW	27	28
Limit (reverse)	SLCCW	29	30
Same location	P-COIN	31	32
zero speed signal	Z-SPD	33	34
Torque consistent output	I-COIN	35	36

4.9.4 CN2-Position pulse signal wiring instructions**(50Pin**High-density connector models**)**

M54SSeries AC servo drives50PinThe high-density connector model has two pulse input ports:

Low speed pulse input:STEP/DIR

High-speed differential pulse input:PULSH/SIGNH.

◆ low speed pulse signal**(**or open collector pulse input**)**

CN2-Pin number	Signal name		illustrate	Maximum pulse frequency	minimum pulse width	Wiring
1	OPC1	Pulse signal input	◆ whenP3-03ofbit4set as"0"hour,Choose to use this position command input port ◆ Optocoupler input,support: 1)open collector pulse signal.5Vor24VDC 2)Low-speed differential pulse input,support5VDC ◆ Support pulse & direction signals,CW/CCWSignal,A/B orthogonal signals ◆ When using an open collector pulse signal,Need to use OPC1andOPC2Hardware pull-up.	500KHz	1μs	A1
3	STEP+					
4	STEP-					
2	OPC2	Pulse direction signal input				
5	DIR+					
6	DIR-					

◆ high speed pulse signal**(Line Driver**Dedicated to pulse input**)**

CN2-Pin number	Signal name		illustrate	Maximum pulse frequency	minimum pulse width	Wiring
44	PULSH+	Pulse signal input	◆ whenP3-03ofbit4set as"1"hour,Choose to use this position command input port ◆ Differential input (Line Driver),Suitable for high-speed pulse signals with differential output,support5VDC,The maximum pulse input frequency is4MHz. ◆ Support pulse & direction signals,CW/CCWSignal,A/Borthogonal signals	4MHz	0.125μs	A2
45	PULSH-					
46	SIGNH+	Pulse direction signal input				
47	SIGNH-					

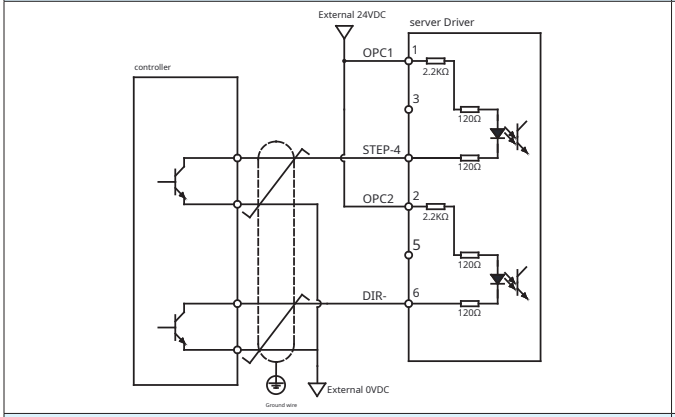
Notice:Low speed pulse input**STEP/DIR**,and high-speed differential pulse input**PULSH/SIGNH**cannot be used at the same time,Please use parameters **P3-03**of**Bit4**BitSelect position pulse signal input source.

0:Low speed pulse inputSTEP/DIR

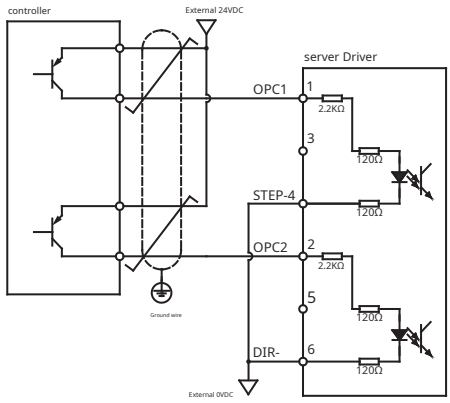
1:High-speed differential pulse inputPULSH/SIGNH

A1----low speed pulse**STEP/DIR**Input wiring

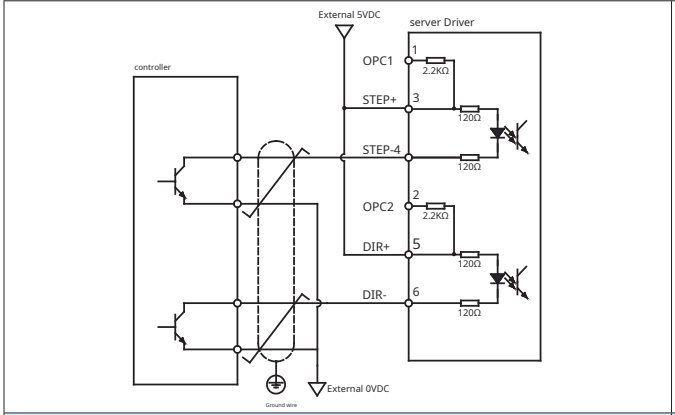
A.The pulse source is open collector modeNPNinput (external24Vpower supply)



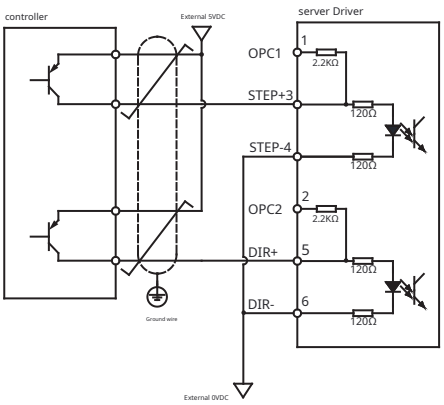
B.The pulse source is open collector modePNPinput (external24Vpower supply)



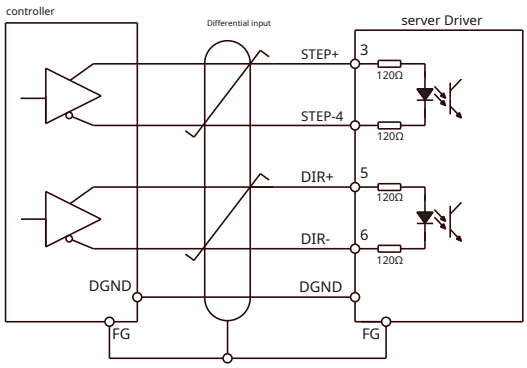
C.The pulse source is open collector modeNPNinput (external5Vpower supply)



D.The pulse source is open collector modePNPinput (external5Vpower supply)



E.The pulse source is a differential signal input



◆ for**24V**Signal

Effective limit of pulse input signal:>16V

Pulse input signal invalid limit:<8V

Fuzzy area:8V<fuzzy area<16V

◆ for**5V**Signal

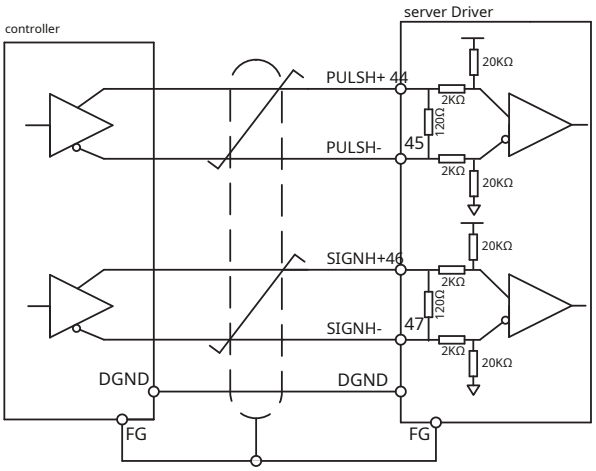
Effective limit of pulse input signal:>3V

Pulse input signal invalid limit:<2V

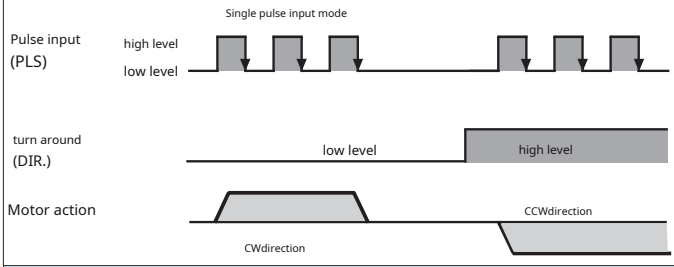
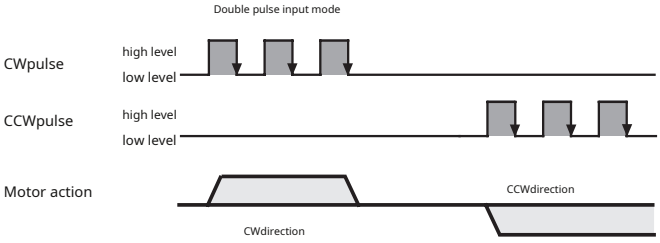
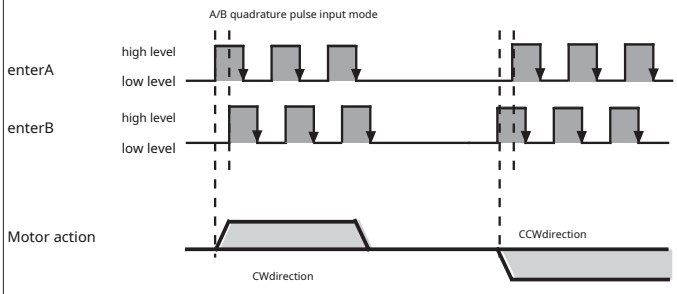
Fuzzy area:2V<fuzzy area<3V The pulse input signal voltage value needs to avoid appearing in the fuzzy area of the above voltage.,thus avoiding the generation of uncertain pulses.

A2----high speed pulse**PULSH/SIGNH**Input wiring

PULSH/SIGNHThe input port is5VSpecifications of differential high-speed pulse signals,Do not enter24VVoltage.



◆ Pulse input method description

pulse**&**direction	double pulse**(CW/CCW**pulse**)**
When there is a pulse input and the direction input isClosedhour,The motor rotates in one direction. When there is a pulse input and the direction input isOpenhour,The motor turns in the other direction. * The direction signal can be defined through parametersP3-03ofbit3Configuration. The figure below shows the motor configuration when the direction input isON,The motor is inCWturn in direction.	whenSTEPorPULSHWhen there is pulse signal input,The motor rotates in one direction. whenDIRorSIGNHWhen there is pulse signal input,The motor turns in the other direction . * The direction can be defined through parametersP3-03ofbit3Configuration.
	
A&B Quadrature pulse	
take overA&BQuadrature pulse,Control motor rotation. * The direction can be passed through parametersP3-03ofbit3Configuration. Direction is determined by which channel is ahead of the other channel. The figure below shows whenAahead of the curveBMutually90Time,The motor rotation direction is CW. whenBGo aheadAMutually90Time,The motor rotation direction isCCW.	
	

4.9.5 CN2digital input,Output signal wiring instructions**(50Pin**High-density connector models**)**

4.9.5.1digital input**X1~X10**

M54SSeries AC servo drives50PinHigh-density connector models feature10optocoupler isolation commonCOMSingle-ended input signal of point.Because these input circuits are optically isolated,They require a power supply.If you are connected toPLC,you can usePLCpower supply. If you are connecting a relay or mechanical switch,You need a separate24VDCpower supply.The maximum withstand current is 20mA.

what is**COM?**

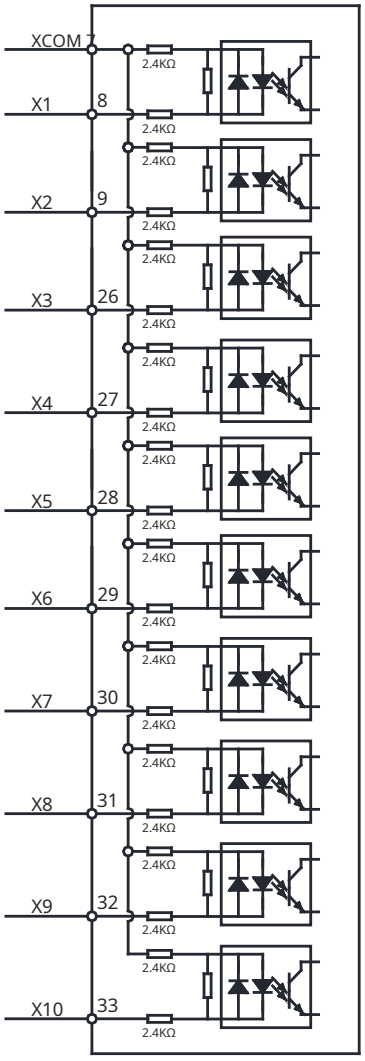
"Common"Represents an equipotential common terminal.If you are using source current (PNP)Signal,you shouldCOMGround (negative pole of power supply),If you are using current sink (NPN)Signal,SoCOMIt should be connected to the positive terminal of the power supply.

hint:

CLOSED:The driver digital input circuit forms a loop,Current flows into or out of the input pin,The driver has an input signal.

OPEN: The driver digital input circuit does not form a loop,No current flows into or out of the input pin,The driver has no input signal

X1~X10 The internal circuit block diagram is as shown below



◆ for**24V**Signal

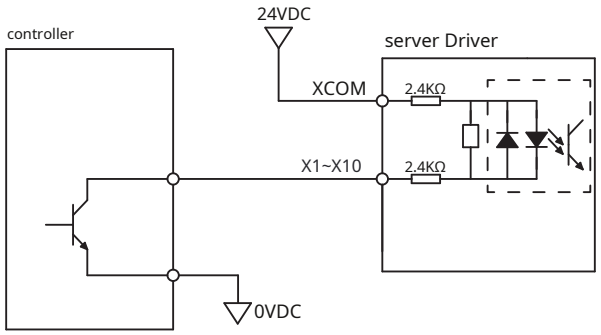
Effective limit of input signal:>16V

Input signal invalid limit:<8V

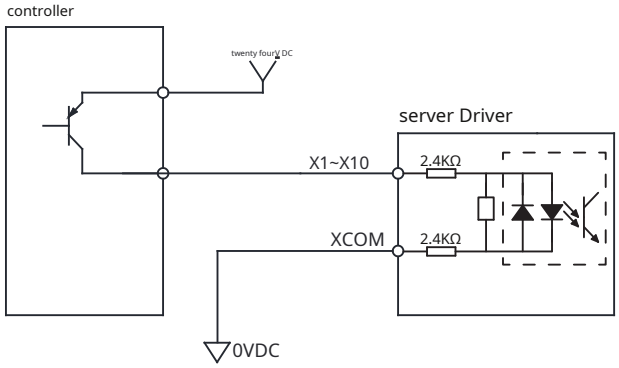
Fuzzy area:8V<fuzzy area<16V

The input signal voltage should be avoided to be in the fuzzy zone.,Avoid generating abnormal input signals.digital input**X1~X10**Wiring example

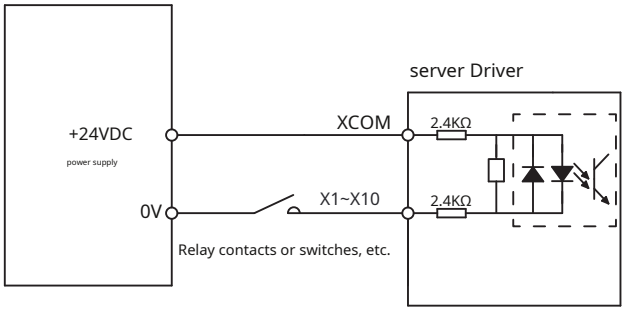
A.controllerSINKMode (sink current)



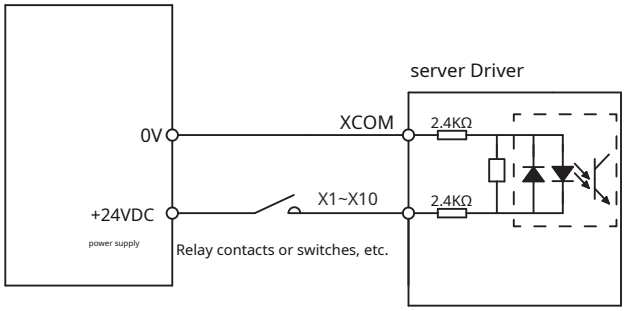
B.controllerSourcingMode (source current)



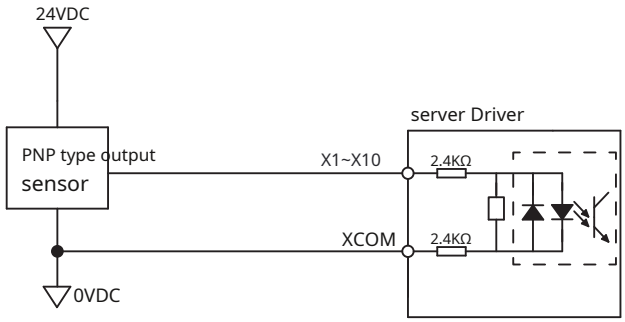
C.Connect relay contacts or switches (XCOMpick up+24V)



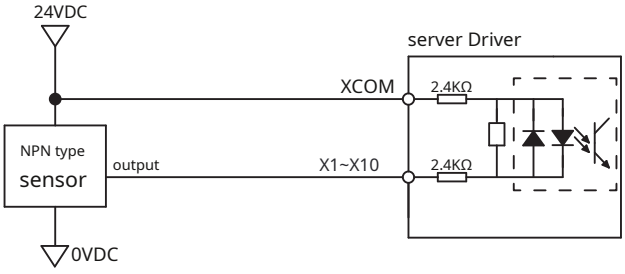
D.Connect relay contacts or switches (XCOMcatch0V)



E.connectPNPtype sensor



F.connectNPNtype sensor

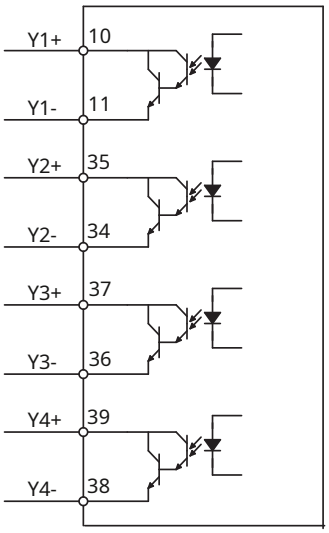


4.9.5.2 Digital output**Y1 ~ Y4**

M54Sseries50PinHigh-density connector models feature6Optocoupler isolated digital output point,inY1,Y2,Y3andY4yes4Optocoupler isolated differential digital output points,Respective functions can be configured through parameters.allowSINKorSOURCINGconnection method.

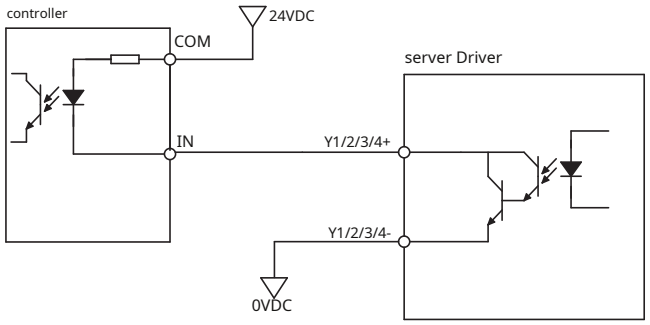
Maximum withstand voltage30VDC,current100mA. **Y1 ~ Y4**

Output signal internal block diagram

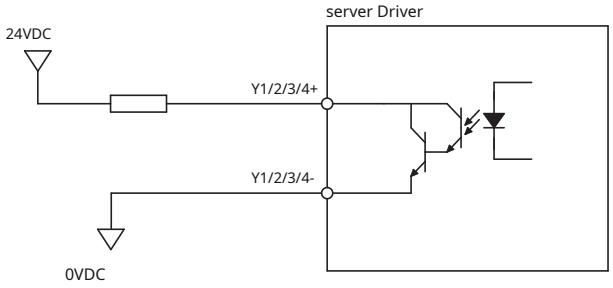


Y1 ~ Y4 Output connection example

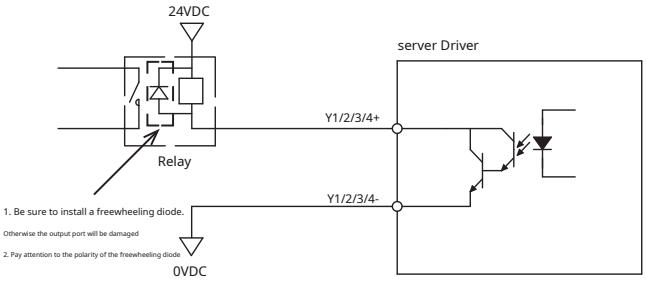
A.Connected to control optocoupler



B.connected to a resistive load



C.Connected to inductive loads such as relays

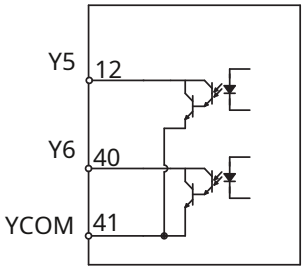


4.9.5.3 Digital output**Y5 ~ Y6**

M54Sseries50PinHigh-density connector models are also available2optocoupler isolation commonCOMpoint output signalY5andY6.

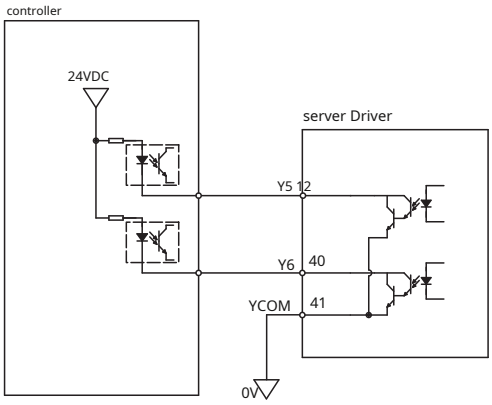
Maximum withstand voltage30VDC,current100mA.

Y5 ~ Y6 Output signal internal block diagram

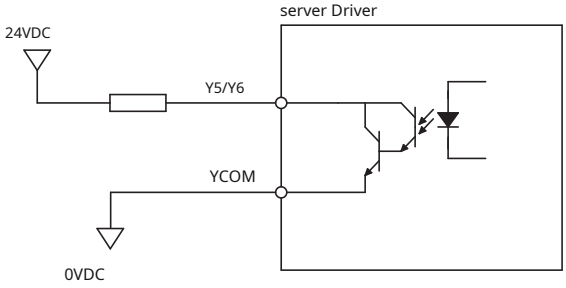


Y5 ~ Y6 Output connection example

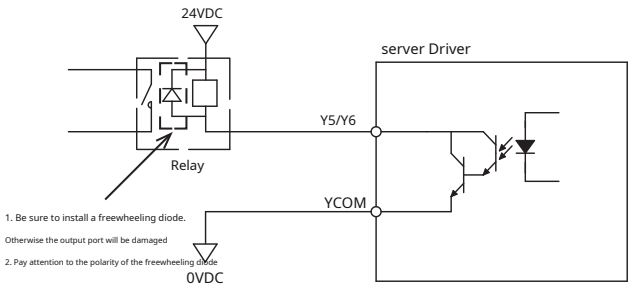
A.Connected to control optocoupler



B.connected to a resistive load



C.Connected to inductive loads such as relays



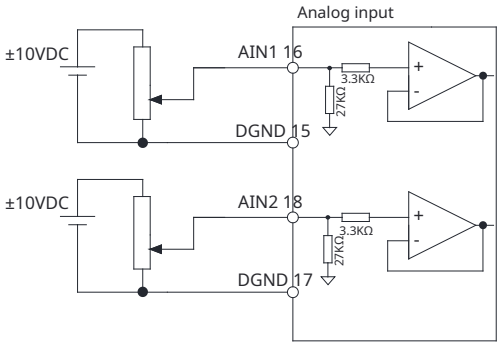
4.9.6 Analog signal wiring instructions

4.9.6.1 Analog signal input

RS-485Type driver has2single-ended analog input,Speed corresponding to two analog inputs,Torque range can be set via parameters.

CN2-Pin number	Signal name		illustrate
16	AIN1	Analog signal input	Analog speed command -10V ~ +10V,express-3000 ~ +3000rpm The setting range can be changed through parameters
18	AIN2		Analog torque command in analog torque mode -10V ~ +10V,express -100% ~ +100%motor torque output
13,14 15,17,25	DGND		Reference ground for analog input signals

A3----Analog input connection example



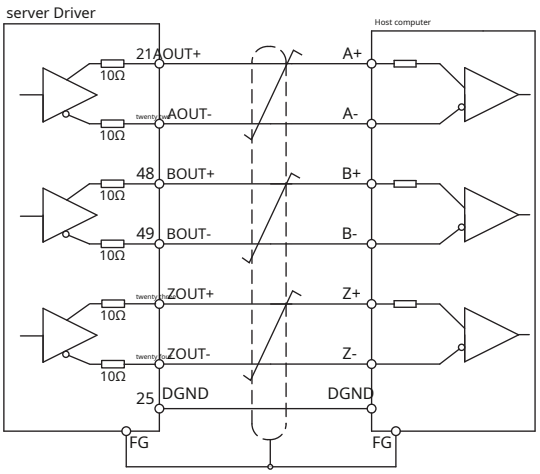
4.9.7 Encoder frequency division output

M54Sseries50PinHigh-density connector models convert encoder signalsAMutually,BMutually,Zphase passesLine DriverDifferential mode output,The output specifications are5V.

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

CN2-Pin number	Signal name		illustrate
twenty one	AOUT+	Encoder signal Pulse output	Convert the encoder feedback signal toA,B,ZThe method of differential output can set the number of pulses per revolution and the pulse output frequency division ratio through parameters.
twenty two	AOUT-		
48	BOUT+		
49	BOUT-		
twenty three	ZOUT+		
twenty four	ZOUT-		
19	OCZ	ZSignal output	Set the encoder'sZThe signal is output as an open collector
13,14,15,17,25	DGND		OCZoutput place

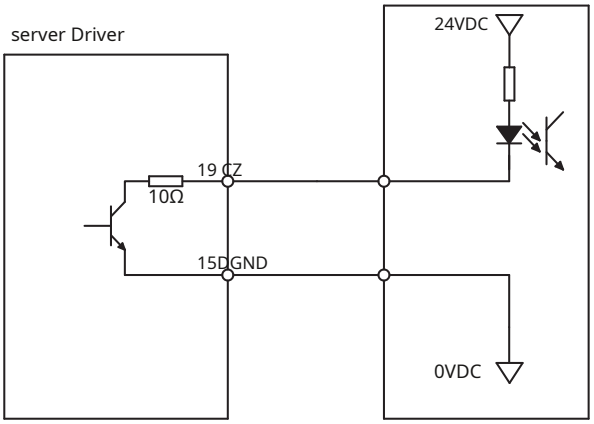
4.9.7.1 A/B/Z Differential Signal Connection Example



Notice:Please ensure that the host computer is connected to the digital ground of the drive.

4.9.7.2 Z Phase open collector output

Convert the encoder signal toZPhase output through open collector.due to encoderZThe phase signal pulse width is very small,Therefore, the host computer receiving circuit needs to use high-speed optocoupler.

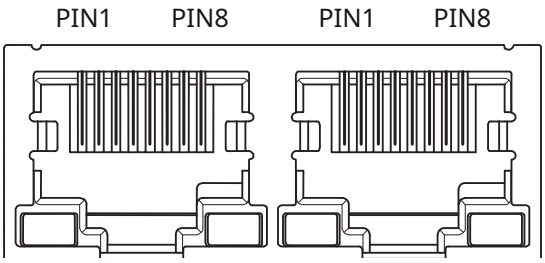


4.10CN6,CN7—RS-485Communication Interface

drive'sCN6andCN7Adopt standardsRJ45(8p8c)the design of,Can be constructedRS-485orRS-422network,useModbus/RTU protocol for communication control.

4.10.1 CN6,CN7Pin definition

-RSeries communication drivers can be connected through the dual ports on the driver side.RJ45Connector,Daisy-chaining using straight-through network cables.Dual ports on drive sideRJ45The connector diagram is as follows:



RJ45(8p8c)The pin definition is as follows:

foot position	definition
1	RX+
2	RX-
3	Tx+
4,5	NC.
6	TX-
7,8	GND

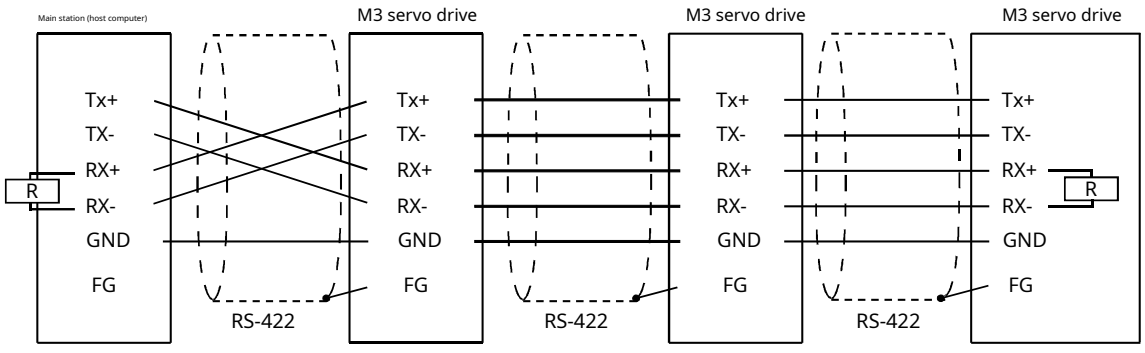
4.10.2 RS-485/422wiring method

RS-485/422The communication method allows onePChost (orPLCor human-machine interfaceHMIor other type of computer) to connect and control multiple drives. RS-485/422The communication method also allows the use of longer communication cables.Recommended Use5Quasi-twisted pairCat-5,Because it is widely used in computer network communications,low cost,Easy to buy,good quality,Reliable data transmission is its advantage.

M54SSeries AC servoRS-485/RS-422Communication supports half-duplex mode or full-duplex mode.The connection method during host control can be point-to-point (one host to oneM54Sdriver),A multi-station network can also be established (one channel can support up to32towerM54Sdriver).

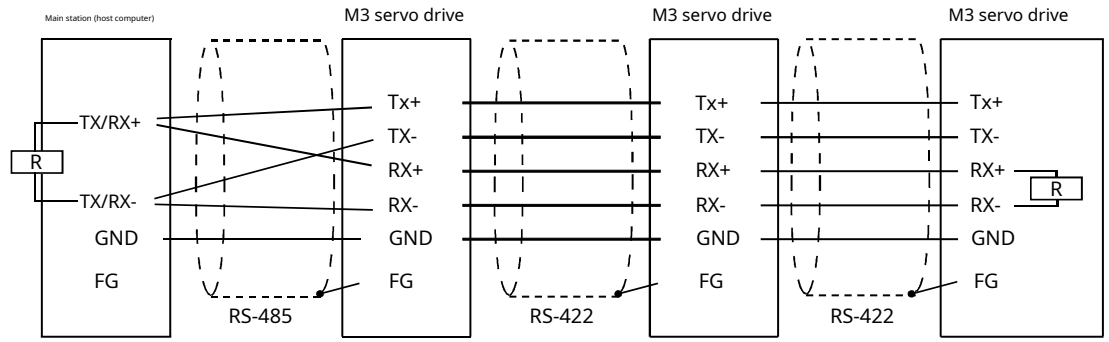
4.10.2.1 RS-422full duplex mode

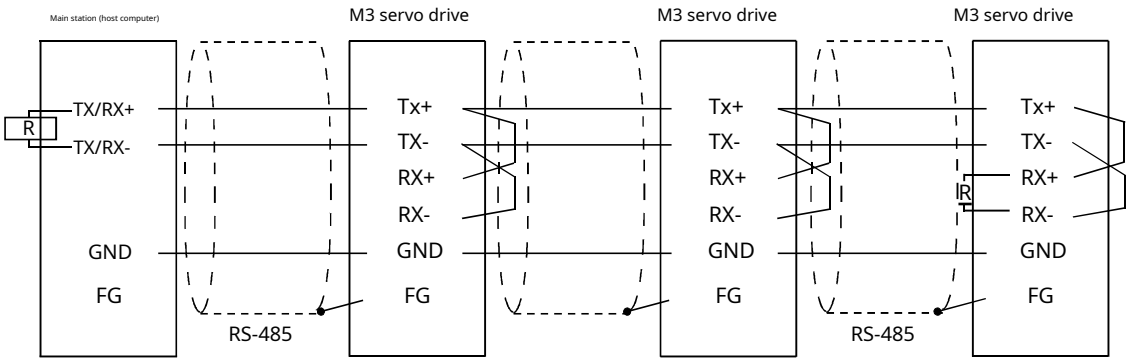
RS-422Full-duplex mode uses separate cables for data transmission and reception.The host is connected to the drive via a pair ofRX+andRX-end of the cable to send data to the drive,in turn connected to the drive via a pair ofTx+andTX-The cable at the end receives the data sent by the driver..in addition,There is also a logical ground terminal on each drive,It can be used to common the logical ground of all drives.The logic ground of the first driver in the bus must be the same as the main controller..



4.10.2.2 **RS-485**two-wire system

RS-485In a two-wire system, the same cable is used for data transmission and reception.,The host must stop sending status before receiving data,That is, when the host sends a query command,before the drive responds,The host must stop sending status,Otherwise, the data sent by the driver will not be received by the host.The driver can set the sending delay,By changing this parameter you can adjust or compensate for the time the host stops sending status.Users can send via the busTD Command to uniformly set the transmission delay time of all drives,You can also passLUNASoftware sets up the drive. existRS-422Four-wire connection method,Users can set shorter sending delays.

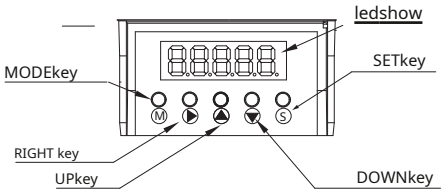




Notice:due to use**RJ45**Crystal Head,We strongly recommend using the standard**CAT5e**line-like.

5Display panel operation

5.1Display panel name and function



logo	name	Function
	ledshow	five7SegmentedledDigital tube displays driver status and alarm information,Parameter values and setting values
M	MODEkey	◆ Long press to switchledDisplay mode a)Monitor selection mode b)Function selection mode c)Parameter setting mode ◆ When editing parameters,dogMODEkey to shift the currently edited digits to the left
▶	RIGHTkey	When editing parameters,dogRIGHTkey to right-shift the currently edited digits
▲ ▼	UP/DOWNkey	dogUP/DOWNKey scroll monitoring content/function,Modify parameters/settings
S	SETkey	Short press to enter the selected parameter,Long press to save modified parameters

5.2 Mode switching

1)according toMODEkey andSETkey,Status display available,Function operation,Switching between parameter setting and other modes

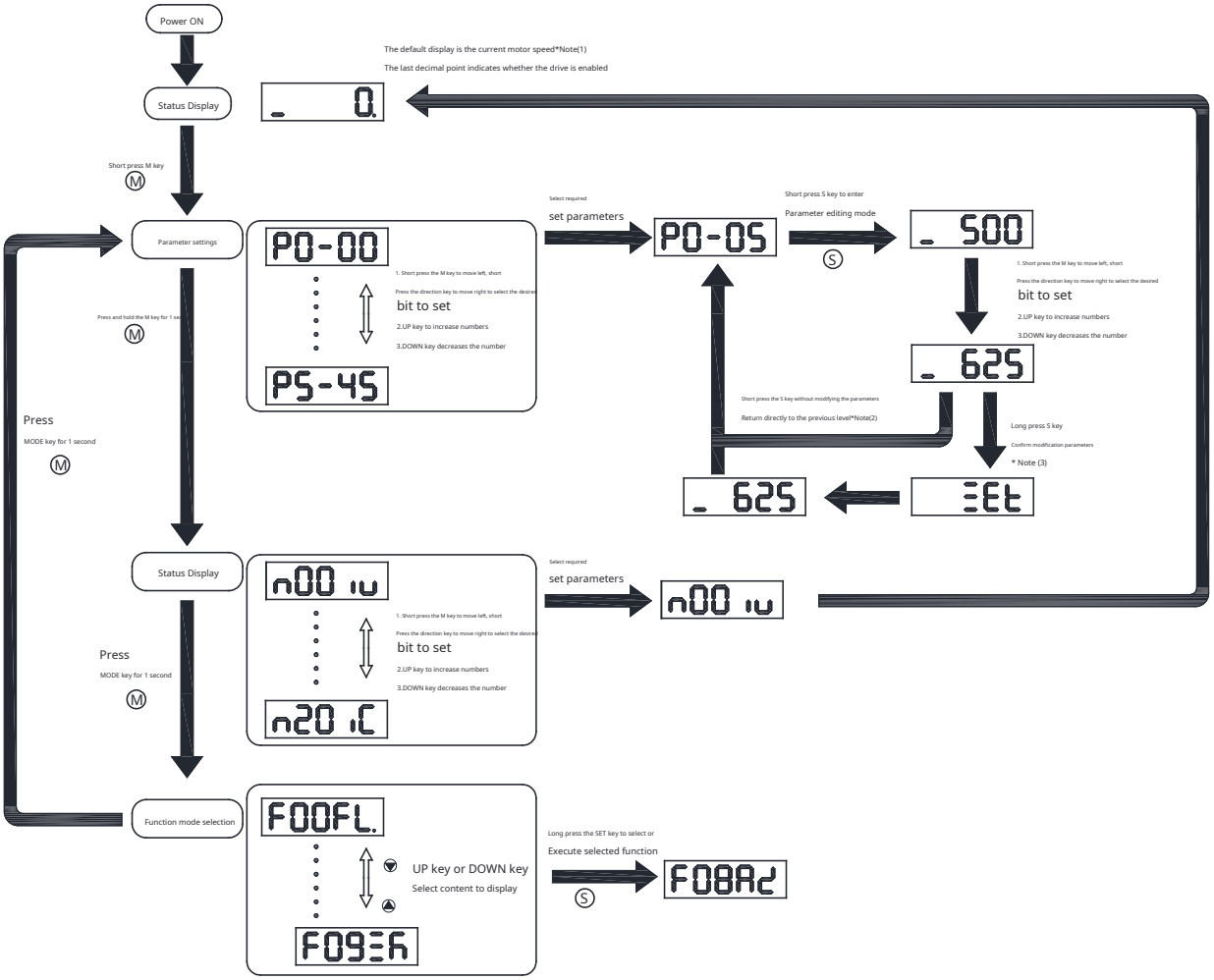
2)If no abnormal alarm occurs,Abnormal alarm mode will not be displayed

3)When an abnormal alarm occurs,No matter in any mode, it will immediately switch to the abnormal alarm mode and display the current alarm code..according toModekey and Setkey to return to the mode before the alarm.,Press the up and down keys to view other alarms

4)Display selection mode in status,Functional operating mode,In parameter setting mode,dogMODEThe key will switch the operation bits of addition and subtraction,The selected bit will flash

5)Press and hold in status display modeSETkey,The operation panel will be locked.To unlock,Long press againSETPlease refer to the figure below

for operation switching between key modes..



Notice:

(1) After power on, the customer selection status display content will be displayed..By default, the current motor speed is displayed..

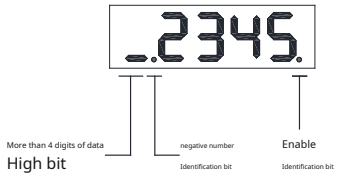
(2) In parameter editing mode,dog**SET**key will exit parameter editing mode,Return to parameter setting selection interface,and do not save the settings made

(3) In parameter editing mode,Press**SET**The key will determine the parameters to be modified this time.,and take effect immediately,But it won't be saved to the drive **Flash** middle.If it is necessary to save this parameter after power off,Need to be in the parameter selection interface,Press**SET**key to save parameters

(4) When the motor is running,Do not save parameters.

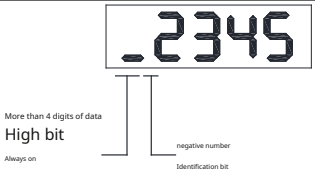
5.3Display content

5.3.1decimal point meaning

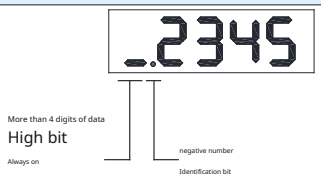
Display content	illustrate
	◆ Enable flag bit:ledThe decimal point in the lower right corner of the panel indicates whether the drive is enabled. The bit is always on.:Indicates that the drive is enabled,Motor energized excitation go out:Indicates that the driver is in a non-enabled state,Motor is not powered ◆ Negative number flag:The negative number indicator bit indicates whether the positive number or negative number is displayed at this time. Always on:Indicates that the displayed data is a negative number go out:Indicates that the displayed data is a positive number ◆ 4bits and above data high-order identification bits:When the displayed data is greater than4bit time,Will be displayed in pagination,The identification bit will mark this time The number of digits where the data is located,For details, please refer to5.3.2more than the4Display of digits

5.3.2Display of data

1) 4 Positive number display of digits and below

Display content	illustrate
	◆ The first one from the left is4bits and above data bits identification bits.exist7End typeledat the bottom,It means low4bits of data Always on:The data displayed on behalf of is low4bit data,And there is no higher bit data flashing:The data displayed on behalf of is low4bit data,And there are more than4digits ◆ When the decimal point of the negative number indicator goes out,Indicates that the displayed data is a positive number as the picture shows,The number shown is:**2345**

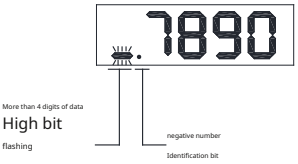
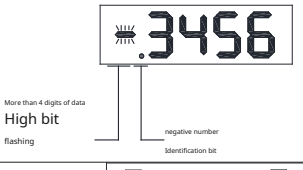
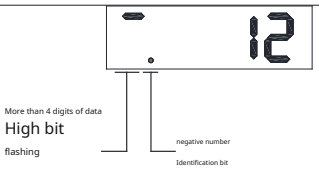
twenty four Display negative numbers of digits and below

Display content	illustrate
	◆ The first one from the left is4bits and above data bits identification bits.exist7End typeledat the bottom,It means low4bits of data Always on:The data displayed on behalf of is low4bit data,And there is no higher bit data flashing:The data displayed on behalf of is low4bit data,And there are more than4digits ◆ When the decimal point of the negative number indicator is always on,Indicates that the displayed data is a negative number as the picture shows,The number shown is:**-2345**

3) 5Display of digits and above

becauseM54SSeries AC servoledThe display panel only5Bit,When it is necessary to display greater than5bits of data,Use the following method.

List:Display if necessary**-1234567890**

	Display content	illustrate
Low4bit "7890"show		◆ The first one from the left is4bits and above data bits identification bits,exist7End typeledat the bottom,It means low4bits of data flashing:The data displayed on behalf of is low4bit data,And there are more than4digits ◆ When the decimal point of the negative number indicator is always on,Indicates that the displayed data is a negative number
middle4bit "3456"show		◆ The first one from the left is7End typeledcenter lights up,The representative shows the middle4bits of data Always on:Represents the displayed data as the middle4bit data,And there is no higher bit data flashing:Represents the displayed data as the middle4bit data,And there are higher digits
the highest "12"display		◆ The first one from the left is7End typeledcenter lights up,The representative shows the highest4Bit data is always on:Represents the displayed data as the middle4bit data,and no higher-order data

Note:When the high-order flag flashes,Represents high positions and numbers,Short press the "up" and "down" keys to switch the number of pages displayed..

5.3.3 Other display content

Display content	illustrate
	express""SET".When modifying parameters,Press"S"key1Second,Parameter modification successful,will take effect immediately,But it will not be saved when the power is turned off..
	express"SAVED".Select the parameters that need to be saved, such asP0-05,Press"S"key1Second,showSAVED,Indicates that parameters are saved to non-volatile registers,And effective when power off
	In parameter modification mode,When the motor is rotating.Press"S"key,showBusy,Indicates that the current parameters cannot be saved temporarily..Please wait until the motor stops rotating,Save parameters again

5.3.4 Point-to-point motion mode

Display content	illustrate
	P--CWIndicates that the motor rotates forward in point-to-point mode.
	P-CCWIndicates motor reverse rotation in point-to-point mode

Note: The above display indicates that the motor is in test run mode and can be used to check if the servo system is ready.

5.3.5 JOGmodel

Display content	illustrate
	J--CWIndicates that the motor isJOGForward rotation in mode
	J-CCWIndicates that the motor isJOGInvert in mode

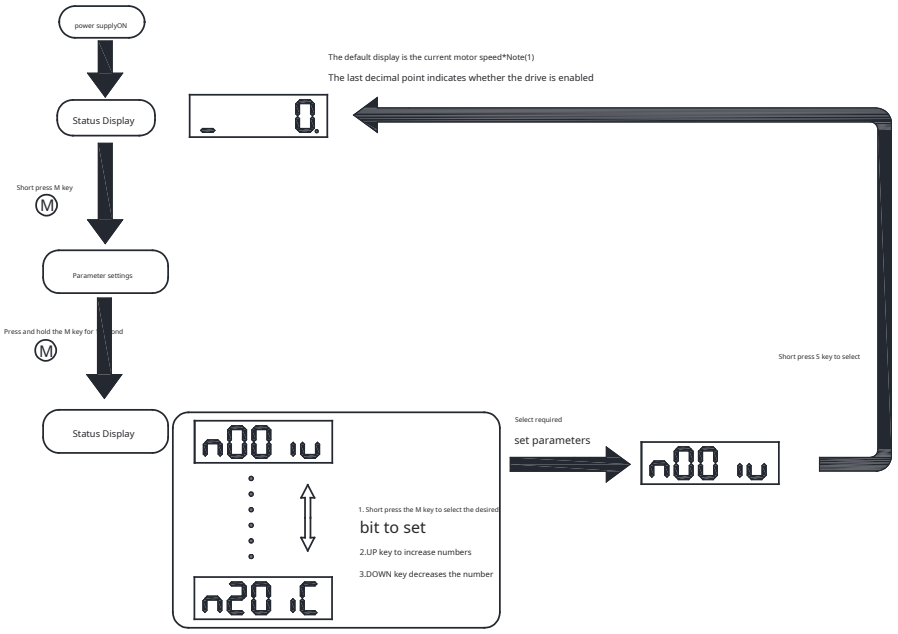
Note: The above display indicates that the motor is in test run mode and can be used to check if the servo system is ready.

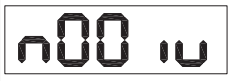
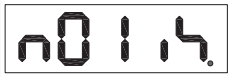
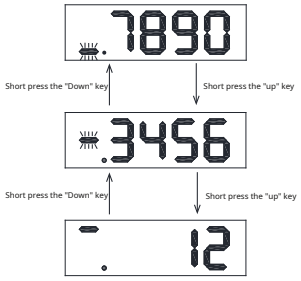
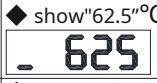
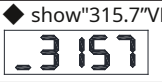
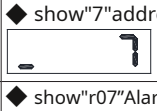
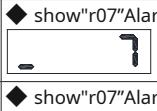
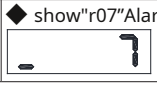
5.3.6 Key lock and unlock

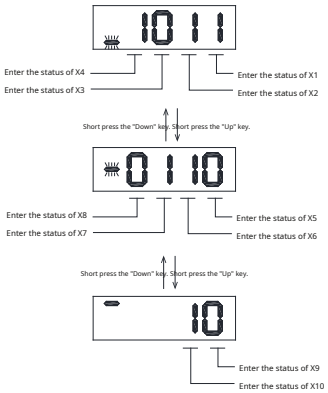
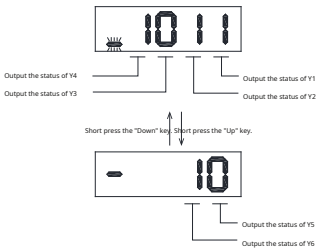
Display content	illustrate
	Indicates the key is locked.In status display mode,Long press means ""SET".1Second,to lock the keys
	When the keys are locked,Long press means "SET"1Second,Will unlock the keys

5.4 Status display selection mode

When it is necessary to change the content displayed in the status display mode,First press "M"key to switch to status display selection mode,Then use  choose what you need,Finally press "S"key to confirm.The process is as shown below.



n-Status Display Select mode settings	Show symbols	illustrate	unit	Display example
n-00		Motor actual speed	RPM RPM	◆ show"3000"rpmhour  ◆ show"-3000"rpmhour 
n-01		position error	Pulse	◆ show -1234567890 
n-02		Pulse command input count	counts	
n-03		Encoder feedback pulse number	counts	
n-04		Position command count	counts	
n-05		drive temperature	x 0.1℃	◆ show"62.5"℃ 
n-06		DC-Busbus voltage	x 0.1V	◆ show"315.7"VDC 
n-07		Driver communication address		◆ show"7"address 
n-08		Alarm history1		◆ show"r07"Alarm code 
n-09		Alarm history2		◆ show"r07"Alarm code 

n-Status Display Select mode settings	Show symbols	illustrate	unit	Display example
n-10	n 10AH	Alarm history3		◆ show"r07"Alarm code _ 7
n-11	n 11AH	Alarm history4		◆ show"r07"Alarm code _ 7
n-12	n 12AH	Alarm history5		◆ show"r07"Alarm code _ 7
n-13	n 13AH	Alarm history6		◆ show"r07"Alarm code _ 7
n-14	n 14AH	Alarm history7		◆ show"r07"Alarm code _ 7
n-15	n 15AH	Alarm history8		◆ show"r07"Alarm code _ 7
n-16	n 16 .A	Analog input1	x 0.001V	◆ show"8.211"V _8211
n-17	n 17 .A	Analog input2	x 0.001V	◆ show"8.707"V _8707
n-18	n 18 .n	Digital input status		◆ Every7Terminal digital represents the status of a digital input: 1:Closedstate 0:Openstate 
n-19	n 19oU	Digital output status		◆ Every7Terminal digital represents the status of a digital output: 1:Closedstate 0:Openstate 
n-20	n20 .C	Torque output percentage	0.1%	◆ The displayed current command is72.5% _725

Notice:

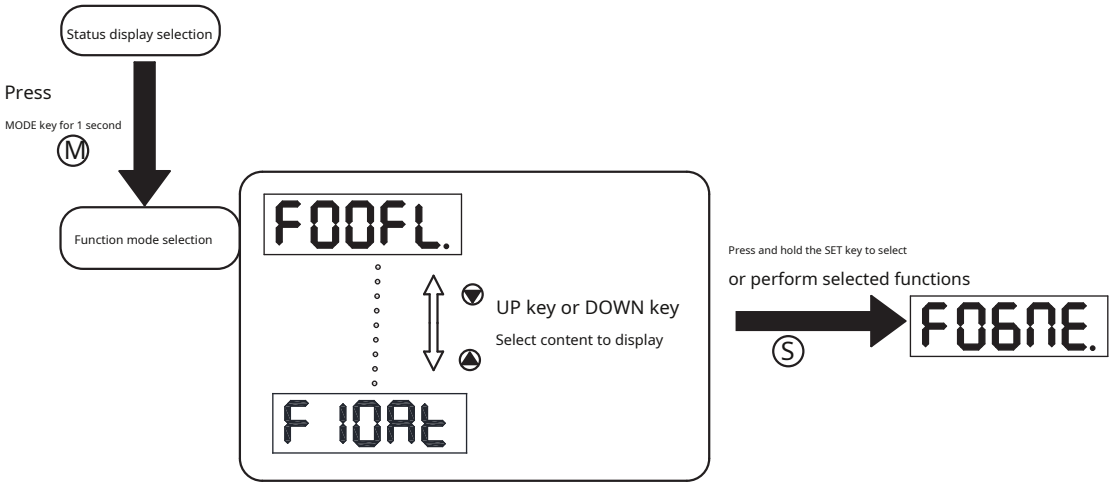
1:**CLOSED**:Drive digital input**(**output**)**circuit forming a loop,Current flows into or out of the input pin,The drive has input**(**output**)**Signal. **0**:

OPEN: Drive digital input**(**output**)**The circuit does not form a loop,No current flows into or out of the input pin,No input to the drive**(**output**)**Signal

5.5 Functional operating mode

In this mode, the user can select the functions to be performed,byF+Parameter number display.In status display selection mode,Long press to enter  1Advance in seconds function operation mode,use  Select what you need,Finally press and hold to confirm or execute the selected function 

(Notice:**F00FL**and**F01CJ**except).

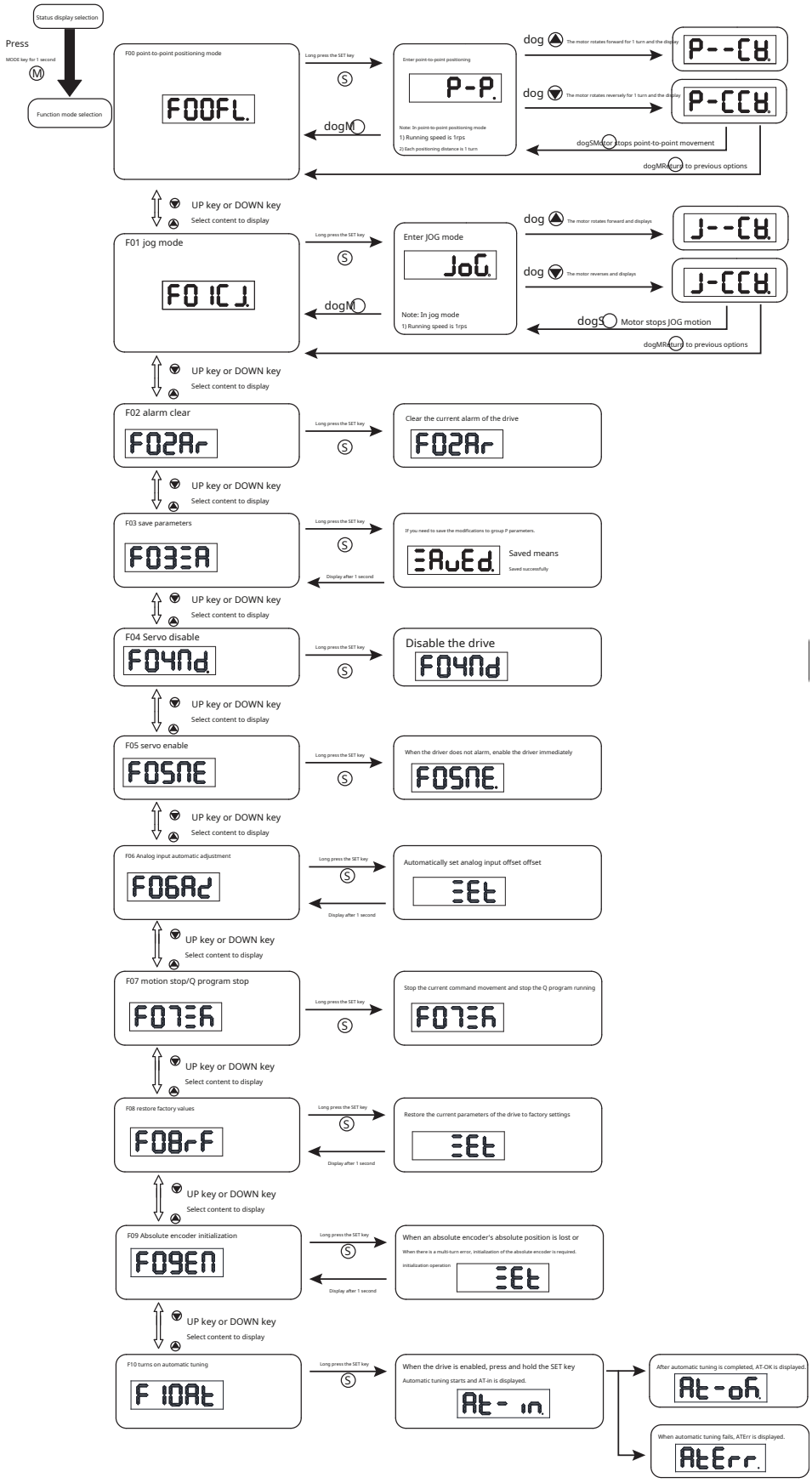


5.5.1 Function operation mode function comparison table

The contents of functional operation modes are as follows:.

F-Function operation model	Show symbols	illustrate
F00	F00FL	(F00FL) ----Point-to-point location mode 1)The running speed is1revolutions per second 2)The running distance is1change
F01	F01CJ	(F01CJ) ----In jog mode, use1rotation per second
F02	F02Ar	(F02AR) ----Clear the current alarm of the drive
F03	F03SA	(F03SA) ----save pairPModification of group parameters
F04	F04Md	(F04MD) ----Disable drive
F05	F05ME	(F05ME) ----Drive enable
F06	F06Az	(F06AZ) ----Automatically set analog offset
F07	F07SK	(F07SK) ----Movement stopped/QProgram stops
F08	F08rF	(F08ERF) ----Restore drive parameters to default factory settings
F09	F09EM	(F09EM) ----Absolute encoder initialization
F10	F 10AT	(F10AT) ----Turn on automatic parameter tuning

5.5.2 Operation flow chart



5.6 Parameter setting mode

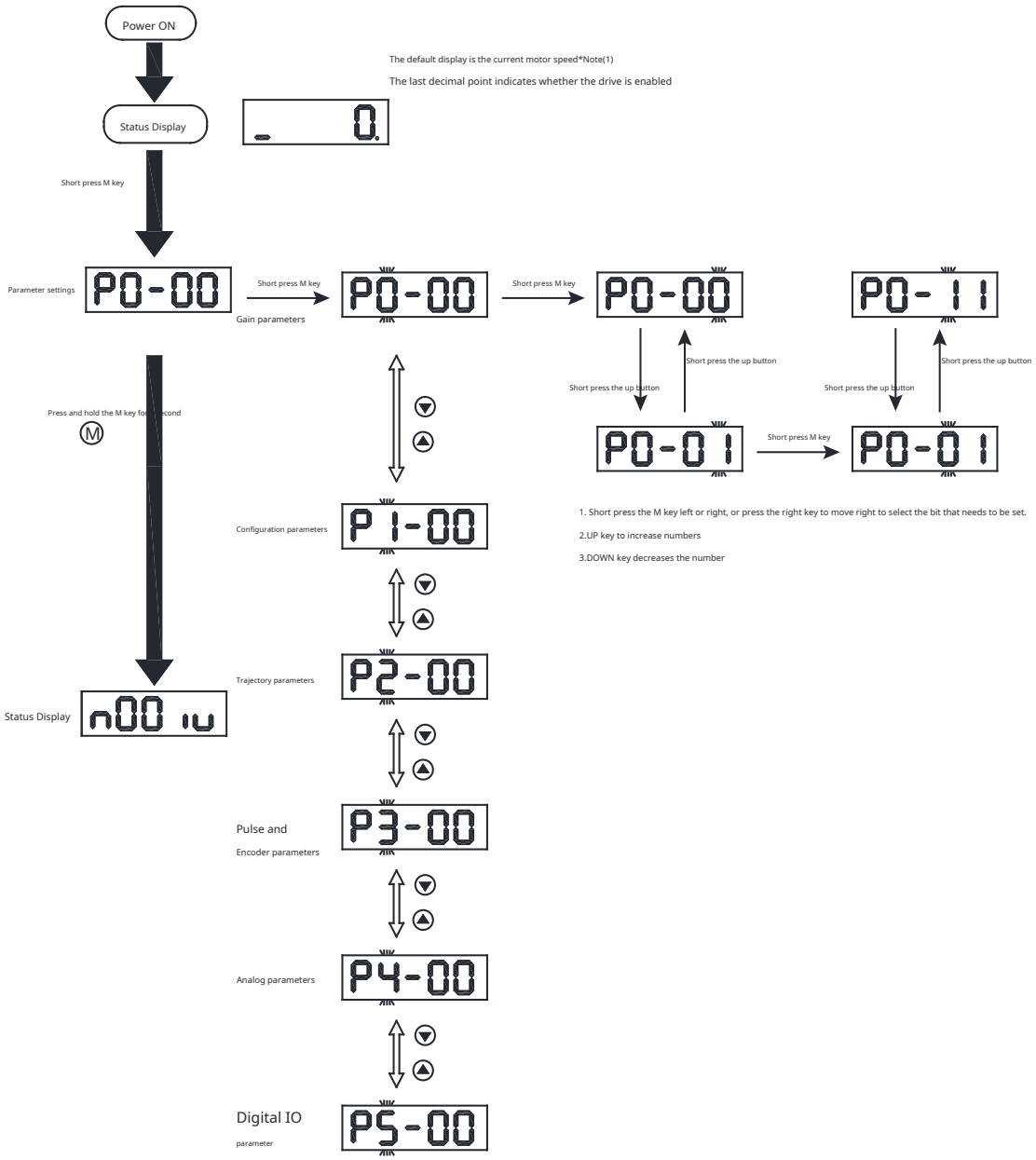
5.6.1 Parameter setting method

In this mode, the user can modify the parameters that need to be set.,byP+Parameter number display.

1)dog"M"key to select the bit to be set

2)Short press the "up" key to increase the number

3)Short press the "Down" key to increase the number



5.6.2 Examples of modifying and saving parameters

A.Change parameters:

1)dog"M"key moves up,Select the bit to be set

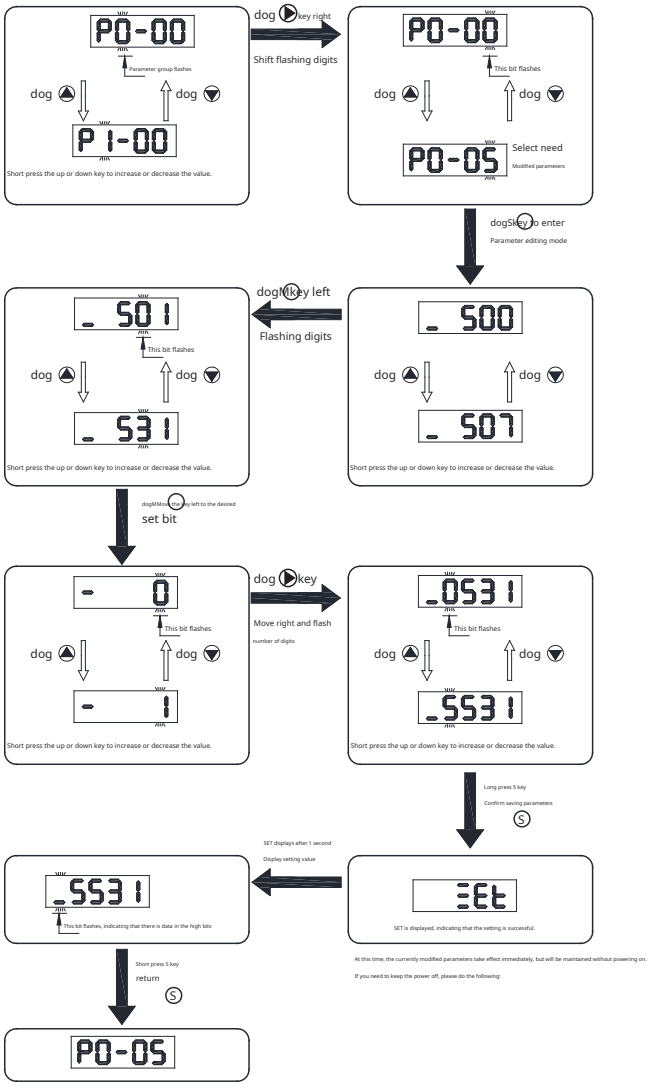
2)Short press the "right" key to move to the lower position,Select the bit to be set

3)Short press the "up" key to increase the number

4)Short press the "Down" key to increase the number

5)Press"S"Example of key confirmation to modify parameter settings

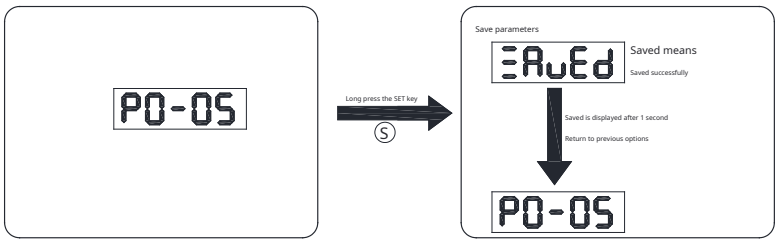
:will parameterP0-05change into15531.



BParameter saving

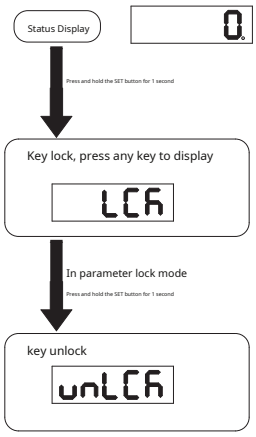
After the parameters are modified successfully,Can take effect immediately (except for some parameters that require power off to take effect).But it can be maintained without power,That is, after the next power outage,Will restore the previously saved value.

If necessary, keep the power off,existP0Group parameter display interface,PressSETJust press.The operation process is as follows.



5.7key lock

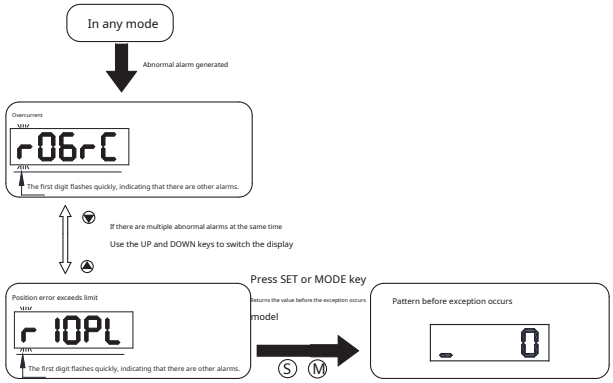
To prevent misoperation by people who are not familiar with this drive,Provides key lock function.When the keys are locked,It will be impossible to operate and modify parameters.



5.8Abnormal alarm display

in any case,Once the driver generates the following alarm,will enter the abnormal alarm display mode..As shown below.

- ifledThe first one on the right"r"flash quickly,Indicates that there are multiple abnormal alarms.You can press  Turn the page to view.
- dog  ,  Will return to the mode before the abnormal alarm was generated..



The alarm display code is as follows

Display content	illustrate	Alarm type	Drive status after alarm
r01ot	Drive over temperature alarm	Report an error	Servo off
r02ur	Internal voltage alarm	Report an error	Servo off
r03uH	Driver overvoltage alarm	Report an error	Servo off
r04HC	Overcurrent	Report an error	Servo off
r05LC		Report an error	Servo off
r06rC		Report an error	Servo off
r09Eb	Encoder signal error	Report an error	Servo off
r 10PL	Position error exceeds limit	Report an error	Servo off
r 11Lu	Driver low voltage alarm	Report an error	Servo off

Display content	illustrate	Alarm type	Drive status after alarm
	Stall alarm	Report an error	Servo off
	Forward rotation prohibition limit and reverse rotation prohibition limit	warn	Do not change current status
	Reverse prohibition limit	warn	Do not change current status,The motor cannot continue to reverse
	Forward rotation prohibition limit	warn	Do not change current status,The motor cannot continue to rotate forward
	drive reset	warn	Do not change current status
	Communication abnormality	warn	Do not change current status
	Parameter saving failed	warn	Do not change current status
	AC power input phase missing	Report an error	Servo off
	Safe torque is prohibited	warn	Servo off
	Regenerative potential discharge failure warning	Report an error	Servo off
	Under voltage warning	warn	Do not change current status
	noneQProgram warning	warn	Do not change current status
	Alarm when commanding the motor to rotate when it is not enabled	warn	Do not change current status
	Driver internal voltage error	Report an error	Servo off
		Report an error	Servo off
	emergency stop	warn	Motor decelerates and stops
	Full closed loop hybrid position error exceeds limit	Report an error	Servo off
	Second encoder error	Report an error	Servo off
	memory error	Report an error	Servo off
	Absolute encoder battery is under voltage	warn	Do not change current status
	Absolute position lost	warn	Do not change current status
	Absolute value position overflow	warn	Do not change current status
	Motor overtemperature	Report an error	Servo off
	Drive processor overtemperature	Report an error	Servo off
	Absolute encoder multiturn error	Report an error	Servo off
	Motor stalled	Report an error	Servo off
	Origin return parameter configuration error	warn	Do not change current status
	Motor collision alarm	Report an error	Servo off
	Encoder communication abnormality	Report an error	Servo off
	I/OSignal function reuse	warn	Do not change current status

6Trial run

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

6.1Inspection before trial operation

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

1)Wiring inspection

Check power input terminalsP1,Motor output terminalP2,Encoder inputCN3,Communication terminalCN1Whether the wiring is correct,Is the wiring secure?,Is there a short circuit?.Confirm proper grounding.

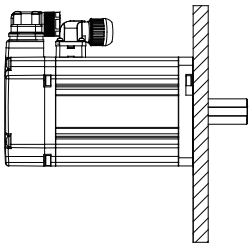
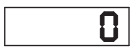
2)Mains voltage check

examineL1/L2/L3Whether the voltage between.examineL1C/L2CIs the voltage between

3)Make sure the motor and driver are securely installed

4)Make sure the motor shaft is not loaded

6.2Trial steps

step	content	illustrate
1	Please fix the servo motor. 	1)Servo motors can be installed on machinery 2)Please do not connect the load to the servo motor yet
2	Confirm that the connection between the motor and the driver is correct	1)MotorU,V,WMust correspond to the red pinout,yellow,blue.PECorresponds to yellow-green.If you connect the wrong motor, it will not operate properly. 2)Confirm that the motor encoder is correctly connected toCN3
3	Confirm that the power circuit wiring is correct	refer to4.2External main circuit wiring Chapter Confirm whether the power input circuit is correct
4	Power on	Pay attention to the power supply voltage,220VThe drive must not enter380VACpower supply
5	Under normal circumstances,will be displayed  In case of alarm,then display 	1)Under normal circumstances,The driver has no alarm display,and is in a non-enabled state 2)if appearsr-09Call the police,Indicates a problem with the encoder cable connection,Please check whether the wiring is correct after cutting off the power 3)Please refer to other alarms10.Troubleshooting
6	Use a motor with an electromagnetic brake,Required before use Set up the electromagnetic brake control circuit	refer to4.6Connection method of motor with electromagnetic brake
7	JogJOGMode operation	There are no exceptions in the above steps,Click to moveJOGMode trial run

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

6.3 JOGoperate

step	Display content	illustrate
1	F00FL	Press M key,Enter functional operating mode
2	F05nE	use ▲, ▼ key selectionF05MEServo enable function
3	F05nE.	Press S key,The last decimal point lights up,Represents servo enable
4	F01CJ.	use ▲, ▼ key selectionF01CJJogJOGFunction
5	JoG.	dog S key to enterJOGmodel
6	J--CW.	dog ▲ key,The motor is1Forward rotation per second
7	or J-CCW.	or short press ▼ key,The motor is1Reversal per second
8	JoG.	dog S key,Motor stops running
9	F01CJ.	dog M key,Return to functional operating mode
10	F04nd	chooseF04MD,Press S key1Second,The motor will be deactivated

6.4Connect to computer for parameter setting

If the servo drive and motor meet the design requirements,It is necessary for users to useLunaMake the following settings for the debugging software::

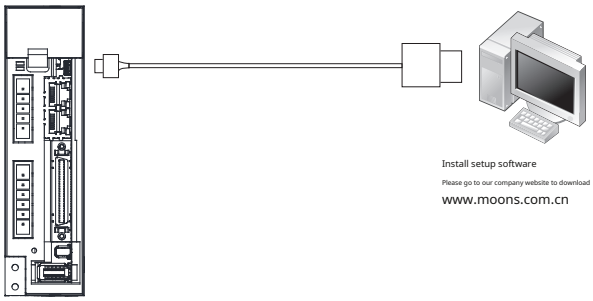
1.Configuration selection motor

2.Select working mode

3.Set the driver input and output signal functions

4.Use the online auto-tuning function,debugPIDParameter

connection method



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

7control function

7.1Input and output signal settings

Input and output signal connectorCN2There are preassigned functions on,Pre-assigned functions can also be changed into other functions based on application needs, Or change the input logic.Function and logic settings can be performed through parameters.

7.1.1Input signal settings

7.1.1.1Assignable functions to input signals

The functions and logic comparison table that can be assigned to the input signal are as follows:.parameterP5-00arriveP5-09Digital input definedX1arriveX10function,Write the values corresponding to the functions in the table below into the above parameters to set the digital input functions..

Signal name	abbreviation symbol	Setting values 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 switching	CM-SEL	9	10
Gain switching	GAIN-SEL	11	12
emergency stop	E-STOP	13	14
Return to origin start	S-HOM	15	16
Position error counter clear input	C-CLR	17	18
Torque limit input	TQ-LMT	19	20
Zero speed clamp input	ZCLAMP	twenty one	twenty two
Pulse input prohibition input	INHP	25	26
Multi-terminal speed selection input1	SPD1	27	28
Multi-terminal speed selection input2	SPD2	29	30
Multi-terminal speed selection input3	SPD3	31	32
Torque and speed start	SP-STA	33	34
Speed command direction	SPD-DIR	35	36
Speed limit input	V-LMT	37	38
Origin sensor input	HOM-SW	39	40
implementQprogram	START-Q	45	46

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 pin,The driver receives the input signal

OPEN: The driver digital input circuit does not form a loop,No current flows into or out of the input pin,Driver has no input signal

7.1.1.2 Default function for input signals

50PinInput signal of high-density connector type driverX1~X10Corresponding parameters,The functions and default parameter values in each mode are as follows:.

					Factory default		
CN2- Pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	enter logic	default value
8	X1	digital input1	P5-00	MU1	CCW-LMT	Closed	7
9	X2	digital input2	P5-01	MU2	CW-LMT	Closed	5
26	X3	digital input3	P5-02	MU3	A-CLR	Closed	3
27	X4	digital input4	P5-03	MU4	S-ON	Closed	1
28	X5	digital input5	P5-04	MU5	E-STOP	Closed	13
29	X6	digital input6	P5-05	MU6	CM-SEL	Closed	9
30	X7	digital input7	P5-06	MU7	GPIN	Closed	0
31	X8	digital input8	P5-07	MU8	HOM-SW	Closed	39
32	X9	digital input9	P5-08	MU9	GPIN	Closed	0
33	X10	digital input10	P5-09	MUA	GPIN	Closed	0
7	XCOM	digital inputCOMend	-	-	Xinput common		

7.1.2Output signal settings

7.1.2.1Assignable functions for output signals

The functions and logic comparison table that can be assigned to the output signal are as follows:.parameterP5-12 ~ P5-17Digital output definedY1arriveY6function,Write the values corresponding to the functions in the table below into the above parameters to set the digital output function..

Signal name	abbreviation symbol	Logic and setting value when the output signal is valid	
		Output when the signal is valid Closed	Output when the signal is valid Open
Universal output	GPOUT	0	
fault output	FLT	1	2
Warning output (alarm)	WARN	3	4
Motor brake release output	BRK	5	not support
Servo-onstatus output	SON-ST	7	8
Positioning completed output	IN-POS	9	10
Dynamic position following output	DYM-LMT	11	12
Torque reaches output	TQ-REACH	13	14
Torque limit output	T-LMT	15	16
Consistent speed 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
Limit (forward rotation)	SLCW	27	28
Limit (reverse)	SLCCW	29	30
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:Driver digital output circuit forms loop,Current flows into or out of the pin,Driver output signal

OPEN: The driver digital output circuit does not form a loop,No current flows into or out of the pin,The driver does not output a signal

7.1.2.2Default function for output signals

50PinOutput signal of high-density connector type driverY1~Y6Corresponding parameters,The functions and default parameter values in each mode are as follows:.

					Factory default		
CN2- Pin number	Signal name	Signal description	Corresponding parameters	instruction	Signal name	Output logic	default value
11	Y1+	Digital output1+	P5-12	MO1	SON-ST	Closed	7
10	Y1-	Digital output1-					
35	Y2+	Digital output2+	P5-13	MO2	S-RDY	Closed	twenty three
34	Y2-	Digital output2-					
37	Y3+	Digital output3+	P5-14	MO3	FLT	Closed	1
36	Y3-	Digital output3-					
39	Y4+	Digital output4+	P5-15	MO4	IN-POS	Closed	9
38	Y4-	Digital output4-					
12	Y5	Digital output5	P5-16	MO5	HOMED	Closed	25
40	Y6	Digital output6	P5-17	MO6	T-LMT	Closed	15
41	YCOM	Digital output common terminal	-		Y5,Y6Output common terminal		

7.1.3 Servo enable**(Servo On)**set up

Set the signal to control servo motor enable/disable.

under default settings,Servo enableThe signal is set as follows

Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	effect	Support mode			
S-ON	X4	27	P5-03	MU4	1	Set the signal to control servo motor enable/disable	P	V	T	F
	XCOM	7								

signal logic:

set value	signal logic	Function
1	Closed	When the input status isClosedstate,Drive enable
2	Open	When the input status isOpenstate,Drive enable

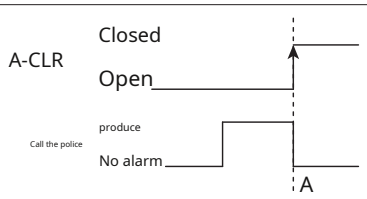
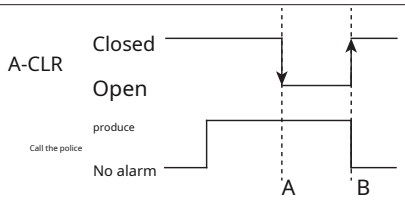
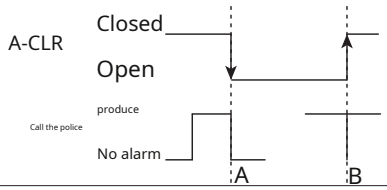
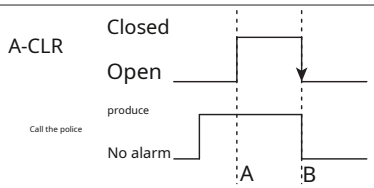
7.1.4 Alarm clear**(Alarm Reset)**

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

under default settings,Alarm clearThe signal is set by the table below

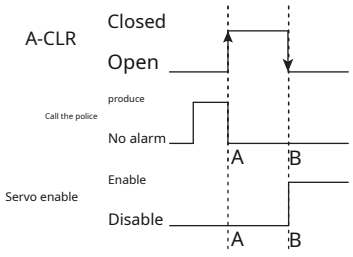
Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	effect	Support mode			
A-CLR	X3	26	P5-02	MU3	3	Clear abnormal warnings or alarms that occur on the drive	P	V	T	F
	XCOM	7								

signal logic

<table>
<tr><th>set value</th><th>signal logic</th><th colspan="2">Function</th></tr>
<tr><td rowspan="3">3</td><td rowspan="3">Closed</td><td colspan="2">under normal circumstances,The input must remain atOpen(high level) state.This is an edge trigger signal,Only if the input is fromOpen(high level) becomesClosed(low level),will clear the alarm.</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>1) A-CLRforOpen,Alarm not cleared
2)existApoint,A-CLRDepend onOpenarriveClosed,Alarm clear</td><td>1) A-CLRforClosed,Alarm not cleared
2)existApoint,A-CLRDepend onClosedarriveOpen,Alarm not cleared
3)existBpoint,A-CLRDepend onOpenarriveClosed,clear alarm</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Open</td><td colspan="2">under normal circumstances,A-CLRThe input must remain atClosed(low level) state.This edge trigger signal,only ifA-CLRfrom Closed(low level) becomesOpen(high level),will clear the alarm.</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>1) A-CLRforClosed,Alarm not cleared
2)existApoint,A-CLRDepend onClosedarriveOpen,Alarm clear
3)existBpoint,A-CLRDepend onOpenarriveClosed,Alarm not cleared</td><td>1) A-CLRforOpen,Alarm not cleared
2)existApoint,A-CLRDepend onOpenarriveClosed,Alarm not cleared
3)existBpoint,A-CLRDepend onClosedarriveOpen,clear alarm</td></tr>
</table>

Notice:

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



1)Apoint,A-CLRA rising edge on 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 the correct,Reverse limit switch.

under default settings,just,Reverse limitThe signal is set by the table below.

Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	effect	Support mode			
CCW-LMT	X1	8	P5-00	MU1	7	Motor reverse direction limit signal input	P	V	T	F
	XCOM	7								
CW-LMT	X2	9	P5-01	MU2	5	Motor forward direction limit signal input				
	XCOM	7								

signal logic:

type	Signal name	set value	signal logic	Function
enter	CCW-LMT	7	Closed	When the input status isClosedstate,Motor reverse direction limit warning, Unable to continue reversing after triggering
		8	Open	When the input status isOpenstate,Motor reverse direction limit warning, Unable to continue reversing after triggering
	CW-LMT	5	Closed	When the input status isClosedstate,The motor cannot continue to rotate forward after the limit warning in the forward direction is triggered.
		6	Open	When the input status isOpenstate,The motor cannot continue to rotate forward after the limit warning in the forward direction is triggered.

7.1.6 Gain switching function

Use the gain switching function,to meet the requirements under different load conditions,

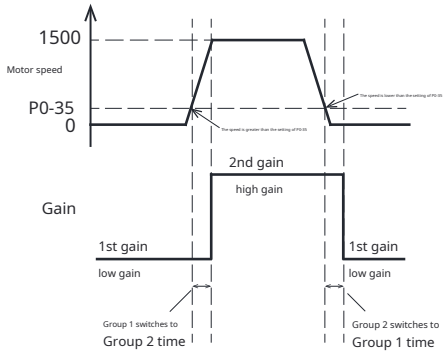
1)Increase gain when positioning,Shorten positioning settling time

2)Reduce gain when motor is stopped,dampen vibration

3)While the motor is running,Increase gain,Get better command following performance

Example:

Use lower gain when the motor is at low speed or stationary,reduce noise.While the motor is rotating,Switch to higher gain,Improve command followability.



1)Gain switching related parameters

parameter	instruction	parameter name	type	default value	unit
P0-05	KP	first position loop gain	First set of gains	52	0.1Hz
P0-07	KD	First 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	First speed loop integration 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	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	First gain switching to second gain delay time	-	10	ms

2)Gain switching method

Gain switching is available:

A.external input signal

B.Gain automatic switching.

3)External input signal switching

Use external input signalGAIN-SEL,whenGAIN-SELWhen the input conditions are met,switch section1gain to2Gain.

type	Signal name	set value	signal logic	Function
enter	GAIN-SEL	11	Closed	The default is the1Gain is effective. When the input status isClosedstate,No.2The gain takes effect when the input status isOpenstate,No.1Gain takes effect
		12	Open	When the input status isClosedstate,No.1The gain takes effect when the input status isOpenstate,No.2Gain takes effect

Notice:

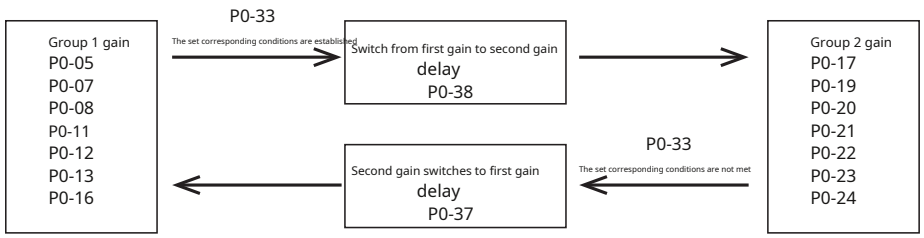
◆ When the gain switching mode is configured as external input signal switching,Automatic gain switching is invalid,That is, regardless ofP0-33How to set,Gain switching is determined by external input signal.

4)Automatic gain switching

parameterP0-33Method used to set automatic gain switching:

parameter	set value	Switch condition	Switch wait time
P0-33	0(default value)	fixed at no.1Group	-
	1	Switch to page2group conditions:Absolute value of position error≥P0-34set value	P0-38
		Switch back to Chapter1group conditions:Absolute value of position error<P0-34set value	P0-37
	2	Switch to page2group conditions:absolute value of actual speed≥P0-35set value	P0-38
		Switch back to Chapter1group conditions:The absolute value of the actual speed<P0-35set value	P0-37
	3	Switch to page2group conditions:Absolute value of actual torque≥P0-36set value	P0-38
		Switch back to Chapter1group conditions:The absolute value of the actual torque<P0-36set value	P0-37
	4	Switch to page2group conditions:The location arrival condition is not met	P0-38
		Switch back to Chapter1group conditions:The location arrival condition is established	P0-37

Automatically switch modes

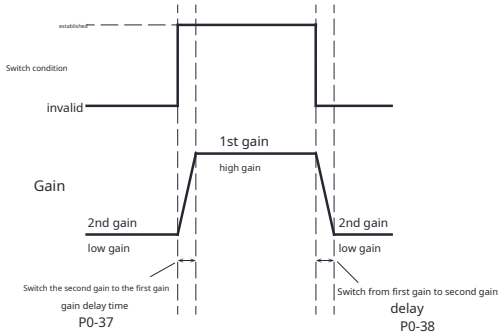


5)Switch transition time

As shown below,

When the switching condition is established,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 is not met,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



7.1.7 Control mode switching

M54SSeries AC servo in addition to individual position control,speed control,Outside torque control,You can also combine the two methods,and switch to using. Use external input signalCM-SEL,whenCM-SELWhen conditions are met,Switch the current control mode to another one.

1)Control mode switching related parameters

Control mode through parametersP1-00andP1-01to set.

parameter	instruction	parameter name	Default settings
P1-00	CM	master control mode	7
P1-01	EN	Second control mode	twenty one

Notice:

-PPulse driver does not support control mode switching function

2)Configurable control modes

The control modes that can be set are as follows:.

Control mode setting value	model	control signal	illustrate
1	Command torque mode	SCLCommunication command	useSCLCommand control motor output torque
2	Analog torque mode	+10~-10VAnalog signal	Using external analog quantities for torque control,The output torque of the motor has a linear relationship with the analog input value
7	Digital pulse position mode	Pulse & Direction CW/CCWpulse A/BQuadrature pulse	External pulse signal control
11	Analog speed mode	+10~-10VAnalog signal	Using external analog quantities for speed control,The motor speed has a linear relationship with the analog input value
15	Internal speed mode	Digital input signal	Internal speed mode
twenty one	Point-to-point location mode	SCLinstruction	useModbus,QProgramming and other instructions for point-to-point position mode control

3)Interchangeable control modes

control mode	P1-00Master control mode setting	P1-01Second control mode
Pulse position < ==== > Internal speed	7	15
Pulse position < ==== > Analog speed	7	11
Pulse position < ==== > Analog torque	7	2
Pulse position < ==== > Command torque	7	1
Analog speed < ==== > Analog torque	11	2
Analog speed < ==== > Command torque	11	1
Internal speed < ==== > Analog speed	15	11
Internal speed < ==== > Analog torque	15	2
Internal speed < ==== > Command torque	15	1

4)Control mode switching input signal setting

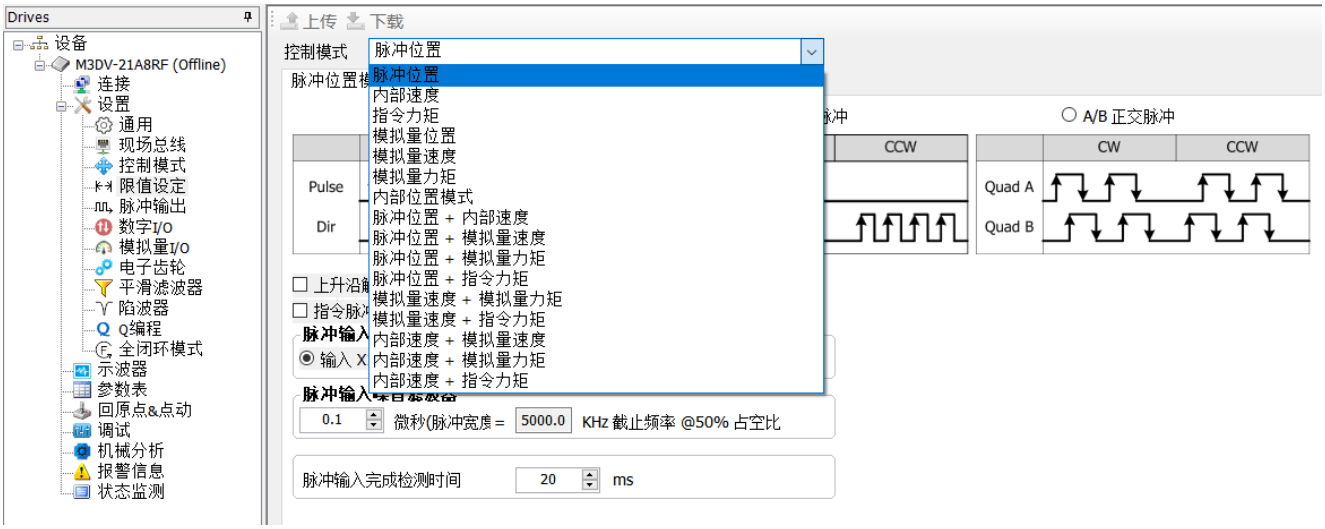
When using the control mode switching function,Configuration is required in all control modes,And the input logic must be consistent.If not configured correctly,then the switching function will not work properly.

◆ **M54S**series-**F**and-**R(50pin**high density connector**)**The default settings for the model are as follows:

Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	signal logic	effect	Support mode			
CM-SEL	X6	29	P5-05	MU6	9	Closed	Main control mode--->No.2control mode	P	V	T	F
	XCOM	7				Open	No.2Control mode--->Master control mode				

◆ Use software settings

In the software control mode interface,Directly select the desired control mode.



7.1.8 Emergency stop input

Emergency stop is a function that forcibly stops the operation of the servo motor through an external digital input

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

When the emergency stop input signal is valid,drive withP2-01The maximum braking deceleration stops,After stopping,The motor is in a non-enabled state,and generates an "emergency stop" fault error..

type	Signal name	set value	signal logic	Function
enter	E-STOP	13	Closed	When the input status isClosedstate,Drive emergency stop. When the input status isOpenstate,Emergency stop does not take effect
		14	Open	When the input status isOpenstate,The drive emergency stops when the input status isClosedstate,Emergency stop does not take effect

The default settings are as follows

Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	signal logic	effect	Support mode			
E-STOP	X5	28	P5-04	MU5	13	Closed	Drive emergency stop	P	V	T	F
	XCOM	7				Open	Emergency stop does not take effect				

7.1.9Fault error output

When a drive fails,will produceFault error output,And the servo system will change from the enabled state to the non-enabled state . parameterP5-12 ~ P5-17Set the drive digital outputY1 ~ Y6function. Need to use this function,One digital output of the servo drive is configured asFLTFunction.

type	Signal name	Output function setting value	signal logic	Function
output	FLT	1	Closed	The driver is faulty and an error message is generated.,The output isClosedstate
			Open	Drive OK,No fault reporting,The output isOpenstate
		2	Open	The driver is faulty and an error message is generated.,The output isOpenstate
			Closed	Drive OK,No fault reporting,The output isClosedstate

Display content	illustrate	alarm type	After the alarm occurs drive status	Display content	illustrate	alarm type	After the alarm occurs drive status
r01ot	Drive over temperature alarm	Report an error	Servo off	r25ur	Driver internal voltage error	Report an error	Servo off
r02ur	Internal voltage alarm	Report an error	Servo off	r26ur		Report an error	Servo off
r03uH	Driver overvoltage alarm	Report an error	Servo off	r28FP	Full closed loop position error exceeds limit	Report an error	Servo off
r04HC	Overcurrent	Report an error	Servo off	r29FE	Second encoder error	Report an error	Servo off
r05LC		Report an error	Servo off	r30nE	memory error	Report an error	Servo off
r06rC		Report an error	Servo off	r34Nt	Motor overtemperature	Report an error	Servo off
r09Eb	Encoder signal error	Report an error	Servo off	r35Ct	Drive processor overtemperature	Report an error	Servo off
r 10PL	Position error exceeds limit	Report an error	Servo off	r36Nr	Absolute encoder multiturn error	Report an error	Servo off
r 11Lu	Driver low voltage alarm	Report an error	Servo off	r37Et	Motor stalled	Report an error	Servo off
r 12ou	Stall alarm	Report an error	Servo off	r40H1	Motor collision alarm	Report an error	Servo off
r 19LP	AC power input phase missing	Report an error	Servo off	r41Er	Encoder communication abnormality	Report an error	Servo off
r21rF	Regenerative potential release failure	Report an error	Servo off				

The output default settings are as follows

Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	signal logic	effect	Support mode			
FLT	Y3+	37	P5-14	MO3	1	Closed	The driver is faulty and an error message is generated.	P	V	T	F
	Y3-	36				Open	Drive OK,No fault reporting				

7.1.10warning output

When the drive generates the following types of abnormal warnings,A warning signal will be output. parameterP5-12 ~ P5-17Set the drive digital outputY1 ~ Y6function. To use this feature, One digital output of the servo drive is configured asWARNFunction.

type	Signal name	Output function setting value	signal logic	Function
output	WARN	3	Closed	When the output isClosedstate,Indicates that the drive is faulty
			Open	When the output isOPENstate,Indicates the drive is normal,No exception warning
		4	Open	When the output isOPENstate,The drive is faulty
			Closed	When the output isClosedstate,Drive OK,No exception warning

Display content	illustrate	Alarm type	Drive status after alarm
r 13Lt	Forward rotation prohibition limit and reverse rotation prohibition limit	warn	Do not change current status
r 14cL	Reverse prohibition limit	warn	Do not change current status,The motor cannot continue to reverse
r 15JL	Forward rotation prohibition limit	warn	Do not change current status,The motor cannot continue to rotate forward
r 16CL	drive reset	warn	Do not change current status
r 17CE	Communication abnormality	warn	Do not change current status
r 18=F	Parameter saving failed	warn	Do not change current status
r20to	Safe torque is prohibited	warn	Servo off
r22uV	Under voltage warning	warn	Do not change current status
r239E	noneQProgram warning	warn	Do not change current status
r24dd	Alarm when commanding the motor to rotate when it is not enabled	warn	Do not change current status
r27E=	emergency stop	warn	Motor decelerates and stops
r3 16t	Absolute encoder battery is under voltage	warn	Do not change current status
r32AP	Absolute position lost	warn	Do not change current status
r33oP	Absolute value position overflow	warn	Do not change current status
r39Hr	Origin return exception warning	warn	Do not change current status
r42 io	I/OSignal function reuse	warn	Do not change current status

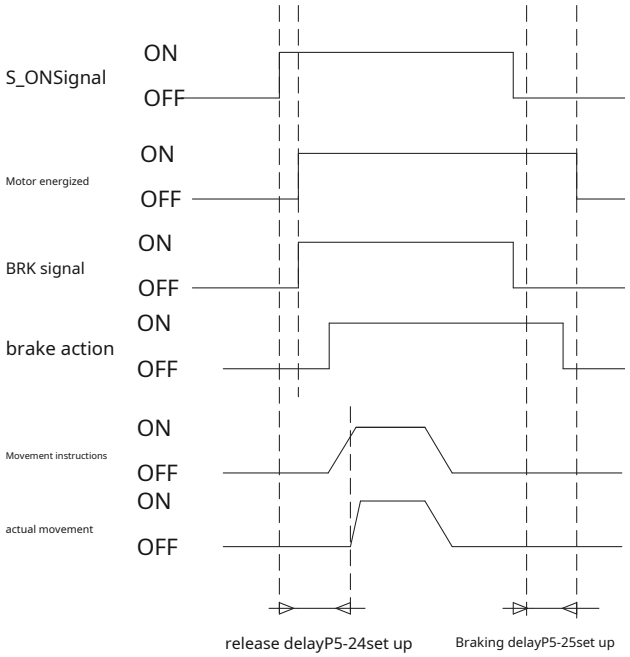
7.1.11 Motor brake control

When the drive power supply isOFFOr in order to keep the position fixed when the motor is not enabled,Requires servo motor with 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 asBRKFunction.

type	Signal name	Output function setting value	signal logic	Function
output	BRK	5	Closed	When servo is enabled,outputBRKSignal,The output status isClosed
			Open	When the servo is disabled,No outputBRKSignal,The output status isOpen

Because the brake has an action delay,To avoid damage to the brake,Need to pay attention to the timing of actions during use.



The release delay and braking delay time can use debugging softwareLunato set.Or by modifying the parametersP5-24and parametersP5-25to set. Note:About the wiring method and precautions of the brake,Please view the chapter**4.6**Connection method of motor electromagnetic brake

7.1.12 Servo ReadySignal output

When the servo drive is powered on,The drive does not have any alarms,Then outputServo ReadySignal,Indicates that the servo drive is ready, Can operate.Servo ReadyIt refers to the situation where all of the following conditions are met::

1)There is no fault with the drive

2)Main power supply is normal

3) STOno trigger

4)emergency stopE-STOPno trigger

When the servo is not ready,Even if the drive receivesS-ON(enable) signal,The drive will not be enabled,The motor will not excite.

type	Signal name	Output function setting value	signal logic	Function
output	S-RDY	twenty three	Closed	drive ready,output signal,The output status isClosed
			Open	drive not ready,No signal output,The output status isOpen
		twenty four	Open	drive ready,No signal output,The output status isOpen
			Closed	drive not ready,output signal,The output status isClosed

The default settings of the output function are as follows

Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	signal logic	effect	Support mode			
S-RDY	Y2+	35	P5-13	MO2	twenty three	Closed	drive ready	P	V	T	F
	Y2-	34				Open	drive not ready				

7.1.13 Servo enable status signal output

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

parameterP5-12 ~ P5-17Set the drive digital outputY1 ~ Y6function. When using this function,A

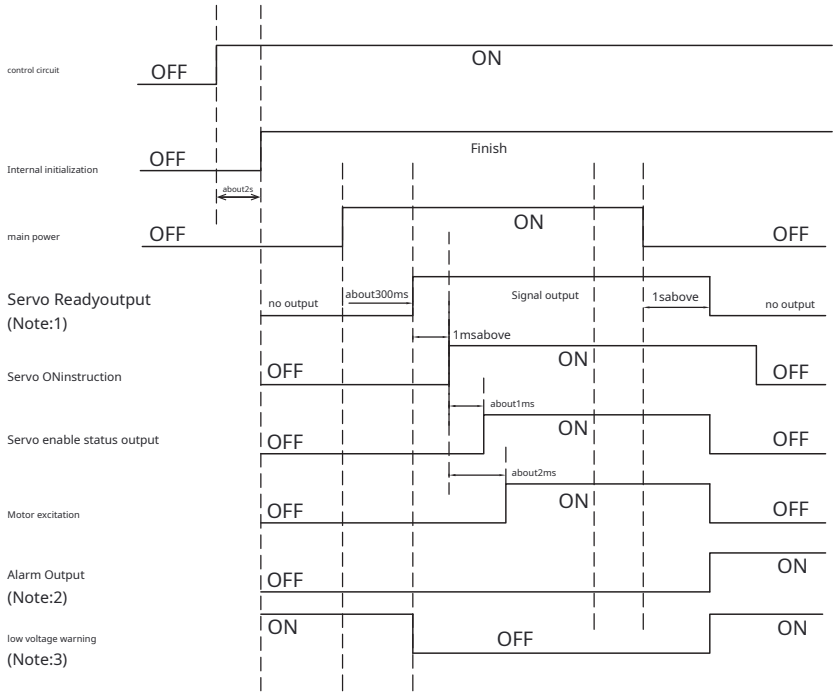
digital output of the servo drive needs to be configured asSON-STFunction.

type	Signal name	Output function setting value	signal logic	Function
output	SON-ST	7	Closed	Drive is enabled,output signal,The output status isClosed
			Open	Drive not enabled,No signal output,The output status isOpen
		8	Open	Drive is enabled,No signal output,The output status isOpen
			Closed	Drive not enabled,output signal,The output status isClosed

The default settings of the output function are as follows

Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	signal logic	effect	Support mode			
SON-ST	Y1+	11	P5-12	MO1	7	Closed	Drive is enabled	P	V	T	F
	Y1-	10				Open	Drive not enabled				

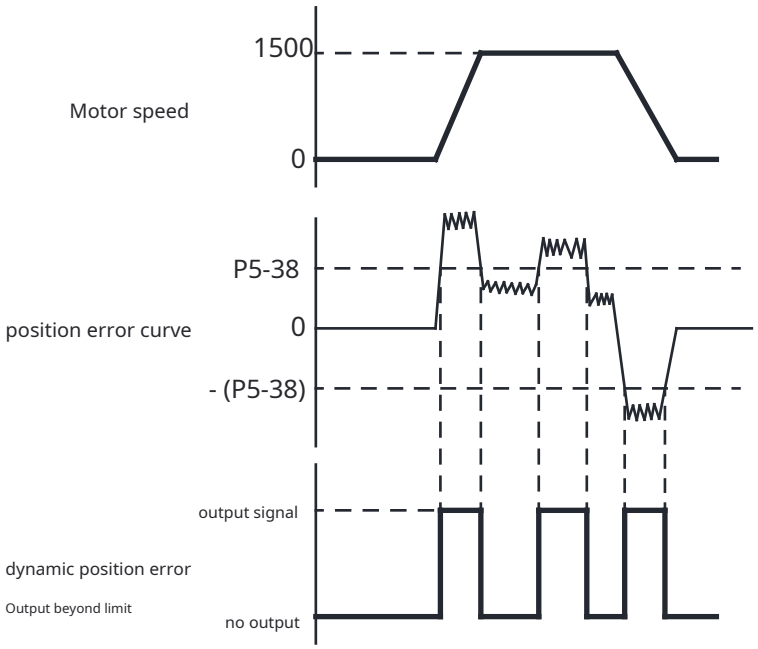
The timing diagram is as follows:



7.1.14 Dynamic position following output

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

The figure below shows the setting value of11,That is, the error exceedsP5-38set up,output signal,The output status isClosedSchematic diagram of.



type	Signal name	set value	signal logic	Function
output	DYM-LMT	11	Closed	The error exceedsP5-38set up,output signal,The output status isClosed
			Open	The error does not exceedP5-38set up,No signal output,The output status isOpen
		12	Open	The error exceedsP5-38set up,No signal output,The output status isOpen
			Closed	The error does not exceedP5-38set up,output signal,The output status isClosed

7.1.15 Rotation limit output

Rotation limit output means that the motor encounters or triggers the limit switch (or software limit) in 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)Forward rotation limit outputSLCW

2)Reverse limit outputSLCCW

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

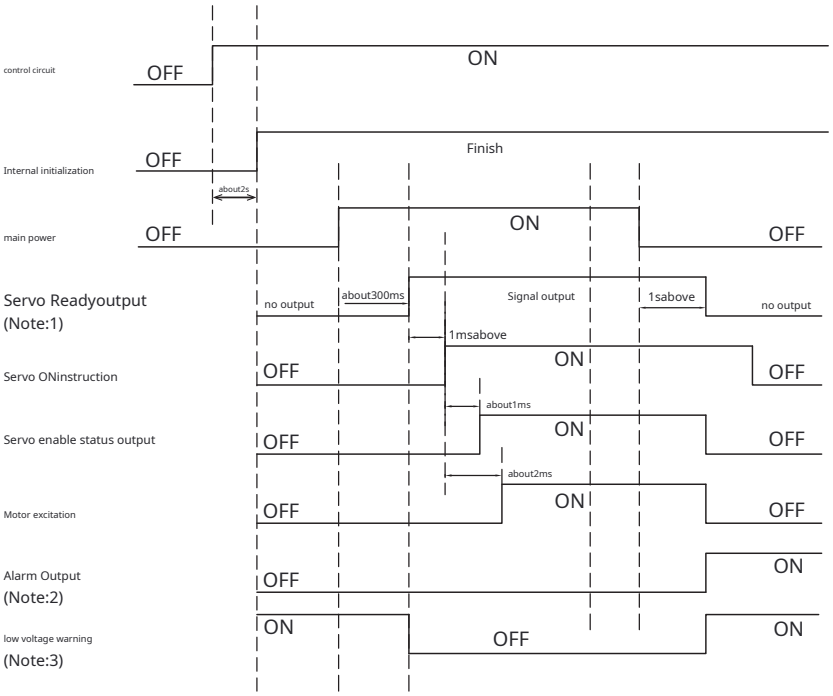
In an absolute value system,The types of limit switches are as follows,When the following conditions are met arbitrarily,The corresponding rotation limit signal will be output..

1)Limit signal of digital input

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

7.1.16 Timing diagram

7.1.16.1 The timing diagram for turning on the power is as follows:

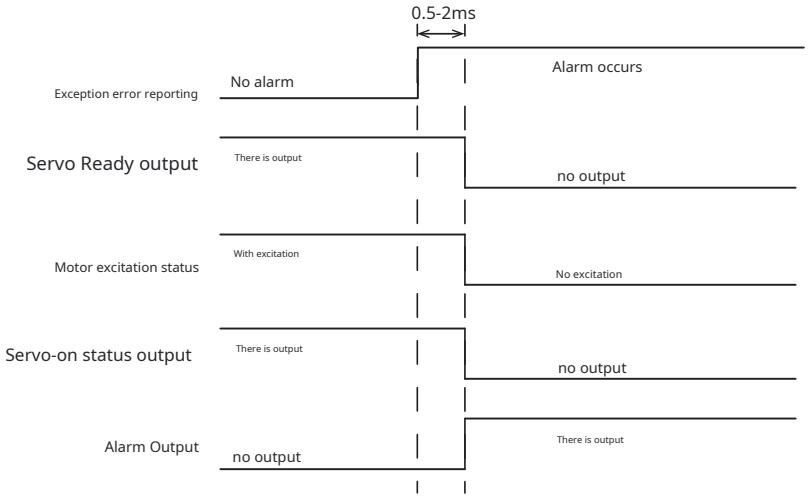


Note**1**:When the main circuit is powered off,Due to the presence of capacitance in the driver,might need**1s**or longer,will stop output**Servo Ready**Signal.

Note**2**:in enabled state,When the main circuit is powered off,Possible alarm contents include:Under voltage alarm**(**warn**)**,Voltage too low**(**Fault**)**,Position error exceeds limit**(**If the motor loses power while in motion**)**.

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

7.1.16.2 Timing diagram when fault alarm occurs

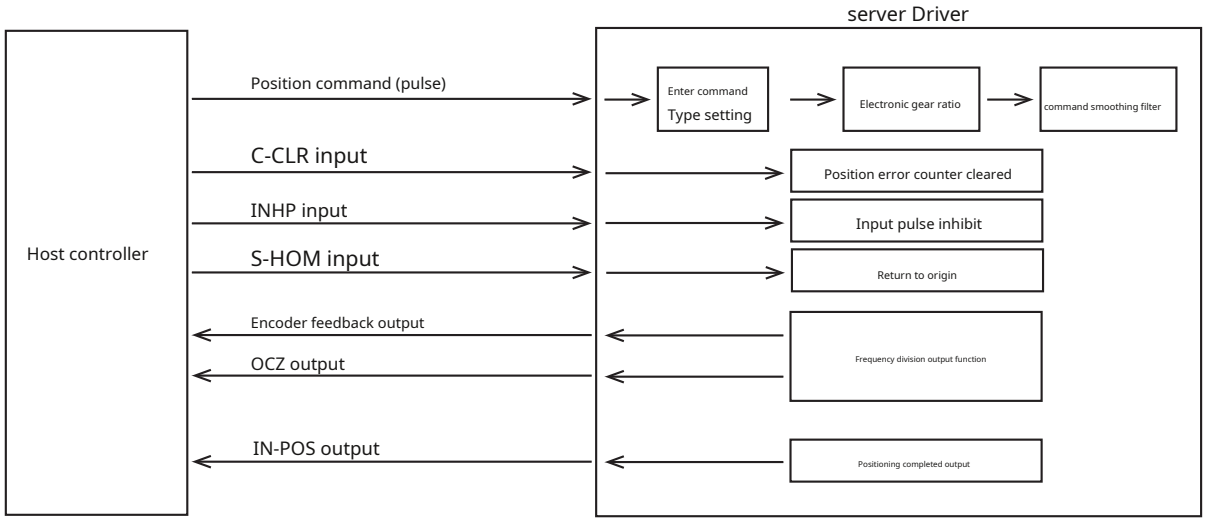


7.2location mode

7.2.1Overview of the location mode setting process

The position mode is to perform position control based on the position command input from the host controller..The following describes the basic settings for position control..

◆ Function setting block diagram



◆ Location mode selection

Location mode is widely used in devices that require precise positioning.existM54SMultiple position modes available in series AC servo:Digital pulse position mode,Command position mode.

by driveledoperation panel orLunaDebugging software 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	7	Digital pulse position mode	◆ Pulse & Direction ◆ CW/CCWpulse ◆ A/BQuadrature pulse	500KHzOpen collector high speed input or4MHz Differential signal input
		twenty one	Command position mode	◆ Qprogramming ◆ Modbus/RTU	useQprogramming orModbus/RTUCommunication instructions for position control

◆ Pulse position command input setting

In digital pulse position mode,The following content needs to be set:

◆ Pulse command source

◆ Pulse command type

◆ Rotation direction setting

◆ Conditions for valid pulse edges

◆ Pulse input noise filtering

Related parameters

parameter	instruction	parameter name	Predetermined area	default value	unit	illustrate
P3-03	PT	Pulse input setting	1~30	9	-	Source of command for input pulse,Pulse type,Set the direction of rotation and valid pulse edge type.: ◆ bit0andbit1:Pulse command type ◆ bit2:Rotation direction setting ◆ bit3:Conditions for valid pulse edges ◆ bit4:Pulse command source
P3-02	SZ	Pulse input filter width	0~3200	2	-	Setting the pulse input noise filter

Detailed parameter settings,Please refer to chapter**7.2.3**Position command input settings

◆ Electronic gear ratio

The electronic gear ratio is the value obtained by multiplying the pulse command input from the host controller by the set electronic gear ratio.,As a position command in position control mode .By using this function,The motor rotation corresponding to the input command pulse can be set arbitrarily.,Movement amount.

Related parameters

parameter	instruction	name	Numeric range	default value	unit	
P3-00	EN	electronic gear ratio numerator	1~2147483647	1048576	-	Numerator that sets the electronic gear ratio
P3-01	EU	Electronic gear ratio denominator	1~2147483647	10000	-	Set the denominator of the electronic gear ratio
P3-05	EG	Number of pulses required per revolution	200~131072	10000	-	Set the number of pulses required per motor revolution

Detailed parameter settings,Please refer to chapter**7.2.4**Electronic gear ratio

◆ command smoothing filter

Filter the position command or speed command,Smoothing motion instructions,Can reduce operating transients of motors and mechanical systems,Make running smoother.

Related parameter settings

parameter	instruction	name	Numeric range	default value	unit	illustrate
P2-05	JT	Jerk time	0~250	10	ms	Time constant of smoothing filter in internal trajectory mode
P2-28	KJ	low pass smoothing filter	0~1000	10	ms	When setting the low-pass filter for the position command or speed command time constant
P2-29	FF	interpolation filter	0~250	10	ms	Time constant of smoothing filter under pulse position command

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

◆ Position error counter clearing function

In pulse position mode,Use external input signal,Clear the position error counter of the servo drive.whenC-CLRWhen conditions are met,The position error counter is0,No position compensation.

Related settings

type	Signal name	set value	signal logic	Function
enter	C-CLR	17	Closed	C-CLRFeature enabled,The position error counter is0
			Open	C-CLRFunction not enabled,Value of position error counter = position command - encoder feedback
		18	Open	C-CLRFeature enabled,The position error counter is0
			Closed	C-CLRFunction not enabled,Value of position error counter = position command - encoder feedback

Detailed parameter settings,Please refer to chapter**7.2.7**Position error counter clearing function

◆ Pulse input inhibit function

Pulse inhibit function (INHP)Refers to the pulse position mode,Use external input signal,Input pulse counting can be forcibly disabled.whenINHPWhen conditions are met,The servo drive will ignore external pulse input,And the servo motor will stop running immediately.

Related settings

type	Signal name	set value	signal logic	Function
enter	INHP	25	Closed	INHPFeature enabled,Driver does not respond to input pulses
			Open	INHPFunction not enabled,The driver responds to input pulses
		26	Open	INHPFeature enabled,Driver does not respond to input pulses
			Closed	INHPFunction not enabled,The driver responds to input pulses

Detailed parameter settings,Please refer to chapter**7.2.6**Pulse inhibit function

◆ Positioning complete signal

in location mode,Use the positioning completion signal output to indicate the current positioning status of the servo motor..When the difference between the total number of pulse commands received by the driver and the actual number of pulses moved by the servo motor, that is, the position error, is less than the parameter setting value,Output positioning completion signal.

Related settings

type	Signal name	set value	signal logic	Function
output	IN-POS	9	Closed	Positioning completedIN-POSCondition is established,output signal,The output status isclosed
			Open	Positioning completedIN-POSCondition is not met,No signal output,The output status isopen
		10	Open	Positioning completedIN-POSCondition is established,output signal,The output status isopen
			Closed	Positioning completedIN-POSCondition is not met,No signal output,The output status isclosed

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

◆ Pulse frequency division output

The pulse frequency division output function of the servo driver is a way to use the external position command pulse or the position information fed back by the encoder.90°out of phase2phase pulse (A/BPhase) differential output function,But when the pulse source is the encoder,supportZphase pulse output.

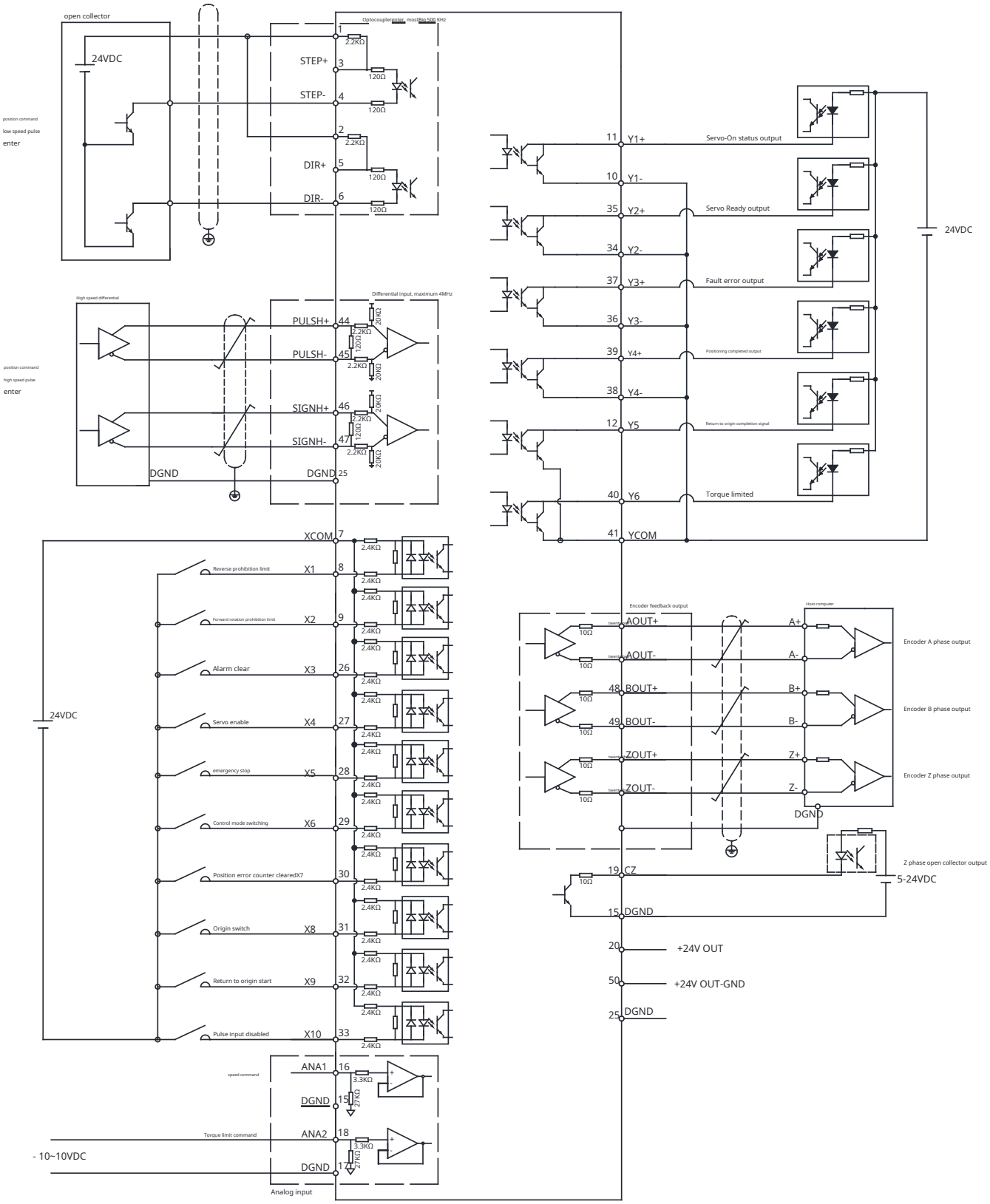
Related parameters

parameter	instruction	name	Numeric range	default value	unit	
P3-12	PO	Pulse frequency division output mode	0~256	1	-	Setting of pulse frequency division output mode
P3-13	ON	Pulse frequency division output ratio numerator	0~13107200	10000	-	Numerator that sets the pulse output distribution ratio
P3-14	OD	Pulse frequency division output ratio denominator	0~13107200	131072	-	Set the denominator of the pulse output distribution ratio

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

7.2.2 Digital pulse position mode wiring diagram

7.2.2.1 M54Sseries**50Pin**high density connector



7.2.3 Position command input settings

whenP1-00set as7,That is, in digital pulse position mode,Need to set:

- Pulse command source
- Pulse command type
- Pulse command direction signal logic setting
- Conditions for valid pulse edges
- Pulse input noise filtering

Related parameters

parameter	instruction	parameter name	Predetermined area	default value	unit	illustrate
P3-03	PT	Pulse input setting	1~30	9	-	Source of command for input pulse,Pulse type,Set the direction of rotation and valid pulse edge type.: ◆ bit0andbit1:Pulse command type ◆ bit2:Rotation direction setting ◆ bit3:Conditions for valid pulse edges ◆ bit4:Pulse command source
P3-02	SZ	Pulse input filter width	0~3200	2	-	Setting the pulse input noise filter

parameter**P3-03**

Use parametersP3-03Source of command for input pulse,Pulse type,Set the direction of rotation and valid pulse edge type.

parameterP3-03Input pulse setting							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	0:Low speed pulse input	0:Valid on falling edge	0:CWdirection	bit1=0,bit0=1:pulse+direction	
			1:High-speed differential pulse input	1:Valid on rising edge	1:CCWdirection	bit1=1,bit0=0: CW/CCW	
						bit1=1,bit0=1: A/BQuadrature pulse	
bit0andbit1:Pulse command type bit2:Rotation direction setting bit3:Conditions for valid pulse edges bit4:Pulse command source							

7.2.3.1 Input pulse source

The pulse input source is determined by the parameterP3-03ofbit4set up

parameterP3-03Input pulse setting							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	0:Low speed pulse input				
			1:High-speed differential pulse input				

M54SThe series has two sets of input sources:

◆ **P3-03**of**bit4 = 0**low speed pulse signal**(**or open collector pulse input**)**

CN2-Pin number	Signal name		illustrate
1	OPC1	Pulse signal input	whenP3-03ofbit4set as"0"hour,Choose to use this position command input port ◆ Optocoupler input,support: 1)open collector pulse signal,support24VDCenter 2)Low-speed differential pulse input,support5VDC ◆ The maximum pulse input frequency is500KHz. ◆ Support pulse & direction signals,CW/CCWSignal,A/Borthogonal signals ◆ When using an open collector pulse signal,Need to useOPC1andOPC2Hardware pull-up.
3	STEP+		
4	STEP-		
2	OPC2	Pulse direction signal input	
5	DIR+		
6	DIR-		

◆ **P3-03**of**bit4 = 1**high speed pulse signal**(Line Driver**Dedicated to pulse input**)**

CN2-Pin number	Signal name		illustrate
44	PULSH+	Pulse signal input	whenP3-03ofbit4set as"1"hour,Choose to use this position command input port ◆ Differential input (Line Driver),Suitable for high-speed pulse signals with differential output,support5VDC,The maximum pulse input frequency is4MHz. ◆ Support pulse & direction signals,CW/CCWSignal,A/Borthogonal signals
45	PULSH-		
46	SIGNH+	Pulse direction signal input	
47	SIGNH-		

7.2.3.2 Input pulse type setting

◆ Instruction type,turn around,Pulse edge valid conditions

parameterP3-03ofbit0,bit1,bit2,bit3Set the command type of the input pulse respectively,Motor rotation direction,Pulse count edge valid conditions.

parameterP3-03Input pulse setting							
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
			Pulse input source	Pulse edge valid conditions	Rotation direction setting	Instruction type	
0	0	0	0:Low speed pulse input 1:High-speed differential pulse input	0:Valid on falling edge 1:Valid on rising edge	0:CWdirection 1:CCWdirection	bit1=0,bit0=1:pulse+direction bit1=1,bit0=0: CW/CCW bit1=1,bit0=1: A/BQuadrature pulse	

1)Instruction type:

There are three types of input pulses to choose from::Pulse & Direction,CW/CCWpulse,A/BQuadrature pulse.

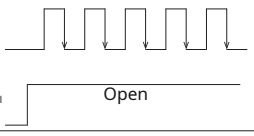
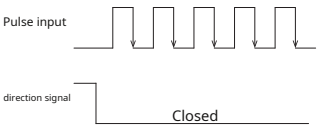
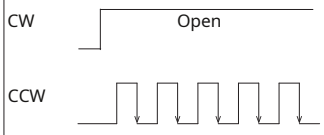
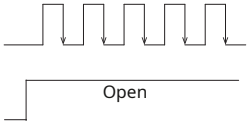
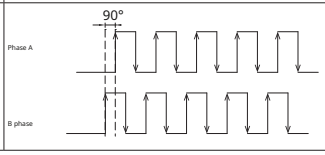
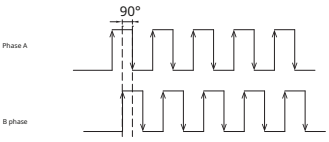
by parametersP3-03ofbit0andbit1set up.

bit 1	bit 0	Instruction type
0	1	Pulse & Direction (default setting)
1	0	CW/CCWpulse
1	1	A/BQuadrature pulse

2)turn around:

parameterP3-03ofbit2Determine the relationship between the direction of the input pulse and the direction of motor rotation,As shown below.

Rotation direction setting bit2	Pulse type	Forward condition		reversal condition	
0(default setting)	pulse+direction	direction signal hold forClosedhour For forward rotation	Pulse input direction signal Closed	direction signal hold forOpentime is reverse	Pulse input direction signal Open
	CW/CCWpulse	whenCWPhases have pulses rush,andCCW The signal isOpen forward rotation	CW CCW Open	whenCCWphase there pulse,andCW The signal isOpen time reversal	CW Open CCW
	A/BQuadrature pulse	whenAphase pulse super forwardBMutually90°hour For forward rotation	90° Phase A B phase	whenBphase pulse super forwardAMutually90°hour for reversal	90° Phase A B phase

Rotation direction setting bit2	Pulse type	Forward condition		reversal condition	
1	pulse+direction	direction signal hold forOpentime is Forward		direction signal hold forClosedhour for reversal	
	CW/CCWpulse	whenCCWphase there pulse,andCW The signal isOpen forward rotation		whenCWPhases have pulses rush,andCCW The signal isOpen time reversal	
	A/BQuadrature pulse	whenBphase pulse super forwardAMutually90°hour For forward rotation		whenAphase pulse super forwardBMutually90°hour for reversal	

3)Pulse count edge valid conditions:

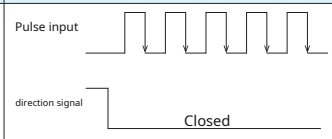
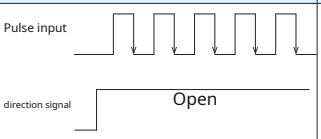
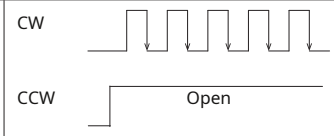
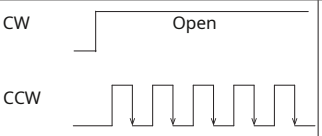
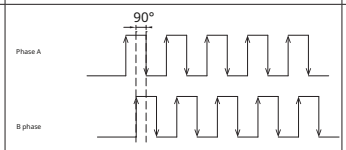
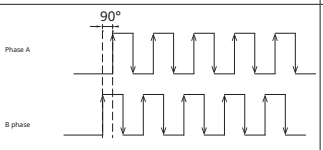
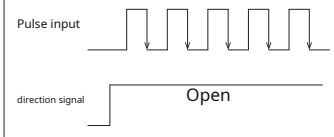
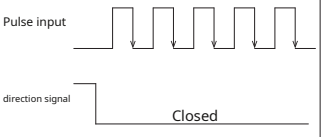
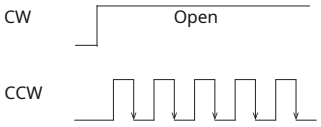
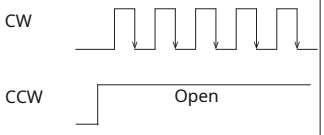
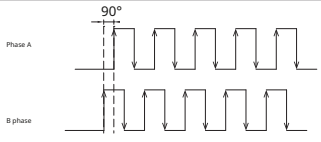
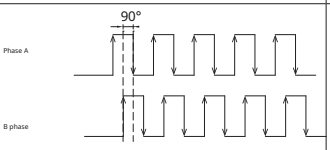
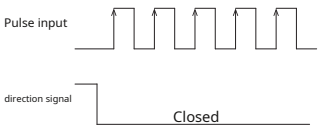
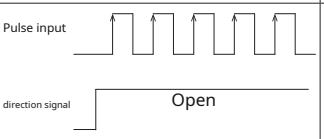
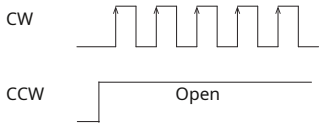
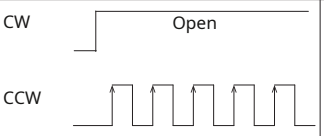
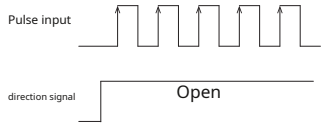
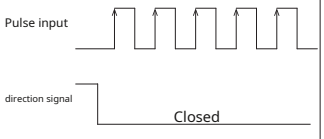
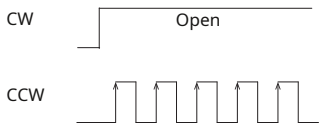
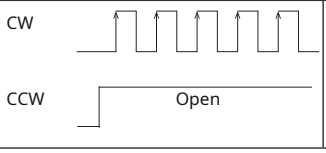
parameterP3-03ofbit3Determines the edge validity conditions for pulse counting

bit 3	edge validity conditions
0	Valid on falling edge (default setting)
1	Valid on rising edge

7.2.3.3 Quick setting of input pulse type

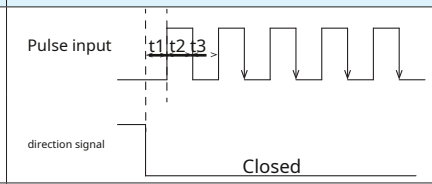
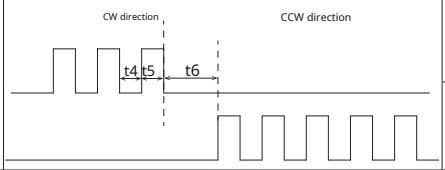
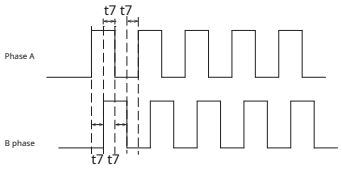
The following table lists the parameters based on the following conditionsP3-03Quick setup method

- Pulse command source
- Pulse command type
- Pulse command direction signal logic setting
- Conditions for valid pulse edges

pulse edge Valid conditions	rotate direction set up	Pulse command type			Forward	reverse	parameterP3-03 set value (10base)	
							low speed pulse When typing	High speed differential pulse When inputting
bit3	bit2	bit1	bit0					
0	0	0	1	Pulse+ direction			1	17
0	0	1	0	CW/ CCW pulse			2	18
0	0	1	1	A/Bjust Jiaomai rush			3	19
0	1	0	1	Pulse+ direction			5	twenty one
0	1	1	0	CW/ CCW pulse			6	twenty two
0	1	1	1	A/Bjust Jiaomai rush			7	twenty three
1	0	0	1	Pulse+ direction			9	25
1	0	1	0	CW/ CCW pulse			10	26
1	1	0	1	Pulse+ direction			13	29
1	1	1	0	CW/ CCW pulse			14	30

7.2.3.4 Pulse command specifications

The minimum pulse width of the input pulse should meet the following conditions.

		Low speed pulse input port STEP+, STEP-, DIR+, DIR-						High-speed differential pulse input PULSH+,PULSH- SIGN+,SIGN-		
		differenceLine Driver Shortest pulse width (μs)			open collector Shortest pulse width (μs)			High speed differentialLine Driver Shortest pulse width (μs)		
pulse+direction		t1	t2	t3	t1	t2	t3	t1	t2	t3
		0.25	0.25	0.25	1	1	1	0.125	0.125	0.125
CW/CCW pulse		t4	t5	t6	t4	t5	t6	t4	t5	t6
		0.25	0.25	0.25	1	1	1	0.125	0.125	0.125
A/BQuadrature pulse		t7			t7			t7		
		0.25			1			0.125		

Pulse level switching (rise/fall) time should be less than0.1μs

7.2.3.5 Pulse input noise filtering

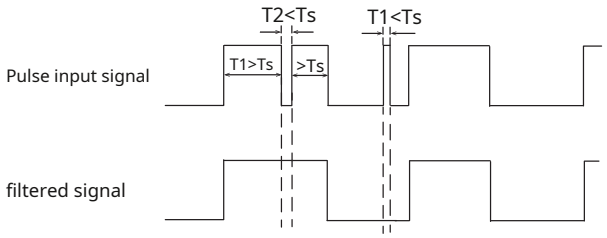
Use parametersP3-02Pulse input signals can be filtered,Prevent pulse signals from being interfered with,Causes servo motor to operate randomly.Input impulse noise is filtered as a low pass filter,Unit is0.1μs.

Related parameter settings

parameter	instruction	name	Numeric range	default value	unit	illustrate
P3-02	SZ	Pulse input filter width	0~32000	2	0.1μs	Setting the pulse input noise filter

Mechanism:

likeP3-02The set value isTs,The input pulse high level holding time isT1,The low level holding time isT2,Then the relationship between the input pulse signal and the filtered signal is as follows:



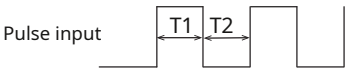
- When the pulse width of the input pulseT1andT2greater than at the same timeTs,This pulse input is valid.
- When the pulse width of the input pulseT1,T2There is one less thanTshour,The pulse will be filtered out,Pulse input is invalid.

$$\text{The set filter time } Ts \le \frac{1}{A \times \text{actual pulse frequency (Hz)}}$$

Generally, when the input frequency duty cycle is 50%, A takes the value 4 or 5.

Example:

1)When the input pulse frequency**200KHz**,The duty cycle is**50%**.



$$T1 = \frac{1}{200000} \times 0.5 = 0.0000025s \qquad T2 = \frac{1}{200000} \times 0.5 = 0.0000025s$$

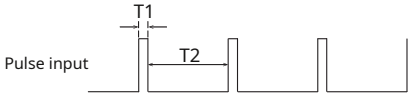
$$Ts = \frac{1}{5 \times 200000} = 0.000001s$$ because Ts < T1 and T2

That is, the minimum filtering time is1μs.Since the parametersP3-02The unit is0.1μs

Therefore:

P3-02The set value is10.

2)When the input pulse frequency**500KHz**,The duty cycle is**10%**.



$$T1 = \frac{1}{500000} \times 0.1 = 0.0000002s \quad T2 = \frac{1}{500000} \times 0.9 = 0.0000018s$$

$$Ts = \frac{T1}{2} = 0.0000001s$$

Since the pulse width of the input pulseT1andT2need to be greater thanP3-02hour,This pulse input is valid only.But in10%Under the condition of duty cycle,If according to the formulaAvalue5,Ts=0.4μsand greater thanT1,At this time the pulse input will be invalid.

therefore:

The value isTs=0.5 x T1=0.1μs,Since the parametersP3-02The unit is0.1μs

Therefore:

P3-02The set value is1.

7.2.4 Electronic gear ratio

M54SSeries servo drives have two position command systems,parameterP3-16Used to select which position command system to use.

parameterP3-16 set value	illustrate	Remark
0	Based on parametersP3-05(Number of pulses required per revolution)	Set the number of command pulses per motor revolution. Notice: ◆ At this time, the electronic gear ratioP03-00andP3-01invalid. ◆ The read number of current position pulses of the motor is also determined by this parameter. That is, the number of pulses read per revolution of the motor = parameterP3-05set up
1	Electronic gear ratio effective	◆ Electronic gear ratioP03-00andP3-01efficient,parameterP3-05(The required number of pulses per revolution) is invalid. ◆ The calculation formula for the read current position pulse number of the motor is as follows:: Number of motor pulses read per revolution = 1048576 (encoder resolution) x Electronic gear ratio denominator P3-01 / Electronic gear ratio numerator P3-00

The electronic gear ratio is the value obtained by multiplying the pulse command input from the host controller by the set electronic gear ratio.,As the command position unit in position control mode.By using this function,The motor rotation corresponding to the input command pulse can be set arbitrarily.,Movement amount.

$$\text{external position pulse (communication position command)} \times \frac{\text{Electronic gear ratio numerator P3-00}}{\text{Electronic gear ratio denominator P3-01}} = \text{command position}$$

◆ When parametersP3-16 = 0hour,Electronic gear ratio is invalid.The number of pulses for one revolution of the motor is determined by the parameterP3-05Decide.

◆ When parametersP3-16 = 1hour,Electronic gear ratio effective,The number of pulses for one revolution of the motor is fixed to the resolution of the encoder.No matter what combination 17-bit,20-bitresolution encoder,It takes the motor to rotate once1048576pulses.

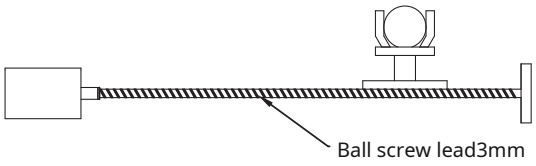
For example:The number of pulses required per motor revolution is1048576pulses,When the electronic gear ratio is equal to1hour,Host computer sends1048576pulses, The motor rotates once.When the electronic gear ratio is equal to1:2hour,That is, every time the host computer2The motor rotation pulse corresponding to each pulse is1pulses,The host computer needs to send2097152pulses,After multiplying by the electronic gear ratio,The position command unit is1048576pulses,The motor rotates once.

Set a reasonable electronic gear ratio,It will simplify the calculation of the number of pulses sent by the host computer..

Related parameters

parameter	instruction	name	Numeric range	default value	unit	illustrate
P3-00	EN	electronic gear ratio numerator	1~2147483647	1048576	-	Numerator that sets the electronic gear ratio
P3-01	EU	Electronic gear ratio denominator	1~2147483647	10000	-	Set the denominator of the electronic gear ratio
P3-05	EG	Number of pulses required per revolution	200~131072	10000	pulses	Set the number of pulses required for the motor to rotate once
P3-16	PU	Electronic gear ratio switch	0~1	0	-	Whether to use electronic gear ratio

For example:The screw lead is**3mm**,When it is necessary to move**4mm**.



If electronic gear ratio is not used,Calculate the number of pulses required:

Since the lead is3mm,That is, every time the motor rotates,Workbench movement3mm,Then move4mmthen you need to transfer: "4/3lock up".

Calculate the number of pulses required:

If the number of pulses required per motor revolution is1048576pulses,So$_{1048576 \times \frac{4}{3}}$ = 1398101.33333.....pulses.

move4mmNeed to input pulse digit1398101.3333,and will produce cumulative errors.Using electronic gear ratio will solve this problem.

7.2.4.1 Calculation method of electronic gear ratio:

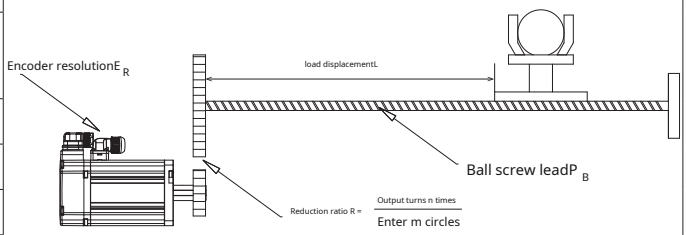
The total mechanical transmission ratio between the motor shaft and the load side ism:n (Motor rotationmlap time,load movementnlock up),The electronic gear ratio can be quickly calculated by the following formula.

$$\text{Electronic gear ratio } \frac{B}{A} = \frac{\text{Parameter P3-00}}{\text{Parameter P3-01}} = \frac{\text{Encoder resolution}}{\text{Position command for one rotation of the load shaft}} \times \frac{m}{n}$$

7.2.4.2 Motor gear ratio calculation list

Take the screw rod as an example,The relevant parameters are:

- Lead screw:PB,unitmm
- Load position:L,unitmm
- The overall reduction ratio of the system:R = Output turns n times / Enter m circles
- Motor encoder resolutionE,unitcounts,E_R=1048576 counts
- electronic gear ratio numerator:B,Corresponding parametersP3-00
- Electronic gear ratio denominator:A,Corresponding parametersP3-01
- Number of external pulse inputs:P,unitcounts



1)According to the number of external pulse input**P(counts)**and the corresponding load displacement**L(mm)**,Calculate electronic gear ratio

The load displacement isLhour,The number of turns corresponding to the load $\frac{L}{P_B}$,The number of turns the motor shaft rotates is $\frac{P \times \frac{B}{A}}{E_R}$,

according to

Number of motor shaft turnsxReduction ratio = number of turns of load rotation

then there is

$$\frac{P \times \frac{B}{A}}{E_R} \times R = \frac{L}{P_B}$$

So the electronic gear ratio is:

$$\frac{B}{A} = \frac{L}{P_B} \times \frac{1}{R} \times \frac{E_R}{P}$$

2)external input**1**pulses and the corresponding load displacement**ΔL**,Calculate electronic gear ratio

When external input1pulses,The load displacement is ΔL,The number of turns corresponding to the load ΔL,The number of turns the motor shaft rotates is $\frac{\frac{1 \times B}{A}}{E_R}$.

according to

Number of motor shaft turnsxReduction ratio = number of turns of load rotation

then there is

$$\frac{\frac{1 \times B}{A}}{E_R} \times R = \frac{\Delta L}{P_B}$$

So the electronic gear ratio is:

$$\frac{B}{A} = \frac{\Delta L}{P_B} \times \frac{1}{R} \times E_R$$

3)According to the external input pulse frequency**F(Hz)**and the corresponding load displacement speed**V(mm/s)**,Calculate electronic gear ratio

load speed: $\frac{V}{P_B}$ (rps),Motor speed: $\frac{F \times \frac{B}{A.}}{E_G}$

according to

Motor shaft speedxReduction ratio = load speed

then there is

$$F \times \frac{B}{A} \times \frac{1}{E_G} \times R = \frac{V_L}{P_B}$$

So the electronic gear ratio is:

$$\frac{B}{A} = \frac{V_L}{P_B} \times 1 \times \frac{E_G}{R} \times \frac{1}{F}$$

7.2.4.3 Electronic gear ratio calculation example

Use lead as3mmof screw,The reduction ratio is10:1.The host computer needs to send1pulses,Workpiece walking1um.

$$\frac{B}{A} = \frac{1}{3000} \times 10 \times 1048576 = \frac{1048576}{300}$$

Right now

P3-00The electronic gear ratio numerator is:1048576 P3-01

The denominator of the electronic gear ratio is:300

7.2.5 Command smoothing filter settings

When the position command or speed command of the servo system jumps,It is easy to cause the entire system to vibrate,Operation noise will also increase.Command smoothing filtering is to filter the position command or speed command,Smoothing motion instructions,Can reduce operating transients of motors and mechanical systems, Make running smoother.

command smoothing filter frequency,bymsas unit.The larger the setting value,SThe curve outline becomes more obvious.Set the value to0Smoothing filter will be disabled.

May cause excessive load jitter during transient changes in speed,Set at this timeSCurves are useful for reducing shock caused by acceleration/deceleration processes. For example when the load is connected to the motor via a long lever arm.If the arm is not rigid enough,Motor speed changes can cause abnormal oscillations and increase load stabilization time.set upSCurves can mitigate this unwanted oscillation and reduce settling time.

Related parameter settings

parameter	instruction	name	Numeric range	default value	unit	illustrate
P2-05	JT	Jerk time	0~250	10	ms	Time constant of smoothing filter in internal trajectory mode
P2-28	KJ	low pass smoothing filter	0~1000	10	ms	When setting the low-pass filter for the position command or speed command time constant
P2-29	FF	interpolation filter	0~250	10	ms	Time constant of smoothing filter under pulse position command

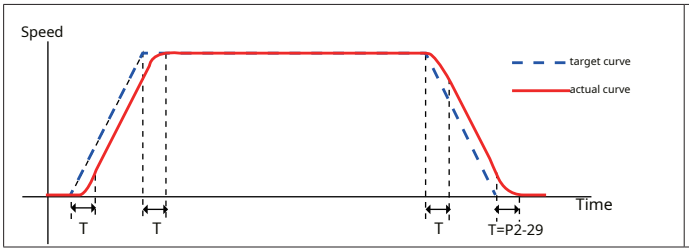
Notice:set as**0**hour,Filter function is invalid

7.2.5.1interpolation filter

parameterP2-29The interpolation filter works in the position mode of external pulse input.Applicable to:

- No acceleration or deceleration is performed when the pulse command is input.
- Input pulse command step change
- When the command pulse frequency is extremely low

The smoothing effect of the interpolation filter on the input command is as shown below.

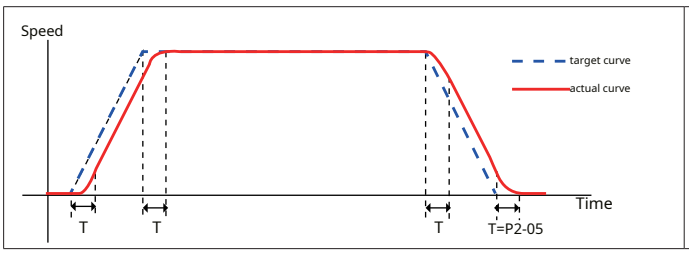


- Interpolation filtering will cause a certain delay to the command pulseT,But it will not affect the final positioning accuracy
- P2-29The larger the time constant,The smoother effect is more obvious,The command response delay will also increase,Should be based on actual application conditions,Set a reasonable filter time constant

7.2.5.2 Jerk time

parameterP2-05Jerk time in internal trajectory mode (position,speed,torque),Analog position,Analog speed,Analog torque, Or effective when controlled by communication command.

The effect of jerk smoothing on input commands is as shown below.

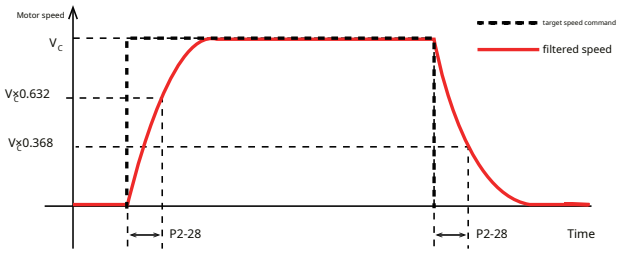


- The jerk filter will cause a certain delay in the commandT,But it will not affect the final positioning accuracy
- P2-05The larger the time constant,The smoother effect is more obvious,The command response delay will also increase,Should be based on actual application conditions,Set a reasonable filter time constant

7.2.5.3low pass smoothing filter

parameterP2-28The low-pass smoothing filter can be effective in the control mode used,For example:External pulse control position mode,Internal trajectory mode (position,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 shown below.

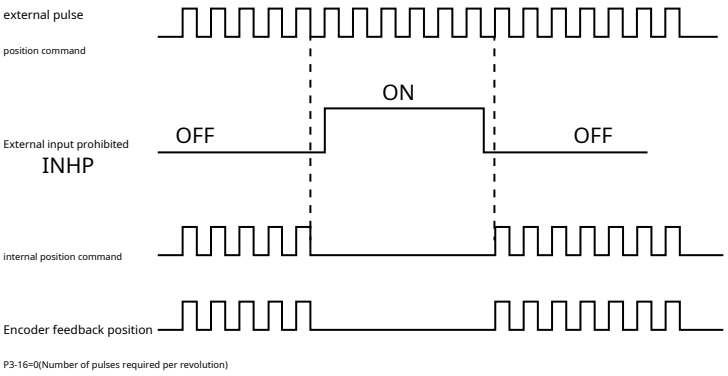


- The low-pass smoothing filter will cause a certain delay in the motion command.T,But it will not affect the final positioning accuracy
- P2-28The larger the time constant,The smoother effect is more obvious,The command response delay will also increase, Should be based on actual application conditions,Set a reasonable filter time constant

7.2.6Pulse inhibit function

Pulse inhibit function (INHP)Refers to the pulse position mode,Use external input signal,Input pulse counting can be forcibly disabled. whenINHP

When the input conditions are met,The servo drive will ignore external pulse input,And the servo motor will stop running immediately.



Need to use this function,One digital input of the servo drive is configured asINHPFunction.

type	Signal name	set value	signal logic	Function
enter	INHP	25	Closed	INHPFeature enabled,Driver does not respond to input pulses
			Open	INHPFunction not enabled,The driver responds to input pulses
		26	Open	INHPFeature enabled,Driver does not respond to input pulses
			Closed	INHPFunction not enabled,The driver responds to input pulses

7.2.7Position error counter clear input

Position error = position command - encoder feedback actual position

Position error counter clearing function (C-CLR)Refers to the pulse position mode,Use external input signal,Clear the position error counter of the servo drive.whenC-CLRWhen conditions are met,The position error counter is0,No position compensation.

type	Signal name	set value	signal logic	Function
enter	C-CLR	17	Closed	C-CLRFeature enabled,The position error counter is0
			Open	C-CLRFunction not enabled,Value of position error counter = position command - encoder feedback
		18	Open	C-CLRFeature enabled,The position error counter is0
			Closed	C-CLRFunction not enabled,Value of position error counter = position command - encoder feedback

7.2.8 Positioning complete signal

in location mode,Use the positioning completion signal output to indicate the current positioning status of the servo motor..When the difference between the total number of pulse commands received by the driver and the actual number of pulses moved by the servo motor, that is, the position error is less thanP5-39When the setting value of,Output positioning completion signal.

type	Signal name	set value	signal logic	Function
output	IN-POS	9	Closed	Positioning completedIN-POSCondition is established,output signal,The output status isclosed
			Open	Positioning completedIN-POSCondition is not met,No signal output,The output status isopen
		10	Open	Positioning completedIN-POSCondition is established,output signal,The output status isopen
			Closed	Positioning completedIN-POSCondition is not met,No signal output,The output status isclosed

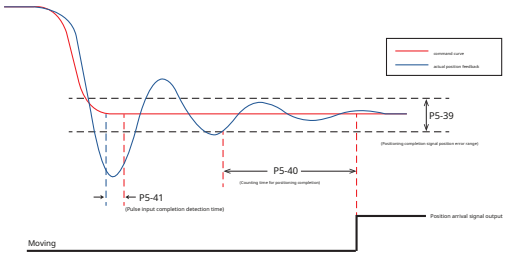
The default settings of the output function are as follows

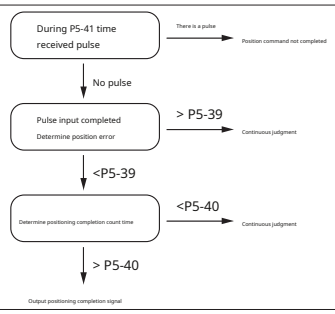
Signal name	Enter name	PINfoot position (CN2)	parameter	instruction	signal logic set value	signal logic	effect	Support mode			
IN-POS	Y4+	39	P5-15	MO4	9	Closed	Positioning completedIN-POSCondition is established,output signal	P	V	T	F
	Y4-	38				Open	Positioning completedIN-POSCondition is not met,No signal output				

Related parameter settings

parameter	instruction	name	Numeric range	default value	unit	illustrate
P5-39	PD	Positioning completion signal position error threshold	0~32000	40	pulse	Positioning completion signal position error range
P5-40	PE	Motion judgment condition counting time	0~32000	10	ms	Positioning completion count time
P5-41	TT	Pulse input completion detection time	0~20000	2	ms	Pulse input completion detection time

As shown below





DangzaiP5-41Pulse input completion detection time,The drive does not receive a new pulse input,It is recognized that pulse input is completed.

Thereafter, if the position error is less than the parameterP5-39(Positioning completion signal position error range),and the duration exceeds the parameterP5-40(Counting time for positioning completion),Output positioning completion signal.

7.2.9 Position consistent output

Position consistent outputP-COINThe signal is to inform the motor that the actual position is equal to the parameter given byP5-46The set location.

Position consistent output**P-COIN**settings

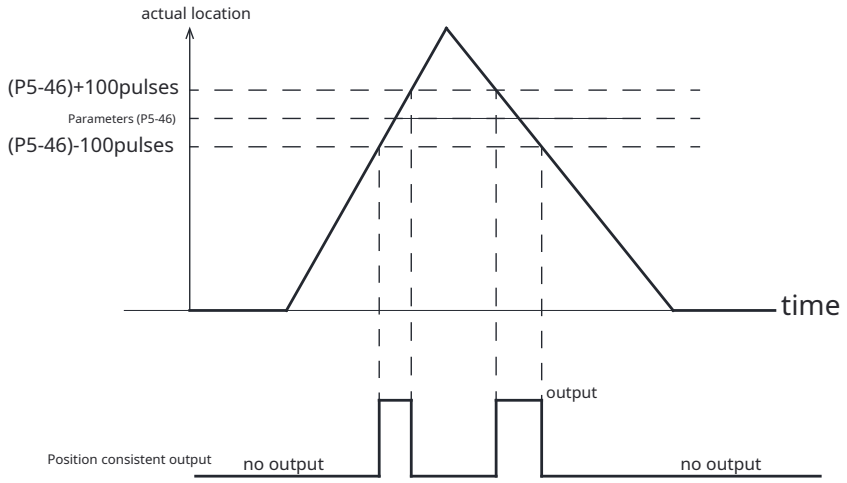
type	Signal name	set value	signal logic	Function
output	P-COIN	31	Closed	Same locationP-COINThe judgment condition is established,output signal,The output status isclosed
			Open	Same locationP-COINThe judgment condition is not established,No signal output,The output status isopen
		32	Open	Same locationP-COINThe judgment condition is established,output signal,The output status isopen
			Closed	Same locationP-COINThe judgment condition is not established,No signal output,The output status isclosed

Related parameter settings

parameter	instruction	name	unit	Numeric range	default value	illustrate
P5-46	DG	Absolutely reach the location	pulses	- 2147483647 ~ +2147483647	10	Determine the target position of the output position coincidence signal

Same location**P-COIN**Analyzing conditions:

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



7.2.10 Gain parameters in position mode

In location mode,Reasonable gain parameters can make the servo system run smoother,Accurate,And has excellent positioning performance.

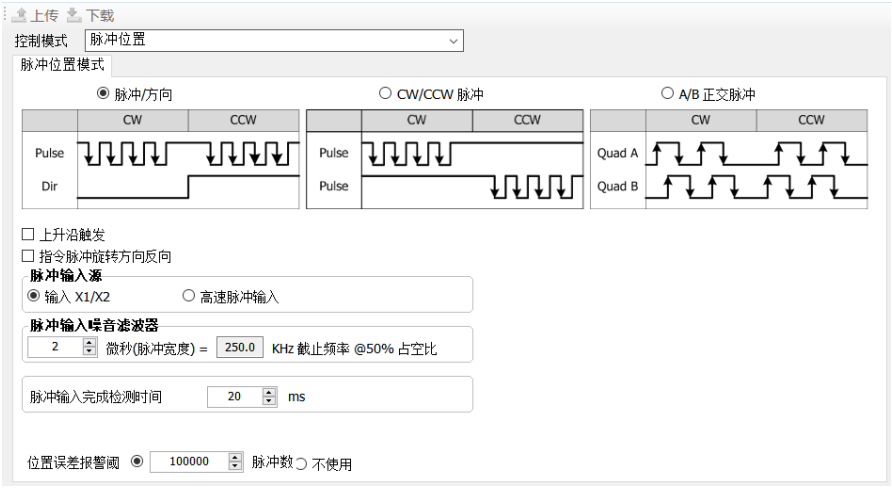
Use debugging softwareLunaThe following gain parameters in position mode can be automatically adjusted.You can also use software orledUse the operation panel to modify and fine-tune corresponding parameters..

parameter	instruction	parameter name	type	default value	unit
P0-03	KG	First rigidity level	First set of gains	5	-
P0-05	KP	first position loop gain		52	0.1Hz
P0-07	KD	First 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	First speed loop integration time constant		189	ms
P0-16	KC	First command torque filter frequency		1099	0.1Hz
P0-04	KX	Second rigidity level	Second set of gains	5	
P0-17	UP	Second position loop gain		52	0.1Hz
P0-19	UD	Second position loop differential time constant		0	ms
P0-20	UE	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	First gain switching to second gain delay time	-	0	ms
P0-00	UM	Parameter tuning mode	global gain	0	-
P0-09	KL	Speed feed forward gain		3000	0.01%
P0-10	KR	Speed feedforward filter frequency		20000	0.1Hz
P0-14	KK	Acceleration feedforward gain		3000	0.01%
P0-15	KT	Acceleration feedforward filter frequency		20000	0.1Hz

7.2.11 Set location mode using software

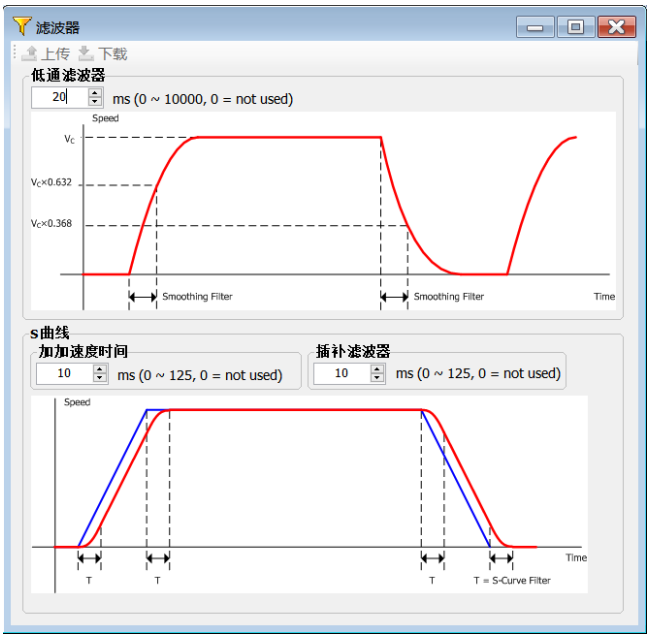
Use debugging softwareLunaEasily set parameters for configuring position mode.

first step:Select control mode



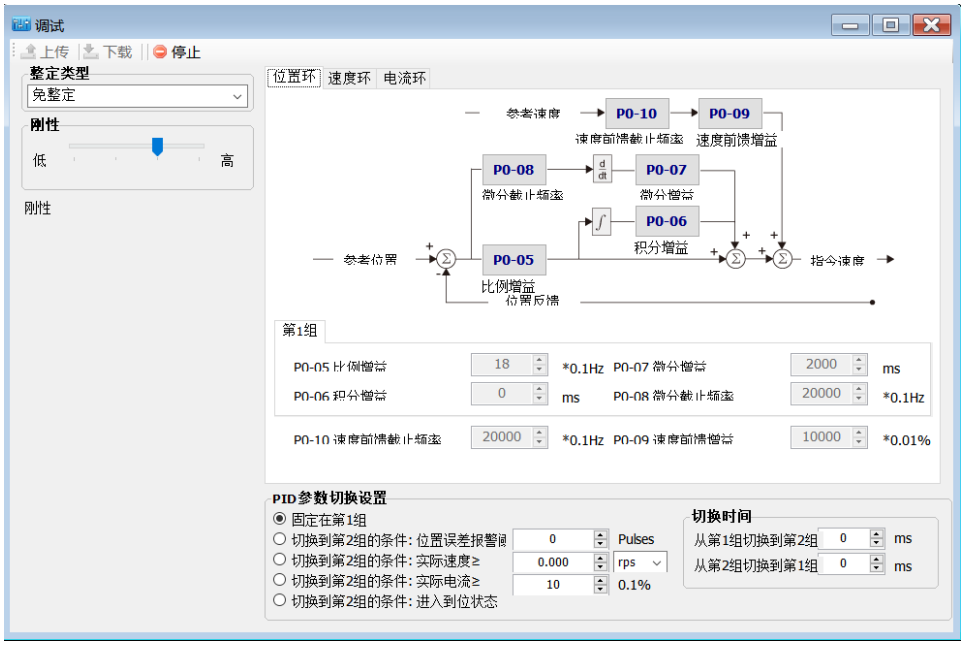
Step 2:Set electronic gear ratio

third step:Set smoothing filter



the fourth step:Input and output settings

the fifth step:Gain debugging

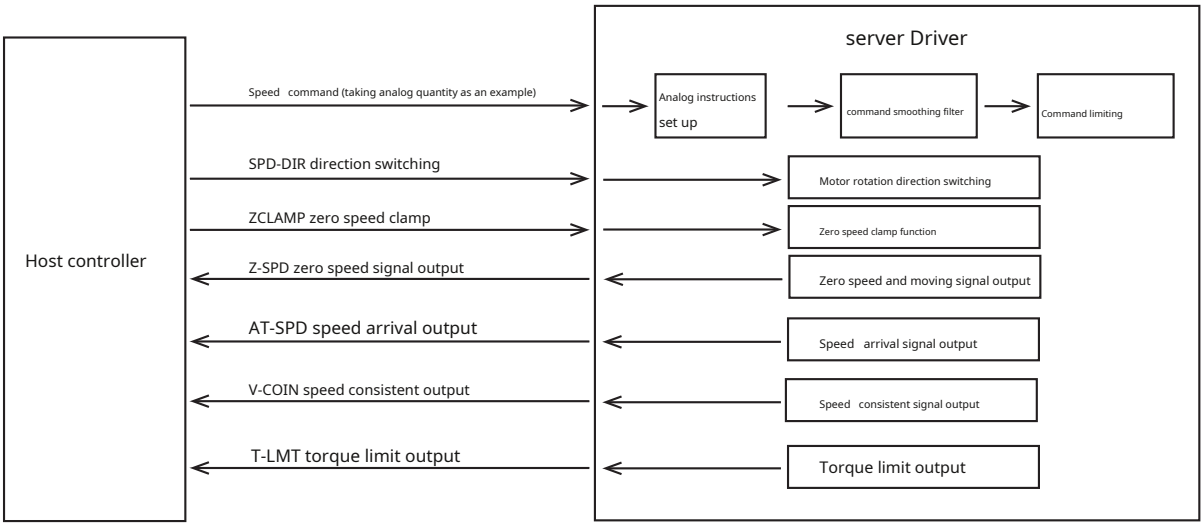


7.3speed mode

7.3.1Speed control mode selection

Speed control mode is used in precision speed control situations.

◆ Function setting block diagram



◆ Speed control mode selection

M54SSeries servo drives have three control modes: speed mode:Analog speed mode,Command speed mode and internal multi-speed mode.

1)Analog speed mode:-10~+10VdcExternal analog voltage to control the motor speed.

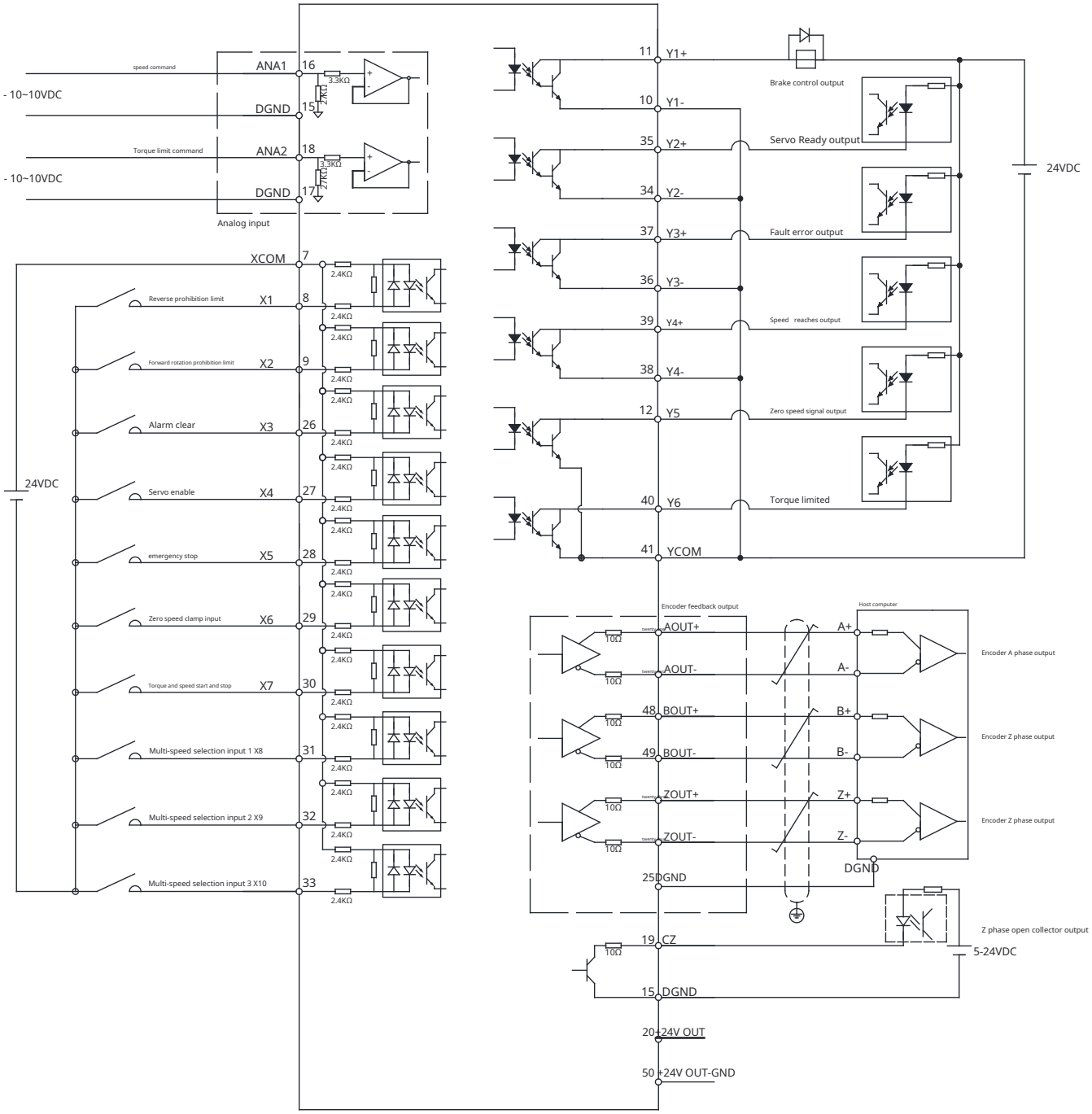
2)Command speed mode:Use MOONS exclusiveQProgramming instructions to control motors,Or useModbusCommand control motor speed.

3)Multi-speed speed mode:Use digital input signals to select motor speeds in different segments,There can be at most8segment speed.

model	control signal	parameterP1-00set up	illustrate
Analog speed mode	+10~-10VAnalog signal	11	◆ Analog speed mode
Command speed mode	communication instructions orQprogramming	twenty one	◆ useQProgramming function control ◆ useModbuscommand control useModbusWhen the instruction directly controls the motor operation,Must beP1-00set astwenty one
Multi-speed speed mode	Digital input signal	15	After the drive is enabled,byP2-10 ~ P2-17Run at set speed,The specific gear position is input digitally.SPD1,SPD2,SPD3Determined by input status.

7.3.2 Speed mode wiring diagram

◆ M54Sseries50pinHigh-density connector models



7.3.3 Analog speed mode related parameters

M54SSeries AC servo has2road12bitAnalog input,-10~+10Vdc,AIN1as speed command,AIN2as torque command. Low-pass filtering of analog inputs can be set individually,OffsetOffset,dead zoneDead bandwait.

parameter	instruction	name	Numeric range	default value	unit	describe
P1-00	CM	master control mode	1,2,7,11,15,21	7		Driver first control mode selection
P1-01	EN	Second control mode	1,2,7,11,15,21	twenty one		Driver second control mode selection
P1-03	JM	Speed control clamp mode	1-2	2		Select control type for speed mode
P4-01	AG	Analog input speed scaling	0~100	50	Rps	◆ The speed in analog speed control mode is the same as the analog Proportional coefficient value of quantity input. ◆ The analog input voltage is10VDCThe corresponding motor speed value when
P4-02	AN	Analog input torque scaling	0~3000	1000	0.1%	◆ The output torque in analog torque control mode is the same as Proportional coefficient value of analog input ◆ The analog input voltage is10VDCThe corresponding output torque when
P4-03	AV1	Analog input1Offset	- 10000 ~ 10000	0	mV	Analog input1offset of
P4-04	AV2	Analog input2Offset	- 10000 ~ 10000	0	mV	Analog input2offset of
P4-05	AD1	Analog input1dead zone	0~255	0	mV	Analog input1dead zone
P4-06	AD2	Analog input2dead zone	0~255	0	mV	Analog input2dead zone
P4-07	AF1	Analog input1low pass filter	0~20000	1000	0.1Hz	Analog input noise filter1
P4-08	AF2	Analog input2low pass filter	0~20000	1000	0.1Hz	Analog input noise filter2
P4-11	FA1	Speed limit source setting	0~2	0		Speed command source setting
P2-03	JA	Internal speed mode acceleration	0.167~5000	100	rps/s	In internal speed control mode and analog speed mode acceleration
P2-04	JL	Internal speed mode deceleration	0.167~5000	100	rps/s	In internal speed control mode and analog speed mode deceleration

Notice:

1.The parameter units in this table are the units in the software,driver**led**The units displayed will be different.,For details, please refer to**8**Parameters Table

2.Default values vary from drive to drive,Depends on the driver used..

7.3.4 Basic settings of analog speed mode

7.3.4.1 Speed command source setting

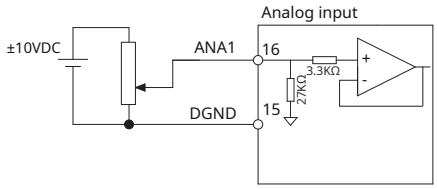
The source of the analog speed command is determined by the parameterP4-11definition.

parameter	instruction	name	unit	Numeric range	default value	illustrate
P4-11	FA1	Speed limit source setting	-	0,1	0	Define speed limit source settings: 0:Use internal speed limit 1:Analog speed command

Notice:When the control mode is selected as analog speed mode,**P4-11**will automatically be set to:**1**,That is, analog speed command.

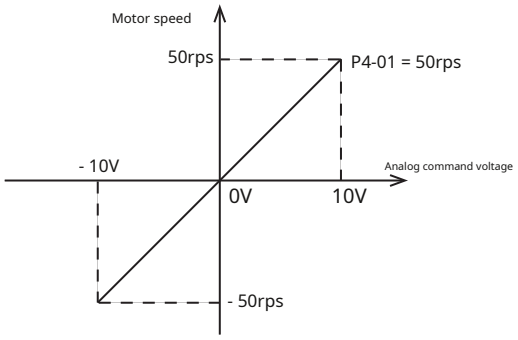
7.3.4.2 Analog speed command wiringWay

Pin type	signal name	ConnectorPINfoot	Function
enter	AIN1	16	Analog speed command signal
	DGND	15	Grounding for analog speed command signal



7.3.4.3 Analog speed scaling

The analog input voltage range is -10~+10VDC,Set input in analog speed mode10VThe motor speed corresponding to the voltage range.



Pass parametersP4-00set up,You can also use debugging softwareLunaThe software sets this input range.

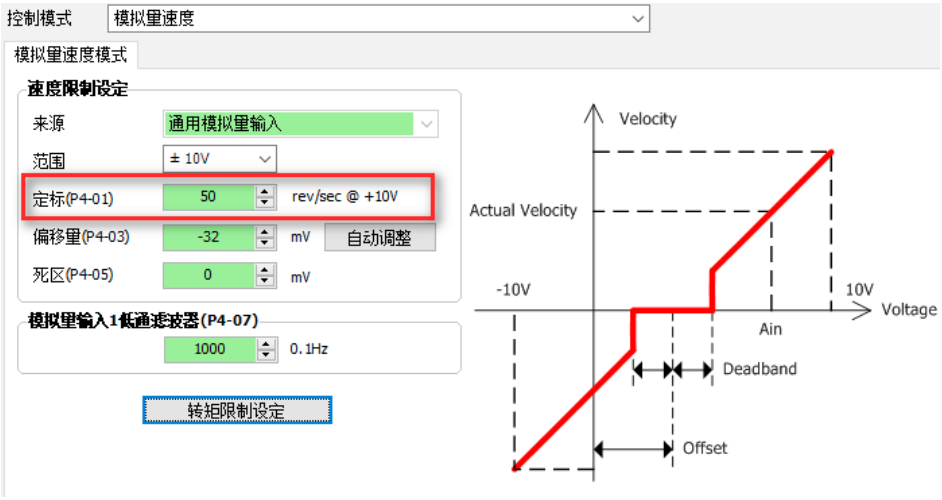
parameter	instruction	name	unit	Numeric range	default value	illustrate
P4-01	AG	Analog input speed scaling	rps	0~100	50	The analog input voltage is10VDCcorresponding electricity Engine speed value

Note:To enter or view this setting through the drive panel,Please calculate according to the following formula:

$$\text{Panel display value}=V\times 240$$

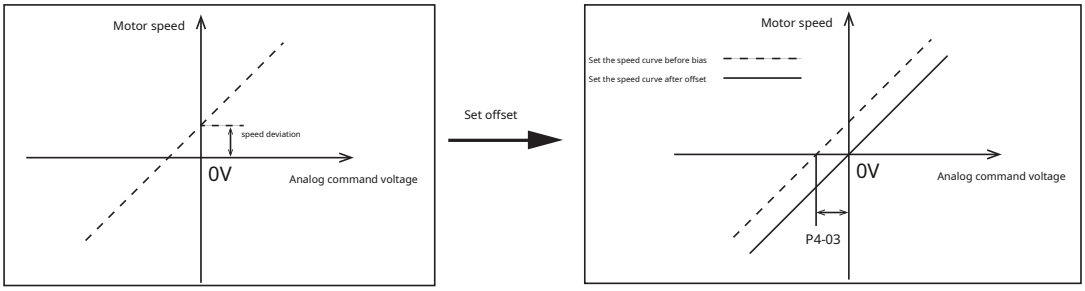
in V is the speed that needs to be set,Unit isrps(rpm/second)

Software settings



7.3.4.4Analog input offset

When using analog speed mode,In some cases, even if the analog instruction of the host computer is0V,The servo motor may also rotate slightly. This is because when receiving analog signals,produces a slight bias,That is zero drift.

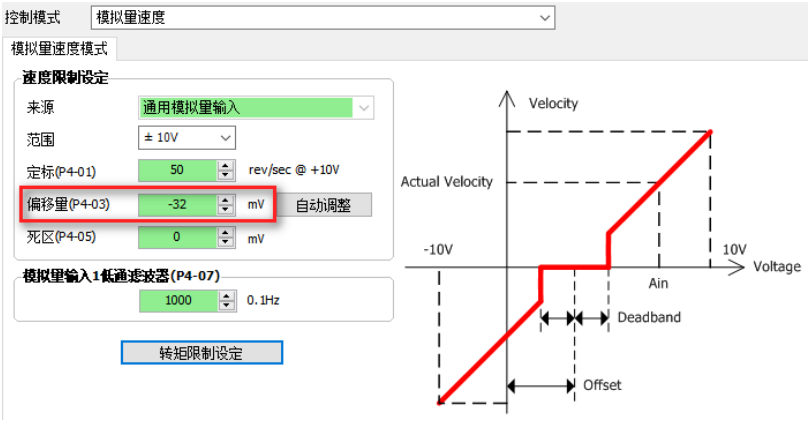


To eliminate this situation,Debugging software is requiredLunaThe software automatically adjusts the offset or manually modifies the parameters.P4-03,P4-04.

parameter	instruction	name	unit	Numeric range	default value	illustrate
P4-03	AV1	Analog input1Offset	mV	- 10000 ~ 10000	0	Analog input1offset of
P4-04	AV2	Analog input2Offset	mV	- 10000 ~ 10000	0	Analog input2offset of

M54SThe series provides two methods for automatically setting analog offsets.

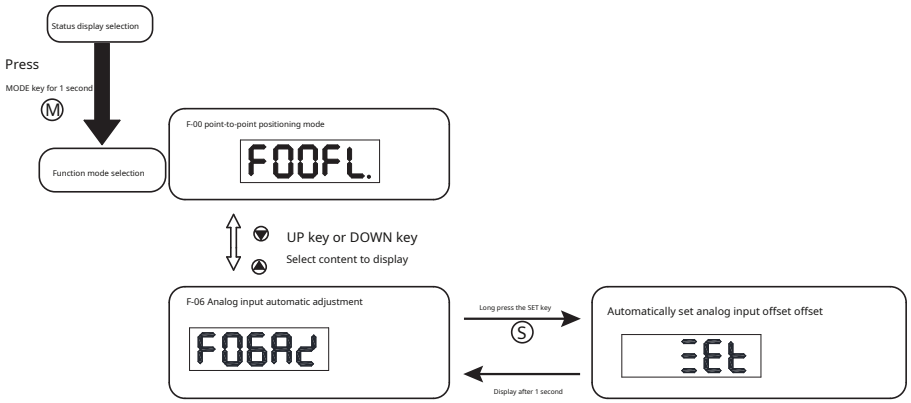
1)Automatically set via software



2)pass**led**Operation panel settings

ledIn the function mode of the operation panel,chooseF06AZfunction code,Analog inputs can be set at the same time1,Analog input2The bias of.

The relevant operations are as follows.Detailed operation introduction,Please refer to chapter5.5Functional operating mode.



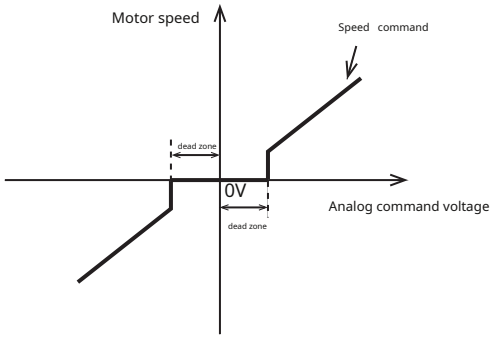
Notice:

When performing automatic adjustment of analog input offset:

- The servo drive is in a non-enabled state
- Analog command output of the host computer0VVoltage.

7.3.4.5Analog dead zone

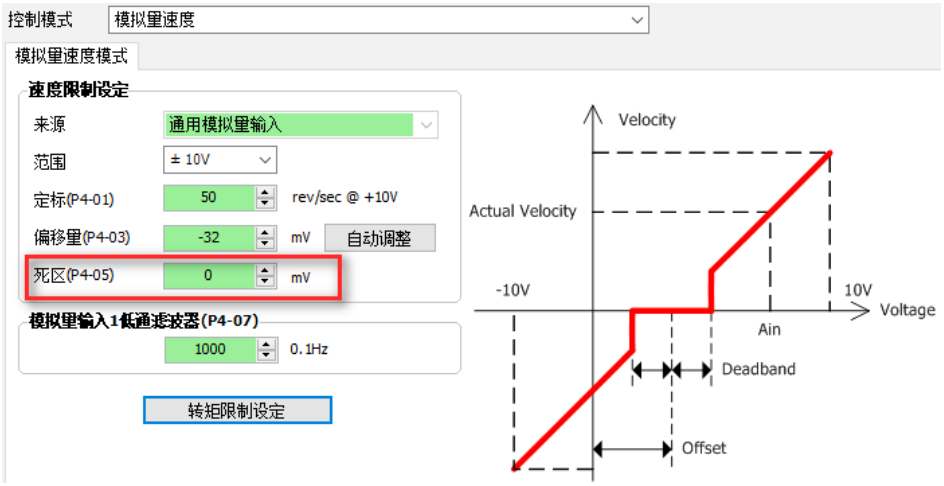
During analog control,The input voltage is0Vhour,Due to some disturbances and other reasons,The input voltage is not absolute0V,Will be at0VFluctuate left and right,This causes the motor to squirm at a very low speed..Therefore, in order to eliminate this situation,Set a reasonable dead zone value,It can be guaranteed that when the input voltage is within the dead zone range,are recognized as0V.



debugging softwareLunaThe software sets this input range,or via parametersP4-05,P4-06set up.

parameter	instruction	name	unit	Numeric range	default value	illustrate
P4-05	AD1	Analog input1dead zone	mV	0~255	0	Analog input1dead zone
P4-06	AD2	Analog input2dead zone	mV	0~255	0	Analog input2dead zone

Software settings



7.3.4.6Analog input filtering

When using analog quantities,due to external interference,Will cause a jump in the analog voltage,This causes a jump in speed or output torque., Affects the accuracy of control.The analog input filter is a low-pass digital filter,Set a reasonable filter frequency,Can eliminate jumps.

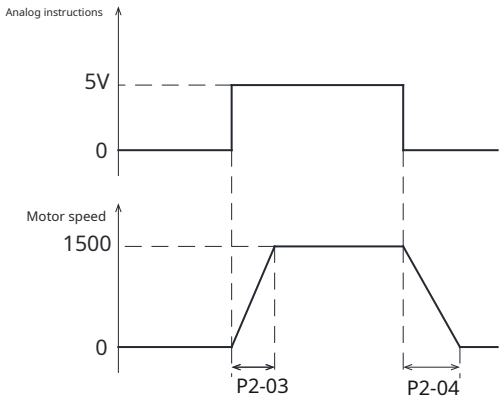
parameter	instruction	name	unit	Numeric range	default value	illustrate
P4-07	AF1	Analog input1low pass filter	0.1Hz	0~20000	1000	Analog input noise filter1
P4-08	AF2	Analog input2low pass filter	0.1Hz	0~20000	1000	Analog input noise filter1

Notice:

Generally there is no need to change the value,If the setting value is too small,Responsiveness to speed commands will decrease.

7.3.4.7 Acceleration smoothing of analog velocity

Analog instructions are generally step signals,For example, the analog input voltage changes from1Varrive2V,It is easy to cause the motor to accelerate rapidly and cause the equipment to vibrate.. Acceleration smoothing filtering is to smooth the step speed command.,That is, by setting the,deceleration time,to achieve control plus,The purpose of deceleration.



In analog speed mode,parameterP2-03,P2-04Set acceleration individually,deceleration.

parameter	instruction	name	unit	Numeric range	default value	illustrate
P2-03	JA	Internal speed mode acceleration	rps/s	0.167~5000	100	In internal speed or analog speed control mode acceleration
P2-04	JL	Internal speed mode deceleration	rps/s	0.167~5000	100	In internal speed or analog speed control mode deceleration

Note:To enter or view this setting through the drive panel,Please calculate according to the following formula:

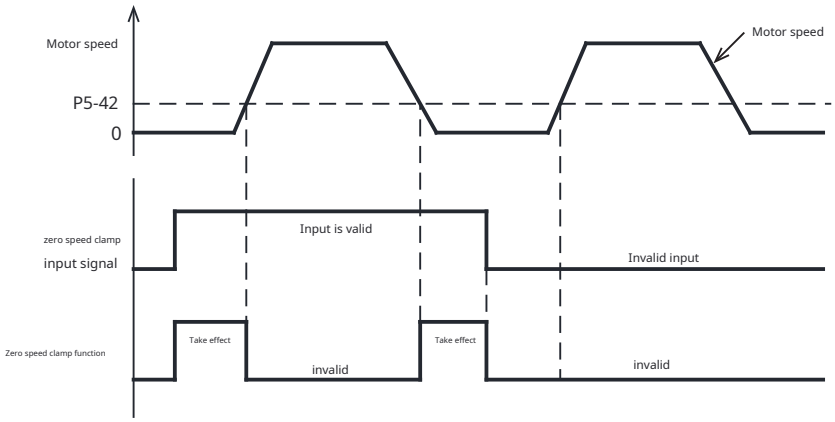
$$\text{Panel display value}=V\times 6$$

in V is the required setting plus,deceleration,Unit isrps/s(rpm/sec$_2$)

7.3.5 Zero speed clamp function

In speed control mode,When the zero speed clamp input signalZCLAMPWhen valid,And the speed command is less thanP5-42(When the setting value is zero speed judgment threshold),The servo motor enters the zero position lock state.At this time, the internal position loop control of the driver,Even if rotation occurs due to external force,It will also return to the position when clamping.

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



If the zero speed clamp takes 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,Rapid deceleration will cause strong vibrations.

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

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

type	Signal name	set value	signal logic	Function
enter	ZCLAMP	twenty one	Closed	Input signal is valid,And the speed command is less thanP5-42hour,ZCLAMPFunction takes effect
			Open	Input signal is invalid,Even if the speed command is less thanP5-42,ZCLAMPThe function does not take effect either
		twenty two	Open	Input signal is valid,And the speed command is less thanP5-42hour,ZCLAMPFunction takes effect
			Closed	Input signal is invalid,Even if the speed command is less thanP5-42,ZCLAMPThe function does not take effect either

Related parameters

parameter	instruction	name	unit	Numeric range	default value	illustrate
P5-42	ZV	Zero speed judgment threshold	rps	0~2	0.5	When the speed is less than or equal to this set value,driver It is considered that it is in a zero speed state at this time

Note:To enter or view this setting through the drive panel,Please calculate according to the following formula:

Panel display value**=**Zero speed judgment threshold**X 240**

inZero speed judgment threshold,Unit isrps(revolutions per second).

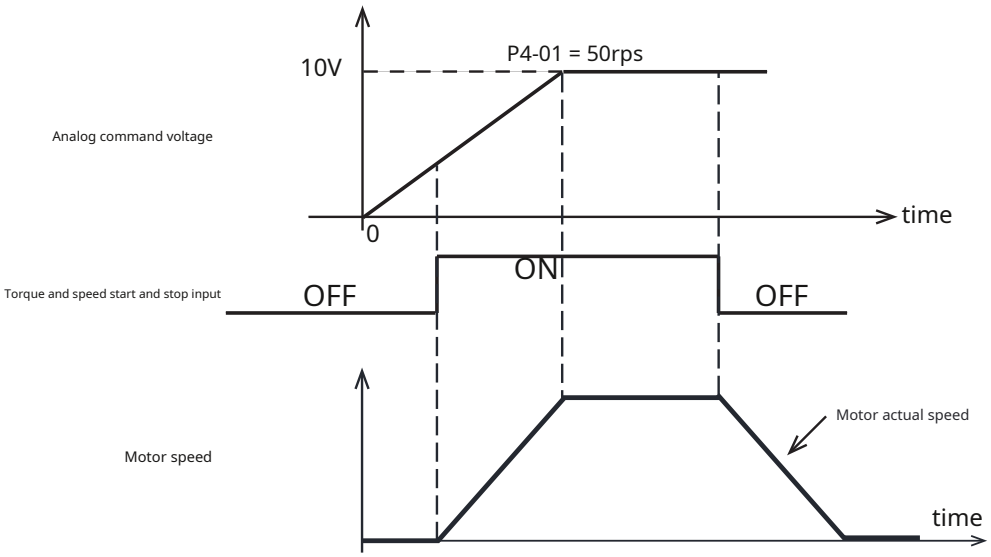
7.3.6 Motor start, stop and rotation direction switching in analog speed mode

7.3.6.1 Speed start/stop input

In analog speed mode,The motor speed is determined by the actual analog input size.When the speed command is "zero",Motor stops rotating. You can also use "torque and speed start input" to control the start and stop of the motor in analog speed mode..

Notice:

In analog speed mode,When the digital input is configured with the "torque and speed start and stop" function,If the input logic of start and stop isOFFstate, Even if the speed command corresponding to the analog input is not zero,The motor won't turn either.



7.3.6.2 Rotation direction switch

in speed mode,Normally, the rotation direction of the motor is determined by the positive and negative values of the analog quantity.,Or determined by the positive or negative command speed.When a pin in the digital input is set to switch the speed command directionSPD-DIRhour,Servo drive responds to analog speed command,Or take the absolute value of the command speed,Then determine the final direction of the motor based on the logical state of the speed command direction input signal..

For example, the host controller can only send0~10Vvoltage,If the motor needs to be reversed,This feature can be used.

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

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

type	Signal name	set value	signal logic	Function
enter	SPD-DIR	35	Closed	Input signal is valid,Reverse speed command direction
			Open	Input signal is invalid,The direction of motor rotation is determined by the direction of the speed command
		36	Open	Input signal is valid,Reverse speed command direction
			Closed	Input signal is invalid,The direction of motor rotation 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 analog values, Or determined by the positive or negative command speed

The actual rotation direction and parameters of the motorP1-11Motor rotation direction,Speed command (such as analog,communication command),Speed command direction switching SPD-DIRThree parties 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 (such as analog,communication command)	Speed command direction switchingSPD-DIR enter	Actual motor rotation direction
0	just	This input function is not set	CWclockwise
0	burden	This input function is not set	CCWCounterclockwise
1	just	This input function is not set	CCWCounterclockwise
1	burden	This input function is not set	CWclockwise

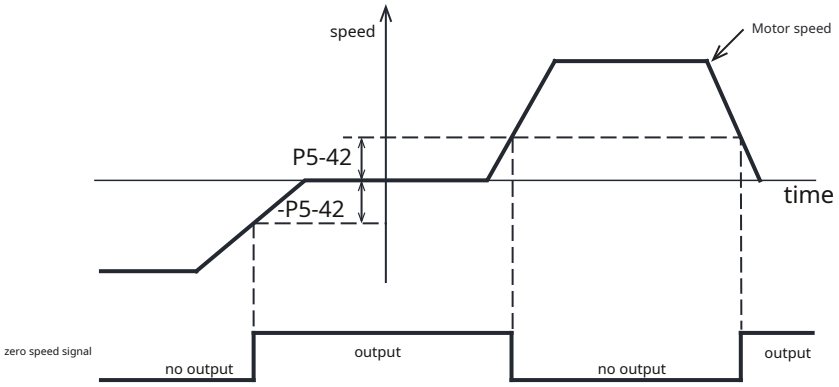
When the driver input pin is configured for speed command direction switching**SPD-DIR**:

parameterP1-11Motor rotation direction set value	speed command (such as analog,communication command)	Speed command direction switchingSPD-DIR input status	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	

7.3.7 Zero speed signal output

When the absolute value of the actual motor speed is less than**P5-42**(zero speed judgment threshold),Servo drive outputs zero speed signal**Z-SPD**.The opposite of,If the absolute value of the actual motor speed is greater than this value,Then no zero speed signal is output**Z-SPD**.

The judgment of the zero speed signal is not affected by the control mode and servo status..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 output**Z-SPD**hour,Digital output pins need to be assigned this function.

type	Signal name	set value	signal logic	Function
output	Z-SPD	33	Closed	Z-SPDThe judgment condition is established,output signal,The output status isclosed
			Open	Z-SPDThe judgment condition is not established,No signal output,The output status isopen
		34	Open	Z-SPDThe judgment condition is established,output signal,The output status isOpen
			Closed	Z-SPDThe judgment condition is not established,No signal output,The output status isClosed

Related parameters

parameter	instruction	name	unit	Numeric range	default value	illustrate
P5-42	ZV	Zero speed judgment threshold	rps	0.1~2	0.5	When the speed is less than or equal to this set value,drive The controller considers it to be at zero speed at this time

Note:To enter or view this setting through the drive panel,Please calculate according to the following formula:

Panel display value**=**Zero speed judgment threshold**X 240**

in**Zero speed judgment threshold**,Unit is**rps**(revolutions per second

7.3.8 Speed reaches output

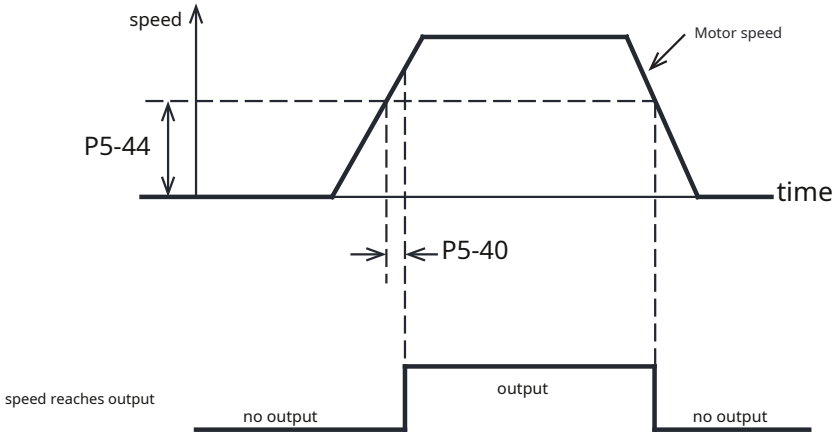
in speed mode,When the filtered motor actual speed exceedsP5-44(Speed reaches threshold),and the time exceedsP5-40(Counting time for positioning completion),Will output the speed arrival signalAT-SPD.

If the actual motor speed after filtering does not exceedP5-44(Speed reaches threshold),Then no speed arrival signal is output.AT-SPD

Speed arrives and speeds out**AT-SPD**settings

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

type	Signal name	set value	signal logic	Function
output	AT-SPD	19	Closed	AT-SPDThe judgment condition is established,output signal,The output status isclosed
			Open	AT-SPDThe judgment condition is not established,No signal output,The output status isopen
		20	Open	AT-SPDThe judgment condition is established,output signal,The output status isOpen
			Closed	AT-SPDThe judgment condition is not established,No signal output,The output status isClosed



Related parameters

parameter	instruction	name	unit	Numeric range	default value	illustrate
P5-44	VV	Determine the speed reaches the target value	Rps	0~100	10	When the filtered motor actual speed exceedsP5-44(Speed reaches threshold) ,and the time exceedsP5-40(Counting time for positioning completion),Will output the speed arrival signalAT-SPD
P5-40	PE	Motion judgment condition counting time	ms	0~32000	10	Positioning completion count time

Note:To enter via the drive panel or view this**P5-40**set up,Please calculate according to the following formula:

Panel display value**=**Speed reaches the judgment threshold**X 240**

inSpeed reaches the judgment threshold,Unit isrps(revolutions per second)

7.3.9 Speed consistent signal

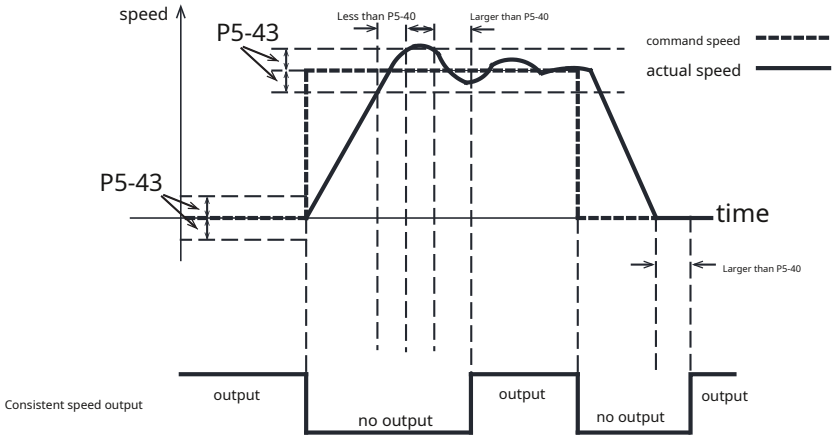
in speed mode,When the deviation between the filtered motor actual speed and the command speed, that is, the speed error isP5-43(When the speed consistent fluctuation threshold) is within the range setting,and time is enoughP5-40(Counting time for positioning completion),Then it is determined that the actual speed of the motor is consistent with the command speed.,Output speed consistent signalV-COIN.

If the filtered speed error exceedsP5-43(Velocity wave consistency threshold),Then no speed consistent signal is output.V-COIN

same speed**V-COIN**settings

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

type	Signal name	set value	signal logic	Function
output	V-COIN	17	Closed	V-COINThe judgment condition is established,output signal,The output status isclosed
			Open	V-COINThe judgment condition is not established,No signal output,The output status isopen
		18	Open	V-COINThe judgment condition is established,output signal,The output status isOpen
			Closed	The judgment condition is not established,No signal output,The output status isClosed



Related parameters

parameter	instruction	name	unit	Numeric range	default value	illustrate
P5-43	VR	Consistent speed fluctuation range	Rps	0~100	0.1	The speed error isP5-43(When the speed consistent fluctuation threshold) is within the fluctuation range setting,Determine the actual motor speed and command speed consistent,Will output speed consistent signalV-COIN
P5-40	PE	Motion judgment condition counting time	ms	40	0~32000	Positioning completion count time

Note:To enter via the drive panel or view this**P5-43**set up,Please calculate according to the following formula:

Panel display value**=**Speed consistent fluctuation threshold**X 240**

inSpeed consistency judgment threshold,Unit isrps(revolutions per second)

7.3.10 Gain parameters and speed control types of speed mode

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	unit	Numeric range	default value	ledpanel Display value	describe
P1-03	JM	Speed mode control type	-	1,2	2	2	Set control type in speed mode 1.Real-time detection of position errors 2.Speed control only (default setting)

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

Under this control type,Position errors will be detected in real time,When the difference between the actual position fed back by the encoder and the command position, that is, the position error exceedsP3-04(When setting the position error judgment range),The driver will generate a fault alarm indicating that the position error exceeds the limit..

In this mode,The relevant gain parameter is:

parameter	instruction	parameter name	type	default value	unit
P0-05	KP	first position loop gain	First set of gains	52	0.1Hz
P0-07	KD	First 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	First speed loop integration 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	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

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

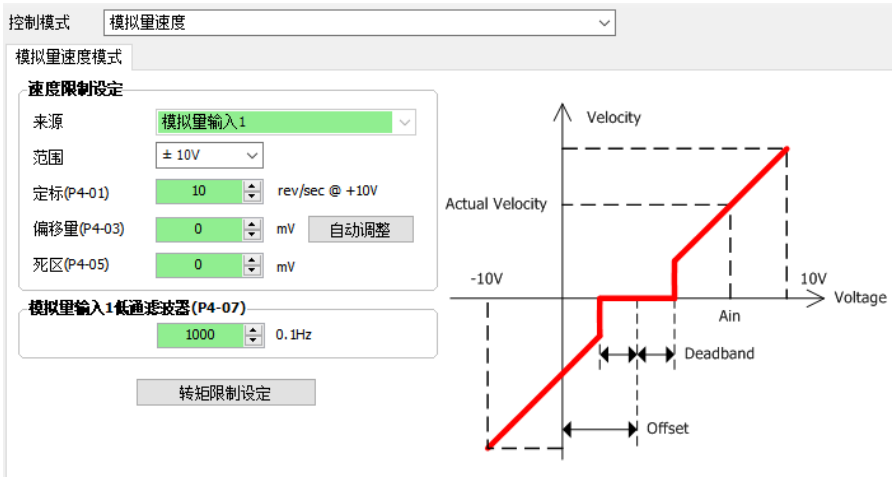
Under this control type,Position errors will not be detected,Even if the motor is stalled,No alarm is generated. When in this control mode,The speed loop gain parameter is given byP0-12speed loop proportional gain sumP0-13Speed loop integration time setting.

parameter	instruction	name	unit	Numeric range	default value
P0-12	VP	Speed loop proportional gain	0.1Hz	0~30000	515
P0-13	VI	Speed loop integration time	ms	0~32767	79

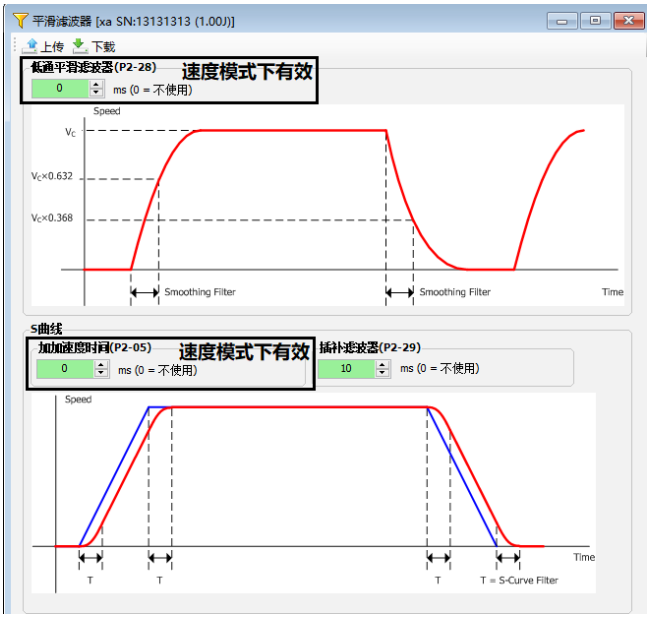
7.3.11Set analog speed mode using software

Use debugging softwareLunaParameters for configuring torque mode can be easily set.

first step:Select control mode

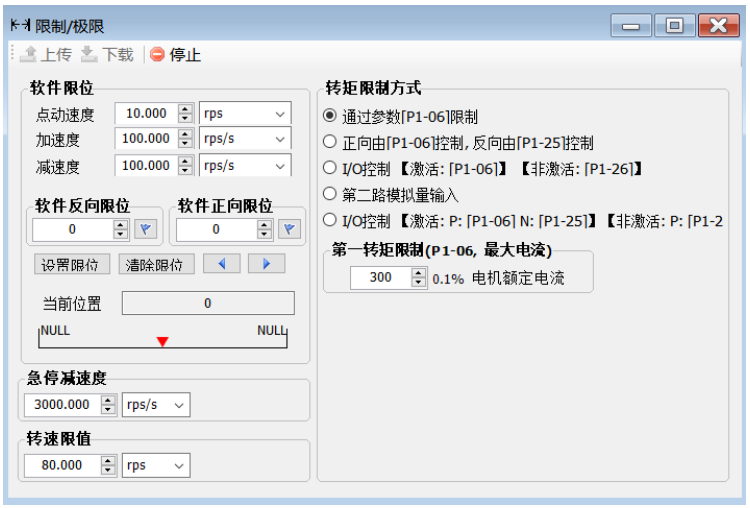


Step 2:Set smoothing filter

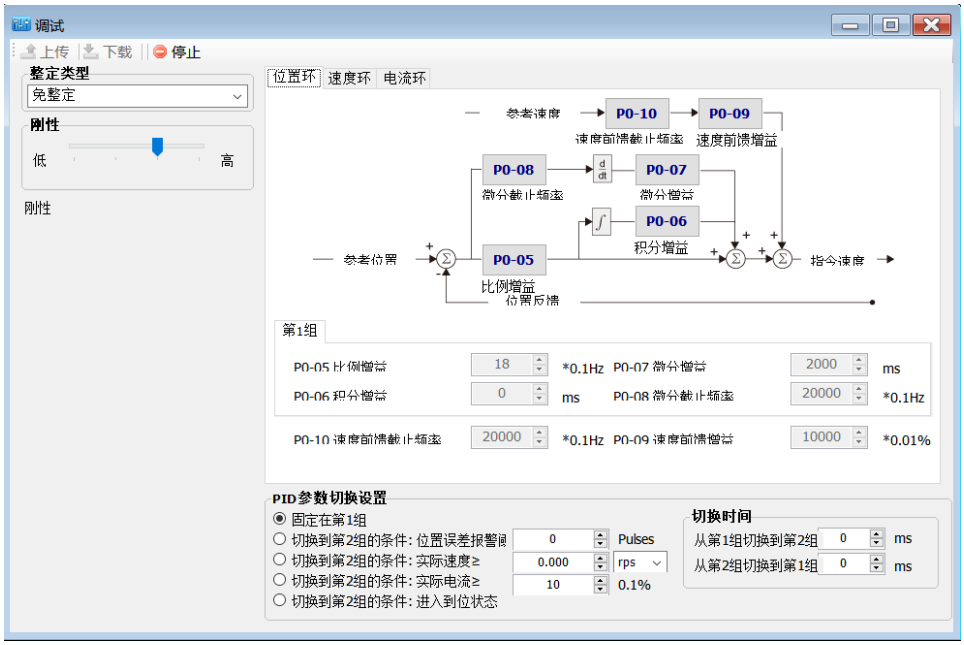


third step:Input and output settings

Torque limit function can also be used in speed mode.If you are using an absolute encoder,You can also set forward and reverse limits.



the fifth step:Gain debugging



7.4Torque mode

7.4.1Torque mode control method

Torque control mode is used in situations requiring precise torque control..M54SThe servo drive has two control modes: torque mode:Analog input torque mode and command torque mode.

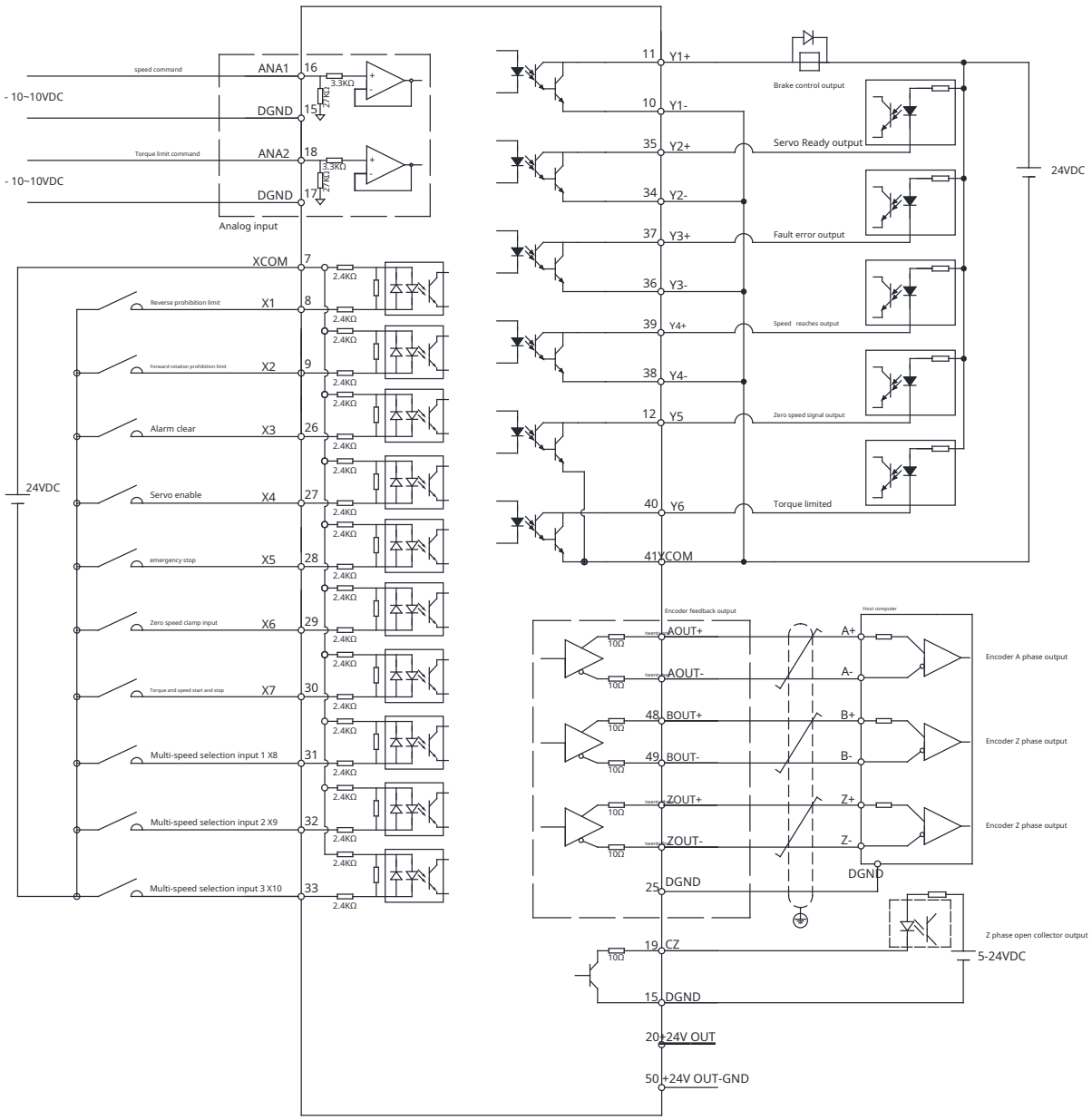
1)Analog torque mode can control the torque of the motor through analog voltage from the outside..

2)Command torque mode uses communication commands to control the motor.

model	control signal	P1-00(CM) definition	illustrate
Analog torque mode	+10~-10VAnalog signal	2	Analog input2(AIN2)as torque command,The torque output of the motor is proportional to the analog input voltage
Command torque mode	Communication command	1	useModbusCommand writing torque command

7.4.2Analog torque mode wiring diagram

◆ M54Sseries-Fand-R(50pinHigh-density connector) models



7.4.3 Analog torque mode related parameters

M54SSeries AC servo has2road12bitAnalog input,-10~+10Vdc,AIN1as speed command,AIN2as torque command. Input low-pass filter can be set individually,OffsetOffset,dead zoneDead bandwait

parameter	instruction	name	Numeric range	default value	unit	describe
P1-00	CM	master control mode	1,2,7,11,15,21	7		Driver first control mode selection
P1-01	EN	Second control mode	1,2,7,11,15,21	twenty one		Driver second control mode selection
P1-03	JM	Speed control clamp mode	1-2	2		Select control type for speed mode
P4-01	AG	Analog input speed scaling	0~100	50	Rps	◆ The speed in analog speed control mode is the same as the analog speed Entered scale factor value. ◆ The analog input voltage is10VDCThe corresponding motor speed value when
P4-02	AN	Analog input torque scaling	0~3000	1000	0.1%	◆ The output torque in analog torque control mode is the same as the Proportional coefficient value of quasi-quantity input ◆ The analog input voltage is10VDCThe corresponding output torque when
P4-03	AV1	Analog input1Offset	- 10000 ~ 10000	0	mV	Analog input1offset of
P4-04	AV2	Analog input2Offset	- 10000 ~ 10000	0	mV	Analog input2offset of
P4-05	AD1	Analog input1dead zone	0~255	0	mV	Analog input1dead zone
P4-06	AD2	Analog input2dead zone	0~255	0	mV	Analog input2dead zone
P4-07	AF1	Analog input1low pass filter	0~20000	1000	0.1Hz	Analog input noise filter1
P4-08	AF2	Analog input2low pass filter	0~20000	1000	0.1Hz	Analog input noise filter2
P4-11	FA1	Speed limit source setting	0~2	0		Speed command source setting
P2-03	JA	Internal speed mode acceleration	0.167~5000	100	rps/s	In internal speed control mode and analog speed mode acceleration
P2-04	JL	Internal speed mode deceleration	0.167~5000	100	rps/s	In internal speed control mode and analog speed mode deceleration

Notice:

1.The parameter units in this table are the units in the software,driver**led**The units displayed will be different.,For details, please refer to**8**Parameters Table

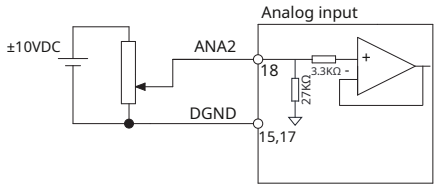
2.Default values vary from drive to drive,Depends on the driver used..

7.4.4Basic settings of analog torque mode

When the control mode of torque mode is selected as:During analog torque control,Right nowP1-00 = 2hour.It is necessary to make relevant settings for the analog input.

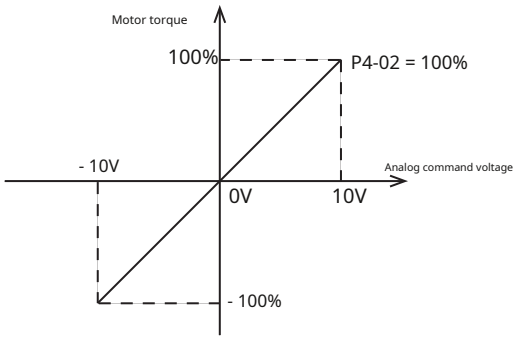
7.4.4.1Torque command signal source

Pin type	signal name	ConnectorPINfoot	Function
enter	AIN2	18	Analog torque command signal
	DGND	15,17	Analog command signal grounding



7.4.4.2 Analog torque scaling

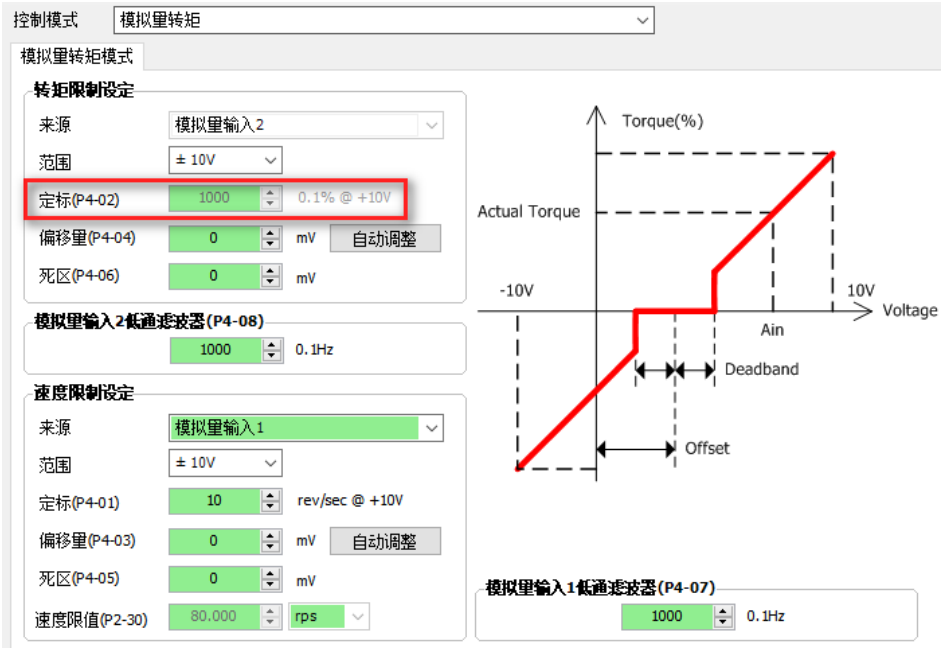
The analog input voltage range is -10~+10VDC,Set input in analog torque mode10VMotor torque corresponding to the voltage range.



Pass parametersP4-00set up,You can also use debugging softwareLunaThe software sets this input range.

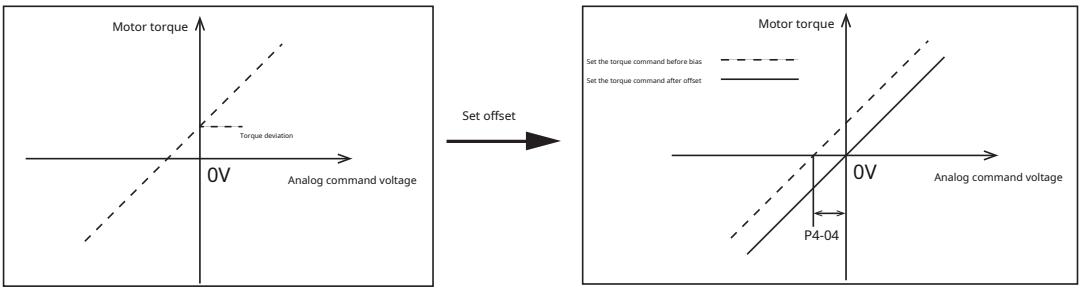
parameter	instruction	name	Numeric range	default value	unit	illustrate
P4-02	AN	Analog input torque scaling	0~3000	1000	0.1%	The analog input voltage is10VDCThe corresponding motor output torque when

Software settings



7.4.4.3 Analog input offset

In analog torque mode,In some cases, even if the analog instruction of the host computer is0V,The servo motor may also rotate slightly.This is because when receiving analog signals,produces a slight bias,That is zero drift.

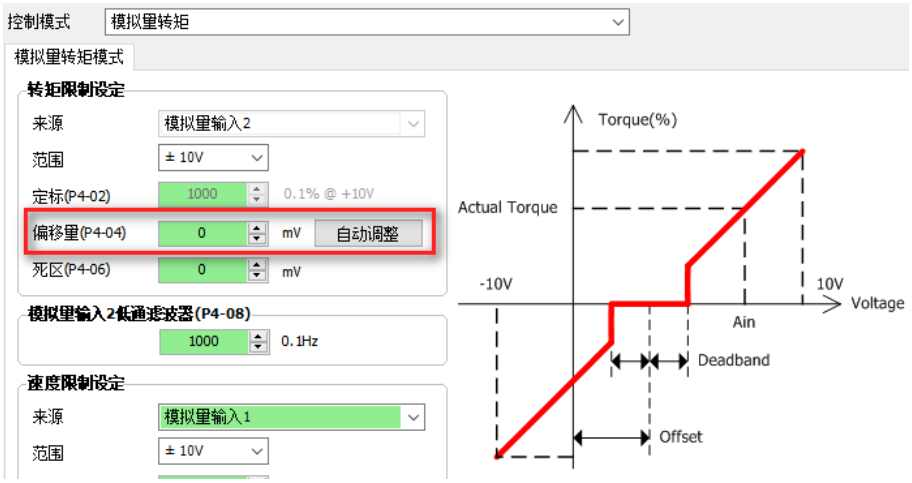


To eliminate this situation,Debugging software is requiredLunaAutomatically adjust offsets or manually modify parametersP4-03,P4-04.

parameter	instruction	name	Numeric range	default value	unit	illustrate
P4-03	AV1	Analog input1Offset	- 10000 ~ 10000	0	mV	Analog input1offset of
P4-04	AV2	Analog input2Offset	- 10000 ~ 10000	0	mV	Analog input2offset of

M54SThe series provides two methods for automatically setting analog offsets.

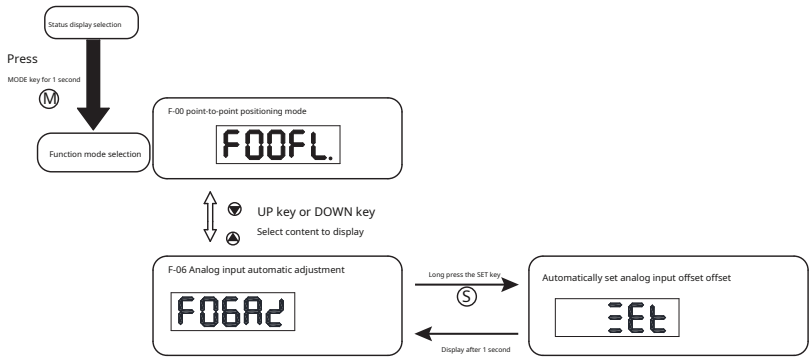
1)Automatically set via software



2)pass**led**Operation panel settings

ledIn the function mode of the operation panel,chooseF06AZfunction code,Analog inputs can be set at the same time1,Analog input2The bias of.

The relevant operations are as follows.Detailed operation introduction,Please refer to chapter5.5Functional operating mode.



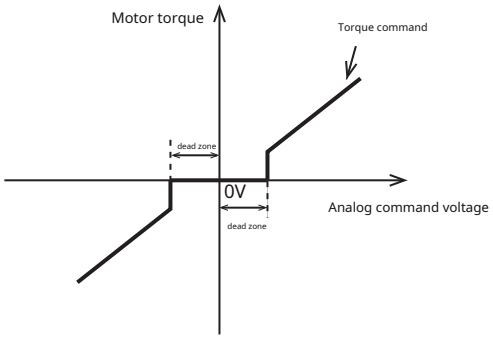
Notice:

When performing automatic adjustment of analog input offset:

- The servo drive is in a non-enabled state
- Analog command output of the host computer0VVoltage.

7.4.4.4Analog dead zone

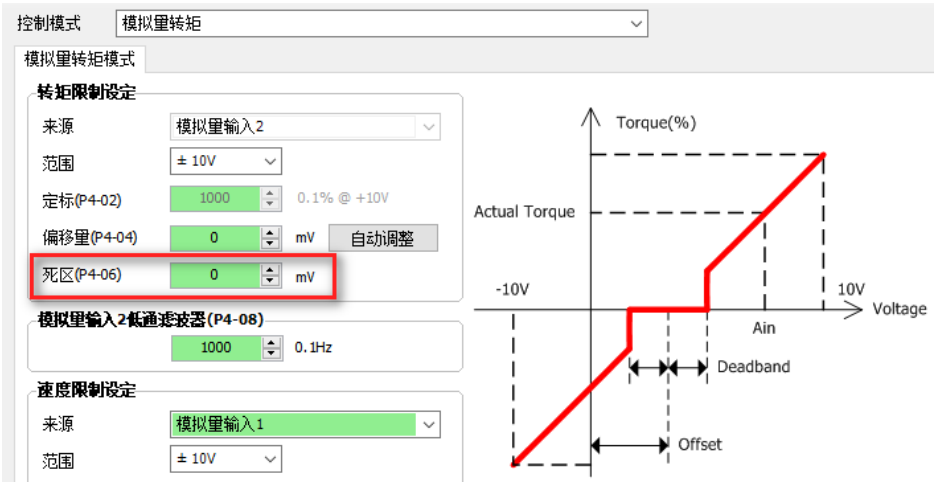
During analog control,The input voltage is0Vhour,Due to some disturbances and other reasons,The input voltage is not absolute0V,Will be at0VFluctuate left and right,This causes the motor to squirm at a very low speed..Therefore, in order to eliminate this situation,Set a reasonable dead zone value,It can be guaranteed that when the input voltage is within the dead zone range,are recognized as0V.



debugging softwareLunaSet this input range,or via parametersP4-05,P4-06set up.

parameter	instruction	name	Numeric range	default value	unit	illustrate
P4-05	AD1	Analog input1dead zone	0~255	0	mV	Analog input1dead zone
P4-06	AD2	Analog input2dead zone	0~255	0	mV	Analog input2dead zone

Software settings



7.4.4.5Analog input filtering

When using analog quantities,due to external interference,Will cause a jump in the analog voltage,This causes a jump in speed or output torque., Affects the accuracy of control.The analog input filter is a low-pass digital filter,Set a reasonable filter frequency,Can eliminate jumps.

parameter	instruction	name	Numeric range	default value	unit	illustrate
P4-07	AF1	Analog input1low pass filter	0~20000	1000	0.1Hz	Analog input noise filter1
P4-08	AF2	Analog input2low pass filter	0~20000	1000	0.1Hz	Analog input noise filter2

Notice:

Generally there is no need to change the value,If the setting value is too small,Responsiveness to torque command will decrease.

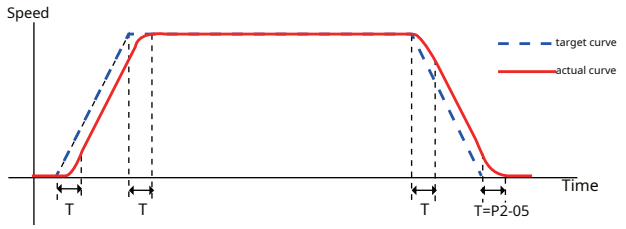
7.4.5 Torque command smoothing filter

Smoothing the torque command,Makes commands smoother,Reduce vibration

◆Jerk time

parameterP2-05(JT)Jerk time in internal trajectory mode (position,speed,torque),Analog position,Analog speed,Analog torque,Or effective when controlled by communication command.

The effect of jerk smoothing on input commands is as shown below.



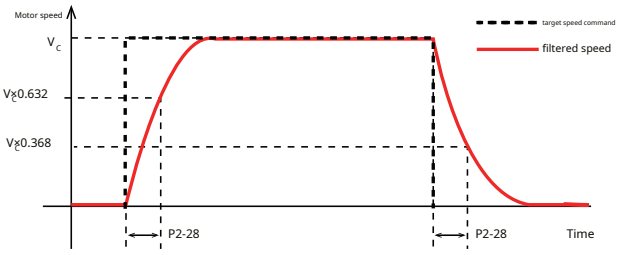
◆ The jerk filter will cause a certain delay in the commandT,But it will not affect the final positioning accuracy

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

◆low pass filter

parameterP2-28(KJ)The low-pass filter can be active in the control mode used,For example:Internal trajectory mode (position,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 shown below.



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

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

7.4.6Speed limit in torque mode

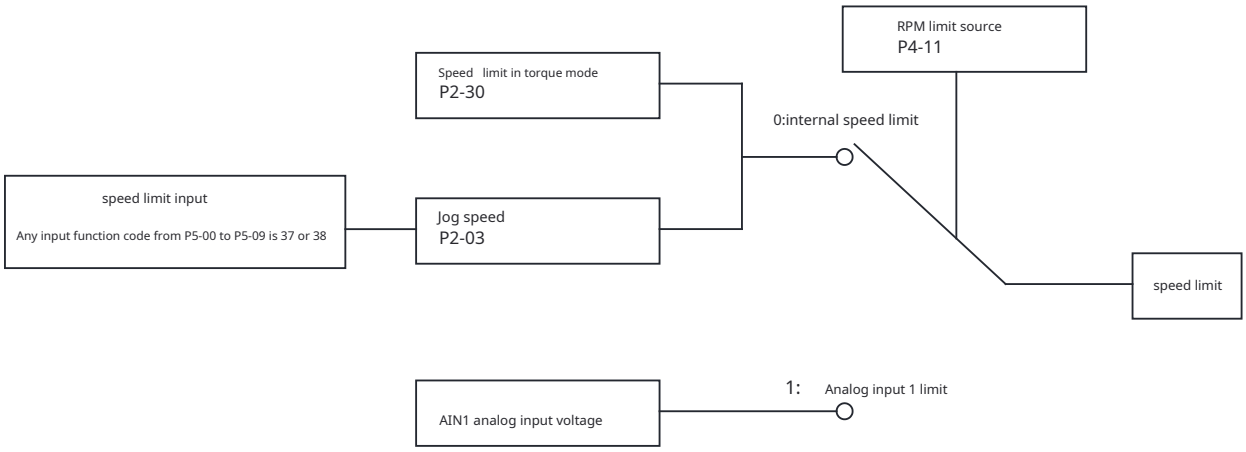
In torque mode,If the output speed of the motor is not limited,When the load connected to the motor is small,And when the torque command is too large,The motor will reach very high speeds,cause unexpected situations.Therefore it is necessary to limit the maximum speed of the motor in torque mode.

◆ Source of speed limit

In torque mode,There are three sources of speed limit:.After setting the speed limit function,The actual motor speed will be limited to the set value.After reaching the speed limit value,The motor operates at the limit value.

The speed limit value should be set according to actual operating requirements..

Speed limit source	describe
Analog inputAIN1limited	Use analog input1as a speed limiting source,10VWhen the corresponding speed limit value is determined by the parameterP4-01(AG)set up
internal speed limit	There are two types of internal speed limits: 1.directly by parametersP2-30(VT)limited 2.The function of digital input is set as speed limit input (V-LMT)hour,When the input logic is established,Speed limit function takes effect,The speed limit value is given byP2-02(JS)set up.



◆ Related parameters

parameter	instruction	name	Numeric range	default value	unit	ledpanel Display value	describe
P4-11	FA	Speed limit source	0~1	0		0	Speed limit source: 0:internal speed limit 1:Analog inputAIN1limited
P4-01	AG	Analog input speed scaling	0~100	50	rps	12000	Analog input speed scaling.In torque mode, When using an analog input as a source of qualification, This parameter acts as10Vcorresponding speed limit value when
P2-30	VT	Speed limit in torque mode	0~100	50	rps	12000	In torque mode,Using internal speed limit When used as a restricted source,This parameter serves as the speed limit value
P2-02	JS	Internal speed mode target speed	- 100 ~ 100	10	rps	2400	In torque mode,When using internal speed limits for restricted sources,When the digital input function is set forV-LMThour,This parameter serves as the speed limit value
P5-00to P5-09	MU1~MUA	Digital input port function allocation	37~38				Enter the numbersX1~X10The function of any input is set to "speed limit input"
P5-12to P5-17	MO1~MO6	Digital output port function allocation	21~22				output digitalY1~Y6The function of any input is set to "speed limit" output.

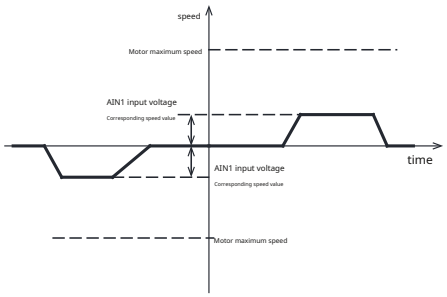
Note:If you need to enter or view through the drive panel**P4-01\P2-30\P2-02**,Please calculate according to the following formula:

$$\text{Panel display value} = V \times 240$$

in V is the speed that needs to be set,Unit is**rps(**change**/**Second**)**

1)Analog input1limit(P4-11 = 1)

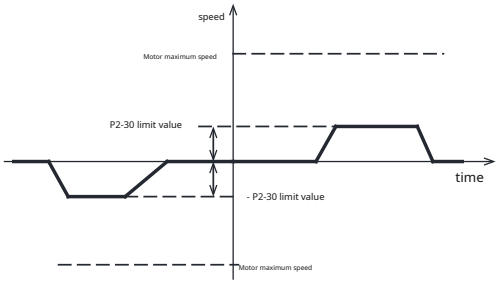
When parametersP4-11The setting value is1hour,Use analog input1as a speed limiting source,10VWhen the corresponding speed limit value is determined by the parameterP4- 01(AG) set up.The motor speed will be limited to the analog input1The absolute value of the speed corresponding to the voltage.



2)internal speed limit(P4-11 = 0)

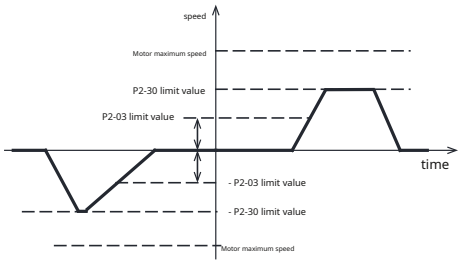
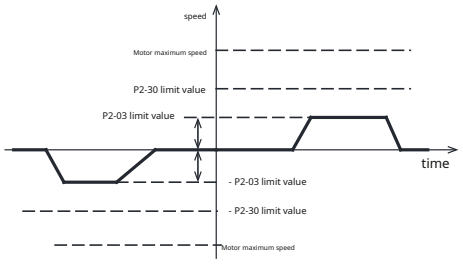
A)Use parameters directly**P2-30**

When parametersP4-11The setting value is0hour,Use parametersP2-30As speed limit under torque simulation.



B)speed limit input**V-LMT**

When the digital input is set to the speed limit function (V-LMT)hour,in parametersP2-30Within the base of the speed limit value,Digital inputs can be used to limit motor speed in torque mode.at this time,When the input logic is valid,The motor speed will be limited to the parameterP2-02set value.

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

speed limit input**V-LMT**settings

When using the speed limit input function,Digital input pins need to be assigned this function.

type	Signal name	set value	signal logic	Function
enter	V-LMT	37	Closed	Input signal is valid,V-LMTFunction takes effect
			Open	Input signal is invalid,V-LMTFunction does not take effect
		38	Open	Input signal is valid,V-LMTFunction takes effect
			Closed	Input signal is invalid,V-LMTFunction does not take effect

3)Software setting example

7.4.7Output in speed limit**(V-LMT)**

In torque mode,Indicates that the motor output speed is limited.V-LMTSignal output.

◆ Related parameters

type	Signal name	set value	signal logic	Function
output	V-LMT	twenty one	Closed	Motor output speed is limited,output signal,The output status isclosed
			Open	Motor output speed is not limited,No signal output,The output status isopen
		twenty two	Open	Motor output speed is limited,output signal,The output status isOpen
			Closed	Motor output speed is not limited,No signal output,The output status isClosed

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

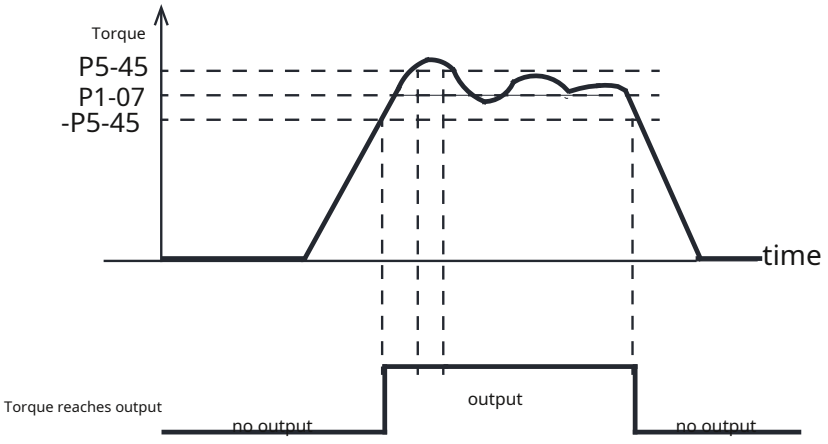
7.4.8 Torque reaches output

When the absolute value of the actual output torque of the motor exceeds the torque reaching thresholdP1-07,Set the output 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 no torque arrival signal is output.TQ-REACH. This function is available in all control modes,Such as location,speed,Torque, etc..

Torque arrival signal**TQ-REACH**settings

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

type	Signal name	set value	signal logic	Function
output	TQ-REACH	13	Closed	TQ-REACHThe judgment condition is established,output signal,The output status isclosed
			Open	TQ-REACHThe judgment condition is not established,No signal output,The output status isopen
		14	Open	TQ-REACHThe judgment condition is established,output signal,The output status isOpen
			Closed	TQ-REACHThe judgment condition is not established,No signal output,The output status isClosed



Related parameters

parameter	instruction	name	Numeric range	default value	unit	illustrate
P1-07	CV	Determine when the torque reaches the target value	0~3000	0	0.1%	When the absolute value of the actual output torque of the motor exceeds the torque reaching threshold valueP1-07,And the torque ripples inP5-41Within the setting range, Set the output torque arrival signalTQ-REACH
P5-45	TV	Torque reaches the fluctuation range	0~3000	10	0.1%	

7.4.9 Torque consistent signal

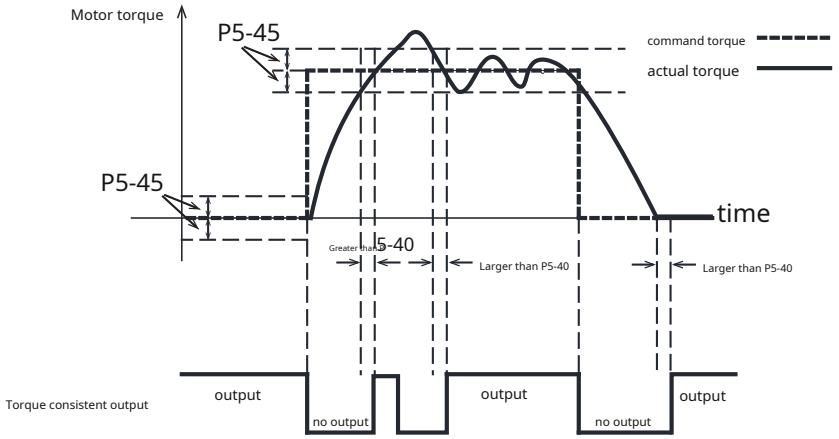
In torque mode,When the difference between the filtered actual torque of the motor and the command torque is the torque deviation,P5-45(When the torque reaches the fluctuation range) within the range setting ,and time is enoughP5-40(Counting time for positioning completion),Then it is deemed that the actual torque of the motor is consistent with the command torque.,Output torque consistent signalI-COIN.

If the filtered torque wave exceeds or is less thanP5-45,Then the torque consistency signal will not be output.I-COIN

Torque consistent output**I-COIN**settings

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

type	Signal name	set value	signal logic	Function
output	I-COIN	35	Closed	I-COINThe judgment condition is established,output signal,The output status isclosed
			Open	I-COINThe judgment condition is not established,No signal output,The output status isopen
		36	Open	I-COINThe judgment condition is established,output signal,The output status isOpen
			Closed	The judgment condition is not established,No signal output,The output status isClosed



Related parameters

parameter	instruction	name	unit	Numeric range	default value	illustrate
P5-45	TV	Torque reaches the fluctuation range	0.1%	0~3000	10	The torque ripples inP5-45When setting,It is determined that the actual torque of the motor is consistent with the command torque.,The output torque will be consistent with the letter NumberI-COIN
P5-40	PE	Motion judgment condition counting time	ms	0~32000	40	Positioning completion count time

7.4.10 Gain parameters and speed control type of torque mode

In torque mode,The torque control method is the same as the speed mode control method.,There are also two types of control:

1.Real-time detection of position errors

2.Speed control only (default setting)

The parameters used are also consistent.

Related parameters

parameter	instruction	name	unit	Numeric range	default value	ledpanel Display value	describe
P1-03	JM	Speed mode control type	-	1,2	2	2	Set control type in speed mode 1.Real-time detection of position errors 2.Speed control only (default setting)

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

Under this control type,Position errors will be detected in real time,When the difference between the actual position fed back by the encoder and the command position, that is, the position error exceedsP3-04(When setting the position error judgment range),The driver will generate a fault alarm indicating that the position error exceeds the limit..

In this mode,The relevant gain parameter is:

parameter	instruction	parameter name	type	default value	unit
P0-05	KP	first position loop gain	First set of gains	52	0.1Hz
P0-07	KD	First 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	First speed loop integration 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	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

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

Under this control type,Position errors will not be detected,Even if the motor is stalled,No alarm is generated. When in this control mode,The gain parameter is given byP0-12speed loop proportional gain sumP0-13Speed loop integration time setting.

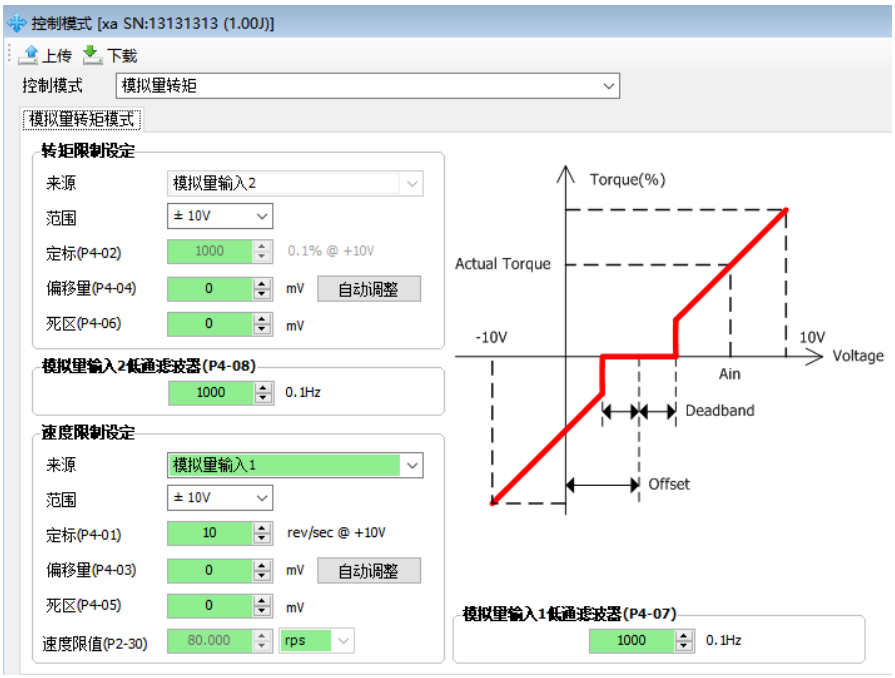
parameter	instruction	name	unit	Numeric range	default value
P0-12	VP	Speed loop proportional gain	0.1Hz	0~30000	515
P0-13	VI	Speed loop integration time	ms	0~32767	79

7.4.11Use software to set analog torque mode

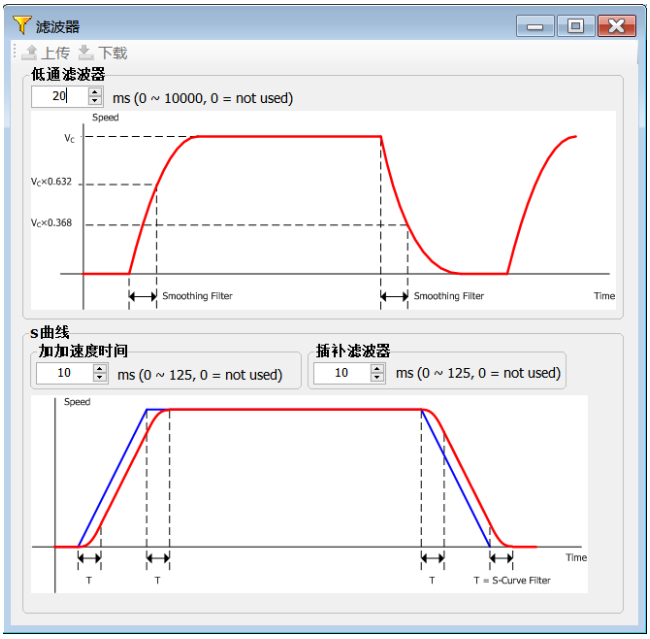
Use debugging softwareLunaParameters for configuring torque mode can be easily set.

first step:Select control mode

Select control mode,Set analog related parameters



Step 2:Set smoothing filter

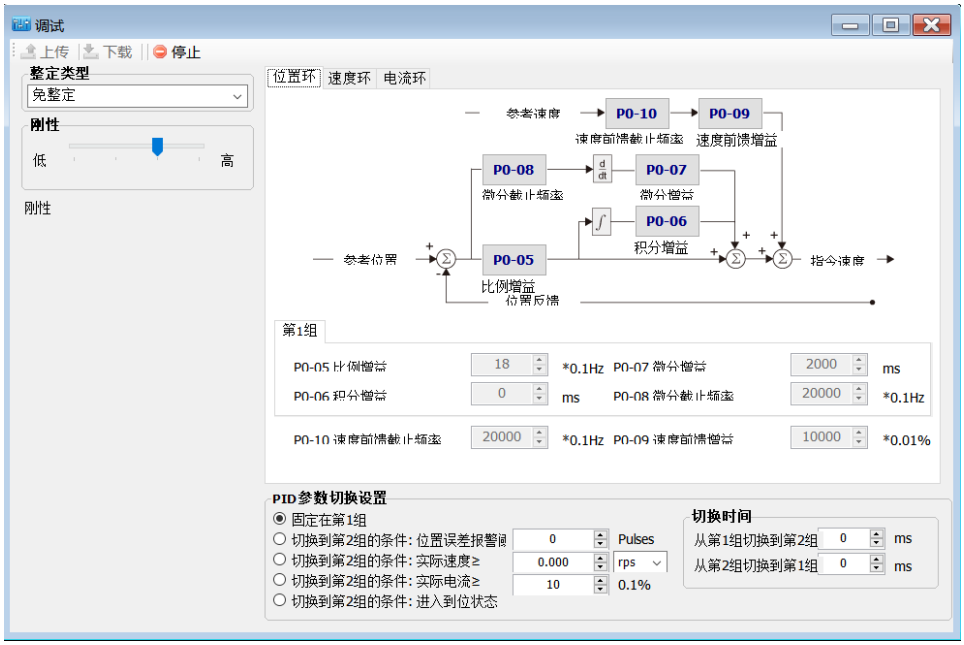


third step:Input and output settings

the fourth step:Speed limit setting

In torque mode,Need to limit the output speed of the motor,Prevent when the load connected to the motor is small,And when the torque command is too large,The motor will reach very high speeds,cause unexpected situations.

the fifth step:Gain debugging



7.5Torque limit

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

This function is available in all control modes,Such as location,speed,Torque, etc..

◆ Torque limiting method

parameterP1-10Defined6Torque limiting method,The restrictions are as follows.

P1-10 Torque limit method setting	Forward torque limit source	Reverse torque limit source
0	register[Y]set up	register[Z]set up
1 (default value)	parameterP1-06	
2	parameterP1-06	parameterP1-25
3	TQ-LMTWhen input is valid:P1-06	
	TQ-LMTWhen input is invalid:P1-25	
4	AIN2,Analog input port2	
5	TQ-LMTWhen input is valid:P1-06	TQ-LMTWhen input is valid:P1-25
	TQ-LMTWhen input is invalid:P1-26	TQ-LMTWhen input is invalid:P1-27

Related parameters

parameter	instruction	name	Numeric range	default value	unit	illustrate
P1-10	LD	Torque limiting method	0~6	0	-	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 drive
P1-25	CX	Second torque limit	0~3000	3000	0.1%	Second torque limit of the drive
P1-26	CY	Third torque limit	0~3000	3000	0.1%	Third torque limit of the drive
P1-27	CZ	Fourth torque limit	0~3000	3000	0.1%	Fourth torque limit of the drive
P4-02	AN	Analog input torque scaling	- 3000 ~ 3000	1000	0.1%	The analog input voltage is10VDCThe corresponding output torque when

7.5.1Torque limit source

7.5.1.1just,Reverse torque is limited by register

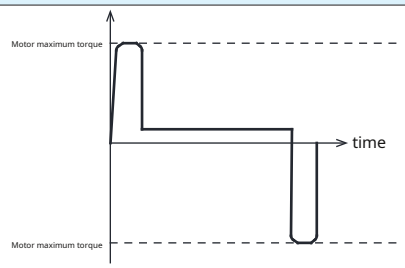
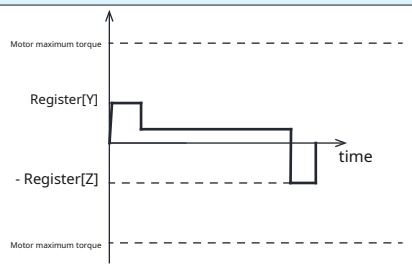
existM54Sin the system,There are some registers forSCLorQProgramming.

in:

whenP1-10 = 0hour,The forward torque limit is determined by the register [Y]Decide,The reverse torque limit is determined by the register [Z]Decide.The values of these two registers can be passedRS-485Communication modifications take effect immediately.

Notice:

register**[Y],[Y]**The setting value is too small,Servo motor plus,Torque deficiency may occur during deceleration.

No starting torque limit	Enable internal parameter restrictions
	
No starting torque limit,The motor output torque can reach the maximum torque of the electrode.	whenP1-10 = 0,Enable internal parameter restrictions,The motor output forward torque is limited to the register [Y]set value,Reverse torque output is limited to - register [Y]value.

7.5.1.2just,Reverse torque is limited by a single parameter

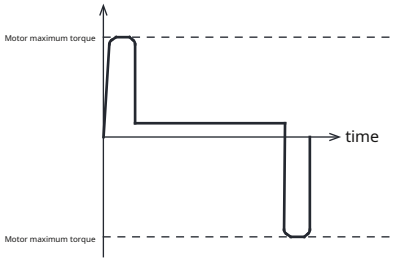
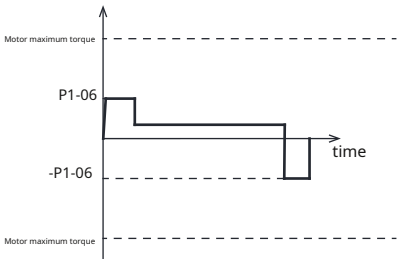
whenP1-10 = 1hour,The forward and reverse torque limits are determined by parametersP1-06Decide.

◆ Related parameters

parameter	instruction	name	Numeric range	default value	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the drive

Notice:

P1-06The setting value is too small,Servo motor plus,Torque deficiency may occur during deceleration.

No starting torque limit	Enable internal parameter limits
	
No starting torque limit,The motor output torque can reach the maximum torque of the electrode.	whenP1-10 = 1,Enable internal parameter limits,The motor output torque is limited toP1-06set value.

7.5.1.3just,Reverse torque is limited by different parameters

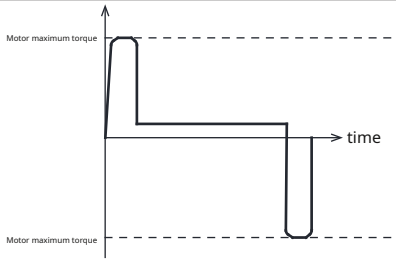
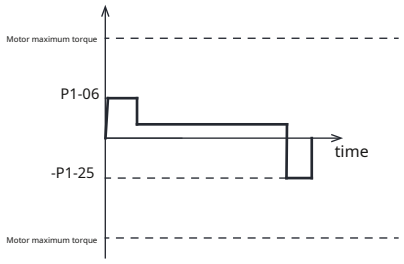
whenP1-10 = 2hour,The forward torque limit is determined by the parameterP1-06Decide,The reverse torque limit is determined by the parameterP1-25Decide.

◆ Related parameters

parameter	instruction	name	Numeric range	default value	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the drive
P1-25	CX	Second torque limit	0~3000	3000	0.1%	Second torque limit of the drive

Notice:

P1-06,**P1-25**The setting value is too small,Servo motor plus,Torque deficiency may occur during deceleration.

No starting torque limit	Enable internal parameter limits
	
No starting torque limit,The motor output torque can reach the maximum torque of the electrode.	whenP1-10 = 2,Enable internal parameter limits,The motor output forward torque is limited toP1-06 set value,Reverse torque output is limited to -(P1-25)value.

7.5.1.4 Torque limit input**TQ-LMT**switch control**---**just,Reverse single parameter

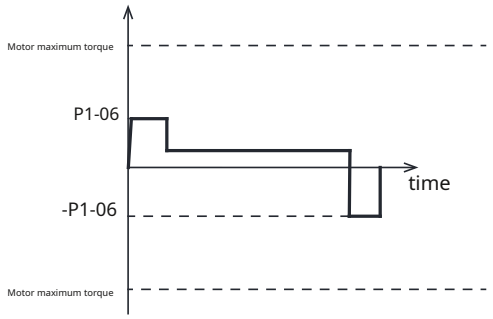
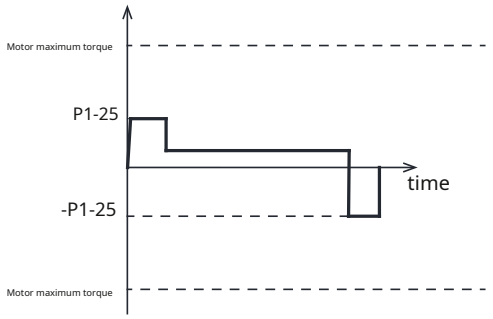
whenP1-10 = 3hour,The forward and reverse torque limits are input by the torque limitTQ-LMTThe logical state of.

- whenTQ-LMTThe input state logic condition is established,When input is valid,The forward and reverse torque limits are determined by parametersP1-06Decide
- whenTQ-LMTThe input status logic condition is not established,When input is invalid,The forward and reverse torque limits are determined by parametersP1-25Decide
- Related parameters

parameter	instruction	name	Numeric range	default value	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the drive
P1-26	CY	Third torque limit	0~3000	3000	0.1%	Third torque limit of the drive

Notice:

P1-06,**P1-25**The setting value is too small,Servo motor plus,Torque deficiency may occur during deceleration.

TQ-LMTTorque limit input is valid	TQ-LMTTorque limit input is invalid
	
whenP1-10 = 3,TQ-LMTTorque limit input is valid,The motor output torque is limited to P1-06set value.	whenP1-10 = 3,TQ-LMTTorque limit input is invalid,The motor output torque is limited toP1-25 set value.

7.5.1.5 Analog input**2**Limit torque

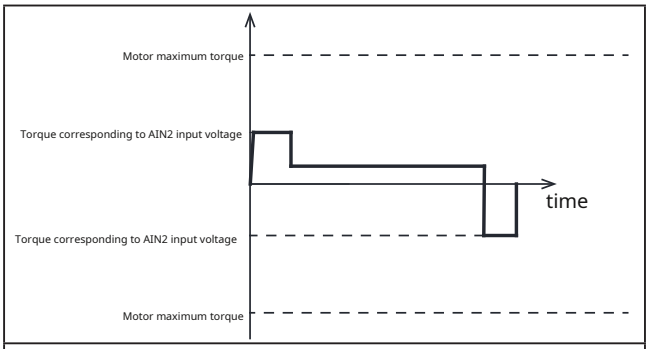
whenP1-10 = 4hour,The forward and reverse torque limits are given byAIN2Analog input2The absolute value of the voltage value determines the torque corresponding to.

- Related parameters

parameter	instruction	name	Numeric range	default value	unit	illustrate
P4-02	AN	Analog input torque scaling	- 3000 ~ 3000	1000	0.1%	The analog input voltage is10VDCThe corresponding output torque when

Notice:

- P4-02The setting value is too small,Servo motor plus,Torque deficiency may occur during deceleration.
- When the analog input voltage is negative,Take the torque corresponding to the absolute value as the forward torque limit



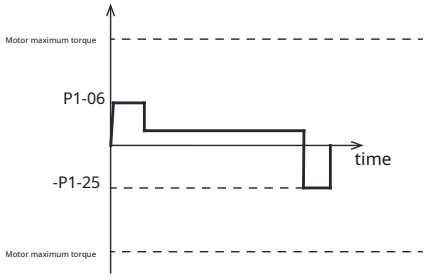
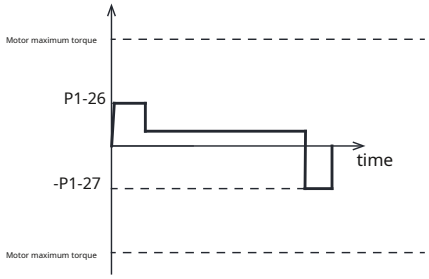
whenP1-10 = 4,The forward and reverse torque limits are given byAIN2Analog input2The absolute value of the voltage value determines the torque corresponding to

7.5.1.6 Torque limit input**TQ-LMT**switch control**---**just,reverse restriction

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

- whenTQ-LMTThe input state logic condition is established,When input is valid,The forward torque limit is determined by the parameterP1-06Decide,The forward torque limit is determined by the parameterP1-25Decide
- whenTQ-LMTThe input status logic condition is not established,When input is invalid,The forward torque limit is determined by the parameterP1-26Decide,The forward torque limit is determined by the parameterP1-27Decide

parameter	instruction	name	Numeric range	default value	unit	illustrate
P1-06	CC	first torque limit	0~3000	3000	0.1%	First torque limit of the drive
P1-25	CX	Second torque limit	0~3000	3000	0.1%	Second torque limit of the drive
P1-26	CY	Third torque limit	0~3000	3000	0.1%	Third torque limit of the drive
P1-27	CZ	Fourth torque limit	0~3000	3000	0.1%	Fourth torque limit of the drive

TQ-LMTTorque limit input is valid	TQ-LMTTorque limit input is invalid
	
whenP1-10 = 3,TQ-LMTTorque limit input is valid,The motor output forward torque is limited toP1-06set value,Reverse torque is limited toP1-25set value.	whenP1-10 = 3,TQ-LMTTorque limit input is invalid,The motor output forward torque is limited to P1-26set value,Reverse torque is limited toP1-27set value

7.5.2Torque limit output(T-LMT)

Indicates the motor output torque limit statusT-LMTSignal output.

- Related parameters

type	Signal name	set value	signal logic	Function
output	T-LMT	15	Closed	Motor output torque is limited,output signal,The output status isclosed
			Open	Motor output torque is not limited,No signal output,The output status isopen
		16	Open	Motor output torque is limited,output signal,The output status isOpen
			Closed	Motor output torque is not limited,No signal output,The output status isClosed

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

7.6 Pulse 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.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	Numeric range	
P3-12	PO	Pulse frequency division output mode setting	0~256	Pulse frequency division output setting
P3-13	ON	Numerator of pulse output distribution ratio	0~13107200	Set the numerator of the pulse output frequency division ratio
P3-14	OD	Denominator of pulse output distribution ratio	0~13107200	Set the denominator of the pulse output frequency division ratio

7.6.1 Pulse frequency division output signal pin

◆ M54Sseries50pinHigh-density connector models

CN2-Pin number	Signal name		illustrate	Wiring
twenty one	AOUT+	Encoder feedback output	Convert the encoder feedback signal toA,B,ZThe method of differential output can set the number of pulses per revolution and the pulse output frequency division ratio through parameters.	Reference section4.9.9Encoder frequency division output (-F andRas well as-Dmodel)
twenty two	AOUT-			
48	BOUT+			
49	BOUT-			
twenty three	ZOUT+			
twenty four	ZOUT-			
19	OCZ		Set the encoder'sZThe signal is output as an open collector	
13,14 15,17,25	DGND		OCZoutput place	

Notice:

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

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

3.The output is**5V**Differential signaling,The maximum allowable current is**20mA**.

7.6.2 Pulse frequency division output mode setting

When using the pulse frequency division output function,Need for output pulse source,Output pulse phase,ZPulse output polarity,The frequency division ratio can be set separately.

Use parametersP3-12Pair of input and pair of output pulse sources,Output pulse phase,ZSet the pulse output polarity type..eachbitThe functions corresponding to 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>When rotating forwardA,BPhase relation</td><td colspan="2">Output pulse source</td></tr>
<tr><td>0:rising edge</td><td>0:AleadingB 90°</td><td colspan="2">bit1=0,bit0=1:Motor encoder
bit1=1,bit0=0:second encoder,Fully closed loop encoder input</td></tr>
<tr><td>1:falling edge</td><td>1:BleadingA 90°</td><td colspan="2">bit1=1,bit0=1:External pulse command</td></tr>
<tr><td colspan="8">bit0andbit1:Output pulse source
bit2:When rotating forwardA/Bphase relationship bit3:ZPulse output polarity</td></tr>
</table>

Notice:

exist**led**When entering the parameter list of the operation panel and software,need to be converted into**10**base.

7.6.2.1 Output pulse source

The pulse frequency division output function supports the following three signal sources for output through the frequency division function.,parameterP3-12ofbit0bit andbit1bits used to select the signal source:

bit1=0,bit0=1:Motor encoder

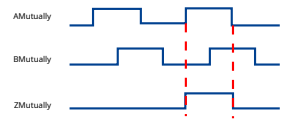
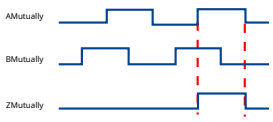
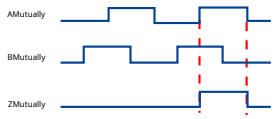
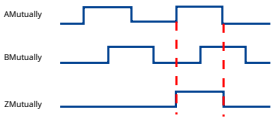
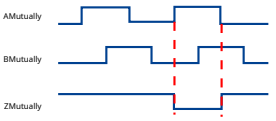
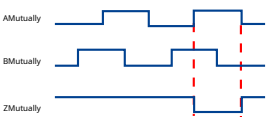
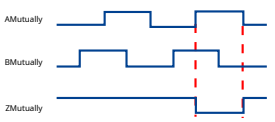
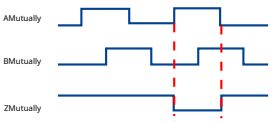
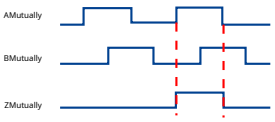
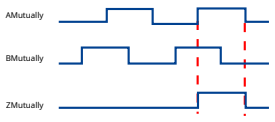
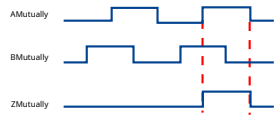
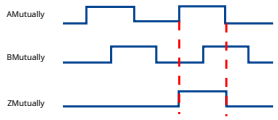
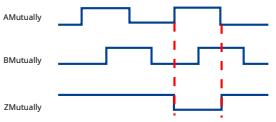
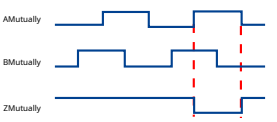
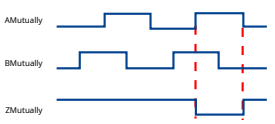
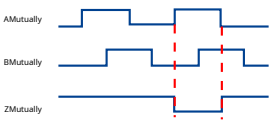
bit1=1,bit0=0:second encoder,Fully closed loop encoder input

bit1=1,bit0=1:External pulse command (By pass)

Notice:

When the signal source is an external pulse command,parameter**P3-13**and parameters**P3-14**invalid,The command pulse is not processed in any way.,direct**by-pass** output.**P3-12**of**bit2**bit and**bit3**Bit settings will also be invalid.

7.6.2.2 Frequency division output mode setting

ZPulse input Output polarity	When rotating forward A,BMutually bit relation	Output pulse source			Forward	reverse	parameterP3-12 set value (10base)
bit3	bit2	bit1	bit0				
0	0	0	1	Motor encoder			1
0	1	0	1	Motor encoder			5
1	0	0	1	Motor encoder			9
1	1	0	1	Motor encoder			13
0	0	1	0	second encoder,Fully closed Ring encoder input			2
0	1	1	0	second encoder,Fully closed Ring encoder input			6
1	0	1	0	second encoder,Fully closed Ring encoder input			10
1	1	1	0	second encoder,Fully closed Ring encoder input			14
any value	any value	1	1	External pulse command	By pass direct output	By pass direct output	3

7.6.3 Pulse frequency division output gear ratio

When the source of the output pulse selects the motor encoder or the second encoder,By setting the encoder's frequency division output gear ratio numerator and denominator,The number of pulses output by the motor per revolution can be set.

Number of pulses output per revolution**(A/B**Count when same,**4**After frequency doubling**) =**

$$\frac{\text{P3-13 Pulse frequency division output ratio numerator}}{\text{P3-14 Pulse frequency division output ratio denominator}} \times 131072$$

Related parameters

parameter	instruction	name	Numeric range	default value	illustrate
P3-13	ON	Pulse frequency division output ratio numerator	0~13107200	10000	Set the numerator of the pulse frequency division output frequency division ratio
P3-14	OD	Pulse frequency division output ratio denominator	0~13107200	131072	Set the denominator of the pulse frequency division output frequency division ratio

Notice:

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

2).when**P3-13**Frequency division ratio numerator**>P3-14**When the frequency division ratio is the denominator,The number of pulses output by the motor during one revolution**(A/B**Mutually**4**After frequency doubling**) = P3-13**

Example:

If you need to output every revolution1000number of pulses.

1).as right**A/B**Count when same,and**4**Frequency multiplier. but:P3-13 = 1000

P3-14 = 131072orP3-14 = 1

2).as right**A/B**Count when same,And when counting, only the rising edge or falling edge is counted.. but:P3-13 = 2000

P3-14 = 131072orP3-14 = 1

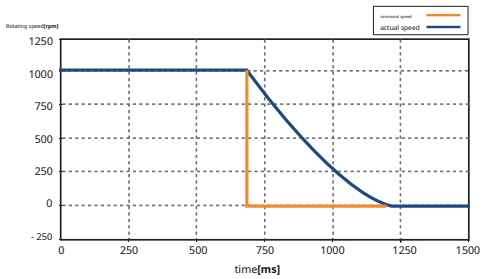
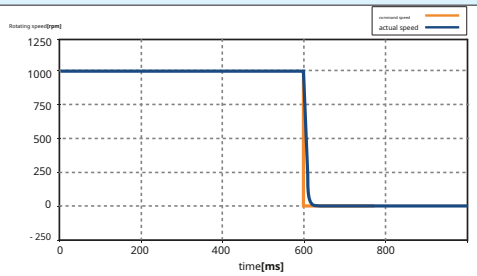
3). If only**A**Phase output count,And when counting, only the rising edge or falling edge is counted. . but:P3-13 = 4000

P3-14 = 131072orP3-14 = 1

7.7dynamic braking

In servo caused by abnormalityOFF,Driver error,In case of sudden power outage, etc.,At this time, the driver is no longer able to control the motor.,You can use the dynamic braking function as a servo motor stopping method.When dynamic braking is working,Move the motorU/V/Wthree phase short circuit,Make the motor stop at the fastest speed, To protect equipment and personal safety.

M54SSeries servoFtype andXAll models have built-in dynamic braking modules.

● Motor stop situation without dynamic braking	● Motor stop situation when using dynamic braking
	
When a drive failure alarm occurs,Disable drive.The motor is in an uncontrollable free deceleration stop state.,The stopping time depends on the motor speed when the enable is disabled,External factors such as the dragging load inertia and mechanical friction.	When a drive failure alarm occurs,When the driver is disabled,,Short circuit the three phases of the motor, Using the back electromotive force to generate current torque in the motor windings,Stop as quickly as possible.Significantly reduces deceleration time,Protect equipment and personal safety.

Notice:

- Dynamic braking with quick stop function.

  Do not enable via servo**/OFF**function to start and stop the operation of the motor.It is easy to cause damage to the dynamic braking module inside the driver..

- When the drive is powered off,Since dynamic braking is already in effect,Slow rotating motor shaft,At this time, it is the power generation state,Short circuit current will occur inside the motor,thus producing braking torque,It is normal at this time.

  Do not operate the drive when the power is off,continued,Quickly apply torque from the outside to rotate the motor shaft,Otherwise the drive may smoke or catch fire.

- Dynamic braking is only suitable for short-term use,Only in exceptions caused by servoOFF,Driver error,Use in case of sudden power outage etc.. After using dynamic braking to stop at high speed,interval**5**minutes before it can be used again

7.7.1 Dynamic braking resistor wiring method

for750Wand below models that support dynamic braking function,The driver has built-in dynamic braking resistor,No external connection required.

7.7.2 Dynamic braking function related parameters:

parameter	instruction	name	Numeric range	default value	unit	illustrate
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,driver It is considered that it is in a zero speed state at this time
P1-29	YV	When dynamic braking is disabled action	0~5	0	-	Select dynamic braking on the drive from servo enable to servo OFFway of action
P1-30	YR	The action of dynamic braking when an error is reported	0~3	0	-	Select the action of dynamic braking when an error occurs
P1-31	YM	Dynamic braking during deceleration when disabled The longest action time in the process	0~30000	500	ms	set in servoOFFcase,Maximum time for dynamic braking to take effect
P1-32	YN	Dynamic braking during the deceleration process when an error is reported The longest action time in	0~30000	500	ms	Set when the driver reports an error,dynamic braking Maximum time for effective work

7.7.3 Servo**OFF**Description of dynamic braking action

ServoOFFhour,Dynamic braking action through parametersP1-29set up,The maximum action time during deceleration passes the parameterP1-31set up,Please refer to the table below.The deceleration process refers to when dynamic braking takes effect,The actual speed of the motor decelerates from the speed when it takes effect to the parameterP5-42Within zero speed threshold,Or the deceleration time reachesP1-31setting time.

P1-29	illustrate	
	deceleration process	After stopping
0	with parametersP2-01The setting decelerates	Maintain freedom of movement
1	with parametersP2-01The setting decelerates	dynamic braking action
2	free movement state	Maintain freedom of movement
3	free movement state	dynamic braking action
4	dynamic braking action	Maintain freedom of movement
5	dynamic braking action	dynamic braking action

7.7.4 Description of dynamic braking action when servo reports error

When the servo reports an error,Dynamic braking action through parametersP1-30set up,The longest operating time during deceleration passesP1-32set up,Please refer to the table below.The deceleration process refers to when dynamic braking takes effect,The actual speed of the motor decelerates from the speed when it takes effect to the parameterP5-42Within zero speed threshold, Or the deceleration time reachesP1-31setting time.

P1-30	illustrate	
	deceleration process	Stopping
0	free movement state	Maintain freedom of movement
1	free movement state	dynamic braking action
2	dynamic braking action	Maintain freedom of movement
3	dynamic braking action	dynamic braking action

7.8 Origin return function

When the origin return function is activated,The servo drive accelerates/decelerates according to the origin return setting set by the host controller.,speed,Origin offset,

Parameters such as origin return mode and origin switch signal generate motion trajectories,Control the motor to perform motion according to the generated motion trajectory;

M54SSeries servo drive support39origin return method

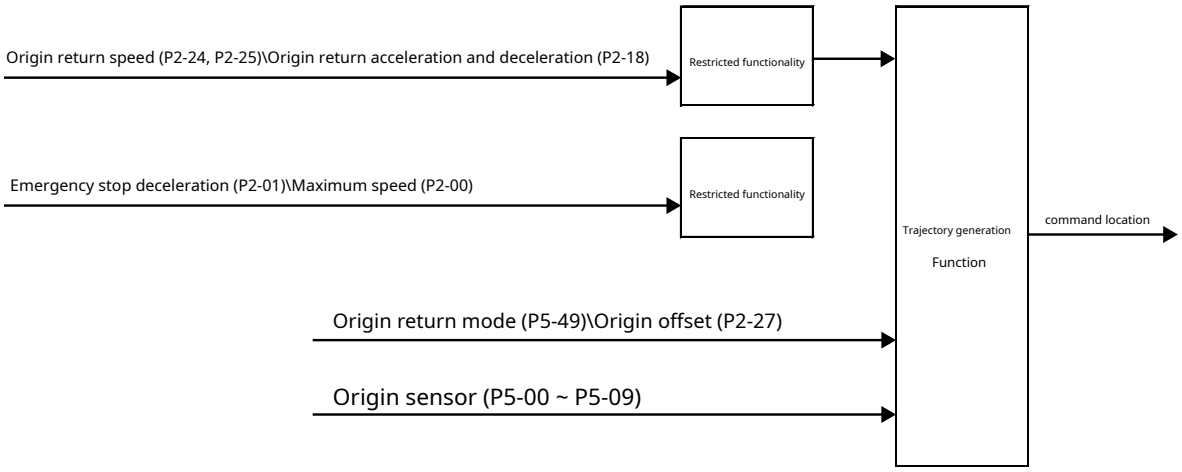
There are two ways to enable origin regression:

◆ Digital input start (S-HOM)

type	Signal name	set value	signal logic	Function
enter	S-HOM	15	Closed	S-HOMFeature enabled,Start returning to origin
			Open	S-HOMFunction not enabled
		16	Open	S-HOMFeature enabled,Start returning to origin
			Closed	S-HOMFunction not enabled

◆ use**Q**program instructions

Related parameters



parameter	instruction	name	Numeric range	default value	unit	illustrate
P5-49	HE	Return to origin mode	- 4 ~ 35	1	-	Choose the way to return to the origin
P2-18	HA1	Return to origin acceleration/deceleration	0.167~5000	100	rps/s	Set the acceleration/deceleration during return to origin
P2-24	HV1	Return to origin first speed	0.0042~100	10	rps	Set the first speed during return to origin
P2-25	HV2	Return to origin second speed	0.0042~100	1	rps	Set the second speed during return to origin
P2-27	HO	Return to origin offset	- 2147483647 ~ +2147483647	0	pulses	Set the offset position after finding the origin when returning to the origin.
P2-00	VM	Maximum speed	0~100	80	rps	Maximum speed limit,Limit in all control modes Motor speed.
P2-01	AM	Servo brake deceleration	0.167~5000	3000	rps/s	Maximum deceleration value during emergency stop
P5-00 ~ P5-09	MU1~ MUA	Digital input port function	39 ~ 40	-	-	Set digital inputX1~X10One of the inputs is the origin sensor

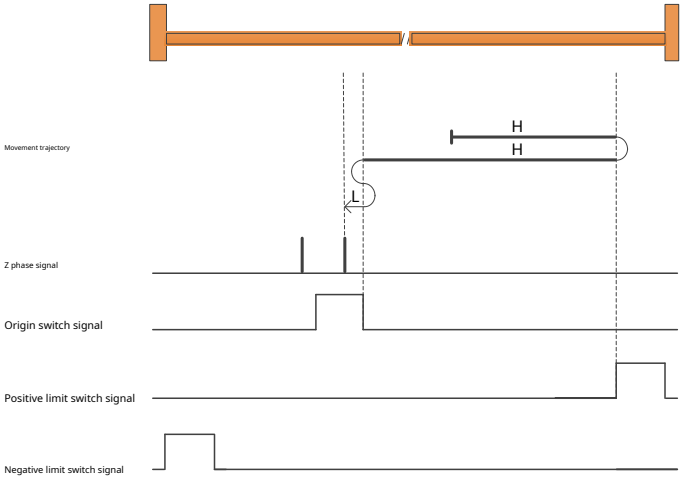
7.8.1 Basic concepts of returning to origin

Return to origin is used to find the mechanical origin,Position the relationship between the mechanical origin and the mechanical zero point.

Mechanical origin:a fixed position on a machine,It can be a certain sensor,It can also be a motorZBelieve the signal. Mechanical zero point: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 point can be set:Mechanical origin = Mechanical zero point +P2-27

whenP2-27=0hour,The mechanical origin coincides with the mechanical zero point.



H:Return to origin first segment speedP2-24 L:

Return to origin second section speedP2-25

Origin switch signal:Set digital inputX1~X10One 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~X10One of the inputs is the positive limit switch,POT=0Indicates that the forward limit signal is invalid, POT=1Indicates that the forward limit signal is valid.

Negative limit switch signal:Set digital inputX1~X10One 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.

7.8.2 Introduction to return to origin method

Return to origin mode	Do you want a motor?**Z**Signal	Do you need an origin sensor?	Do you need a limit switch?
Way -4 & -3			
Way -twenty one	√		
Way1 & 2	√		√
Way3 to 6	√	√	
Way7 to 14	√	√	√
Way15 & 16	Reserved		
Way17 & 18			√
Way19 to 22		√	
Way23 to 30		√	√
Way31 & 32	Reserved		
Way33 & 34	√		
Way35			

Return to origin method-4~-1It 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, it limits the torque of the motor during the process of returning to the origin.,When the mechanical hard limit contacts the load driven by the motor to cause obstruction,When the thrust generated by the motor driving the load is equal to the blocking force and the motor is stationary,This position is considered to be the mechanical origin.During the process of returning to the origin, the torque limit of the motor passesP1-08(Torque limit value of hard limit return to origin mode) setting,100%corresponds to1times motor rated torque;Set the value of this object according to the actual application,If the setting value is too small, the position of returning to the origin may be inaccurate.,Setting a value that is too large may damage the mechanical equipment.

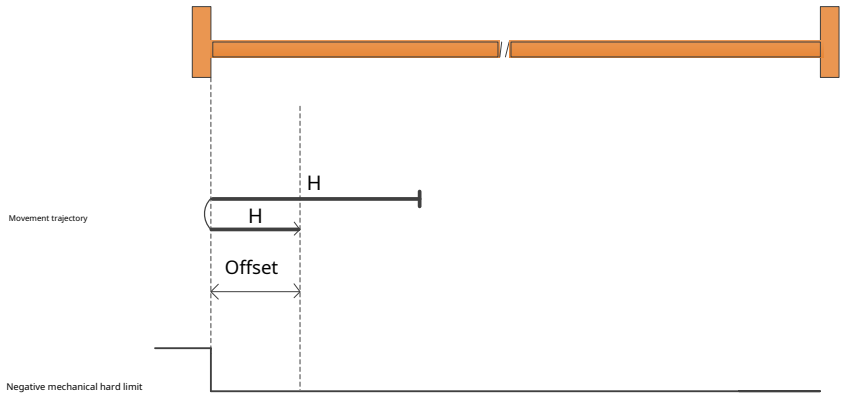
Notice:

Use return to origin method**-4~-1**hour,A suitable return-to-origin offset needs to be set**P2-27**,During the process of returning to the origin, find the mechanical origin and then run the origin offset in the reverse direction.**P2-27**distance.The actual position after the motor stops is the origin offset**P2-27**set value.

Return to origin mode1~35is in accordance withCiA402The return-to-origin method defined by the motion control protocol.

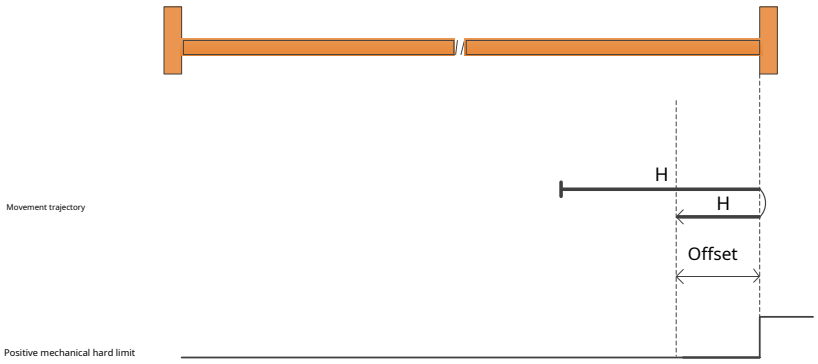
Notice:Use return to origin method**1~35**hour,After the motor returns to the origin,,The actual position of the motor is the origin offset**P2-27**value.

7.8.2.1 Return to origin mode**-4**:negative regression,Looking for negative mechanical hard limit



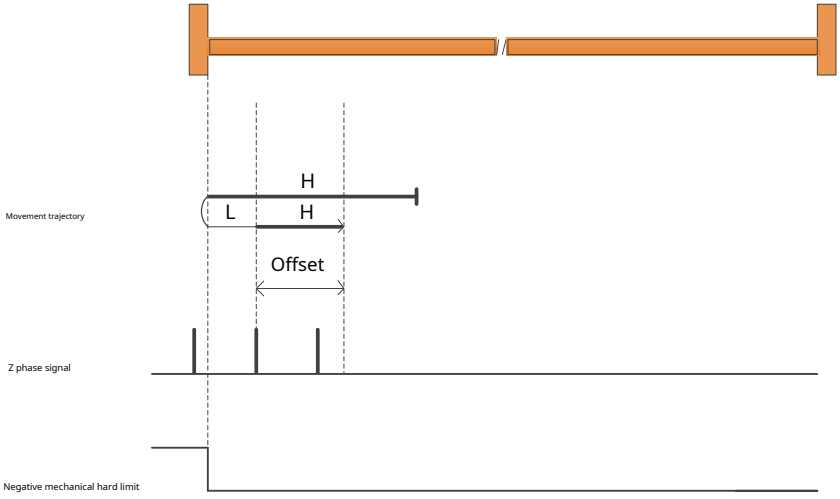
a)Start return at high speed in negative direction,When the mechanical hard limit is encountered and the blocking force is equal to the torque limited by the motor, it decelerates and stops.,Run origin offset at high speed in forward directionP2-27distance,The position of the motor after stopping is0.

7.8.2.2 Return to origin mode**-3**:forward regression,Looking for positive mechanical hard limit



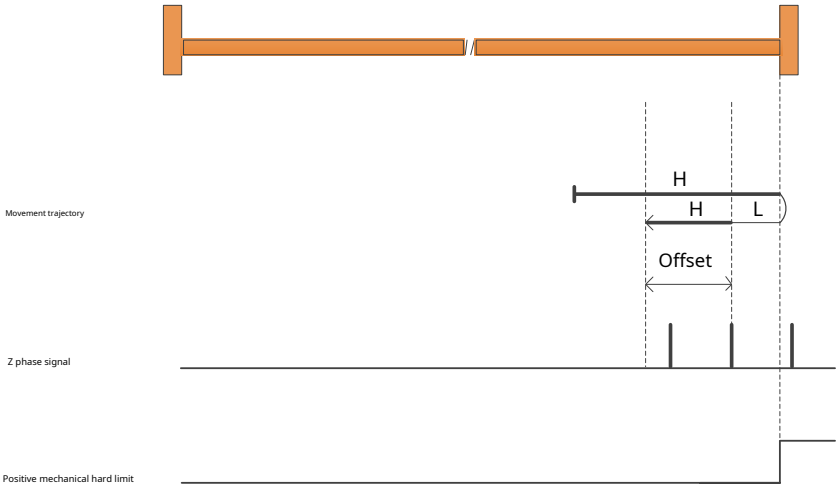
a)Start return at high speed in forward direction,When the mechanical hard limit is encountered and the blocking force is equal to the torque limited by the motor, it decelerates and stops.,Run origin offset at high speed in negative directionP2-27distance,The position of the motor after stopping is0.

7.8.2.3 Return to origin mode**-2**:negative regression,Find the negative mechanical hard limit and**Z**phase pulse signal



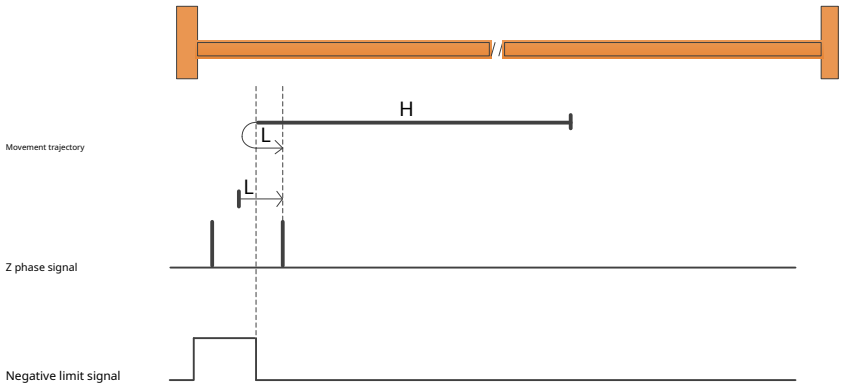
a)Start return at high speed in negative direction,When the mechanical hard limit is encountered and the blocking force is equal to the torque limited by the motor, it decelerates and stops.,Run at forward low speed,meet the firstZPulse stops,Run origin offset at high speed in forward directionP2-27distance,The position of the motor after stopping is0.

7.8.2.4 Return to origin mode**-1**:forward regression,Find the positive mechanical hard limit and**Z**phase pulse signal



a)Start return at high speed in forward direction,When the mechanical hard limit is encountered and the blocking force is equal to the torque limited by the motor, it decelerates and stops.,Run at negative low speed,meet the firstZPulse stops,Run origin offset at high speed in negative directionP2-27distance,The position of the motor after stopping is0.

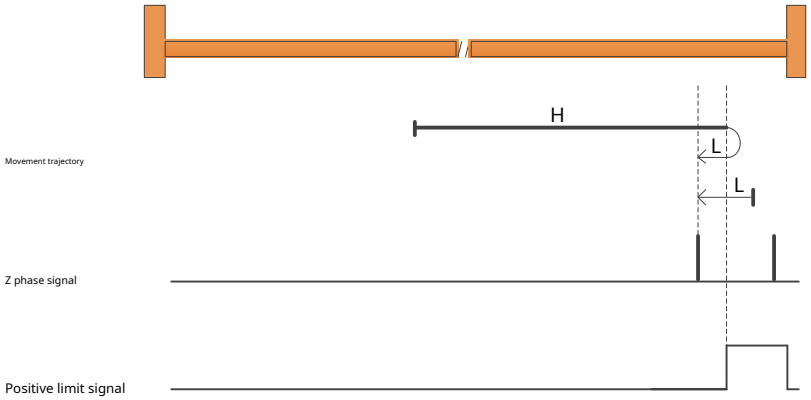
7.8.2.5 Return to origin mode**1**:negative regression,Find negative limit sum**Z**Pulse signal



a)When starting to returnNOT=0,Start return at high speed in negative direction,meetNOTafter rising edge,slow down,reverse,Forward low speed operation,meet NOTThe first after the falling edgeZPulse stops.

b)When starting to returnNOT=1,Start return at low forward speed,meetNOTThe first after the falling edgeZPulse stops.

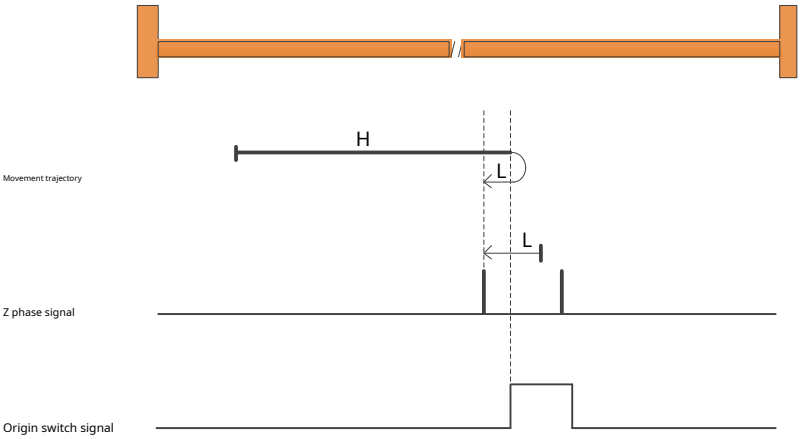
7.8.2.6 Return to origin mode**2**:forward regression,Find the positive limit and**Z**Pulse signal



a)When starting to returnPOT=0,Start return at high speed in forward direction,meetPOTafter rising edge,slow down,reverse,Negative low speed operation,meet POTThe first after the falling edgeZPulse stops.

b)When starting to returnPOT=1,Start return at negative low speed,meetPOTThe first after the falling edgeZPulse stops.

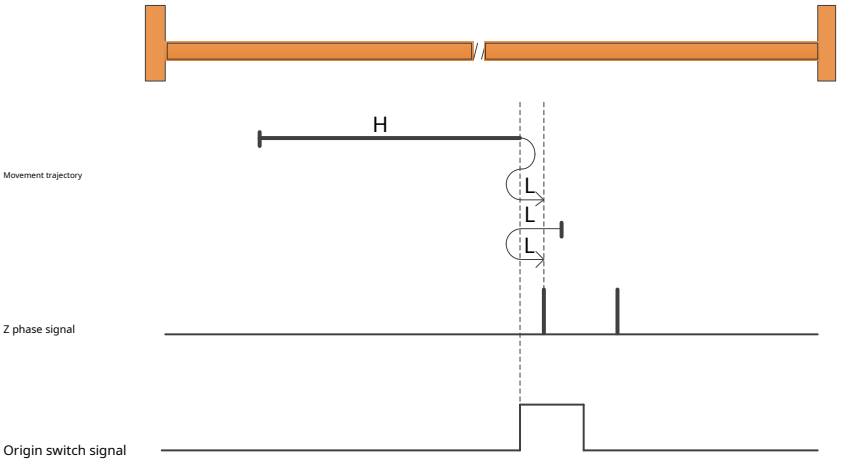
7.8.2.7 Return to origin mode**3**:forward regression,Find the origin sensor falling edge and**Z**Pulse signal



a)When starting to returnHOM-SW=0,Start return at high speed in forward direction,meetHOM-SWafter rising edge,slow down,reverse,Negative low speed operation,meetHOM-SWThe first after the falling edgeZPulse stops.

b)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWThe first after the falling edgeZPulse stops.

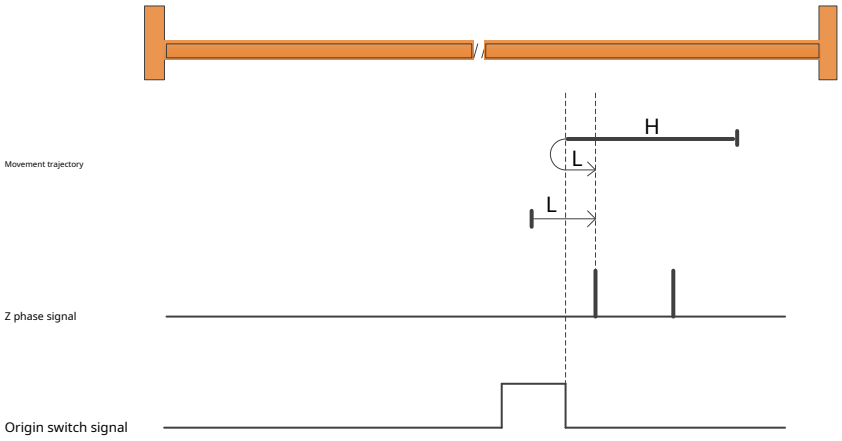
7.8.2.81.0return Origin mode**4**:forward regression,Find the origin on the sensor 16Lift Yanhe**Z**Pulse signal



a)When starting to returnHOM-SW=0,Start return at high speed in forward direction,meetHOM-SWafter rising edge,slow down,reverse,Negative low speed operation toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed.,meetHWThe first after the rising edgeZPulse stops.

b)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the rising edgeZPulse stops.

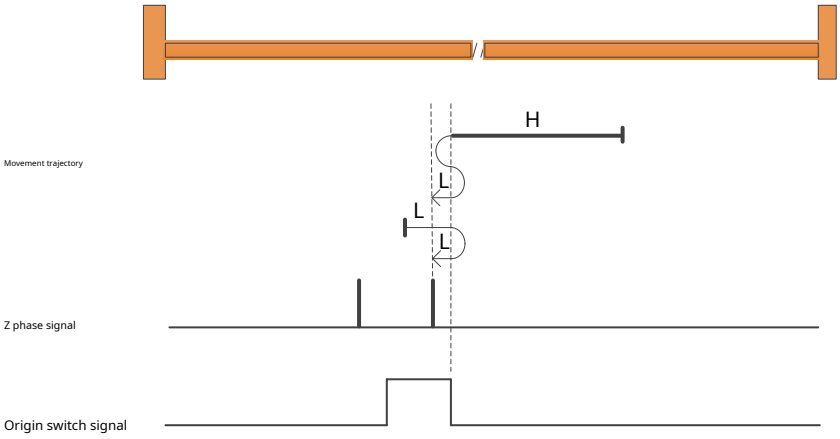
7.8.2.9 Return to origin mode**5**:negative regression,Find the origin sensor falling edge and**Z**Pulse signal



a)When starting to returnHOM-SW=0,Start return at high speed in negative direction,meetHOM-SWafter rising edge,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the falling edgeZPulse stops.

b)When starting to returnHOM-SW=1,Start return at low forward speed,meetHOM-SWThe first after the falling edgeZPulse stops.

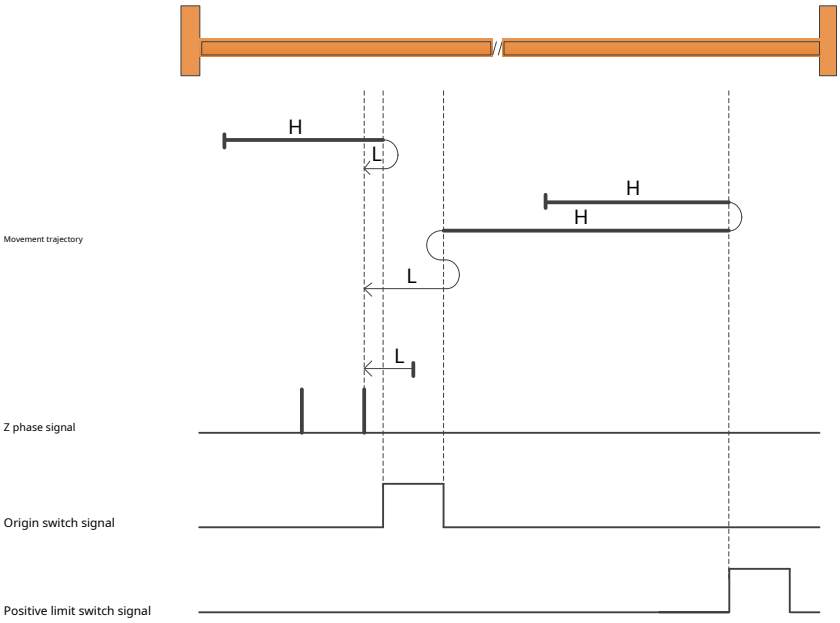
7.8.2.10 Return to origin mode**6**:negative regression,Find the origin sensor rising edge and**Z**Pulse signal



a)When starting to returnHOM-SW=0,Start return at high speed in negative direction,meetHOM-SWafter rising edge,slow down,reverse,Run forward at low speed toHOM-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meetHWThe first after the rising edgeZPulse stops.

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

7.8.2.11 Return to origin mode**7**:forward regression,Find the origin sensor falling edge and**Z**Pulse signal,Automatically reverse direction when encountering forward limit

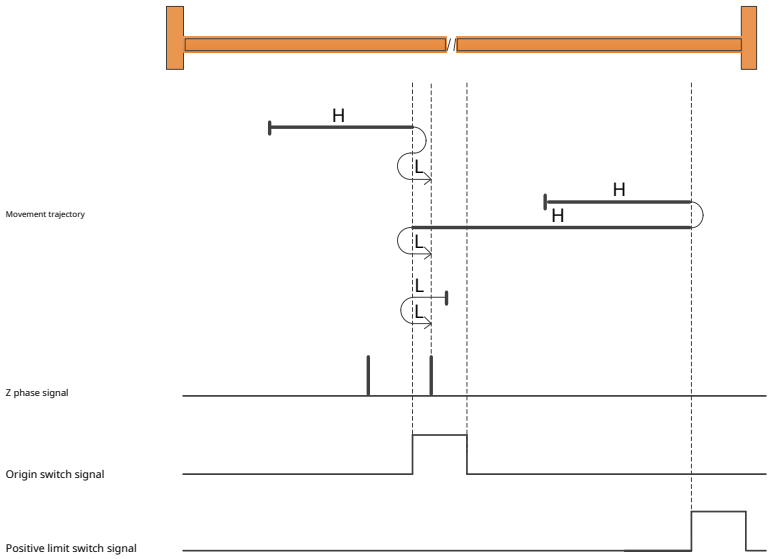


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meet HOM-SW after rising edge,slow down,reverse,Negative low speed operation,meetHOM-SWThe first after the falling edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction,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-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meetHOM-SWThe first falling edge after theZPulse stops.

c)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWThe first after the falling edgeZPulse stops.

7.8.2.12 Return to origin mode**8**:forward regression,Find the origin sensor rising edge and**Z**Pulse signal,Automatically reverse direction when encountering forward limit

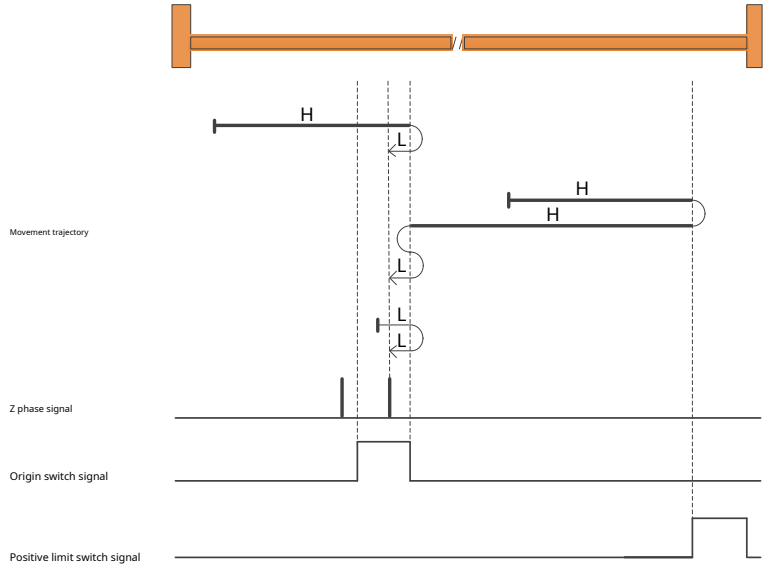


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meet HOM-SW after rising edge,slow down,reverse,Negative low speed operation toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed., meetHOM-SWThe first after the rising edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction, meetPOTAfter the rising edge of,slow down,reverse,Negative high speed operation;meetHOM-SWDecelerating after the falling edge of,reverse,Forward low speed operation,meet HOM-SWfirst after risingZPulse stops.

c)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the rising edgeZPulse stops.

7.8.2.13 Return to origin mode**9**:forward regression,Find the origin sensor rising edge and**Z**Pulse signal,Automatically reverse direction when encountering forward limit

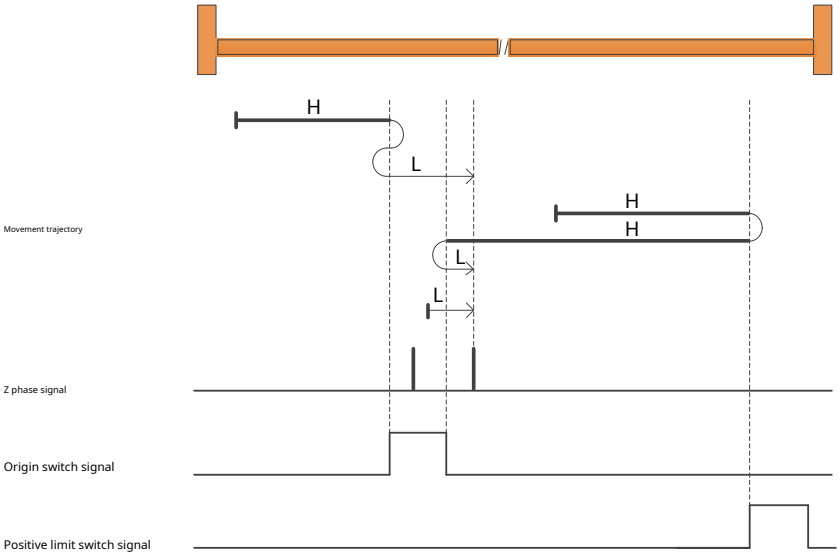


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meetHOM-SW Deceleration after falling edge,reverse,Negative low speed operation,meetHOM-SWThe first after the rising edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction,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-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meetHOM-SWThe first rising edge afterZPulse stops.

c)When starting to returnHOM-SW=1,Start return at low forward speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation , meetHOM-SWThe first rising edge afterZPulse stops.

7.8.2.14 Return to origin mode**10**:forward regression,Find the origin sensor falling edge and**Z**Pulse signal,Automatically reverse direction when encountering forward limit

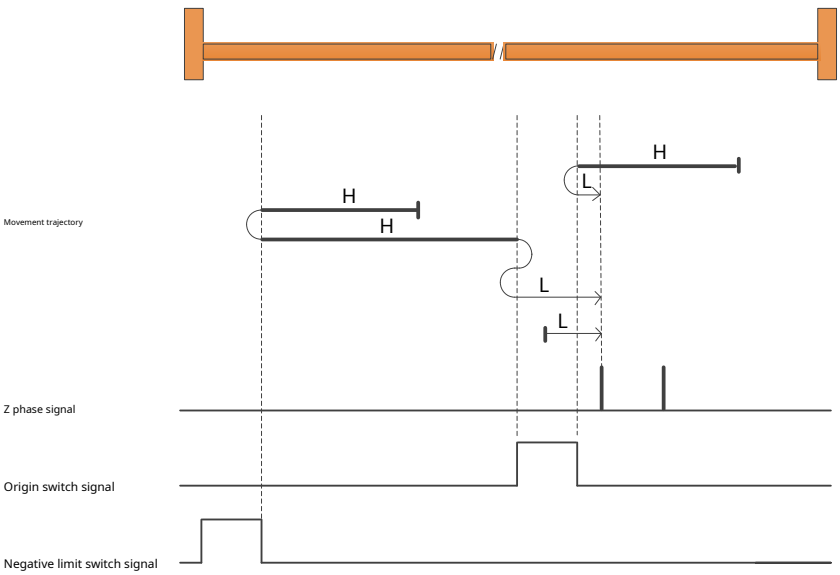


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meetHOM-SW after rising edge,slow down,reverse,Negative low speed operation toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed.,meet HOM-SWThe first after the falling edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction,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-SW The first after the falling edgeZPulse stops.

c)When starting to returnHOM-SW=1,Start return at low forward speed,meetHOM-SWThe first after the falling edgeZPulse stops.

7.8.2.15 Return to origin mode**11**:negative regression,Find the origin sensor falling edge and**Z**Pulse signal,Automatically reverse direction when encountering negative limit

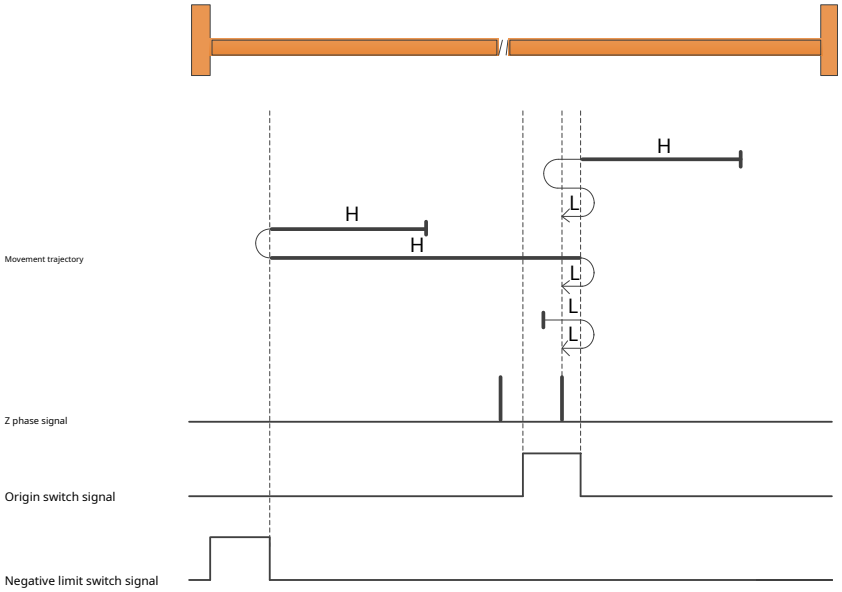


a)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in negative direction,meetHOM-SW after rising edge,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the falling edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,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 toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed.,meetHOM-SWThe first falling edge after theZPulse stops.

c)When starting to returnHOM-SW=1,Start return at low forward speed,meetHOM-SWThe first after the falling edgeZPulse stops.

7.8.2.16 Return to origin mode**12**:negative regression,Find the origin sensor rising edge and**Z**Pulse signal,Automatically reverse direction when encountering negative limit

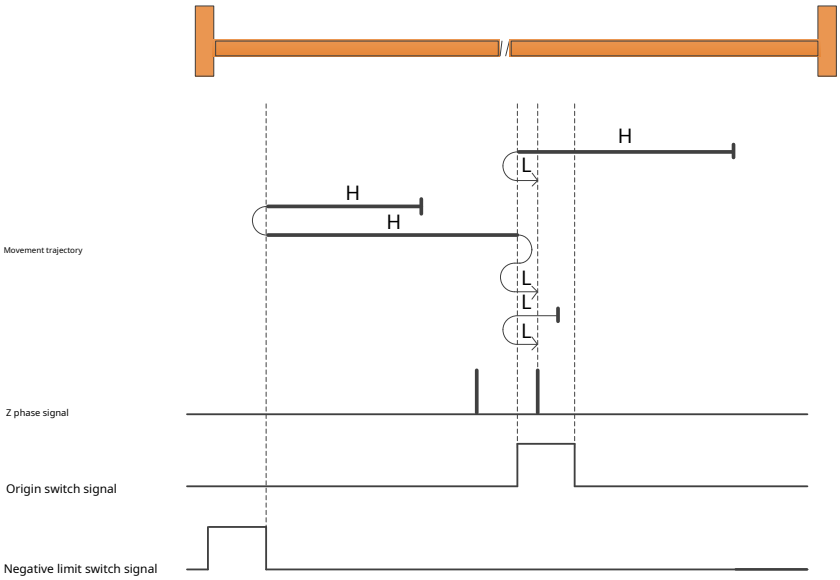


a)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in negative direction,meetHOM-SWafter rising edge,slow down,reverse,Run forward at low speed toHOM-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meetHOM-SWThe first one after the rising edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,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 edgeZPulse stops .

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

7.8.2.17 Return to origin mode**13**:negative regression,Find the origin sensor rising edge and**Z**Pulse signal,Automatically reverse direction when encountering negative limit

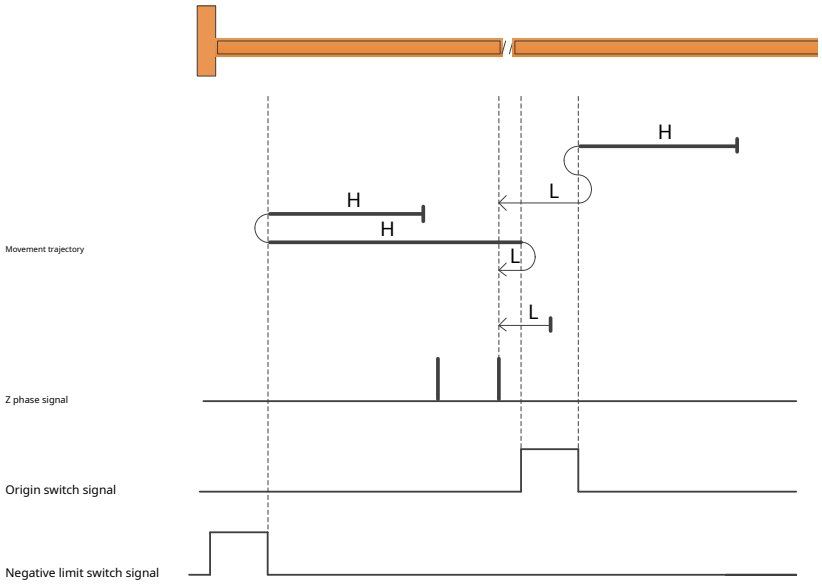


a)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in negative direction,meetHOM-SWafter the falling edge of,slow down,reverse,Forward low speed operation,meetHOM-SWThe first after the rising edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,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 toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed.,meetHOM-SWThe first rising edge afterZPulse stops.

c)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWafter falling edge,slow down,reverse,Forward low speed operation , meetHOM-SWThe first rising edge afterZPulse stops.

7.8.2.18 Return to origin mode**14**:negative regression,Find the origin sensor falling edge and**Z**Pulse signal,Automatically reverse direction when encountering negative limit



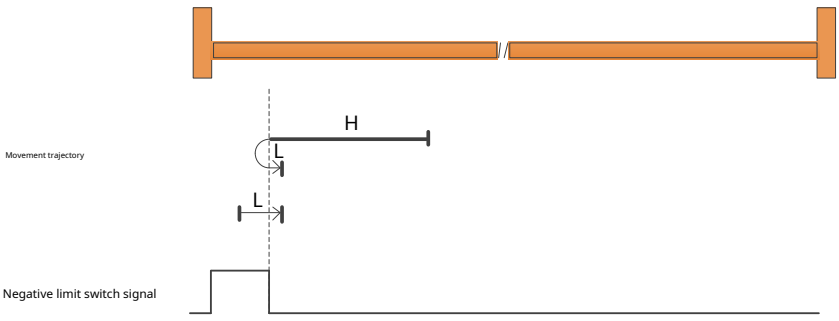
a)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in negative direction,meetHOM-SWafter rising edge,slow down,reverse,Run forward at low speed toHOM-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meet HOM-SWThe first after the falling edgeZPulse stops.

b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,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-SW The first after the falling edgeZPulse stops.

c)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWThe first after the falling edgeZPulse stops.

7.8.2.19 Return to origin mode**15**,**16**reserve

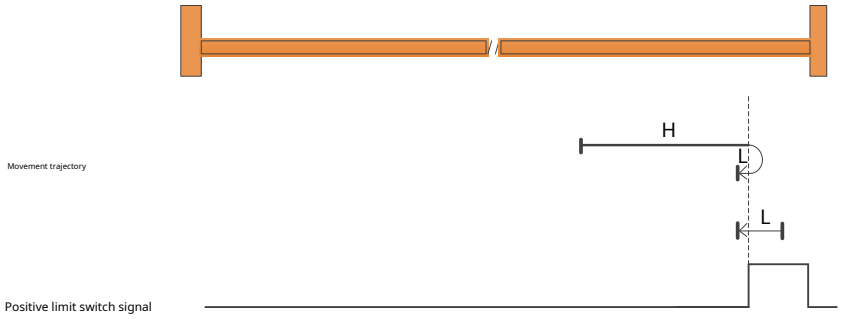
7.8.2.20 Return to origin mode**17**:negative regression,Looking for negative limit signal



a)When starting to returnNOT=0,Start return at high speed in negative direction,meetNOTafter rising edge,slow down,reverse,Forward low speed operation,meet NOTStop after falling edge.

b)When starting to returnNOT=1,Start return at low forward speed,meetNOTStop after falling edge.

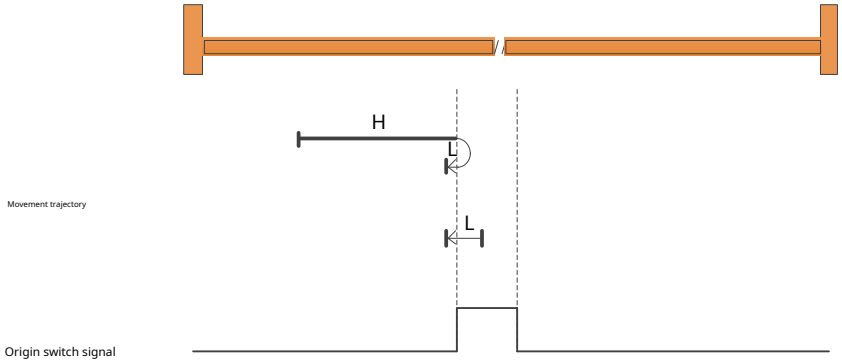
7.8.2.21 Return to origin mode**18**:forward regression,Find positive limit signal



a)When starting to returnPOT=0,Start return at high speed in forward direction,meetPOTafter rising edge,slow down,reverse,Negative low speed operation,meetPOT Stop after falling edge.

b)When starting to returnPOT=1,Start return at negative low speed,meetPOTStop after falling edge.

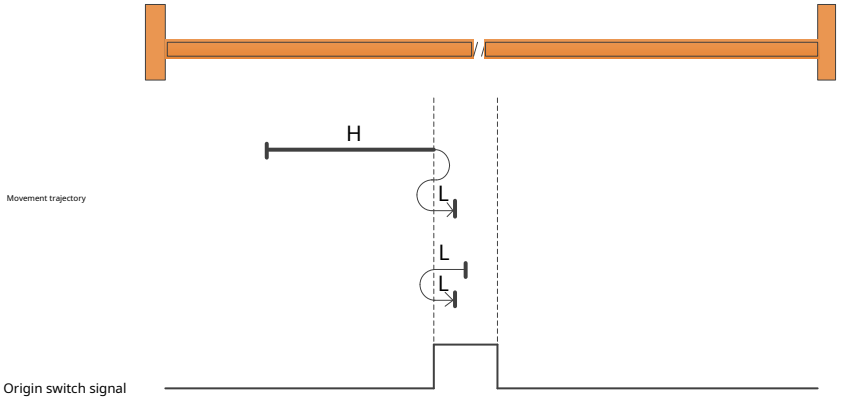
7.8.2.22 Return to origin mode**19**:forward regression,Find the falling edge signal of the origin sensor



a)When starting to returnHOM-SW=0,Start return at high speed in forward direction,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 negative low speed,meetHOM-SWStop after falling edge.

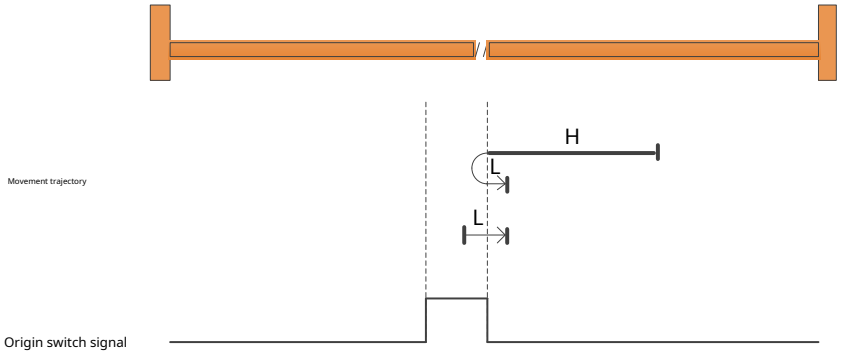
7.8.2.23 Return to origin mode**20**:forward regression,Find the rising edge signal of the origin sensor



a)When starting to returnHOM-SW=0,Start return at high speed in forward direction,meetHOM-SWafter rising edge,slow down,reverse,Negative low speed operation toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed.,meetHOM-SWStop after rising edge.

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

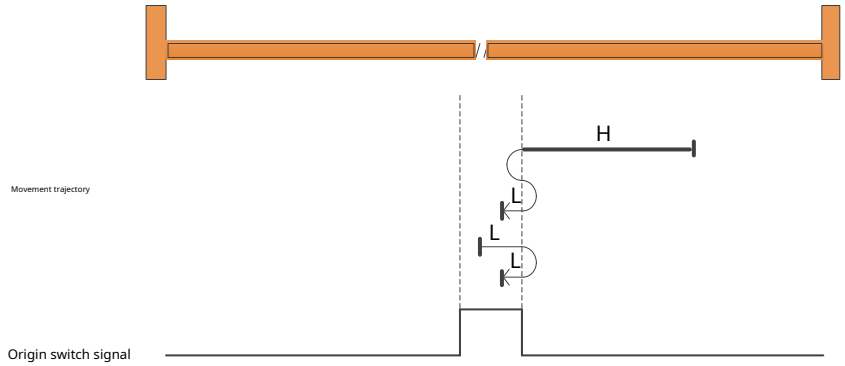
7.8.2.24 Return to origin mode**twenty one**:negative regression,Find the falling edge signal of the origin sensor



a)When starting to returnHOM-SW=0,Start return at high speed in negative direction,meetHOM-SWafter rising edge,slow down,reverse,Forward low speed operation,meetHOM-SWStop after falling edge.

b)When starting to returnHOM-SW=1,Start return at low forward speed,meetHOM-SWStop after falling edge.

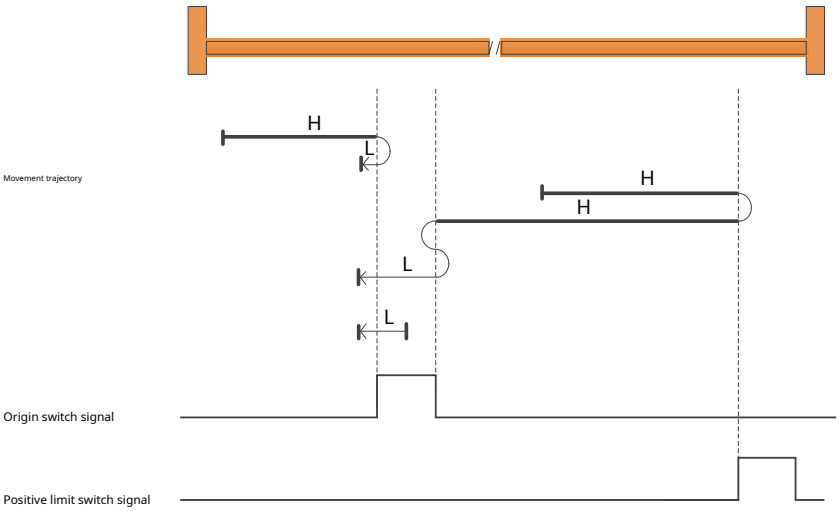
7.8.2.25 Return to origin mode**twenty two**:negative regression,Find the rising edge signal of the origin sensor



a)When starting to returnHOM-SW=0,Start return at high speed in negative direction,meetHOM-SWafter rising edge,slow down,reverse,Run forward at low speed toHOM-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meetHOM-SWStop after rising edge.

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

7.8.2.26 Return to origin mode**twenty three**:forward regression,Find the falling edge signal of the origin sensor,Automatically reverse direction when encountering forward limit

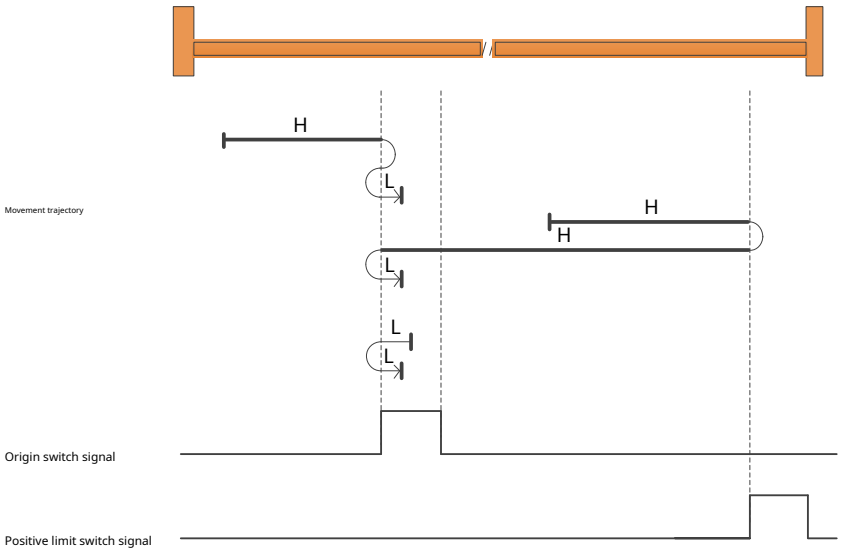


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meetHOM-SW after rising edge,slow down,reverse,Negative low speed operation,meetHOM-SWStop after falling edge.

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction,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-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meetHOM-SWStop after the falling edge of.

c)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWStop after falling edge.

7.8.2.27 Return to origin mode**twenty four**:forward regression,Find the rising edge signal of the origin sensor,Automatically reverse direction when encountering forward limit

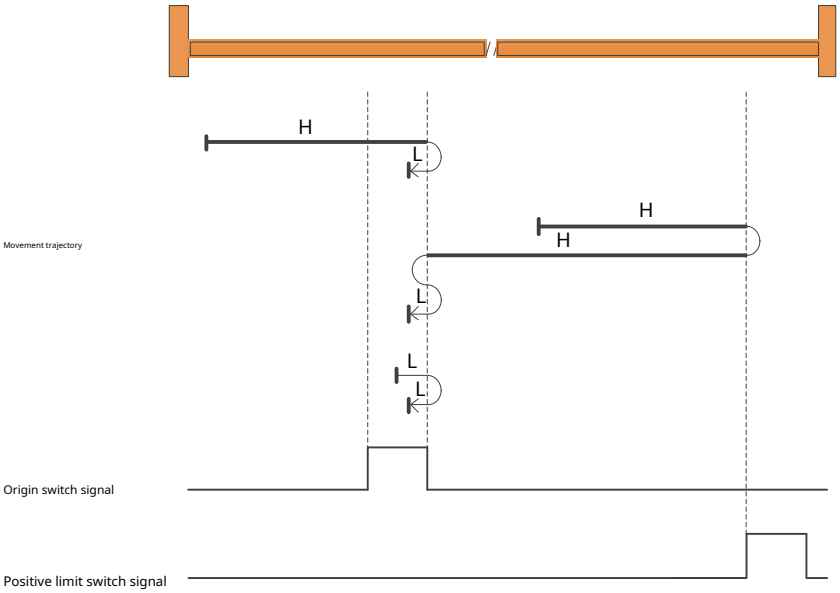


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meet HOM-SW after rising edge,slow down,reverse,Negative low speed operation toHOM-SWAfter the invalid position, decelerate and stop.,After that,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

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction,meetPOTAfter the rising edge of,slow down,reverse,Negative high speed operation;meetHOM-SWDecelerating after the falling edge of,reverse,Forward low speed operation,meet HOM-SW Stop after rising.

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

7.8.2.28 Return to origin mode**25**:forward regression,Find the rising edge signal of the origin sensor,Automatically reverse direction when encountering forward limit

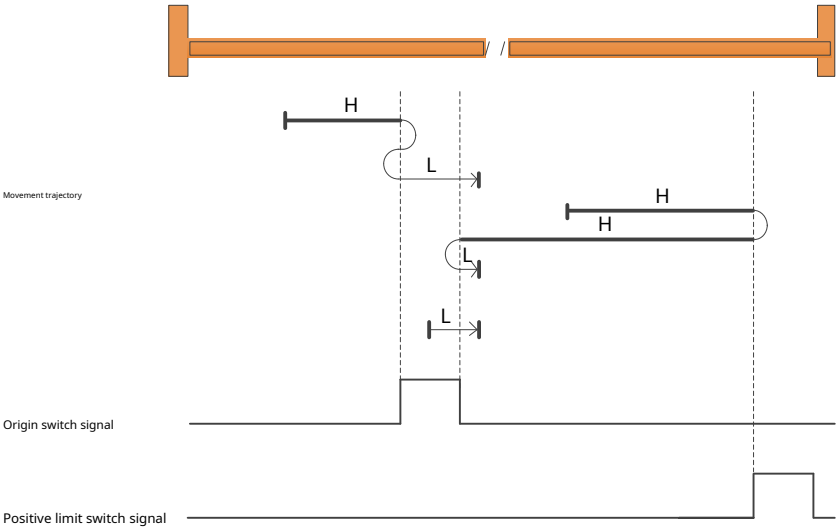


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meetHOM-SW Deceleration after falling edge,reverse,Negative low speed operation,meetHOM-SWStop after rising edge.

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction,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-SWAfter the invalid position, decelerate and stop.,After that, run in the negative direction at low speed.,meetHOM-SWStop after the rising edge of.

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

7.8.2.29 Return to origin mode**26**:forward regression,Find the falling edge signal of the origin sensor,Automatically reverse direction when encountering forward limit

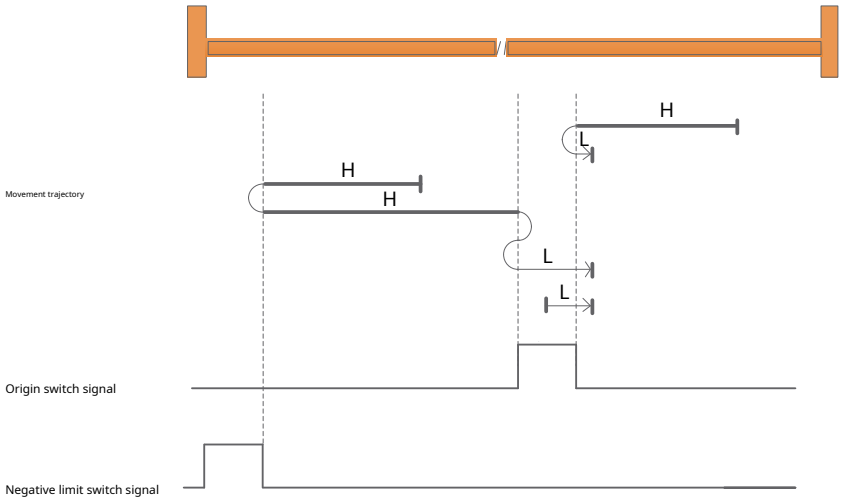


a)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in forward direction,meetHOM-SW after rising edge,slow down,reverse,Negative low speed operation toHOM-SWAfter the invalid position, decelerate and stop.,After that, run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

b)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in forward direction,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 return at low forward speed,meetHOM-SWStop after falling edge.

7.8.2.30 Return to origin mode**27**:negative regression,Find the falling edge signal of the origin sensor,Automatically reverse direction when encountering negative limit

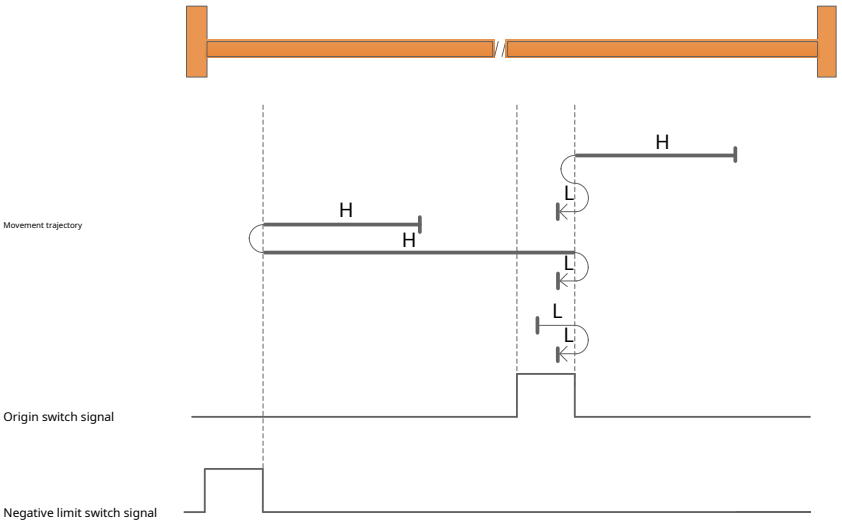


a)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in negative direction,meetHOM-SW after rising edge,slow down,reverse,Forward low speed operation,meetHOM-SWStop after falling edge.

b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,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 toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed.,meetHOM-SWStop after the falling edge of.

c)When starting to returnHOM-SW=1,Start return at low forward speed,meetHOM-SWStop after falling edge.

7.8.2.31 Return to origin mode**28**:negative regression,Find the rising edge signal of the origin sensor,Automatically reverse direction when encountering negative limit

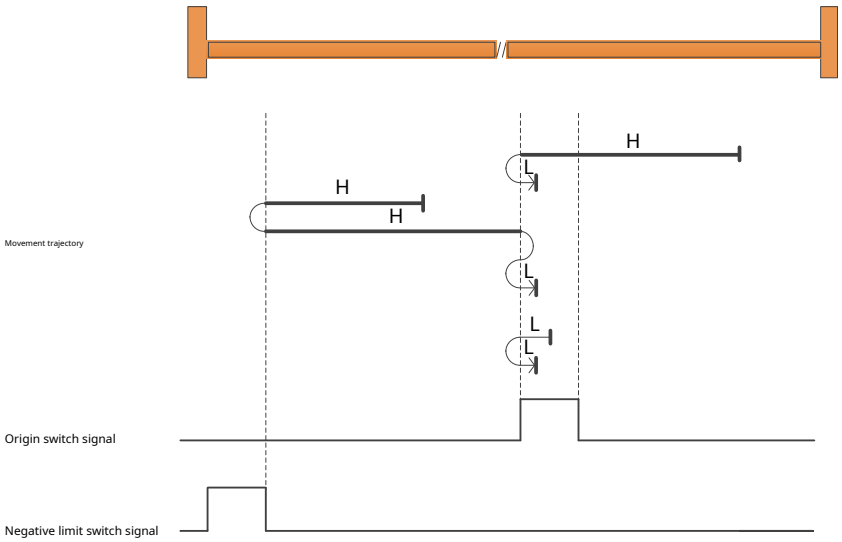


a)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in negative direction,meetHOM-SW after rising edge,slow down,reverse,Run forward at low speed toHOM-SWAfter the invalid position, decelerate and stop.,After that, run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

b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,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 return at low forward speed,meetHOM-SWafter falling edge,slow down,reverse,Negative low speed operation, meetHOM-SWStop after rising edge.

7.8.2.32 Return to origin mode**29**:negative regression,Find the rising edge signal of the origin sensor,Automatically reverse direction when encountering negative limit

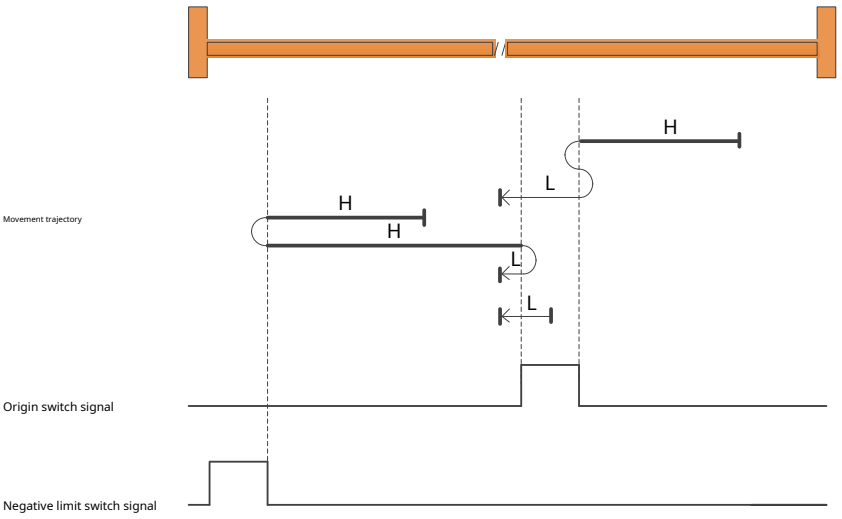


a)When starting to returnHOM-SW=0and is located on the positive side of where the origin sensor is located,Start return at high speed in negative direction,meetHOM-SW after the falling edge of,slow down,reverse,Forward low speed operation,meetHOM-SWStop after rising edge.

b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,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 toHOM-SWAfter the invalid position, decelerate and stop.,After that, run forward at low speed.,meetHOM-SWStop after the rising edge of.

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

7.8.2.33 Return to origin mode**30**:negative regression,Find the falling edge signal of the origin sensor,Automatically reverse direction when encountering negative limit



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

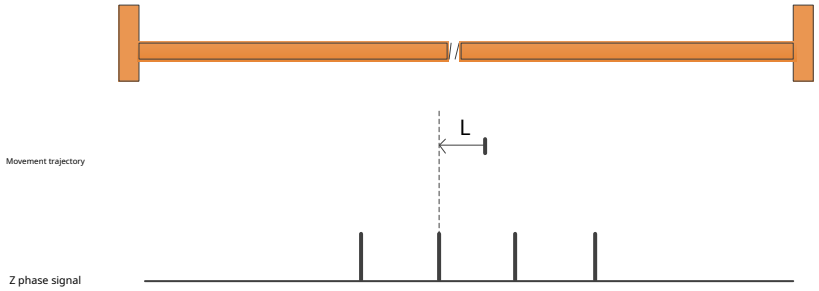
b)When starting to returnHOM-SW=0and is located on the negative side of where the origin sensor is located,Start return at high speed in negative direction,meetNOTAfter the rising edge of,slow down,reverse,Forward high speed operation;meetHOM-SWAfter the rising edge of,slow down,reverse,Negative low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

c)When starting to returnHOM-SW=1,Start return at negative low speed,meetHOM-SWStop after falling edge.

7.8.2.34 Return to origin mode**31**,**32**,**34**,**35**

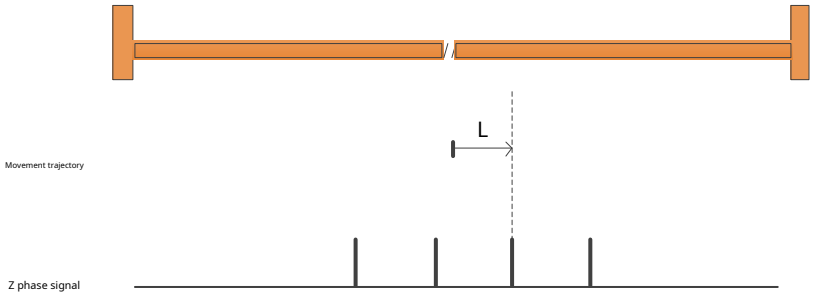
◆ Return to origin mode**31**,**32**reserve

◆ Return to origin mode**33**:negative regression,Find the first**Z**Pulse signal



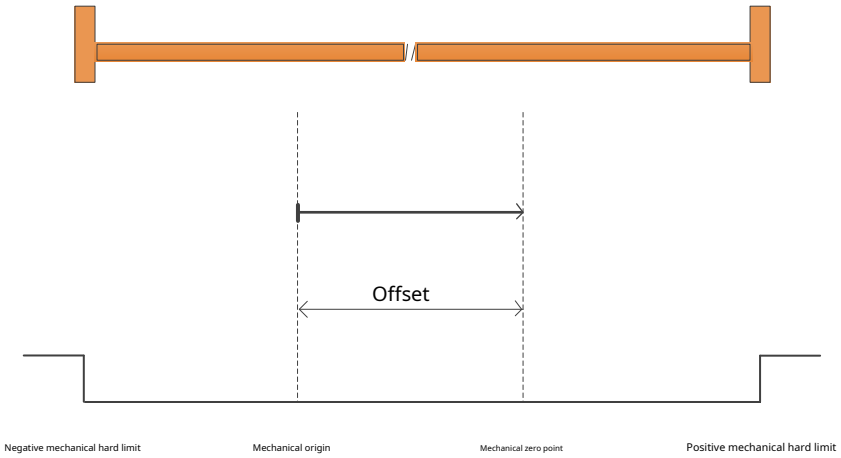
a)Start return at negative low speed,meet the first**Z**Pulse signal stops.

◆ Return to origin mode**34**:forward regression,Find the first**Z**Pulse signal



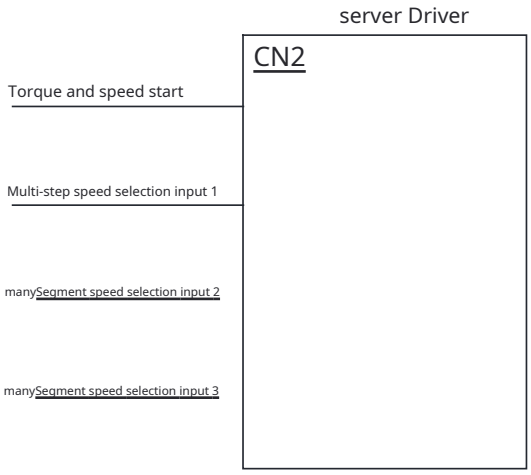
a)Start return at low forward speed,meet the first**Z**Pulse signal stops.

◆ Return to origin mode**35**:Take the current position as the mechanical origin



7.9Internal speed control

M54SSeries support settings8Group internal speed,And select the corresponding speed through the external digital input signal for speed control..Since the parameters are saved in the drive,Therefore, in the absence of analog input,You can also control the speed of the motor.



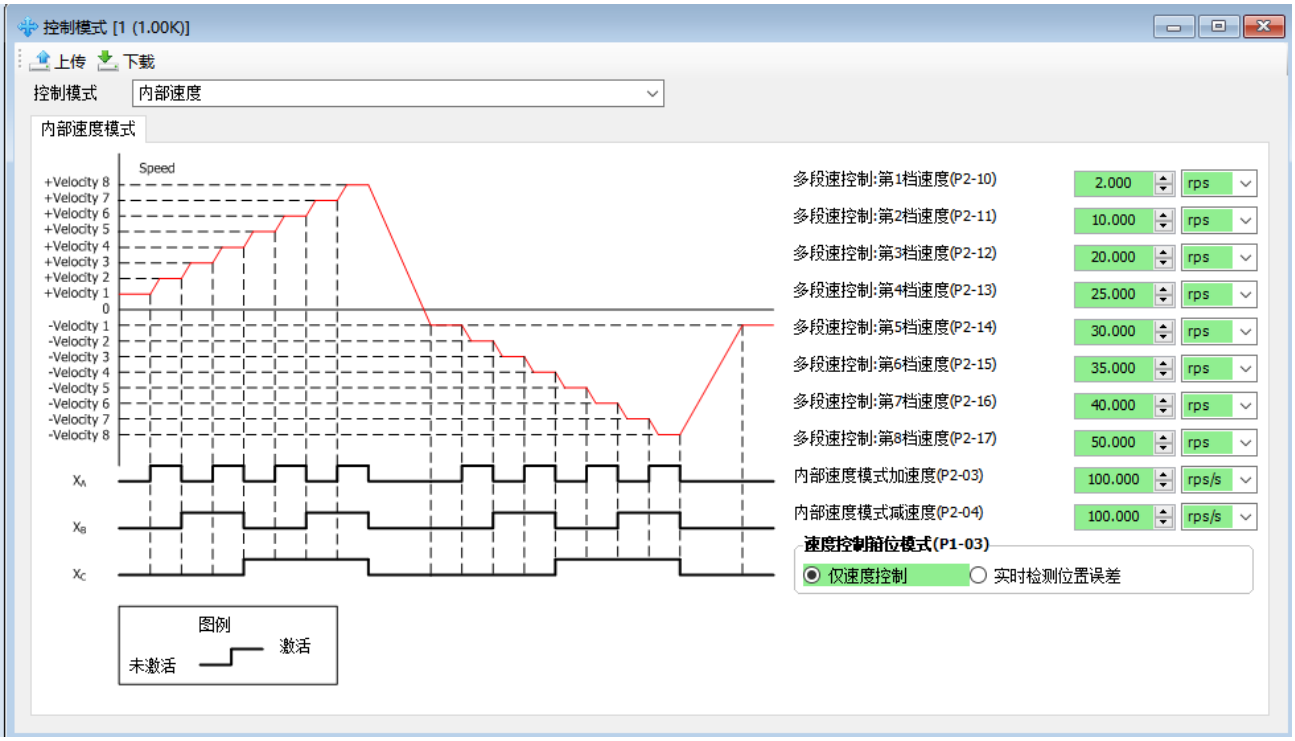
7.9.1Set the control mode to internal speed mode

parameterP1-00Used to set the main control mode of the drive.

set value	illustrate
15	Internal speed mode

Software setting method

You can also passLunaModify the control mode on the “Control Mode” interface of the software.



7.9.2 Input signal settings

When using internal speed mode,It is necessary to set the corresponding function for the digital input of the driver.parameterP5-00 ~ P5-09Used to set digital inputX1~X10function.

Signal name	abbreviation symbol	P5-00 ~ P5-09Setting values and effective logic		illustrate
		Closedvalid when	Openvalid when	
Multi-terminal speed selection input1	SPD1	27	28	Select internal speed input1
Multi-terminal speed selection input2	SPD2	29	30	Select internal speed input2
Multi-terminal speed selection input3	SPD3	31	32	Select internal speed input3
Torque and speed start	SP-STA	33	34	Internal speed start/stop
Speed command direction	SPD-DIR	35	36	Switch motor rotation direction

Notice:

The valid logic of multi-speed selection input must all be "**Closed**" or all of "**Open**",Effective logical conditions cannot be mixed..

Software setting method

useLunaSoftware's "Numbers"IO"Interface assigns functions to digital inputs.

7.9.3 Setting of internal speed value

Speed value setting

parameterP2-10~P2-17To set the internal speed mode8different speeds.

serial number	SCLOrder	Function	default value	scope	unit
P2-10	JC1	Multi-stage speed control: No.1gear speed	0	- 100 ~ 100	rps
P2-11	JC2	Multi-stage speed control: No.2gear speed	10	- 100 ~ 100	rps
P2-12	JC3	Multi-stage speed control: No.3gear speed	20	- 100 ~ 100	rps
P2-13	JC4	Multi-stage speed control: No.4gear speed	25	- 100 ~ 100	rps
P2-14	JC5	Multi-stage speed control: No.5gear speed	30	- 100 ~ 100	rps
P2-15	JC6	Multi-stage speed control: No.6gear speed	35	- 100 ~ 100	rps
P2-16	JC7	Multi-stage speed control: No.7gear speed	40	- 100 ~ 100	rps
P2-17	JC8	Multi-stage speed control: No.8gear speed	50	- 100 ~ 100	rps

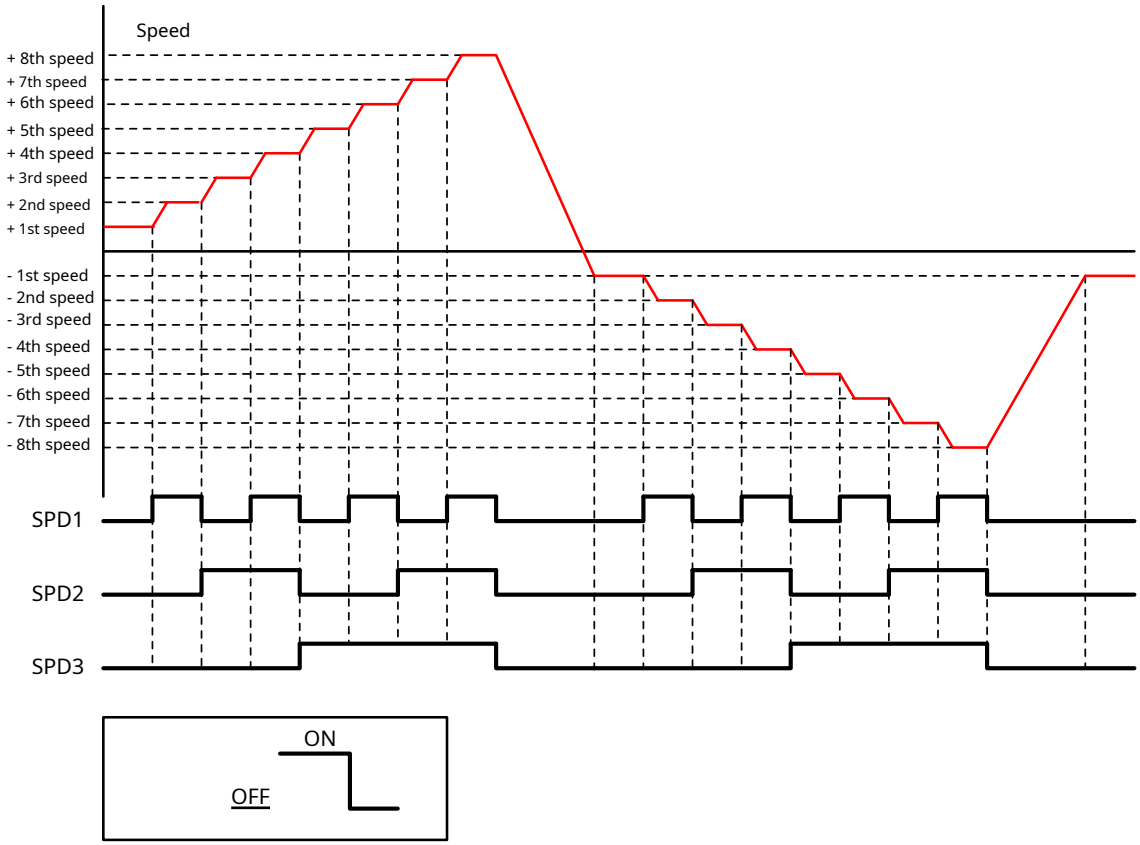
add,Deceleration setting

The acceleration in internal speed mode isP2-03set up,The deceleration is given byP2-04set up.

serial number	SCLOrder	Function	default value	scope	unit
P2-03	JA	Internal speed mode acceleration	100	0.167~5000	rps/s
P2-04	JL	Internal speed mode deceleration	100	0.167~5000	rps/s

7.9.4input signal and**8**Section internal speed combination method

speed select input signal and8The combination relationship of the internal speed of the segment is as follows:.



7.9.5 Direction switching in internal speed mode

In internal speed mode,Normally, the rotation direction of the motor is determined by the parameterP2-10~P2-17Positive or negative determination of command speed.When a pin in the digital input is set to switch the speed command directionSPD-DIRhour,The servo takes the absolute value of the command speed,The final direction of the motor is then determined based on the logic state of the input signal.

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

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

type	Signal name	set value	signal logic	Function
enter	SPD-DIR	35	Closed	Input signal is valid,Reverse speed command direction
			Open	Input signal is invalid,The direction of motor rotation is determined by the direction of the speed command
		36	Open	Input signal is valid,Reverse speed command direction
			Closed	Input signal is invalid,The direction of motor rotation 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 analog values,Or determined by the positive or negative command speed

The actual rotation direction and parameters of the motorP1-11Motor rotation direction,speed command,Speed command direction switchingSPD-DIRThree parties 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	P2-10~P2-17 speed command	Speed command direction switching SPD-DIRenter	Actual motor rotation direction
0	just	No settings	CWclockwise
0	just	No settings	CCWCounterclockwise
0	burden	No settings	CCWCounterclockwise
0	burden	No settings	CWclockwise
1	just	No settings	CCWCounterclockwise
1	just	No settings	CWclockwise
1	burden	No settings	CWclockwise
1	burden	No settings	CCWCounterclockwise

When the driver input pin is configured for speed command direction switching**SPD-DIR**:

parameterP1-11Motor rotation direction set value	P2-10~P2-17 speed 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	

8Parameter settings

8.1Parameter classification

M54SSeries AC servo has6Group parameters.

parameter group	type	Function
P0-XXGroup	PIDGain	Set servo gain parameters
P1-XXGroup	Configuration---Configuration	Configuration function,Set various drive functional parameters
P2-XXGroup	Trajectory---Trajectory planning	When setting the internal control mode of the driver,Parameters related to motion trajectory
P3-XXGroup	Encoder & Step/Dir---Encoder and input pulse settings	Set the encoder,Parameters related to input and output pulses
P4-XXGroup	Analog---Analog settings	Settings and analog inputs,Output related parameters
P5-XXGroup	I/O--IOset up	Set digital input,Output related functions

8.2Parameter list

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

serial number	instruction	Function	default value	scope	unit	effective mechanism
P0-00	UM	Parameter tuning mode	0	0~2	— —	
P0-01	LY	Load type	0	0~2	— —	
P0-02	NR	Load to inertia ratio	0	0~10000	0.01times	
P0-03	KG	First rigidity level	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	First position loop differential time constant	0	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	Speed 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	First speed loop integration 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	0	0~30000	ms	
P0-20	UE	Second position loop differential filter frequency	20000	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	0.000	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	First gain switching to second gain delay time	10	0~10000	ms	
P0-39	LR	Speed feedback filter	0	0~3	— —	

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

serial number	SCLinstruction	Function	default value	scope	unit	effective mechanism
P1-00	CM	master control mode	twenty one	1,2,7,11,15,21	-	Effective immediately
P1-01	EN	Second control mode	twenty one	1,2,7,11,15,21	-	Effective immediately

serial number	SCLinstruction	Function	default value	scope	unit	effective mechanism
P1-02	PM	Power-on working mode	10	8~10	-	
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 hard limit return to origin mode	200	0~3000	0.1%	
P1-09	CL	Torque overload duration	0	0~30000	ms	
P1-10	LD	Torque limiting method	1	1~5	-	
P1-11	RN	Motor rotation direction selection	0	0,1	-	
P1-12	IF	Data Format	H	D/H	-	
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	-	
P1-19	ZR	Regenerative absorption resistor value	200	10~32000	Ω	
P1-20	ZC	Regenerative absorbed resistor power	40	1 ~ 32000	W	
P1-21	ZT	Regeneration absorption time constant	1000	0~8000	ms	
P1-22	PK	Button setting lock	0	0,1	-	
P1-23	DD	ledDefault display items	0	0~20	-	
P1-24	MA	Alarm shielding	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	5000	0~30000	ms	
P1-29	YV	Dynamic brake action when disabled	0	0~5		
P1-30	YR	The action of dynamic braking when an error is reported	0	0~3		
P1-31	YM	Dynamic braking during deceleration with the driver disabled long action time	500	0~30000	ms	
P1-32	YN	Dynamic braking has the longest time during deceleration when an error is reported. action time	500	0~30000	ms	
P1-33	OT	Phase loss detection switch	0	0~1		
P1-34	RT	Current instantaneous change value	1000	0~3000	0.1%	

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

serial number	SCLOrder	Function	default value	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 speed 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	0~250	ms	
P2-06	VE	Speed in internal peer-to-peer mode	10	0.0042~100	rps	
P2-07	AC	Acceleration in internal point-to-point mode	100	0.167~5000	rps/s	
P2-08	DE	Deceleration in internal point-to-point mode	100	0.167~5000	rps/s	
P2-09	VC	Speed regulation in internal point-to-point mode	2	0~100	rps	
P2-10	JC1	Multi-stage speed control: No.1gear speed	2	- 100 ~ 100	rps	
P2-11	JC2	Multi-stage speed control: No.2gear speed	10	- 100 ~ 100	rps	
P2-12	JC3	Multi-stage speed control: No.3gear speed	20	- 100 ~ 100	rps	
P2-13	JC4	Multi-stage speed control: No.4gear speed	25	- 100 ~ 100	rps	
P2-14	JC5	Multi-stage speed control: No.5gear speed	30	- 100 ~ 100	rps	
P2-15	JC6	Multi-stage speed control: No.6gear speed	35	- 100 ~ 100	rps	
P2-16	JC7	Multi-stage speed control: No.7gear speed	40	- 100 ~ 100	rps	
P2-17	JC8	Multi-stage speed control: No.8gear speed	50	- 100 ~ 100	rps	
P2-18	HA1	Return to origin acceleration/deceleration	100	0.167~5000	rps/s	
P2-21	-	Reserved-	-	-	-	
P2-24	HV1	Return to origin first speed	10	0.0042~100	rps	
P2-25	HV2	Return to origin second speed	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	0~250	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	Function	default value	scope	unit	effective mechanism
P3-00	EN	electronic gear ratio numerator	1048576	1~2147483647	-	
P3-01	EU	Electronic gear ratio denominator	10000	1~2147483647	-	
P3-02	SZ	Pulse input filter width	5	0~32000	0.1μs	
P3-03	PT	Pulse input setting	9	0~31		
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	
P3-06	- -	reserve	-	-	-	
P3-07	- -	reserve	-	-	-	
P3-08	- -	reserve	-	-	-	
P3-09	- -	reserve	-	-	-	
P3-10	- -	reserve	-	-	-	
P3-11	- -	reserve	-	-	-	
P3-12	PO	Pulse frequency division output mode	1	0~256	-	
P3-13	ON	Pulse frequency division 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	0~3	-	
P3-16	PU	Electronic gear ratio switch	0	0~1	-	
P3-18	fV	Absolute encoder multiturn counter overflow value	0	0~2147483647 /[P03-5]		

P4-XX Group:**Analog---**Analog settings

serial number	SCLOrder	Function	default value	scope	unit	effective mechanism
P4-01	AG	Analog input speed scaling	50	0~100	rps/10V	
P4-02	AN	Analog input torque scaling	1000	0~3000	0.1%	
P4-03	AV1	Analog input1Offset	0	- 10000 ~ 10000	mV	
P4-04	AV2	Analog input2Offset	0	- 10000 ~ 10000	mV	
P4-05	AD1	Analog input1dead zone	0	0~255	mV	
P4-06	AD2	Analog input2dead zone	0	0~255	mV	
P4-07	AF1	Analog input1low pass filter	1000	0~2000	0.1Hz	
P4-08	AF2	Analog input2low pass filter	1000	0~2000	0.1Hz	
P4-09	AT1	Analog input1trigger threshold	5000	- 10000 ~ 10000	mV	
P4-10	AT2	Analog input2trigger threshold	5000	- 10000 ~ 10000	mV	
P4-11	FA1	Speed limit source setting	1	0~1		
P4-16	- -	reserve	-	-	-	
P4-17	- -	reserve	-	-	-	
P4-18	- -	reserve	-	-	-	
P4-19	- -	reserve	-	-	-	

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

serial number	SCLOrder	Function	default value	scope	unit	effective mechanism
P5-00	MU1	Digital input port1Function	7	0~46	-	
P5-01	MU2	Digital input port2Function	5	0~46	-	
P5-02	MU3	Digital input port3Function	3	0~46	-	
P5-03	MU4	Digital input port4Function		0~46	-	
P5-04	MU5	Digital input port5Function	13	0~46	-	
P5-05	MU6	Digital input port6Function	19	0~46	-	
P5-06	MU7	Digital input port7Function		0~46	-	
P5-07	MU8	Digital input port8Function		0~46	-	
P5-08	MU9	Digital input port9Function		0~46	-	
P5-09	MUA	Digital input port10Function		0~46	-	
P5-12	MO1	Digital output port1Function		0~34	-	
P5-13	MO2	Digital output port2Function		0~34	-	
P5-14	MO3	Digital output port3Function		0~34	-	
P5-15	MO4	Digital output port4Function		0~34	-	
P5-16	MO5	Digital output port5Function		0~34	-	
P5-17	MO6	Digital output port6Function		0~34	-	
P5-24	BD	Movement waiting time after brake release	200	0~32000	ms	
P5-25	BE	After braking,Motor disable waiting 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	
P5-32	FI5	Digital input filter5	1	0~8000	ms	
P5-33	FI6	Digital input filter6	1	0~8000	ms	
P5-34	FI7	Digital input filter7	1	0~8000	ms	
P5-35	FI8	Digital input filter8	1	0~8000	ms	
P5-36	FI9	Digital input filter9	1	0~8000	ms	
P5-37	FIA	Digital input filter10	1	0~8000	ms	
P5-38	PL	Dynamic following error threshold	10	0~2147483647	pulses	
P5-39	PD	Positioning completion signal position error threshold	40	0~32000	pulses	
P5-40	PE	Motion judgment condition counting time	10	0~30000	ms	
P5-41	TT	Pulse input completion detection time	2	0~20000	ms	
P5-42	ZV	Zero speed judgment threshold	0.5	0.1~2	rps	
P5-43	VR	Consistent speed fluctuation range	0.1	0~100	rps	
P5-44	VV	Determine 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	Absolutely reach the location	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	Return to origin mode	1	- 4 ~ 40	-	
P5-51	MS	Zero speed clamp function in speed mode	4	0 ~ 4		

8.3 Parameter Description

8.3.1 P0-XX Group:**PID**Gain settings

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-00	UM	Parameter tuning mode	0	0~2	---	P	S	T	F

Set parameter tuning method.

set value	Parameter tuning mode	illustrate	Remark
0	No need for tuning	by settingP0-03First rigidity level to set Gain value of servo system.	Notice:In this mode,Modify onlyP0-03The first rigidity level is valid.Manually adjust other gain parameters Invalid number.
1	automatic tuning	Perform automatic parameter stabilization,Automatically identify loads Compare,And set the corresponding rigidity and servo system gain parameter.After automatic tuning is completed, Can be modifiedP0-03The first rigidity level is carried out optimization.	Notice:In this mode,Modify onlyP0-03Rigidity level and P0-02Load inertia ratio is effective.Manual adjustment of other gain parameters is invalid.
2	Advanced tuning	After completing automatic tuning,The tuning model can be Set the formula to "Advanced Tuning",OK at this time Modify all gain parameters to optimize system response answer.	In this mode,All gain parameters are valid.

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-01	LY	Load type	0	0~10	---	P	S	T	F

Set the current load type.

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

set value	Load type	illustrate
0	General load	like:Horizontal lead screw load.
1	rigid load	like:Rigid mechanism,Such as a screw type load installed horizontally on a marble base.horizontally placed Taiwan etc..
2	Flexible load	like:Use timing belt,Belt type load.

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-02	NR	Load to inertia ratio	0	0~10000	0.01times	P	S	T	F

Current load to inertia ratio.

Set the ratio of load inertia to motor inertia.

While automatic tuning is in progress,Can identify the load inertia ratio of the current system in real time,When the automatic tuning is completed,This parameter will be automatically saved. When the load inertia ratio is set correctly,P0-05Can accurately represent the gain of the current system.

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-03	KG	First rigidity level	5	1~20	---	P	S	T	F

The first stiffness value of the current system.

When parameter tuning modeP0-00When set to tuning-free and automatic tuning,The higher the rigidity level,The gain of the servo system is stronger,The response is faster,Excessively large values will cause system vibration.

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-04	KX	Second rigidity level	5	1~20	---	P	S	T	F

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

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

When parameter tuning modeP0-00When set to tuning-free and automatic tuning,The higher the rigidity level,The gain of the servo system is stronger,The response is faster,Excessively large values will cause system vibration.

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

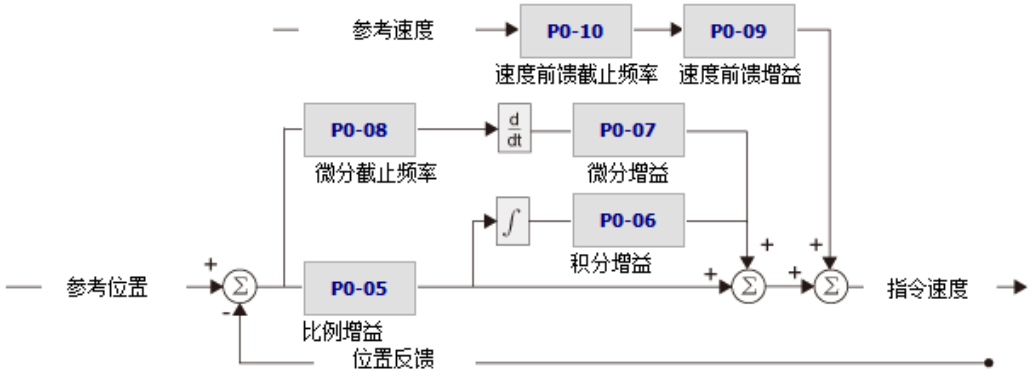
Set the stiffness gain of position control.

0Indicates not to use,20000means maximizing the proportional effect. Increasing this parameter can improve the responsiveness of the system,

Reduce position error,Shorten positioning time. When the position loop proportional gain is too small,Will cause the system to not respond

quickly enough,Position error decreases slowly. But if the setting is too large,may cause vibration.

The algorithm control block diagram of the position loop is as follows::



parameter	instruction	name	default value	scope	unit	Related patterns			
P0-07	KD	First position loop differential time constant	0	0~30000	ms	P	S	T	

Set the position loop differential time constant of position control.

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

One with only purePIThe controller's motor will overreact to small errors,produces a larger error and becomes unstable,Predict the required output of the motor in advance,This can avoid large errors and instability.The differential term is to realize the advanced output function by analyzing the change rate of position error..For example,If the motor has a position error,But the rate of change of this error is decreasing,After using the differential link,The output torque will decrease.

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

- When the differential time constant (KD)When the setting value is reasonable,The system's ability to suppress vibration is significantly enhanced,and quickly stabilized.
- When the differential time constant (KD)The setting value is too small,The motion system will be too sensitive,Extremely prone to vibration and noise.

parameter	instruction	name	default value	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.

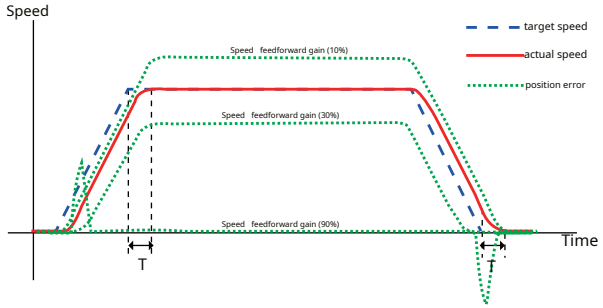
0Indicates no filtering effect.

PIDDifferential low-pass filtering in the differential link of the controller,This filter is a single output low pass filter,used toPIDThe output of the differential link of the controller is low-pass filtered. The smaller the value,It means the lower the filter frequency,The filtering effect is more obvious.default value20000Can be used in most situations for loads with large inertia ratios,Need to increase position loop gainKP, And reduce the position loop differential time constantKDto get a good response. But too much gain will cause jitter,Need to reduce differential low pass filteringKEto prevent jitter,Suppression due to differential low-pass filteringKDnoise caused.

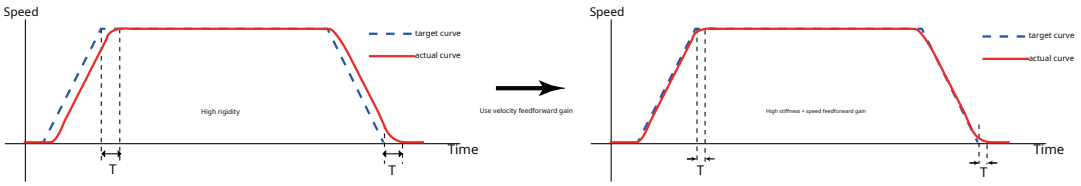
parameter	instruction	name	default value	scope	unit	Related patterns			
P0-09	KL	Speed feed forward gain	10000	- 30000 ~ 3000	0.01%	P	S	T	F

The reference velocity resulting from the calculation of the position loop in the internal trajectory planning multiplied by the ratio of this parameter,Superimposed on the speed command generated by the position loop, the position error can be reduced, speed error,and improve system response speed.

As you can see from the picture below,When the command speed and position loop gain remain unchanged,Increase speed feedforward gain,During exercise,Following position deviation will be reduced.



In the servo algorithm,Speed feedforward is used in conjunction with speed feedback to add more inhibition capabilities.Feedforward values are generated by "trajectory calculation",Increase speed feedforward gain,If the servo motor is running fine,Then the calculated speed value of the motor will be consistent with the actual speed value.,Shorter positioning time and smaller position following error can be obtained.



parameter	instruction	name	default value	scope	unit	Related patterns			
P0-10	KR	Speed feedforward filter frequency	20000	0~40000	0.1Hz	P	S	T	F

Set low-pass filtering for velocity feedforward.

0Indicates no filtering effect.

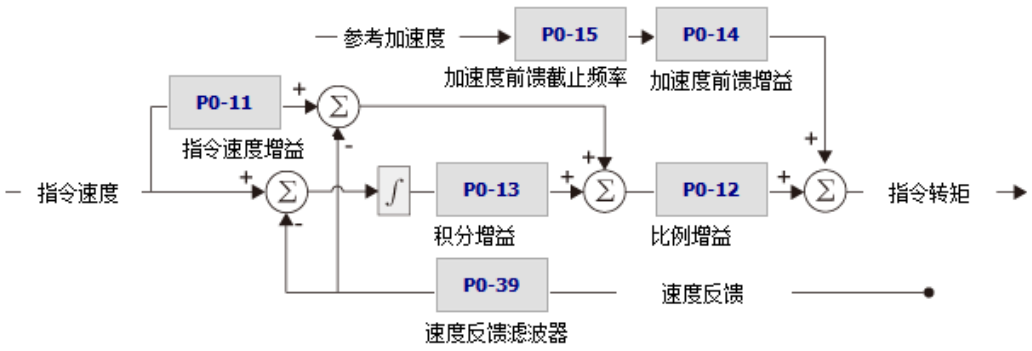
parameter	instruction	name	default value	scope	unit	Related patterns			
P0-11	KF	First command speed gain	10000	- 30000 ~ 3000	0.01%	P	S	T	

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

As motor power increases with each size,The size of the payload has also increased,With the higher performance requirements of servo motors,The servo may need to add more damping.M54SNew speed feedback function added to servo series,to provide greater damping for larger loads.

This module added to the motor is speed negative feedback,Usually used in conjunction with command speed gain feedforward.If the motor speed is as expected,Then there will be no negative feedback.If the speed cannot be satisfied, negative feedback can help "suppress" the difference in speed..Normally both will be set to the same value.

The algorithm control block diagram of the speed loop is as follows:



parameter	instruction	name	default value	scope	unit	Related patterns			
P0-12	VP	First speed loop gain	183	0~30000	0.1Hz	P	S	T	

Set the stiffness gain of the speed loop.

The simplest part of the speed loop is the proportional term,That isVP,The driver directly multiplies the speed error by the proportional gain to obtain the current that needs to be applied to the motor.,For example,If the motor does not rotate,The motor shaft is rotated by hand or other force,The driver will increase the current until the motor speed returns to zero.The faster it deviates from zero speed,The more the reverse torque increases, the more.The speed loop proportional term (also called the speed loop proportional gain) determines how much torque needs to be output based on the input speed error..usually,The greater the inertia or friction load,More torque is needed,Therefore, a larger speed loop proportional gain is needed

In order to improve the overall responsiveness of the servo system,Need to increase the speed loop gain value.Excessive setting will cause vibration.

Gain Bandwidth of Speed LoopP0-12Must be the position loop gainP0-05Bandwidth4-6times,Otherwise, it will cause jitter or overshoot of the device..whenP0-02(Automatic estimation or manual setting) is the true inertia ratio of the load,P0-12The set value is the real bandwidth of the speed loop.

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-13	VI	First speed loop integration time constant	189	0~30000	ms	P	S	T	

Set the integral time constant of the speed loop.

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

Under the action of only proportional gain,Speed error may not return to zero,Or it may take a long time to return to zero.The integration time constant accumulates all errors and works with the 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 setting value is too large,System response will be slower,Poor followability.

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

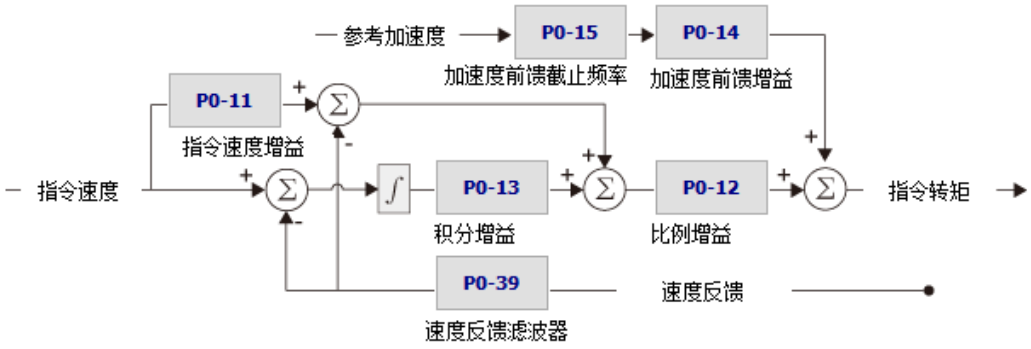
parameter	instruction	name	default value	scope	unit	Related patterns			
P0-14	KK	Acceleration feedforward gain	3000	0~10000	0.01%	P	S	T	F

Acceleration feedforward gain in servo control.

for0Indicates that the feedforward is not used,10000It means that the feedforward effect is maximized.

An important performance indicator of a servo system is its ability to follow control instructions.,ideally,The output of the servo can be,Follow changes in input control commands without overshoot.in traditionalPIDbased on the control algorithm,plus velocity feedforward gainP0-09and acceleration feedforward gainP0-14.Use velocity feedforward to reduce following errors caused by differential gain or system damping,Use acceleration feedforward to compensate for the following error caused by load inertia.

Acceleration feedforward is when the speed loop gives the target speed,There is a proportional factor between the target speed and the required acceleration,It is similar to the moment of inertia,The target speed multiplied by this moment of inertia is the theoretical target acceleration.,That is, the target current,Directly add the target current calculated by this ratio to the output of the current loop.



The acceleration feedforward gain coefficient can significantly improve the dynamic response during acceleration and deceleration by giving an open-loop control current for a certain load under a certain acceleration..

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-15	KT	Acceleration feedforward filter frequency	20000	0~40000	0.1Hz	P	S	T	F

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.

This filter is a single output low pass filter,Used to perform low-pass filtering on the acceleration feedforward gain output..The smaller the value,It means the lower the filter frequency,The filtering effect is more obvious.default value 20000Can be used in most situations.

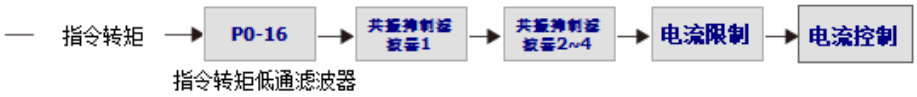
parameter	instruction	name	default value	scope	unit	Related patterns			
P0-16	KC	First command torque filter frequency	1099	0~40000	0.1Hz	P	S	T	

Filter command torque.

This filter is a single output low pass filter,used toPIDThe output of the controller (that is, the reference current) is low-pass filtered.When setting this value, you need to consider the cutoff frequency required for system operation..

The smaller the value,It means the lower the filter frequency,The filtering effect is more obvious.default value1099Can be used in most situations

Used in some specific situations,For example, there is vibration in the motor or obvious 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 mechanical resonance,The low-pass filter cutoff frequency can be set below the resonance frequency point,This way the output of the control loop does not excite resonance. In a large inertia load system,Increase position loop gainKPGood system response can be obtained.But too much gain will cause jitter,This filter parameter needs to be reduced to prevent jitter and howling.



parameter	instruction	name	default value	scope	unit	Related patterns			
P0-17	UP	Second position loop gain	52	0~20000	0.1Hz	P	S	T	F

Set the proportional gain of the second position control.

Please refer to the chapter for first/second gain switching.7.1.6Gain switching function

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-19	UD	Second position loop differential time constant	0	0~30000	ms	P	S	T	F

Set the second position loop differential time constant.

Please refer to the chapter for first/second gain switching.7.1.6Gain switching function

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-20	UE	Second position loop differential filter frequency	20000	0~40000	0.1Hz	P	S	T	F

Set the second position loop differential filter.

Please refer to the chapter for first/second gain switching.7.1.6Gain switching function

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-21	UF	Second command speed gain	10000	- 30000 ~ 3000	0.01%	P	S	T	F

Set the second command speed gain.

Please refer to the chapter for first/second gain switching.7.1.6Gain switching function

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-22	UV	Second speed loop gain	183	0~30000	0.1Hz	P	S	T	F

Set the second speed loop gain.

Please refer to the chapter for first/second gain switching.7.1.6Gain switching function

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-23	UG	Second speed loop integral time constant	189	0~30000	ms	P	S	T	F

Set the second speed loop integral time constant.

Please refer to the chapter for first/second gain switching.7.1.6Gain switching function

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

Set the second command torque low-pass filter.

Please refer to the chapter for first/second gain switching.7.1.6Gain switching function

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-33	SD	Gain switching condition selection	0	0 ~ 4	— —	P	S	T	F

Set parameter tuning method.

set value	Switch mode	Switch condition	Switch wait time
0	Fixed in the first group	fixed at no.1Group	-
1	According to position error	Switch to page2group conditions:Absolute value of position error≥P0-34set value	P0-38
		Switch back to Chapter1group conditions:Absolute value of position error<P0-34set value	P0-37
2	According to the actual speed of the motor	Switch to page2group conditions:absolute value of actual speed≥P0-35set value	P0-38
		Switch back to Chapter1group conditions:The absolute value of the actual speed<P0-35set value	P0-37
3	According to the actual output torque of the motor	Switch to page2group conditions:Absolute value of actual torque≥P0-36set value	P0-38
		Switch back to Chapter1group conditions:The absolute value of the actual torque<P0-36set value	P0-37
4	position arrival signal	Switch to page2group conditions:The location arrival condition is established	P0-38
		Switch back to Chapter1group conditions:The location arrival condition is not met	P0-37

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-34	PN	Gain switching condition-position	0	0~2147483647	Pulses	P	S	T	F

Set position-based gain switching judgment conditions.

During position control,whenP0-33The gain parameter switching method is set to "1"hour,Use this parameter to set the judgment conditions for switching..

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-35	VN	Gain switching condition - speed	0.000	0~100	rps	P	S	T	F

Set the gain switching judgment conditions based on the actual speed of the motor.

Location,speed,During torque control,whenP0-33The gain parameter switching method is set to "2"hour,Use this parameter to set the judgment conditions for switching..

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-36	TN	Gain switching condition - torque	10	0~3000	0.1%	P	S	T	F

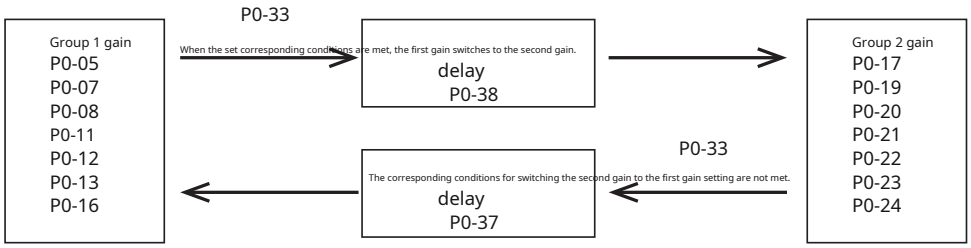
Set the gain switching judgment conditions based on the actual output torque of the motor..

Location,speed,During torque control,whenP0-33The gain parameter switching method is set to "3"hour,Use this parameter to set the judgment conditions for switching..

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

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-38	SE2	First gain switching to second gain delay time	10	0~10000	ms	P	S	T	F

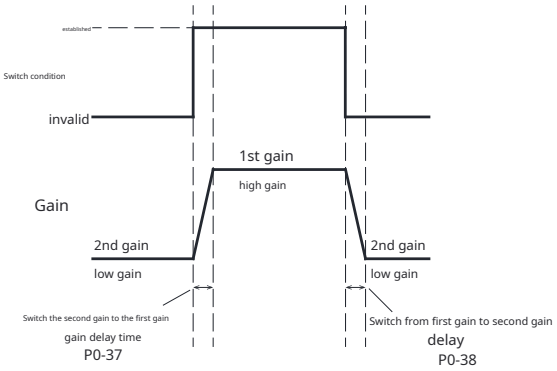
When switching gain,A certain time lag needs to be set.P0-37andP0-38Defines the switching time before the first and second sets of gains.



Switch transition time

As shown below,

- When the switching condition is established,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 is not met,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	default value	scope	unit	Related patterns			
P0-39	LR	Speed feedback filter	0	0~3	— —	P	S	T	F

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	default value	scope	unit	Related patterns			
P1-00	CM	master control mode	twenty one	1,2,7,11,15,21	-	P	S	T	F

parameterP1-00Can be used to set the main 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
2	Analog torque mode	+10~-10VAnalog signal	Using external analog quantities for torque control,The output torque of the motor has a linear relationship with the analog input value
7	Digital pulse position mode	Pulse & Direction CW/CCWpulse A/BQuadrature pulse	500KHzOpen collector high speed input or4MHzDifferential signal input
11	Analog speed mode	+10~-10VAnalog signal	Using external analog quantities for speed control,The motor speed has a linear relationship with the analog input value
15	Multi-speed mode	Digital input signal	internal8Segment speed mode,parameterP2-10 ~ P2-17Separately set the1 Section to Section8segment speed value
twenty one	Internal point-to-point position mode	Communication command	Using communication commands for point-to-point position mode control

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-01	EN	Second control mode	twenty one	1,2,7,11,15,21	-	P	S	T	F

parameterP1-01Can be used to set the second 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
2	Analog torque mode	+10~-10VAnalog signal	Using external analog quantities for torque control,The output torque of the motor has a linear relationship with the analog input value
7	Digital pulse position mode	Pulse & Direction CW/CCWpulse A/BQuadrature pulse	500KHzOpen collector high speed input or4MHzDifferential signal input
11	Analog speed mode	+10~-10VAnalog signal	Using external analog quantities for speed control,The motor speed has a linear relationship with the analog input value
15	Multi-speed mode	Digital input signal	internal8Segment speed mode,parameterP2-10 ~ P2-17Separately set the1 Section to Section8segment speed value
twenty one	Point-to-point location mode	Communication command	Using communication commands for point-to-point position mode control

Notice:

For control mode switching, please refer to the chapter:7.1.7Control mode switching

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-02	PM	Power-on working mode	10	8~10	-	P	S	T	F

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

set value	model
8	Power on and run inModbus/RTUmodel,The servo is automatically enabled after power on
9	Power on and run in supportModbus/RTUCommunicationQmodel,The servo is automatically enabled and executed after power-on.Q program
10	Power on and run in supportModbus/RTUCommunicationQmodel,The servo does not automatically enable after powering on.,QProgram does not execute automatically

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-03	JM	Speed control clamp mode	2	1~2	-	P	S	T	F

In speed mode or torque 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 errors will be detected in real time.When the position error exceeds the parameter P3-04 When the position error exceeds the set value of the limit range,A position error over-limit alarm will be generated..
2	speed control only	When set to this mode,under speed control,Speed control only.

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-05	GC	Command torque in internal torque mode	0	- 3000 ~ 3000	0.1%	P	S	T	F

When using internal torque mode/orMoudbus/RTUWhen in controlled torque mode,The target torque output by the motor can be set through this parameter..

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-06	CC	first torque limit	3000	0~3000	0.1%	P	S	T	F

Set the first limit value of motor output torque.

Please refer to chapter**7.5**Torque limit

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

Torque arrival signal judgment value.

Please refer to chapter**7.4.8**Torque reached

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-08	HC	Torque limit of hard limit return to origin mode	200	0~3000	0.1%	P	S	T	F

Set the torque limit of hard limit return to origin mode,When the actual output torque of the motor reaches this limit,It is determined that the mechanical hard limit has been reached..

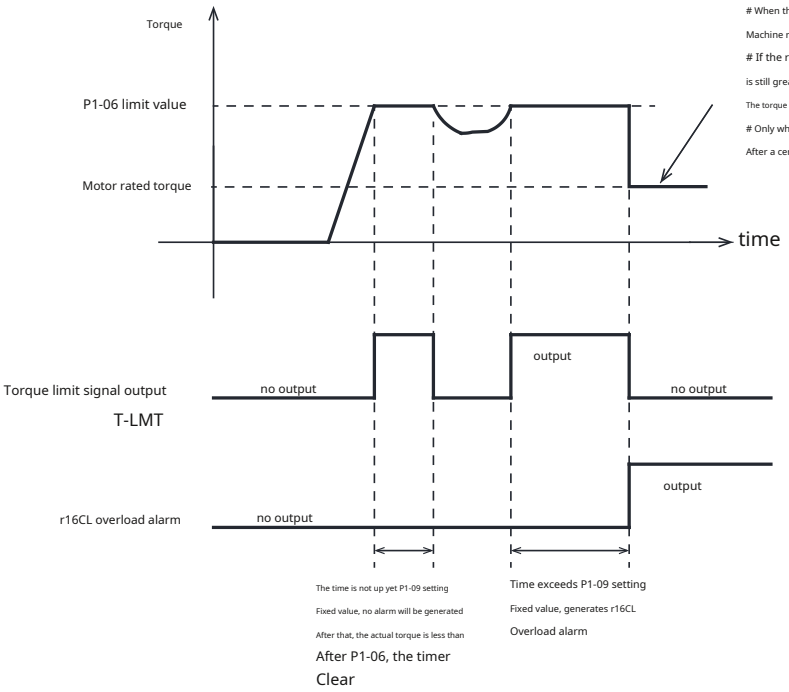
◆ Function introduction of hard limit return to origin mode

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

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-09	CL	Overload torque duration	0	0~30000	ms	P	S	T	F

The 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 setting value,Long-term overloading can easily cause the motor to overheat and be damaged..
- During torque control,This feature is invalid.
- The setting value is "0"hour,does not produce "r16CL"Overload alarm,Servo motor provided2second overload output capability.



When the r16 alarm occurs, the output torque is limited to the electric Machine rated torque

If the reference torque output (i.e. the actual required torque) is still greater than the rated torque setting value of the motor, the actual output The torque will always be limited to the rated torque of the motor.

Only when the reference torque is less than the rated torque of the motor, After a certain period of time, the overload capability will be available again.

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-10	LD	Torque limiting method	1	1~5	ms	P	S	T	F

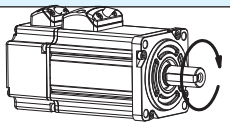
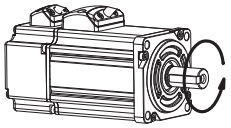
parameterP1-10Defined6Torque limiting method,The restrictions are as follows.

set value	Forward	reverse
0	register[Y]	register[Z]
1	parameterP1-06	
2	parameterP1-06	parameterP1-25
3	TQ-LMTWhen input is valid:P1-06	
	TQ-LMTWhen input is invalid:P1-25	
4	AIN2,Analog input port2	
5	TQ-LMTWhen input is valid:P1-06	TQ-LMTWhen input is valid:P1-25
	TQ-LMTWhen input is invalid:P1-26	TQ-LMTWhen input is invalid:P1-27

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-11	RN	Motor rotation direction setting	0	0,1	-	P	S	T	F

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

set value	turn around	illustrate
0	 clockwise For forward direction	When the command direction is positive,The direction of motor rotation is determined from the motor The front end view is clockwise
1	 Counterclockwise For forward direction	When the command direction is positive,The direction of motor rotation is determined from the motor The front end view is counterclockwise

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-12	IF	SCLCommand data format	H	D,H	-	P	S	T	F

useSCLWhen commanding,Data format used

set value	model
D	10base
H	16base

For example, reading the current position of the encoder "IP"instruction.Assume that the current position value is10hexadecimal:20000.If this parameter is set to "H"hour,IPThe return value of will use16base,Right now IP4E20.

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-13	PR	Protocol	5	1~511	-	P	S	T	F

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

Bit 0 =This bit is valid by default,SCLmodel Bit 1

=Returns whether with address

Bit 2 =Whether to always respond to the

return Bit 3 =Whether to use checksum

Bit 4 =Is itRS485communication Bit 5

= 3Bit Data Register Addressing Bit 6

=Checksum type to use

Bit 7 = MODBUSType driver data whether to use big endian or little endian Bit 8 = RS-485

Communication four-wire system and two-wire system switching

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-14	TD	response delay	2	0~20	ms	P	S	T	F

The response delay when the driver replies to the host computer's command.Usually in use2wire connectionRS485It is necessary to communicate.Because the same set of lines 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	default value	scope	unit	Related patterns			
P1-15	BR	RS-485Communication baud rate	1	1~5	-	P	S	T	F

The baud rate that takes effect after power-on in serial communication.This value will be saved immediately after being configured but will not take effect immediately.,It will not take effect until the next power-on,Therefore, 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	default value	scope	unit	Related patterns			
P1-16	DA	RS-485mailing address	32	1~32	-	P	S	T	F

RS-485andModbus/RTUCorrespondence address of model driver

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-19	ZR	Regenerative absorption resistor value	200	10~32000	Ω	P	S	T	F

Set the resistance value of the regenerative energy absorption resistor,The driver calculates the discharge power on the regenerative resistor based on the current discharge voltage and resistance value..

The default value is the resistance of the regenerative energy absorption resistor built into the driver..

When using external regenerative energy absorption resistor value,Reasonable values must be set.

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-20	ZC	Regenerative absorbed resistor power	40	1 ~ 32000	W	P	S	T	F

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

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-21	ZT	Regeneration absorption time constant	1000	0~8000	ms	P	S	T	F

The time the regenerative resistor can continue to discharge under the discharge voltage.

About the use of regenerative energy absorption resistors,Please refer to chapter4.7**P**2-Regenerative energy absorption resistor wiring method

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-22	PK	Button setting lock	0	0,1	-	P	S	T	F

driveledThe buttons below the display panel can be used to modify and set parameters.,This parameter is used to set whether to lock parameters,Avoid accidental operations that cause drive parameters to be changed.

set value	illustrate
0	Can be modified
1	Modification prohibited

Notice:

When the button is locked,Other parameters cannot be modified.This parameter must be set to "0"back,to modify parameters.

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-23	DD	ledDefault display items	0	0~20	-	P	S	T	F

Set the drive to,ledThe content displayed by the panel by default.

set value	content	unit
0	Motor actual speed	RPMRPM
1	position error	Pulse
2	Pulse command input count	counts
3	Encoder feedback pulse number	counts
4	Position command count	counts
5	drive temperature	x 0.1℃
6	DC-Busbus voltage	x 0.1V
7	Driver communication address	
8	Alarm history1	
9	Alarm history2	
0	Alarm history3	
11	Alarm history4	
12	Alarm history5	
13	Alarm history6	
14	Alarm history7	
15	Alarm history8	
16	Analog input1	x 0.001V
17	Analog input2	x 0.001V
18	Digital input status	
19	Digital output status	
20	Command current percentage	0.1%

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-24	MA	Alarm shielding	4294967295	0 ~ 4294967295	-	P	S	T	F

When the drive generates some non-serious warning message,The bit corresponding to this parameter can mask the corresponding warning message.ledAlarm display function,Blocked warning messages will no longer be displayed when generated5 indivual7

The segment digital tube flashes and displays.

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-25	CX	Second torque limit	3000	0~3000	0.1%	P	S	T	F

Set the second limit value of motor output torque.

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-26	CY	Third torque limit	3000	0~3000	0.1%	P	S	T	F

Set the third limit value of motor output torque.

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-27	CZ	Fourth torque limit	3000	0~3000	0.1%	P	S	T	F

Set the fourth limit value of motor output torque.

Please refer to chapter**7.5**Torque limit

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-28	HT	Motor stall protection time	0	0~30000	ms	P	S	T	F

In position mode or position-based velocity mode (e.g.P1-03 = 1),Stalled rotor will cause the driver to always output the rated torque of the motor..Long-term stalling will cause the motor to overheat.. This parameter sets the motor stall protection time,When the actual output current of the motor is equal to the rated current of the motor,And when the time exceeds the setting of this parameter.will producer37ST(Motor stall alarm),The motor will be deactivated.

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-29	YV	Dynamic brake action when disabled	0	0~5	---	P	S	T	F

ServoOFFhour,Dynamic braking action through parametersP1-29set up,The maximum action time during deceleration passes the parameterP1-31set up,Please refer to the table below. The deceleration process refers to when dynamic braking takes effect,The actual speed of the motor decelerates from the speed when it takes effect to the parameterP5-42Within zero speed threshold,Or the deceleration time reachesP1-31setting time.

value	illustrate	
	deceleration process	After stopping
0	with parametersP2-01The setting decelerates	Maintain freedom of movement
1	with parametersP2-01The setting decelerates	dynamic braking action
2	free movement state	Maintain freedom of movement
3	free movement state	dynamic braking action
4	dynamic braking action	Maintain freedom of movement
5	dynamic braking action	dynamic braking action

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-30	YR	The action of dynamic braking when an error is reported	0	0~3		P	S	T	F

When the servo reports an error,Dynamic braking action through parametersP1-30set up,The longest operating time during deceleration passesP1-32set up,Please refer to the table below. The deceleration process refers to when dynamic braking takes effect,The actual speed of the motor decelerates from the speed when it takes effect to the parameterP5-42Within zero speed threshold,Or the deceleration time reachesP1-31setting time.

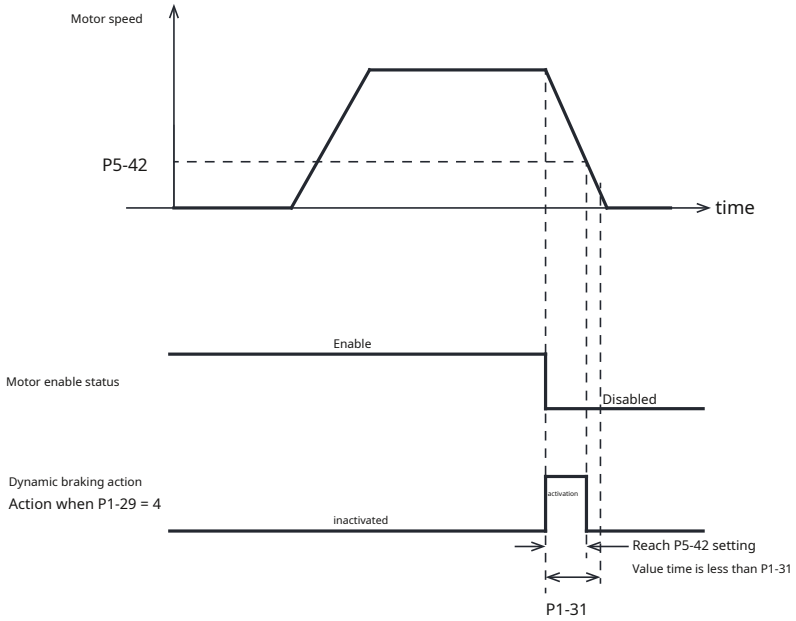
value	illustrate	
	deceleration process	Stopping
0	free movement state	Maintain freedom of movement
1	free movement state	dynamic braking action
2	dynamic braking action	Maintain freedom of movement
3	dynamic braking action	dynamic braking action

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-31	YM	The longest dynamic brake movement during deceleration with deactivation working time	500	0~30000	ms	P	S	T	F

This parameter sets the servoOFFhour,The maximum action time of dynamic braking during deceleration.

The deceleration process refers to when dynamic braking takes effect,The actual speed of the motor decelerates from the speed when it takes effect to the parameterP5-42Within zero speed threshold,Or the deceleration time reachesP1-31setting time.

● When the deceleration time exceedsP1-31settings,Even though 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 operation.

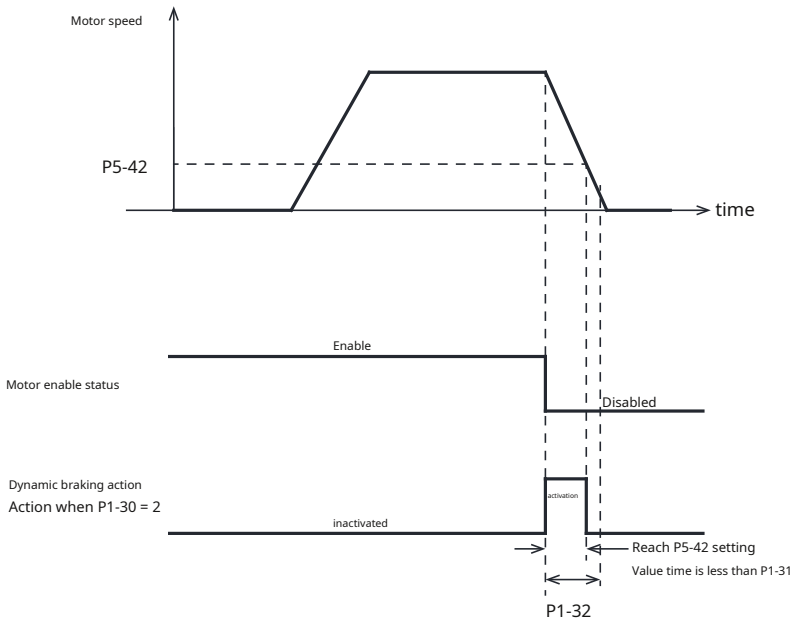


parameter	instruction	name	default value	scope	unit	Related patterns			
P1-32	YN	Maximum operating time of the dynamic brake during incorrect deceleration	500	0~30000	ms	P	S	T	F

This parameter sets the servo's response time after reporting an error.,The maximum action time of dynamic braking during deceleration.

The deceleration process refers to when dynamic braking takes effect,The actual speed of the motor decelerates from the speed when it takes effect to the parameterP5-42Within zero speed threshold,Or the deceleration time reachesP1-32setting time.

● When the deceleration time exceedsP1-32settings,Even though 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 operation.



parameter	instruction	name	default value	scope	unit	Related patterns			
P1-33	OT	Phase loss detection switch	0	0~1		P	S	T	F

Driver power supply phase loss detection switch.

If detection is turned on,When the drive power supply is missing a phase,"AC power input phase loss" alarm occurs (fault coder19).

set value	illustrate
0	Can be modified
1	Modification prohibited

parameter	instruction	name	default value	scope	unit	Related patterns			
P1-34	RT	Current instantaneous change value	1000	0~3000	0.1%	P	S	T	F

This parameter sets the detection value of instantaneous changes in current..

The servo system detects an abnormal mutation in the motor current.,And the sudden current exceeds the parameterP1-34When the setting value of,A "motor collision alarm" (fault coder40).

8.3.3 P2-XXGroup:**Trajectory---**Trajectory planning

Such as entering or viewing through the drive panel**P2**Group parameters,

◆ If the parameter's unit is**rps**,Please calculate according to the following formula:

Panel display value= V x 240

in V is the speed that needs to be set,Unit is**rps(**change**/**Second**)**

◆ If the parameter's unit is**rps/s**,Please calculate according to the following formula:

Panel display value= V x 6

in V is the speed that needs to be set,Unit is**rps(**change**/**Second**)**

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-00	VM	Maximum speed	80	0~100	rps	P	S	T	F
Set the maximum operating speed of the motor. When the actual speed of the motor exceedsP2-00When setting value,and lasts longer than400ms,will producer12OV(Motor stall alarm).									

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

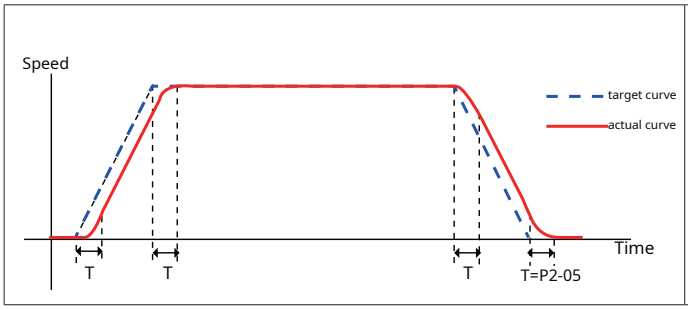
parameter	instruction	name	default value	scope	unit	Related patterns			
P2-02	JS	Internal speed mode target speed	10	- 100 ~ 100	rps	P	S	T	
Target speed value for internal speed mode.									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-03	JA	Internal speed mode acceleration	100	0.167~5000	rps/s	P	S	T	
Acceleration value for internal speed mode.									

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

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-05	JT	Jerk time	10	0~250	ms	P	S	T	F

parameterP2-05Jerk time in internal trajectory mode (position,speed,torque),Analog position,Analog speed,Analog torque,ormodbusEffective when controlled by communication command. The effect of jerk smoothing on input commands is as shown below.



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

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

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

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

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

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-10	JC1	Multi-stage speed control: No.1gear speed	2	- 100 ~ 100	rps	P	S	T	
The first speed value in multi-speed mode Regarding multi-speed control,Please refer to chapter**7.11**Internal speed mode									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-11	JC2	Multi-stage speed control: No.2gear speed	10	- 100 ~ 100	rps	P	S	T	
The second speed value in multi-speed mode									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-12	JC3	Multi-stage speed control: No.3gear speed	20	- 100 ~ 100	rps	P	S	T	
Three-speed value in multi-speed mode									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-13	JC4	Multi-stage speed control: No.4gear speed	25	- 100 ~ 100	rps	P	S	T	
The fourth speed value in multi-speed mode									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-14	JC5	Multi-stage speed control: No.5gear speed	30	- 100 ~ 100	rps	P	S	T	
The fifth speed value in multi-speed mode									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-15	JC6	Multi-stage speed control: No.6gear speed	35	- 100 ~ 100	rps	P	S	T	
The sixth speed value in multi-speed mode									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-16	JC7	Multi-stage speed control: No.7gear speed	40	- 100 ~ 100	rps	P	S	T	
The seventh speed value in multi-speed mode									

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-17	JC8	Multi-stage speed control: No.8gear speed	50	- 100 ~ 100	rps	P	S	T	
The eighth speed value in multi-speed mode									

parameter	instruction	name	default value	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 return-to-origin functional formula,Acceleration value when starting and deceleration value when decelerating.

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-24	HV1	Return to origin first speed	10	0.0042~100	rps	P	S	T	

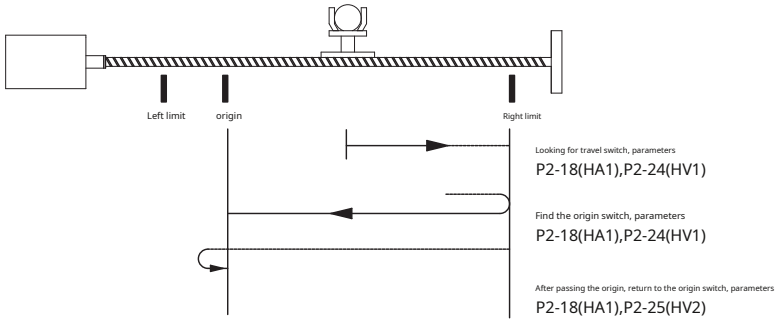
This parameter is set in the return-to-origin functional formula,Running speed of the first segment when returning to the origin.

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-25	HV2	Return to origin second speed	1	0.0042~100	rps	P	S	T	

This parameter is set in the return-to-origin functional formula,Second segment running speed when returning to origin.

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

This parameter is set under the return-to-origin function.,offset value of origin.

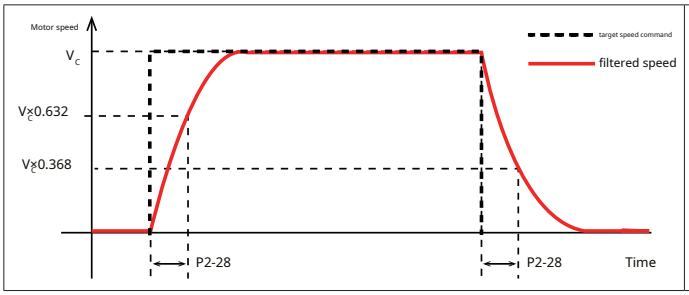


P2-18,P2-24,P2-25,P2-27The parameter is the configuration parameter of the drive's built-in return-to-origin function.,Detailed functions about returning to origin,Please refer to**7.10**Origin return function

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-28	KJ	low pass smoothing filter	0	0~1000	ms	P	S	T	F

parameterP2-28The low-pass smoothing filter can be effective in the control mode used,For example:Internal trajectory mode (position,speed,torque),External pulse or analog position,speed,Analog torque, Communication command control, etc..

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



◆ Low-pass smoothing filtering will cause a certain delay in instructionsT,But it will not affect the final positioning accuracy

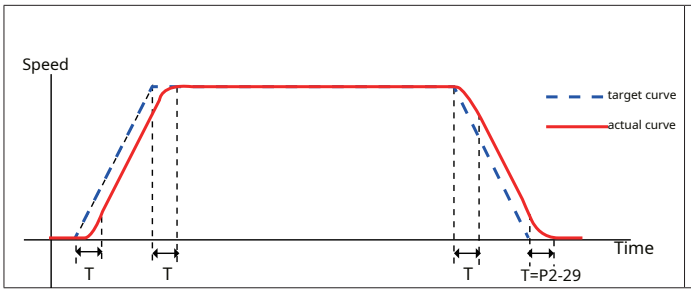
◆ P2-28The larger the time constant,The smoother effect is more obvious,The command response delay will also increase,Should be based on actual application conditions,Set a reasonable filter time constant

parameter	instruction	name	default value	scope	unit	Related patterns			
P2-29	FF	interpolation filter	10	0~250	ms	P	S	T	F

parameterP2-29The interpolation filter works under the pulse position command.Applicable to:

- No acceleration or deceleration is performed when the pulse command is input.
- Input pulse command step change
- When the command pulse frequency is extremely low

The smoothing effect of the interpolation filter on the input command is as shown below.



- Interpolation filtering will cause a certain delay to the command pulseT,But it will not affect the final positioning accuracy
- P2-29The larger the time constant,The smoother effect is more obvious,The command response delay will also increase,Should be based on actual application conditions,Set a reasonable filter time constant

parameter	instruction	name	default value	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,Maximum speed of motor. Detailed speed limits in torque mode,Please refer to**7.4.6**Speed limit in torque mode

8.3.4 P3-XXGroup:**Encoder & Step/Dir---**Encoder and input pulse settings

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-00	EN	electronic gear ratio numerator	1048576	1~2147483647	-	P	S	T	F

This parameter sets the numerator of the electronic gear ratio.

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-01	EU	Electronic gear ratio denominator	10000	1~2147483647	-	P	S	T	F

This parameter sets the denominator of the electronic gear ratio.

The electronic gear ratio is the value obtained by multiplying the pulse command input from the host controller by the set electronic gear ratio.,As a position command in position control mode.By using this function,The motor rotation corresponding to the input command pulse can be set arbitrarily.,Movement amount.

$$\text{external position pulse}_{\text{(communication position command)}} \times \frac{\text{Electronic gear ratio numerator P3-00}}{\text{Electronic gear ratio denominator P3-01}} = \text{command position}$$

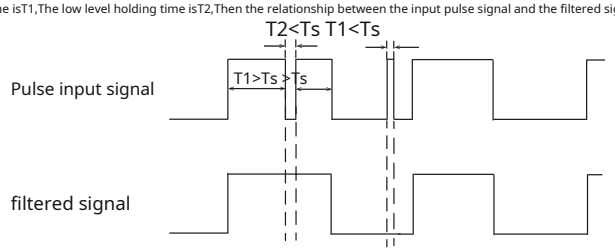
For detailed electronic gear ratio settings, please refer tochapter**7.2.4**Electronic gear ratio.

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-02	SZ	Pulse input filter width	5	0~32000	0.1μs	P	S	T	F

Use parametersP3-02Pulse input signals can be filtered,Prevent pulse signals from being interfered with,Cause malfunction of servo motor.Input impulse noise is filtered as a low pass filter,Unit is0.1μs.

Mechanism:

likeP3-02The set value isTs,The input pulse high level holding time isT1,The low level holding time isT2,Then the relationship between the input pulse signal and the filtered signal is as follows:



- When the pulse width of the input pulseT1andT2greater than at the same timeTs,This pulse input is valid.
- When the pulse width of the input pulseT1,T2There is one less thanTshour,The pulse will be filtered out,Pulse input is invalid.

$$\text{The set filter time } Ts \le \frac{1}{A \times \text{actual pulse frequency (Hz)}}$$

Generally, when the input frequency duty cycle is 50%, A takes the value 4 or 5.

Detailed description,Please refer to**7.2.3.5**Pulse input noise filtering

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-03	PT	Pulse input setting	9	0~31		P	S	T	F

This parameter determines the source of the input pulse command.,Pulse type,Set the direction of rotation and valid pulse edge type.

parameterP3-03Input pulse setting

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	0	0	0:Low speed pulse input	0:Valid on falling edge	0:positive logic	bit1=0,bit0=1:pulse+direction	
			1:High-speed differential pulse input	1:Valid on rising edge	1:Counter logic	bit1=1,bit0=0: CW/CCW	
						bit1=1,bit0=1: A/BQuadrature pulse	

bit0andbit1:Pulse command type

bit2:Rotation direction setting

bit3:Conditions for valid pulse edges

bit4:Pulse command source

◆ Instruction type

There are three types of input pulses to choose from::Pulse & Direction,CW/CCWpulse,A/BQuadrature pulse.

bit1=0,bit0=1	pulse+direction
bit1=1,bit0=0	CW/CCW
bit1=1,bit0=1	A/BQuadrature pulse

◆ Pulse command direction signal logic setting

Changing the logic of the pulse command direction signal can change the rotation direction of the motor.

0:positive logic
1:Counter logic

◆ Conditions for valid pulse edges

Set the conditions for judging whether the pulse output is valid or not.:

0:Valid on falling edge
1:Valid on rising edge

◆ Pulse command source

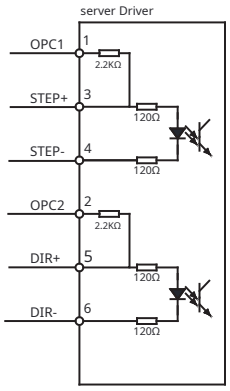
Set the input port of the position command pulse.M54SSeries drivers have multiple input methods,while using,It needs to be based on the pulse type of the host computer and the model of the driver.,to select the appropriate pulse input port.

0:Low speed pulse input
1:High-speed differential pulse input

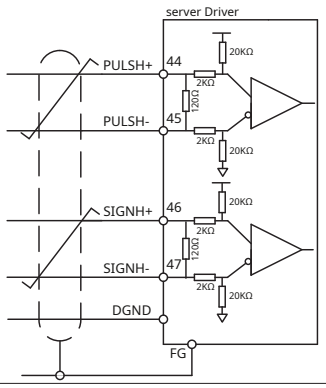
parameter	instruction	name	default value	scope	unit	Related patterns			
P3-03	PT	Pulse input setting	9	0~31		P	S	T	F

1) M54Sseries-**F**and-**R(50pin**high density connector**)**Model,There are two sets of input sources:

◆ Low-speed pulse signal (or open collector pulse input)

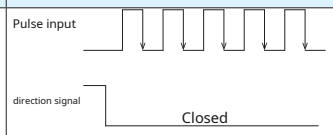
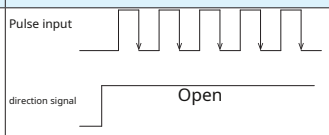
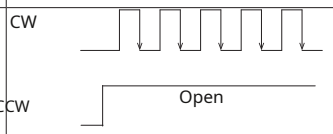
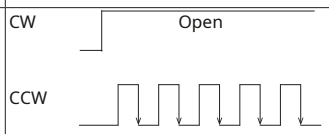
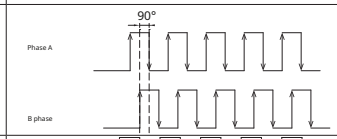
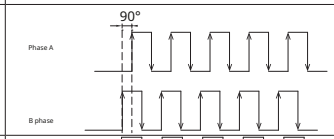
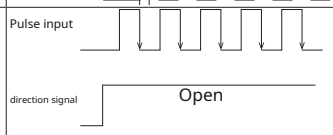
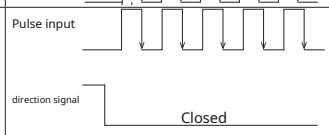
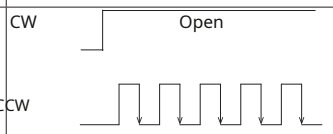
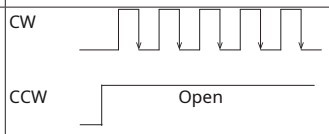
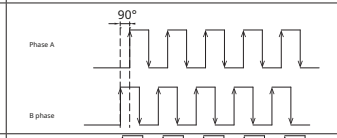
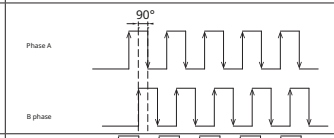
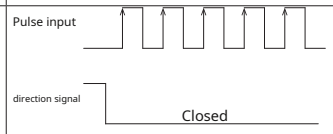
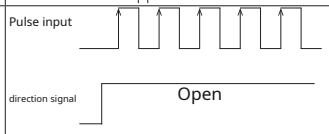
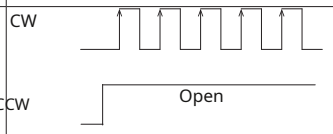
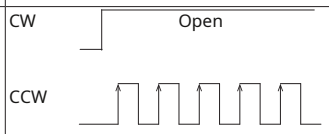
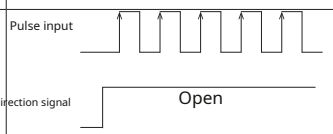
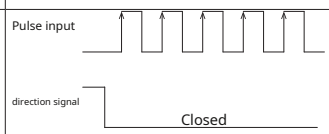
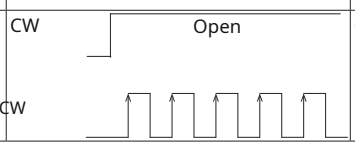
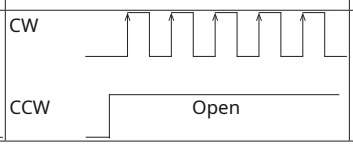
bit4set value	CN2-Pin number	Signal name		Schematic diagram
0	1	OPC1	Pulse signal input	
	3	STEP+		
	4	STEP-		
	2	OPC2	Pulse direction signal input	
	5	DIR+		
	6	DIR-		

◆ High-speed pulse signal (Line DriverPulse input only)

bit4set value	CN2-Pin number	Signal name		Schematic diagram
1	44	PULSH+	Pulse signal input	
	45	PULSH-		
	46	SIGNH+	Pulse direction signal input	
	47	SIGNH-		

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-03	PT	Pulse input setting	9	0~31		P	S	T	F

P3-03 Pulse input setting combination:

pulse edge Valid conditions	rotate direction set up	Pulse command type			Forward	reverse	parameterP3-03 set value (10base)	
							low speed pulse enter	High speed differential Pulse input
bit3	bit2	bit1	bit0					
0	0	0	1	Pulse+ direction			1	17
0	0	1	0	CW/ CCW pulse			2	18
0	0	1	1	A/Bjust Jiaomai rush			3	19
0	1	0	1	Pulse+ direction			5	twenty one
0	1	1	0	CW/ CCW pulse			6	twenty two
0	1	1	1	A/Bjust Jiaomai rush			7	twenty three
1	0	0	1	Pulse+ direction			9	25
1	0	1	0	CW/ CCW pulse			10	26
1	1	0	1	Pulse+ direction			13	29
1	1	1	0	CW/ CCW pulse			14	30

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-04	PF	Position error alarm limit	100000	0~2147483647	pulses	P	S	T	F

Threshold for error reporting when position error exceeds limit.

When the deviation between the target position and the actual position fed back by the encoder exceeds this threshold during movement,An error out of bounds error will occur,driverledThe display panel will show an error code

.

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-05	EG	Number of pulses required per revolution	10000	200~131072	pulses/rev	P	S	T	F

Set the number of pulses per motor revolution.

When parametersP3-16 = 1hour,This parameter setting is invalid.The number of pulses required per motor revolution is set by the motor gear ratio,That is, by parametersP3-00Electronic gear ratio numerator andP3-01Motor gear ratio denominator.

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-12	PO	Encoder frequency division output setting	1	0~256	-	P	S	T	F

parameterP3-12Pair of input and pair of output pulse sources,Output pulse phase,ZSet the pulse output polarity type..eachbitThe functions corresponding to the bits are as follows.

parameterP3-03Input pulse setting

bit7	bit6	bit5	bit4		bit3	bit2	bit1	bit0
0	0	0	0		ZPulse output polarity	When rotating forwardA,Bphase relationship	Output pulse source	
					0:rising edge	0:AleadingB 90°	bit1=0,bit0=1:Motor encoder	
							bit1=1,bit0=0:second encoder,Fully closed loop encoder input	
					1:falling edge	1:BleadingA 90°	bit1=1,bit0=1:External pulse command	

bit 0andbit 1:Output pulse source
bit 2:When rotating forwardA/B
phase relationship bit 3:ZPulse
output polarity bit3 ~ bit16:reserve,set as0.

◆ Output source settings

The pulse frequency division output function supports the following three signal sources for output through the frequency division function.

set value	illustrate
bit1=0,bit0=1	Motor encoder
bit1=1,bit0=0	second encoder,Fully closed loop encoder input
bit1=1,bit0=1	External pulse command

Notice:

When the signal source is an external pulse command,parameterP3-13and parametersP3-14invalid,The command pulse is not processed in any way.,directby-passoutput.P3-12ofbit2 bit andbit3Bit settings will also be invalid.

◆ When rotating forward**A/B**phase relationship

When setting forward rotation,pulse outputAHarmonyBphase relationship

set value	illustrate
0	AleadingB 90°
1	BleadingA 90°

◆ **Z**Pulse output polarity

set upZPhase pulse polarity

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	default value	scope	unit	Related patterns			
P3-13	ON	Numerator of the encoder output distribution ratio	10000	0~13107200	-	P	S	T	F

Set the encoder frequency division output numerator

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-14	OD	Denominator of encoder output distribution ratio	131072	0~13107200	-	P	S	T	F

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 encoder's frequency division output gear ratio numerator and denominator,The number of pulses output by the motor per revolution can be set.

Number of pulses output per revolution**(A/B**Count when same,**4**After frequency doubling**) =**

$$\frac{\text{P3-13 Pulse frequency division output ratio numerator}}{\text{P3-14 Pulse frequency division output ratio denominator}} \times 131072$$

Notice:

- P3-13The numerator of the frequency division ratio needs to be less thanP3-14Frequency division ratio denominator
- whenP3-13Frequency division ratio numerator>P3-14When the frequency division ratio is the denominator,The number of pulses output by the motor during one revolution (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	default value	scope	unit	Related patterns			
P3-15	ES	Absolute encoder settings	0	0~3	-	P	S	T	F

Set how to use the motor absolute encoder:

set value	illustrate	Remark
0	Incremental encoder	Use as an incremental encoder,If no external battery is connected at this time,There will also be no alarm for multiple lost turns.
1	Single-turn absolute encoder	Feedback the absolute position within one revolution of the motor
2	multiturn encoder	That is, as a multi-turn absolute encoder,Record the absolute position of the motor.
3	Multi-turn encoders do not count overflow	Absolute value system for single direction operation

parameter	instruction	name	default value	scope	unit	Related patterns			
P3-16	PU	Electronic gear ratio switch	1	0~1	-	P	S	T	F

M54SSeries servo has two position command and position counting systems,This parameter is used to select which position counting method to use

set value	illustrate	Remark
0	Based on parametersP3-05(Number of pulses required per revolution)	Set the number of command pulses per motor revolution.The current position of the motor read is also determined by this parameter.
1	Electronic gear ratio effective	external position pulse (communication position command) $\times \frac{\text{Electronic gear ratio numerator P3-00}}{\text{Electronic gear ratio denominator P3-01}}$ = command position

The electronic gear ratio is the value obtained by multiplying the pulse command input from the host controller by the set electronic gear ratio.,As the command position unit in position control mode.By using this function,The motor rotation corresponding to the input command pulse can be set arbitrarily.,Movement amount.

$$\text{external position pulse (communication position command)} \times \frac{\text{Electronic gear ratio numerator P3-00}}{\text{Electronic gear ratio denominator P3-01}} = \text{command position}$$

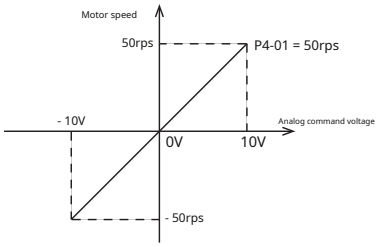
◆ When parametersP3-16 = 0hour,Electronic gear ratio is invalid.The number of pulses for one revolution of the motor has parametersP3-05Decide.

◆ When parametersP3-16 = 1hour,Electronic gear ratio effective,The number of pulses for one revolution of the motor is fixed to the resolution of the encoder.No matter what combination17-bit,20-bitresolution encoder,It takes the motor to rotate once1048576pulses.

8.3.5 P4-XXGroup:**Analog---**Analog settings

parameter	instruction	name	default value	scope	unit	Related patterns			
P4-01	AG	Analog input speed scaling	50	0~100	rps/10V	P	S	T	F

Set analog input1The proportional relationship between the input voltage and the speed command. i.e. analog input1exist10Vhour,Corresponding motor speed.



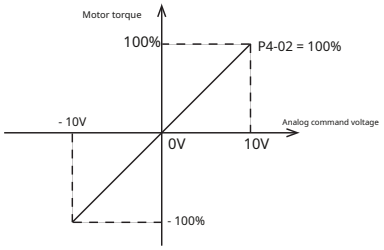
◆ Such as entering or viewing through the drive panel**P2**Group parameters,If the parameter's unit is**rps**,Please calculate according to the following formula:

Panel display value $=\frac{V}{10} \times 240$

in V is the speed that needs to be set,Unit is**rps(**change/Second**)**

parameter	instruction	name	default value	scope	unit	Related patterns			
P4-02	AN	Analog input torque scaling	1000	0~3000	0.1%/10V	P	S	T	F

Set analog input2The proportional relationship between the input voltage and the torque command. i.e. analog input2exist10Vhour,The corresponding motor output torque.

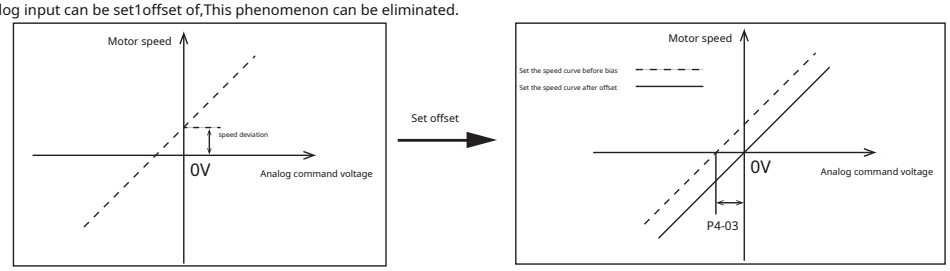


parameter	instruction	name	default value	scope	unit	Related patterns			
P4-03	AV1	Analog input1Offset	0	- 10000 ~ 10000	mV	P	S	T	F

Set analog input1offset of.

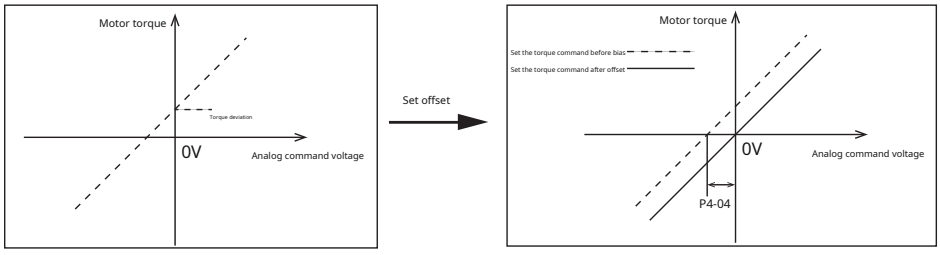
When using analog speed mode,In some cases, even if the analog instruction of the host computer is0V,The servo motor may also rotate slightly.This is because when receiving analog signals,produces a slight bias,That is zero drift.

Use parametersP4-03Analog input can be set1offset of,This phenomenon can be eliminated.



parameter	instruction	name	default value	scope	unit	Related patterns			
P4-04	AV2	Analog input2Offset	0	- 10000 ~ 10000	mV	P	S	T	F

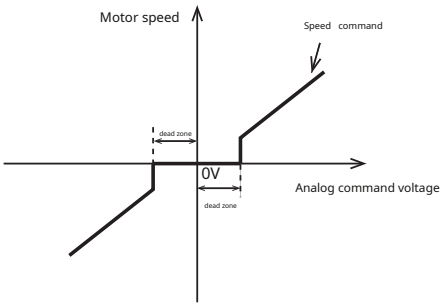
Set analog input2offset of.



parameter	instruction	name	default value	scope	unit	Related patterns			
P4-05	AD1	Analog input1dead zone	0	0~255	mV	P	S	T	F

Set analog input1dead zone.

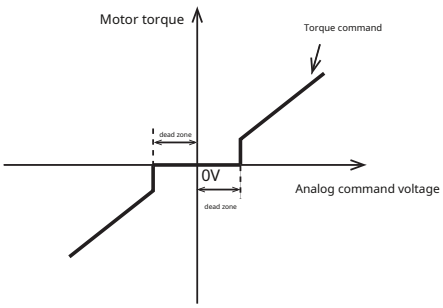
During analog control,The input voltage is0Vhour,Due to some disturbances and other reasons,The input voltage is not absolute0V,Will be at0VFluctuate left and right,This causes the motor to squirm at a very low speed..Therefore, in order to eliminate this situation,Set a reasonable dead zone value,It can be guaranteed that when the input voltage is within the dead zone range,are recognized as0V.



parameter	instruction	name	default value	scope	unit	Related patterns			
P4-06	AD2	Analog input2dead zone	0	0~255	mV	P	S	T	F

Set analog input2dead zone.

During analog control,The input voltage is0Vhour,Due to some disturbances and other reasons,The input voltage is not absolute0V,Will be at0VFluctuate left and right,This causes the motor to squirm at a very low speed..Therefore, in order to eliminate this situation,Set a reasonable dead zone value,It can be guaranteed that when the input voltage is within the dead zone range,are recognized as0V.



parameter	instruction	name	default value	scope	unit	Related patterns			
P4-07	AF1	Analog input1low pass filter	1000	0~2000	0.1Hz	P	S	T	F

Set analog input1low pass filtering.

parameter	instruction	name	default value	scope	unit	Related patterns			
P4-08	AF2	Analog input2low pass filter	1000	0~2000	0.1Hz	P	S	T	F

Set analog input2low pass filtering.

When using analog quantities,due to external interference,Will cause a jump in the analog voltage,This causes a jump in speed or output torque.,Affects the accuracy of control.The analog input filter is a low-pass digital filter,Set a reasonable filter frequency,Can eliminate jumps. Notice:

Generally there is no need to change the value,If the setting value is too small,Responsiveness to speed commands will decrease.

parameter	instruction	name	default value	scope	unit	Related patterns			
P4-09	AT1	Analog input1trigger threshold	5000	- 10000 ~ 10000	mV	P	S	T	F

Set analog input1trigger threshold.

parameter	instruction	name	default value	scope	unit	Related patterns			
P4-10	AT2	Analog input2trigger threshold	5000	- 10000 ~ 10000	mV	P	S	T	F

Set analog input2trigger threshold.

The analog input can be set as the motor speed,Torque command,Can also be used as a general analog input,Feedback the actual voltage value of the current analog input.

existQProgramming,can useAT1orAT2Instruction to set the voltage trigger threshold of the analog input.Use analog voltage as trigger switch,When the voltage value of the analog input is equal to or greater than the parameter setting value,Input is valid.

parameter	instruction	name	default value	scope	unit	Related patterns			
P4-11	AF1	Speed limit source setting	1	0~1	---	P	S	T	F

In torque mode,Motor speed needs to be limited.This parameter sets the source of the motor speed limit command..

set value	illustrate
0	Use internal speed command parameters
1	Analog input1As the source of speed command

8.3.6 P5-XXGroup:IOset up

parameter	instruction	name	default value	scope	unit	Related patterns
P5-00	MU1	Digital input port1Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-01	MU2	Digital input port2Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-02	MU3	Digital input port3Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-03	MU4	Digital input port4Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-04	MU5	Digital input port5Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-05	MU6	Digital input port6Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-06	MU7	Digital input port7Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-07	MU8	Digital input port8Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-08	MU9	Digital input port9Function		0~46		P S T F

parameter	instruction	name	default value	scope	unit	Related patterns
P5-09	MUA	Digital input port10Function		0~46		P S T F

parameterP5-00 ~ P5-09Set the digital input port in sequenceX1~X10function. The functions and logic comparison

table that can be assigned to the input signal are as follows:

Signal name	abbreviation symbol	Setting values 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 switching	CM-SEL	9	10
Gain switching	GAIN-SEL	11	12
emergency stop	E-STOP	13	14
Return to origin start	S-HOM	15	16
Position error counter clear input	C-CLR	17	18
Torque limit input	TQ-LMT	19	20
Zero speed clamp input	ZCLAMP	twenty one	twenty two
Pulse input prohibition input	INHP	25	26
Multi-terminal speed selection input1	SPD1	27	28
Multi-terminal speed selection input2	SPD2	29	30
Multi-terminal speed selection input3	SPD3	31	32
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	default value	scope	unit	Related patterns			
P5-12	MO1	Digital output port1Function		0~34		P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-13	MO2	Digital output port2Function		0~34		P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-14	MO3	Digital output port3Function		0~34		P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-15	MO4	Digital output port4Function		0~34		P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-16	MO5	Digital output port5Function		0~34		P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-17	MO6	Digital output port6Function		0~34		P	S	T	F

parameterP5-12 ~ P5-17Set the digital output port in sequenceY1~Y6function. The functions and logic

comparison table that can be assigned to the output signal are as follows:

Signal name	abbreviation symbol	Logic and setting value when the output signal is valid	
		Output when the signal is valid Closed	Output when the signal is valid Open
Universal output	GPOUT	0	
Fault output (error report)	FLT	1	2
Warning output (alarm)	WARN	3	4
Brake release output	BRK	5	not support
Servo-onstatus output	SON-ST	7	8
Positioning completed output	IN-POS	9	10
Dynamic position error exceeds limit	DYM-LMT	11	12
Torque reaches output	TQ-REACH	13	14
Torque limit output	T-LMT	15	16
Consistent speed 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
Limit (forward rotation)	SLCW	27	28
Limit (reverse)	SLCCW	29	30
Same location	P-COIN	31	32
zero speed signal	Z-SPD	33	34
Torque consistent output	T-COIN	35	36

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-24	BD	Movement waiting time after brake release	200	0~32000	ms	P	S	T	F

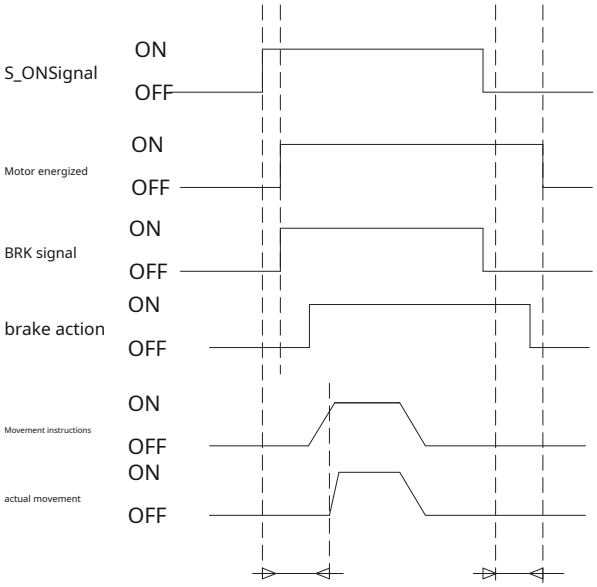
Set the waiting time for the first movement after the drive is enabled,Used to ensure that the brake release output pin has successfully released the motor brake..

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-25	BE	After braking,Motor non-enable waiting delay	200	0~32000	ms	P	S	T	F

P5-24Defines the time to wait for the first movement after the drive is enabled (in milliseconds),before an exercise begins,The brake must be released,Therefore, this parameter sets the delay required to start the next movement after the driver is enabled..This delay only has an effect when the brake output function is active.

Notice:Since this parameter sets the delay required for the first movement after the driver is enabled,,Therefore, it will cause a delay in the actual movement.,If you are sensitive to this delay,And no need to use the braking function,can beP5-24Set as0ms,Or do not configure the output pin with the "motor brake release output" function.

P5-25The parameter determines the delay time from when the driver receives the disable request to when the driver is actually disabled..This delay time ensures that the output pin controls the motor brake braking.



parameter	instruction	name	default value	scope	unit	Related patterns			
P5-27	HX	origin sensor	5	1~10	-	P	S	T	F

This parameter shows which input pin is configured as 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
10	X10

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-28	FI1	Digital input port1filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-29	FI2	Digital input port2filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-30	FI3	Digital input port3filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-31	FI4	Digital input port4filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-32	FI5	Digital input port5filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-33	FI6	Digital input port6filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-34	FI7	Digital input port7filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-35	FI8	Digital input port8filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-36	FI9	Digital input port9filter	2	0~8000	ms	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-37	FIA	Digital input port10filter	2	0~8000	ms	P	S	T	F

parameterP5-28 ~ P5-37Set the digital input port in sequenceX1~X10input filtering time. When the width of the input signal is greater than the set filter time,This input signal is valid.

When the electromagnetic interference in the environment is large,Setting a reasonable filter time can improve the reliability of digital input,However, excessive filtering time affects the response.

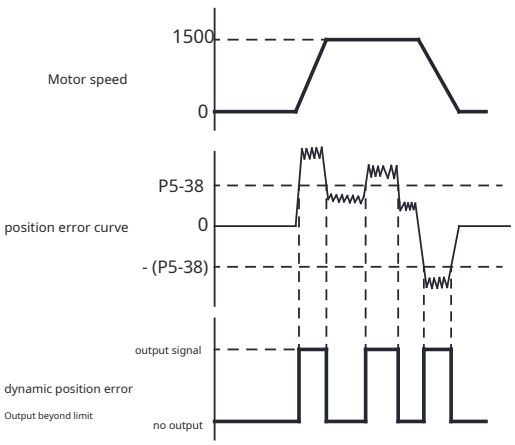
parameter	instruction	name	default value	scope	unit	Related patterns			
P5-38	PL	Dynamic following error threshold	10	0~2147483647	pulses	P	S	T	F

In location mode,P5-38Parameters set the judgment conditions for dynamic position error over-limit output..

◆ Dynamic position error over-limit output judgment conditions:

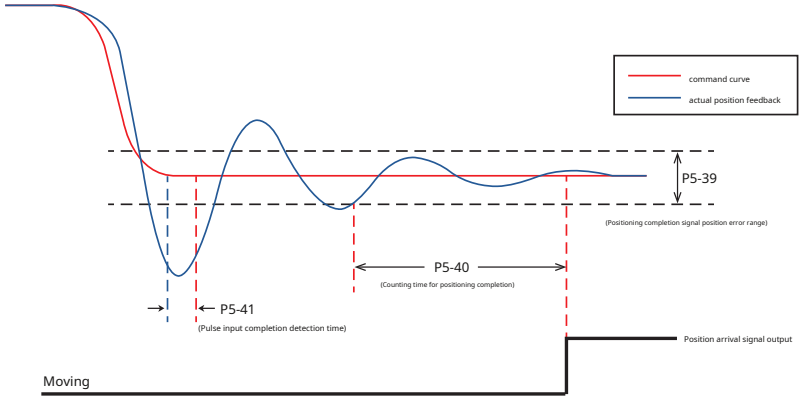
Dynamic position error refers to the motor's,The difference between the actual position of the motor and the command position is greater thanP5-38(When reaching the position signal position threshold),output this signal.

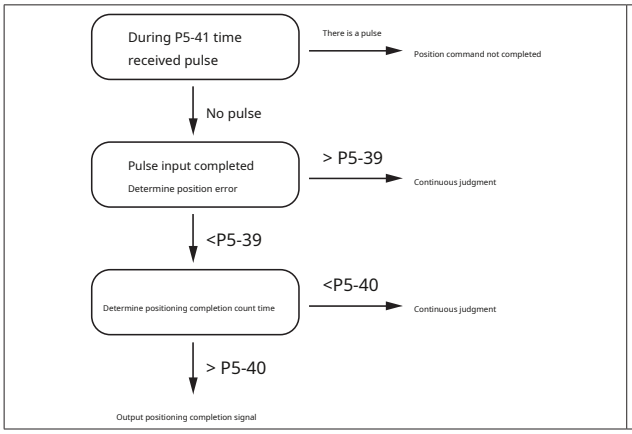
The figure below shows the setting value of11,That is, the error exceedsP5-38set up,output signal,The output status isClosedSchematic diagram of.



parameter	instruction	name	default value	scope	unit	Related patterns			
P5-39	PD	Positioning completion signal position error range	40	0~32000	pulses	P	S	T	F

In location mode,P5-39Parameters set the judgment conditions for positioning completion signal output..





DangzaiP5-41Pulse input completion detection time,The drive does not receive a new pulse input,It is recognized that pulse input is completed.

Thereafter, if the position error is less than the parameterP5-39(Positioning completion signal position error range), and the duration exceeds the parameterP5-40(Counting time for positioning completion),Output positioning completion signal.

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-40	PE	Motion judgment condition counting time	40	0~30000	ms	P	S	T	F

Detection time width of motion judgment conditions.

Please refer to the corresponding chapter for details.

7.2.8Positioning complete signal

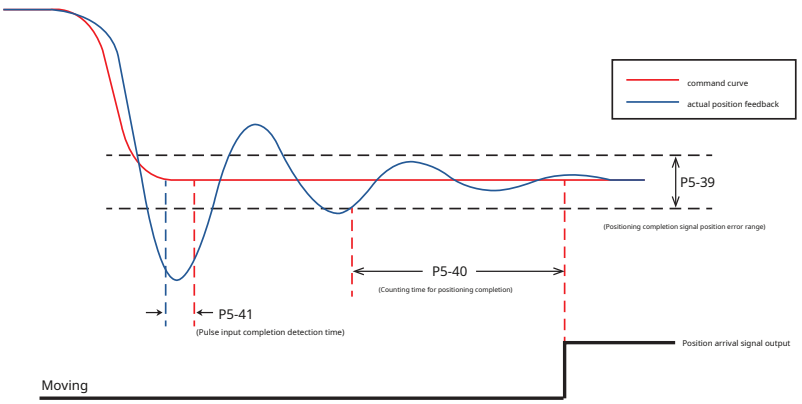
7.3.7Speed reaches output

7.3.8Speed consistent signal

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-41	TT	Pulse input completion detection time	2	0~20000	ms	P	S	T	F

P5-41Parameter sets the detection time width to determine whether the external position pulse command has ended..

Starts when the driver last receives an external pulse signal.,continuedP5-41No new pulse signal is received within the time,At this time, it is judged that the external pulse input has ended..

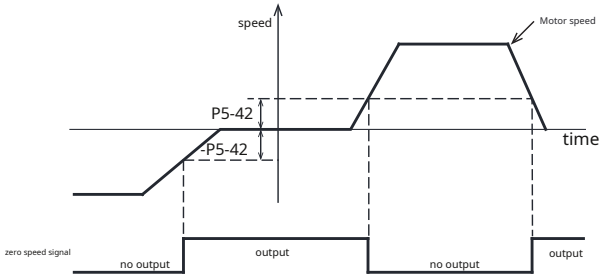


parameter	instruction	name	default value	scope	unit	Related patterns			
P5-42	ZV	Zero speed judgment threshold	0.5	0.1~2	rps	P	S	T	

P5-42Parameter setting to determine whether the motor is at zero speed.

When the absolute value of the actual motor speed 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 motor speed 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 status..Therefore, this signal can also be used as the motor is running (Moving)Signal.



Notice:

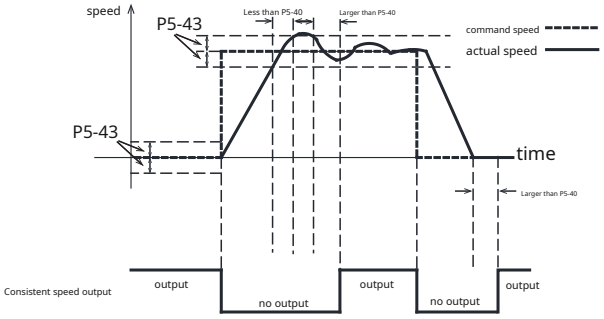
To enter via the drive panel or view thisP5-42set up,Please calculate according to the following formula:

Panel display value=Zero speed judgment threshold**X 240**

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-43	VR	Speed consistent fluctuation threshold	0.1	0~100	rps	P	S	T	

in speed mode,When the deviation between the filtered motor actual speed and the command speed, that is, the speed error isP5-43(When the speed consistent fluctuation threshold) is within the range setting,and time is enoughP5-40(Positioning completed (counting time),Then it is determined that the actual speed of the motor is consistent with the command speed.,Output speed consistent signalV-COIN.

If the filtered velocity error does not exceedP5-43(speed consistent fluctuation threshold),Then no speed consistent signal is output.V-COIN



Notice:

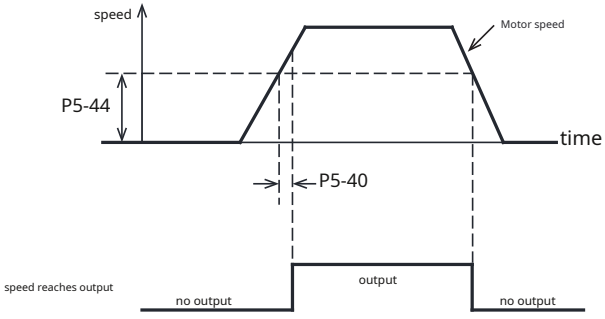
To enter via the drive panel or view thisP5-43set up,Please calculate according to the following formula:

Panel display value=Speed consistency judgment threshold**X 240**

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-44	VV	Determine the speed reaches the target value	10	0~100	rps	P	S	T	

in speed mode,When the filtered motor actual speed exceedsP5-44(Speed reaches threshold),and the time exceedsP5-40(Counting time for positioning completion),Will output the speed arrival signal AT-SPD.

If the actual motor speed after filtering does not exceedP5-44(Speed reaches threshold),Then no speed arrival signal is output.AT-SPD



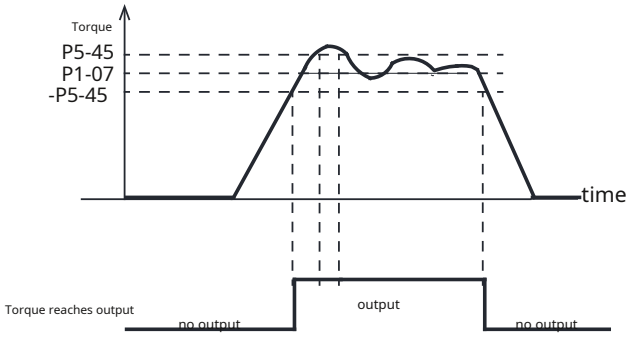
Notice:

To enter via the drive panel or view thisP5-44set up,Please calculate according to the following formula:

Panel display value=Speed reaches the judgment threshold**X 240**

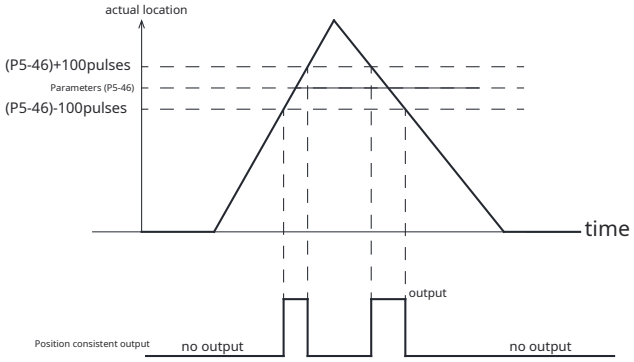
parameter	instruction	name	default value	scope	unit	Related patterns			
P5-45	TV	Torque reaches the fluctuation range	10	0~3000	0.1%	P	S	T	

When the absolute value of the actual output torque of the motor exceeds the torque reaching thresholdP1-07,And the torque ripples inP5-45Within the setting range,Set the output 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 no torque arrival signal is output.TQ-REACH. This function is available in all control modes,Such as location,speed,Torque, etc.. Use torque arrival signalTQ-REACHhour,Digital output pins need to be assigned this function.



parameter	instruction	name	default value	scope	unit	Related patterns			
P5-46	DG	Absolutely in place	10000	- 2147483647 ~ +2147483647	pulses	P	S	T	

When the actual position of the motor is equal to the parameterP5-46When setting,Align the output positionsP-COINSignal.The fluctuation range is±100pulses.



parameter	instruction	name	default value	scope	unit	Related patterns			
P5-47	LP	Positive soft limit	0	- 2147483647 ~ +2147483647	pulses	P	S	T	F

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-48	LM	Reverse soft limit	0	- 2147483647 ~ +2147483647	pulses	P	S	T	F

parameterP5-47 ~ P5-48Set the software limit value inside the driver in sequence. When the motor moves forward,The current position is equal to or exceedsP5-47When setting value,produce  Forward rotation prohibition limit alarm

When the motor moves in reverse direction,The current position is equal to or exceedsP5-48When setting value,produce  Reverse rotation prohibition limit alarm

Notice:

◆ When the encoder type is incremental encoder,After the drive is powered on,parameterP5-47andP5-48can be set and the soft limit can work normally,But it cannot be saved after power off.After powering on again,Parameters restored to default values"0"

◆ When the encoder type is an absolute encoder,parameterP5-47andP5-48can be set,It can also be saved when the power is turned off.

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-49	HE	Return to origin mode	1	- 4 ~ 40	-	P	S	T	F

Set the method of returning to the origin.

Please refer to the chapter for detailed return-to-origin methods.**7.10**Origin return function

parameter	instruction	name	default value	scope	unit	Related patterns			
P5-51	MS	Zero speed clamp function in speed mode	0	0 ~ 4	-	P	S	T	F

Set the zero speed clamp function in speed mode

0	according toIOway to trigger the zero speed clamp.
1	Trigger zero speed clamp based on speed command.
2	The zero speed clamp input signal isONhour,The speed command is forced to0
3	The zero speed clamp input signal isONhour,The speed command is forced to0,The actual speed of the motor is less thanZVSwitch to position control when,Perform servo lock function
4	The zero speed clamp input signal isONhour,The speed command is less thanZVSwitch to position control when,Perform servo lock function

9Troubleshooting

9.1Drive alarm list

Display content	illustrate	Alarm type	Drive status after alarm	Resettable
	Drive over temperature alarm	Report an error	Servo off	yes
	Internal voltage alarm	Report an error	Servo off	no
	Driver overvoltage alarm	Report an error	Servo off	yes
	Overcurrent	Report an error	Servo off	yes
		Report an error	Servo off	yes
		Report an error	Servo off	yes
	Encoder signal error	Report an error	Servo off	no
	Position error exceeds limit	Report an error	Servo off	yes
	Driver low voltage alarm	Report an error	Servo off	yes
	Stall alarm	Report an error	Servo off	yes
	Forward rotation prohibition limit and reverse rotation prohibition limit	warn	Do not change current status	yes
	Reverse prohibition limit	warn	Do not change current status,The motor cannot continue to reverse	yes
	Forward rotation prohibition limit	warn	Do not change current status,The motor cannot continue to rotate forward	yes
	drive reset	warn	Do not change current status	yes
	Communication abnormality	warn	Do not change current status	yes
	Parameter saving failed	warn	Do not change current status	yes
	AC power input phase missing	Report an error	Servo off	yes
	Safe torque is prohibited	warn	Servo off	yes
	Regenerative potential release failure warning	Report an error	Servo off	yes
	Under voltage warning	warn	Do not change current status	yes
	noneQProgram warning	warn	Do not change current status	yes
	Alarm when commanding the motor to rotate when it is not enabled	warn	Do not change current status	yes
	Driver internal voltage error	Report an error	Servo off	no
		Report an error	Servo off	no
	emergency stop	warn	Motor decelerates and stops	yes
	Full closed loop position error exceeds limit	Report an error	Servo off	yes
	Second encoder error	Report an error	Servo off	no

	memory error	Report an error	Servo off	yes
	Absolute encoder battery is under voltage	warn	Do not change current status	yes
	Absolute position lost	warn	Do not change current status	no
	Absolute encoder multi-turn overflow	warn	Do not change current status	no
	Motor overtemperature	Report an error	Servo off	yes
	Drive processor overtemperature	Report an error	Servo off	yes
	Absolute encoder multiturn error	Report an error	Servo off	no
	Motor stalled	Report an error	Servo off	yes
	EtherCATCommunication error	Report an error	Servo off	yes
	Origin return parameter configuration error	warn	Do not change current status	yes
	Motor collision alarm	Report an error	Servo off	yes
	Encoder communication abnormality	Report an error	Servo off	no
	I/OSignal function reuse	warn	Do not change current status	yes

9.2 Causes and solutions of drive alarms

Display content	illustrate	Alarm reason	Approach	Elimination method
r01ot	Drive overtemperature	Drive radiator,The temperature of the power components exceeds Above 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 4.Drive cooling fan failure	1.Reduce drive operating temperature and improve cooling conditions; 2.Raise the drive,Motor capacity,Extend acceleration and deceleration time,Reduce load. 3.Replace the fan or send the servo drive for repair	Clear alarm
r02ur	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 drive.	Power cycle to clear
r03uH	Drive overvoltage	The driver DC bus voltage is too high 220Vseries:higher than420VDC 1.The power supply voltage exceeds the allowable input voltage range; 2.Regenerative discharge circuit breaker; 3.The built-in regenerative absorption resistor is too small to absorb regenerative potential; 4.External regenerative discharge resistor does not match,Resulting in the inability to absorb the regeneration potential; 5.Drive failure (circuit failure).	1.Check input voltage; 2.Check whether the internal and external absorption resistors are set appropriately; 3.Detect the resistance of the external absorption resistor,if for∞It is disconnected or damaged.,Please replace the external absorption resistor; 4.If the above unresolved problem,Please replace the drive.	Clear alarm
r04HC r05LC r06rC	Overcurrent	1.Drive failure; 2.Motor cableU,V,Wshort circuit; 3.Motor burned out; 4.Poor contact of motor cable; 5.Input pulse frequency is too large; 6.Overloaded,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,Suddenly the load becomes heavier,twisting; 9.The electromagnetic brake is in action; 10.In the wiring of multiple machines,Connecting the motor cable to another axis by mistake,Wrong wiring.	1.Remove motor cables,Turn on servo,If the failure still occurs,You need to replace the drive with a new one; 2.Check motor cable connectionsU,V,WIs there a short circuit?,Whether the connector wire has burrs, etc..Correctly connect the motor cables; 3.Check motor cableU,V,WIs the order correct?.U-red,V-yellow,W-blue; 4.Check the motor cableU,V,WInsulation resistance to motor ground wire. Please replace the motor with a new one if the insulation is poor; 5.Increase the power of the driver and motor.Extend acceleration and deceleration time,Reduce load; 6.Check motor connectionsU,V,WIs the connector plug detached?,if loose,fall off,should be tightened; 7.Are the gain parameters debugged properly?; 8.Measure the voltage at the brake terminals; 9.Connect the motor cable,The encoder cables are correctly connected to their respective corresponding axes..	Clear alarm
r09Eb	Encoder signal mistake	Encoder signal error	1.Confirm that the encoder cable is connected correctly to the motor 2.Confirm that the encoder cable is connected correctly to the driver 3.Replace encoder wire 4.Power cycle,If there is still a problem, please replace the motor.	Power cycle to clear
r10PL	Position error exceeds limit	Position error exceeds parameterP3-04(PF)middle "Position error alarm limit" setting	1.Check parametersP3-04(PF) “Is the "position error alarm limit" setting too small?; 2.Are the gain parameters debugged properly?; 3.Whether the motor selection matches the actual load and whether the acceleration and deceleration are excessive big. 4.Whether an unreasonable torque limit is used 5.Electronic gear ratio setting is inappropriate 6.The mechanical part of the motor drive is stuck,Motor stalled 7.Is the motor power line connected correctly?,When there are multiple motors, Are the power lines connected to the correct drive?	Clear alarm
r11Lu	driver low voltage Call the police	DC bus voltage is too low (220VDrive series: lower than90VDC) 1.Power supply voltage is low.Momentary power outage occurs; 2.The power supply capacity is insufficient. The impact caused by the main power supply is turned on. Impact of shock current,causing the supply voltage to drop; 3Drive failure (circuit failure).	Measure input voltage 1.Increase power supply voltage capacity,Replace power supply; 2.Connect the power supply correctly,Please refer to4.3 P1-Driver power wiring method; 2.If the above unresolved problem,Please replace the drive.	Clear alarm

Display content	illustrate	Alarm reason	Approach	Elimination method
	Stall alarm	The motor speed exceedsP2-00limit value	Check whether the motor speed command is within a reasonable range 1.Avoid excessive speed commands; 2.Check the input frequency of command pulse and electronic gear, Electronic gear ratio; 3.When overshoot occurs due to poor gain adjustment,Please adjust the gain; 4.Connect the encoder cable correctly according to the wiring diagram. 5.Check motor cableU,V,WIs the order correct?	Clear alarm
	Forward,Reversal ban stop limit	1.Forward rotation prohibition limit or reverse rotation prohibition of digital input Stop limit is triggered 2.in absolute value system,The actual position of the motor reaches or soft limit	1.The external limit switch has been triggered; 2.The limit input function setting is incorrect,Please refer to7.1.5Forward and reverse limit chapters. 3.in absolute value system,The soft limit setting is unreasonable	Automatically after detachment Clear
	Reverse prohibition limit	1.Reverse limit function trigger 2.in absolute value system,The actual position of the motor encounters or reverses the soft limit		Automatically after detachment Clear
	Forward rotation prohibition limit	1.Forward rotation prohibition limit function triggers 2.in absolute value system,The actual position of the motor encounters or forward soft limit		
	replanted	The driver output current reaches the rated torque of the motor. P1-06settings,and lasts longer thanP1-09 set value 1.Too much acceleration 2.Overloaded,Effective torque exceeds rated torque, Continuous operation for a long time; 3.Poor gain adjustment causes oscillation,vibration,Motor vibrates,Abnormal sound; 4.Machinery is hit,Suddenly the load becomes heavier,	1.Are the gain parameters debugged properly?; 2.Whether the motor selection matches the actual load and whether the acceleration and deceleration are excessive big; 3.Check motor cableU,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 When the current is constant, the Automatically clear
	Communication abnormality	Check communication errors when connecting the driver to the host computer	1.Debugging softwareLunaAttempting to establish communication with the drive (this is a normal alarm) 2.Check communication lines and mailing addresses,Is the baud rate set correctly?	After communication is normal Automatically clear
	Parameter saving failed	Failed while saving parameters	Please try saving again	Automatically clear
	AC power output Entering and missing aspects	When three-phase power is supplied, the driver detects a certain phase power input. Entering and missing aspects	1.Connect the power supply correctly,Please refer to4.3 P1Driver power wiring method;	Automatically clear
	Safe torque prohibition stop	Safe torque inhibitSTOFunction is activated,secure input1or secure input2The input optocoupler for at least one of theOpen.	Confirm security input1,2The input wiring status or safety sensor settings are triggered..	STOenter Automatically after normal Clear
	Regeneration potential absorption Failure warning	Regenerative energy exceeds what the regenerative absorption resistor can handle capacity. 1.Due to the large load inertia, the regenerative energy during deceleration is quantity,causing the bus voltage to rise,Insufficient energy absorption by the regenerative absorption resistor causes an increase in the abnormal detection value; 2.Motor speed is too high,Unable to fully absorb the regenerative energy within the specified deceleration time.	1.The built-in regeneration absorption resistor is too small to absorb the regeneration potential; 2.External regenerative discharge resistor does not match,Resulting in the inability to absorb the regeneration potential; 3.Reduce the operating speed of the equipment and increase the acceleration and deceleration time. 4.Reference section4.7 P2-Regenerative energy absorption resistor wiring method	Clear alarm
	Under voltage warning	Driver undervoltage,lower than200VDC 1.Power supply voltage is low.Momentary power outage occurs; 2.The power supply capacity is insufficient. The impact caused by the main power supply is turned on. Impact of shock current,causing the supply voltage to drop; 3Drive failure (circuit failure) 4.Main power supply to the drive is not supplied	Check input voltage 1.Increase power supply voltage capacity,Replace power supply; 2.Connect the power supply correctly,Please refer to4.3 P1-Driver power wiring method; 3.Check the driveL1/L2/L3Terminals and voltage input 4.If the above unresolved problem,Please replace the drive.	Clear alarm,electricity Automatically when pressure is normal Clear
	noneQProgram warning	The drive runs onQmode,But noQProgram running	1.Check if there isQprogram; 2.Check whether the working mode is correct; 3.examineQIs the program written incorrectly?,Cannot run in loop.	Clear alarm

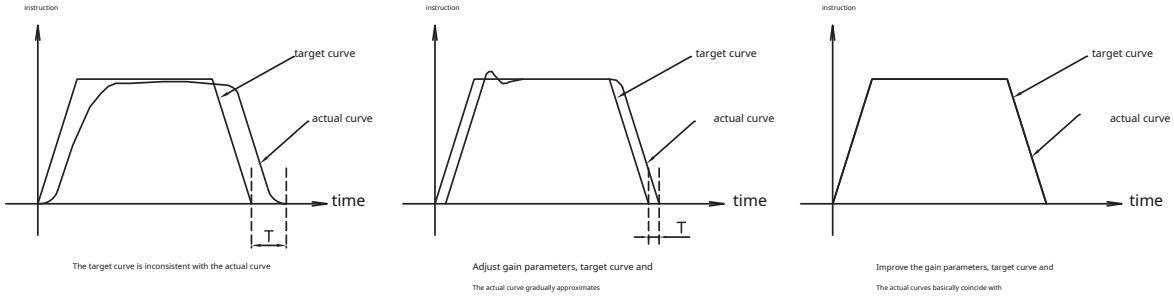
Display content	illustrate	Alarm reason	Approach	Elimination method
r24dd	When the motor is not enabled order it to operate Call the police	When the motor is not enabled,Receive operation command	Please enable the motor first,Send operation command again	Clear alarm Automatically clear
r25ur r26ur	Internal 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.	Power cycle to clear
r27E=	emergency stop	Digital input emergency stop function is triggered	1.Check emergency stop input switch 2.Confirm whether the emergency stop input logic setting is reasonable	Clear alarm
r28FP	Fully closed loop position Error exceeds limit	Full closed loop control position error exceeds the set value	1.examineP3-10,P3-11Is the set value too small? 2.examineCN4Is the external encoder input normal?	Clear alarm
r29FE	second encoder mistake	CN4-Second encoder input abnormality	examineCN4Is the external encoder input normal?	Clear alarm
r30nE	memory error	Drive internal memory abnormality	It cannot be cleared if the power is turned on again.,Please contact the manufacturer.	Power cycle to clear
r3 1bt	absolute value encoding The device battery is under voltage	The battery voltage of the absolute encoder is lower than specified value3.2V	Reminder to replace battery. To prevent the absolute value position from being lost,Please power on the drive Replace the battery if	Automatically clear
r32AP	absolute position lost	The absolute value encoder fails because the battery voltage is too low or the power supply Loss of internal multi-turn absolute position due to power outage. 1.Encoder type configured as absolute,but no battery installed 2.The absolute encoder is used for the first time when it leaves the factory. 3.Battery voltage is too low,Failure to replace the battery in time 4.Replace in case of drive control power outage Battery 5.Poor contact or disconnection of the battery power supply line 6.Absolute encoder,Current location is beyond -2147483647 ~ +2147483648	1.Check whether the battery voltage is lower than2.8V,If it is lower than please replace the battery in time. 2.Please replace the battery when the driver control power is supplied. 3.Check and repair wiring,Allow the battery to power the encoder normally 1)Check encoder wiring 2)Check inside the battery box,Wiring between external and driver	After replacing the battery, Need to perform absolute value Encoder multi-turn clearing Zero operations
r33oP	absolute value encoding Multi-circle overflow	1.The number of absolute encoder turns exceeds the maximum range. surround:-32768 ~ +32767	1.Check whether the actual motor position exceeds the maximum range 2.Out of range,Please perform multi-turn clearing of the absolute encoder 3.If one-way operation is required,Setting parametersP3-15for2(Multi-turn encoders do not count overflow)	perform absolute value compilation Encoder multi-turn clear Automatically clear after
r34nt	Motor overtemperature	The driver detects that the motor temperature exceeds the allowable value	1.Check whether the ambient temperature of the motor is too high 2.Reduce the ambient temperature of the motor and improve cooling conditions; 3.Raise the drive,Motor capacity,Extend acceleration and deceleration time,Reduce load. 4.Is the motor subject to friction from the load? 5.When using a motor with an oil seal,Please derate your usage.The motor output torque should be the rated torque of the motor.70% 6.The temperature rise and torque of the motor are determined by the motor installed on the standard heat sink. measured on,When the motor mounting plate is small,To prevent the motor from overheating,Please derate your usage 7.The motor temperature is normal and cannot be cleared after powering on again.,Please replace the motor	Power cycle to clear
r35Ct	drive handling The device is overheated	Drive processor temperature is too high	1.Check whether the drive installation environment temperature is too high 2.Reduce the ambient temperature of the drive and improve cooling conditions 3.The drive needs to be installed on a metal backplane with good heat dissipation 4.Raise the drive,Motor capacity,Extend acceleration and deceleration time,Reduce load. 5.Replace the fan or send the servo drive for repair 6.The temperature of the drive radiator is normal and the alarm persists after powering on again. old existence,Please replace the drive	Clear alarm

Display content	illustrate	Alarm reason	Approach	Elimination method
	absolute value encoding Multi-turn error	Absolute encoder multiturn error 1.Encoder type configured as absolute,but no battery installed 2.The absolute encoder is used for the first time after leaving the factory.	It is necessary to perform multi-turn clearing operation of the absolute encoder	perform absolute value compilation Encoder multi-turn clear Automatically clear after
	Motor stalled	Operating in non-torque mode,Motor stall time exceeds PassP1-28set time	1.Check whether the mechanical part of the motor drive is stuck 2.Check whether the electromagnetic brake is on	Clear alarm
	EtherCATPass message error	EtherCATCommunication error 1.EtherCATCommunication parameter configuration error 2.EtherCATCommunication interruption	1.examineEtherCATCommunication configuration parameters 2.Check whether the communication line is normal	After the communication is normal, Automatically clear
	Origin return parameter Number of configuration errors	Origin return parameter configuration error 1.Use the return-to-origin method with limit signal,Limit signal is not configured 2.Use the return-to-origin method with origin signal,Origin signal is not configured	Check whether the origin return parameters are configured completely	Clear alarm
	Motor collision Call the police	The servo system detects an abnormal sudden change in the motor current. changes, and the sudden change in current exceeds the parameterP1-34The design Value. 1.Motor-driven loads and other fixed loads produce collision 2.Servo gain setting is unreasonable,Gain is too large 3.motorUWPhase sequence error,Motor speed car 4.parameterP1-34Setting too small	1.Check the motorUVWphase sequence 2.Check whether the servo gain parameters are reasonable 3.Check the load	Clear alarm
	Encoder communication abnormal	The servo system detects communication with the servo motor encoder. An abnormality occurred in the message 1.Coding wires are not wired according to correct definitions 2.There is no encoder cable connected between the driver and the motor. 3.Encoder wire contact is poor or broken 4.Interference causes encoder communication abnormalities 5.Encoder damaged	1.Check that the encoder wiring is correctly defined 2.Check the connection between the encoder wire and the drive and motor 3.Make sure the motor and driver are well grounded 4.The encoder line uses a twisted pair screen with good anti-interference ability. shielded wire 5.Replace the motor and encoder harnesses respectively,Check whether the motor is abnormal	Power cycle to clear
	I/OSignal function Reuse	1.existQused in the programI/OThe function of the signal is a non-general function 2. SCLused in instructionsI/OThe function of the signal is a non-general function	1.make relevantI/OThe signal function is configured as a general function 2.The use function is a general functionI/OSignal	Clear alarm

10Servo gain tuning

Servo gain tuning is a function that optimizes the responsiveness of the servo unit..

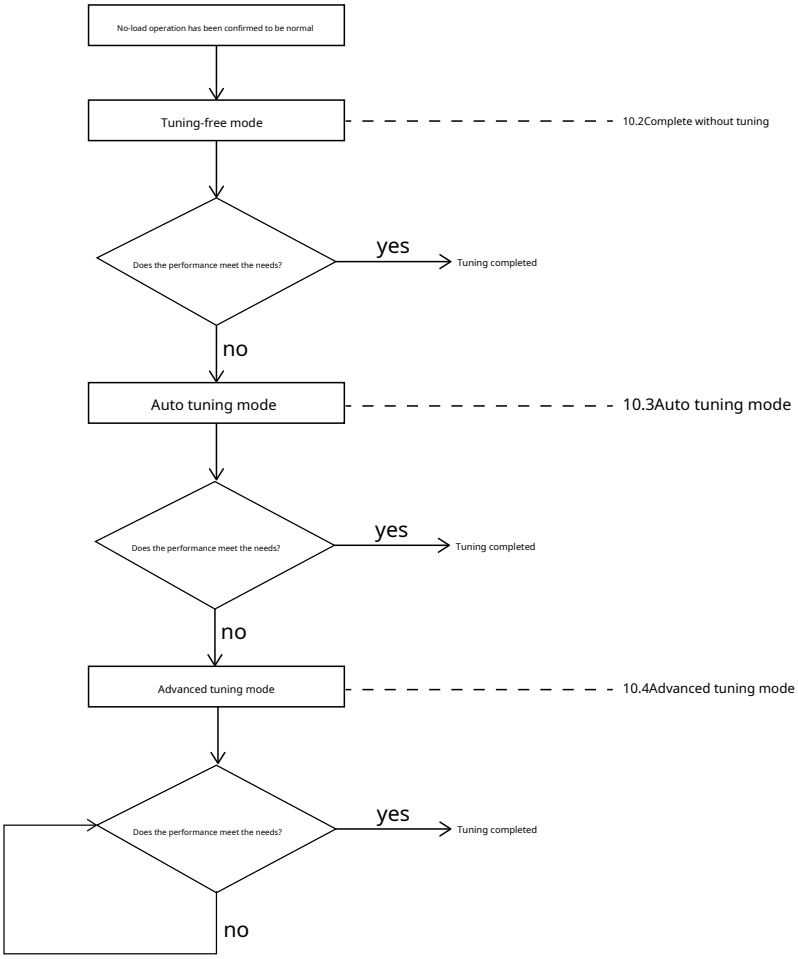
For instructions from the upper-level system,The driver needs to drive the motor according to the instructions without delay as much as possible and accurately..In order to make the motor action closer to the instruction,Maximize mechanical performance,This requires gain adjustment.



10.1Introduction to servo debugging process and modes

10.1.1Servo debugging flow chart

The servo debugging flow chart is as follows,Before starting servo debugging,It should be ensured that the servo system follows the chapter6Trial run,Can run normally.



10.1.2 Introduction to parameter tuning mode

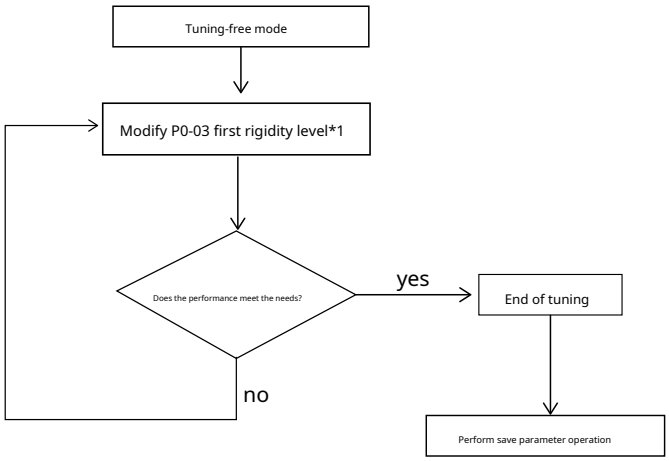
Servo parameter tuning has multiple modes to choose from,by parametersP0-00set up.

parameterP0-00 set value	Parameter tuning mode	Manually modify valid parameters	introduce
0	No need for tuning	P0-03First rigidity level P0-04Second rigidity level	In "tuning-free mode",The servo system is in a relatively stable but low rigidity state,At this time, the inertia ratioP0-02force default0and cannot be modified. You can try to select an initial stiffness that allows the servo system to move normally.,and gradually adjust the rigidity level,Make servo rigidity meet application requirements.
1	automatic tuning	P0-03First rigidity level P0-04Second rigidity level P0-02Load to inertia ratio	In "auto-tuning mode",The servo system will automatically identify the external load inertia ratio, Automatically selects the appropriate stiffness level,And automatically adjust the following content (manual modification is invalid): ◆ gain (position loop,speed loop) ◆ 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 servo control loop

10.2 Tuning-free mode

"Tuning-free mode" is the default mode of the servo when it leaves the factory.,The servo system is in a relatively stable but low rigidity state,Power on and run immediately after installation, Meets most application requirements.

You can try to select an initial stiffness that allows the servo system to move normally.,and gradually adjust the rigidity level,Make servo rigidity meet application requirements.



Note that in this mode:

◆ Inertia ratioP0-02force default0and cannot be modified.

◆ Other gain parameter modifications are invalid.

◆ When switching gain,The second group of rigidity levelsP0-04efficient

10.3 Auto tuning mode

In "auto-tuning mode",The servo system will automatically identify the external load inertia ratio,Automatically selects the appropriate stiffness level,Automatically optimize and adjust the following content,

- gain (position loop,speed loop)
- Filter (torque filter)

During auto-tuning,The parameters in the table below will automatically change.After automatic tuning is completed,Parameters are automatically stored in the drive.

parameter	name	Is manual modification valid in automatic tuning mode?
P0-02	Load to inertia ratio	yes
P0-03	First rigidity level	yes
P0-05	first position loop gain	no
P0-07	First position loop differential time constant	no
P0-08	First position loop differential filter frequency	no
P0-09	Speed feed forward gain	no
P0-10	Speed feedforward filter frequency	no
P0-11	First command speed gain	no
P0-12	First speed loop gain	no
P0-13	First speed loop integration time constant	no
P0-14	Acceleration feedforward gain	no
P0-15	Acceleration feedforward filter frequency	no
P0-16	First command torque filter frequency	no

10.3.1 Automatically adjusted motion trajectory conditions

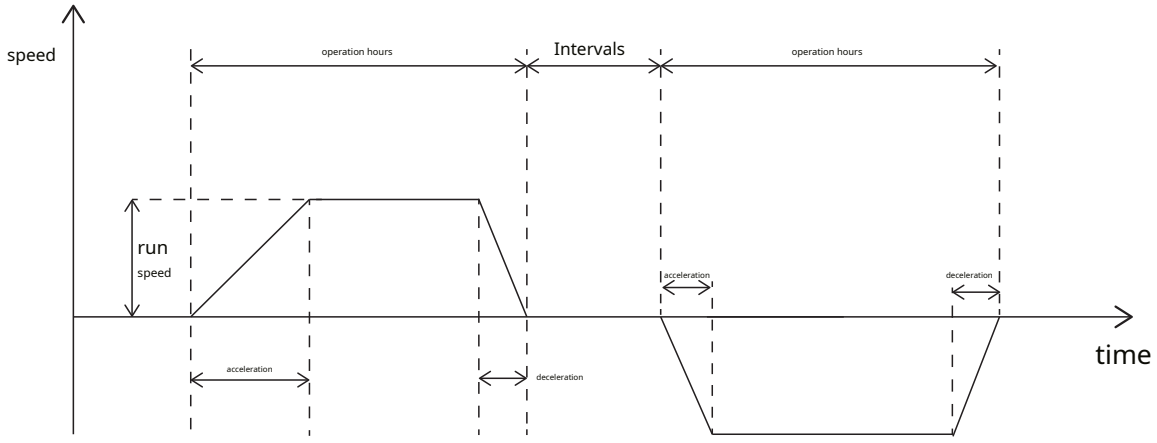
In order to accurately complete automatic parameter tuning,A reasonable movement trajectory needs to be set,Include enough itinerary,Running speed,operation hours,Acceleration, deceleration and interval time between two movements.

operation hours:more than the0.5Second

Running speed:more than the180rpm

acceleration/deceleration:more than the

30rps/s Intervals:more than the1.5Second

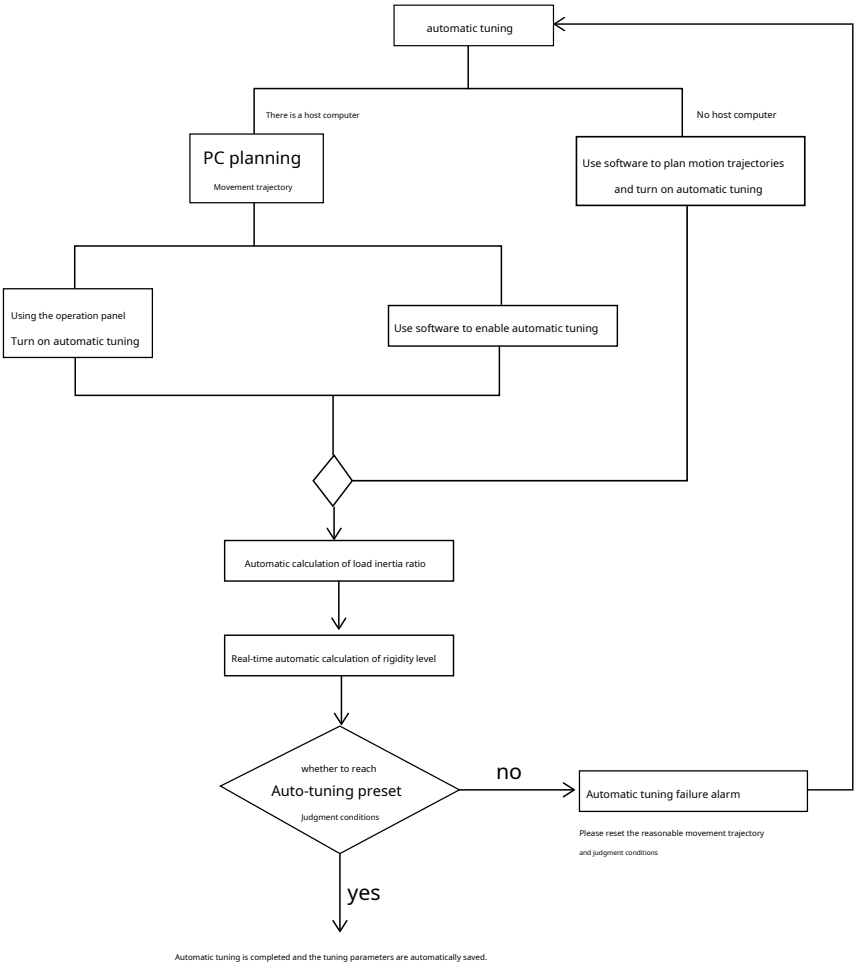


Before starting automatic tuning,P0-03The rigidity level is recommended to be5.

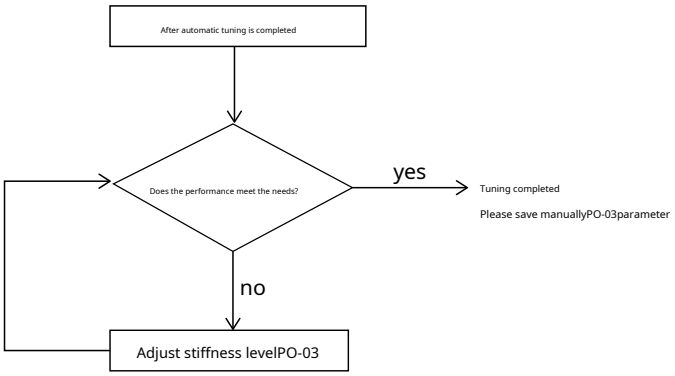
10.3.2 Automatic tuning flow chart

Users can passLunaAutomatic parameter tuning and debugging using software or the operation panel on the driver. The flow chart of

automatic tuning is as follows



After completing automatic tuning,You can continue to use parametersP0-03,P0-04Adjust servo response and stiffness.



10.3.3 Start automatic tuning--via operation panel

The driver button starts the automatic tuning process:

(1)Press"MODE"key,Switch to "functional mode",show"F 0 0 FL”

(2)Press the Up Arrow or Down Arrow key,show"F 1 0 AT”

(3)Press""SET"key,And turn on the automatic tuning function and enter the display interface,show"A t – in”

(4)Command the motor to start moving according to the planned motion trajectory

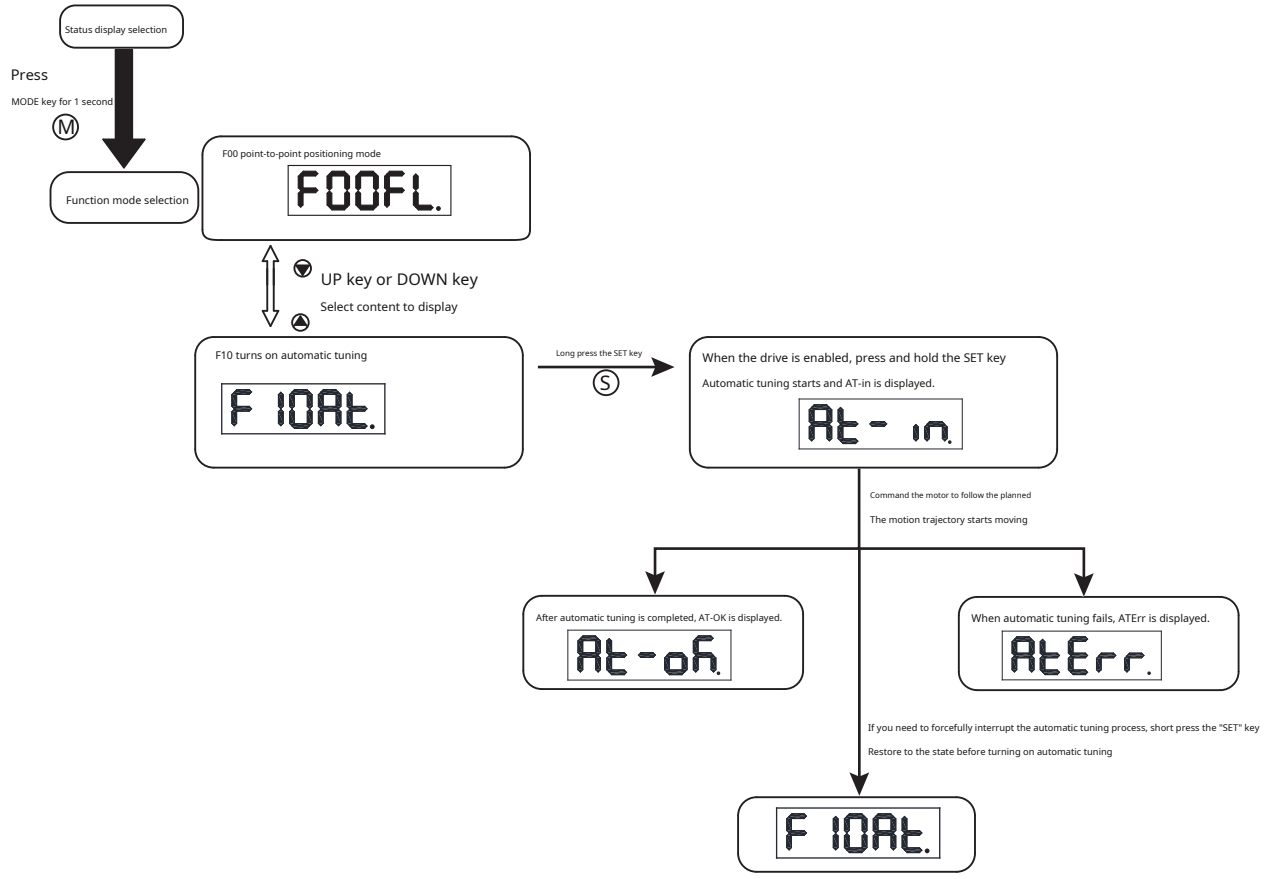
(5)If an error occurs,show"AtErr",dog""SET"key to exit the error message

(6)After the automatic tuning process ends (including forced interruption),show"A t-ok”

(7)If you need to forcefully interrupt the automatic tuning process,dog""SET"key,Restore to the state before turning on automatic tuning

Notice:

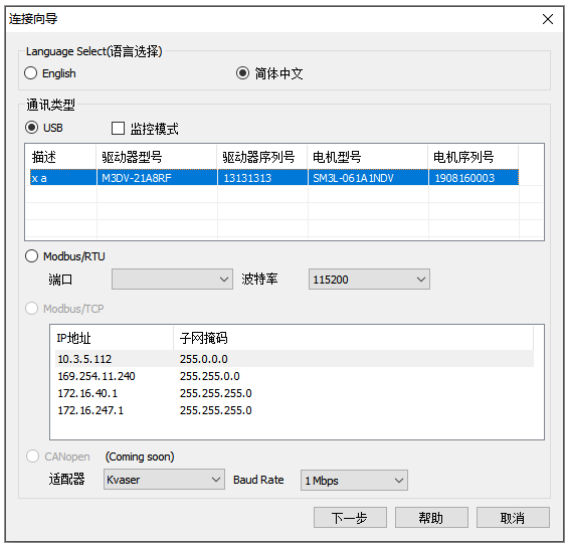
Before starting automatic tuning,The servo drive needs to be in the enabled state,Otherwise it will produceAtErralarm



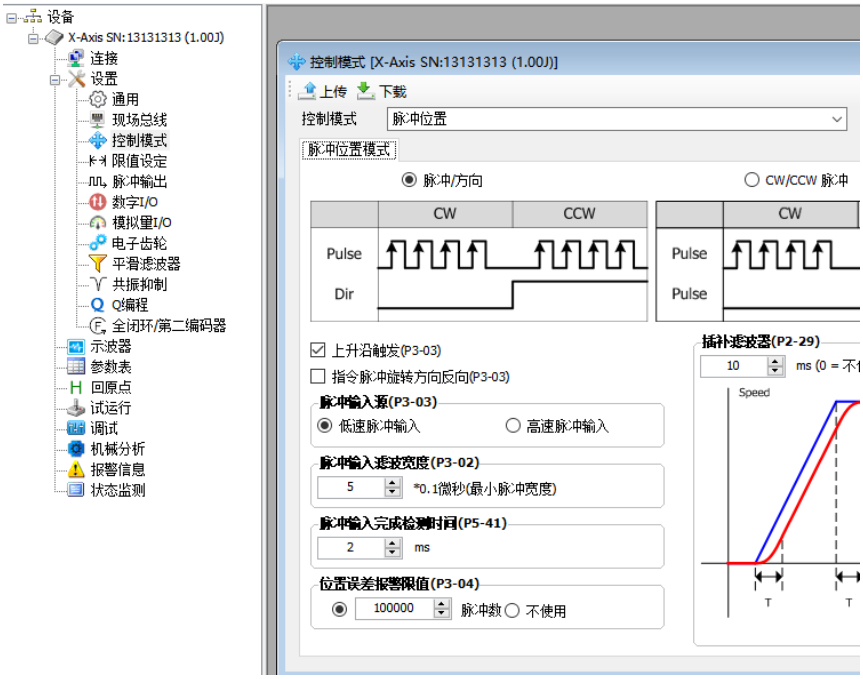
10.3.4 Start automatic tuning--Software operation is enabled

Recommended UseLunaThe software starts automatic parameter tuning,Proceed as follows.

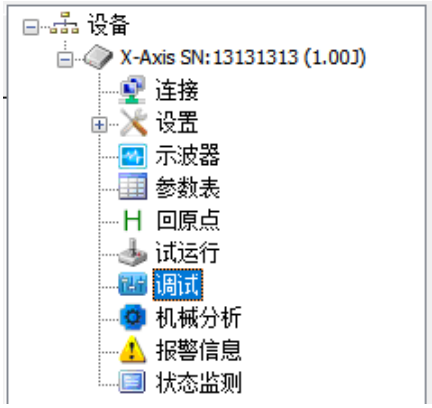
step one:Use the connection wizard----select the drive to be connected----click "Next" to establish communication with the drive



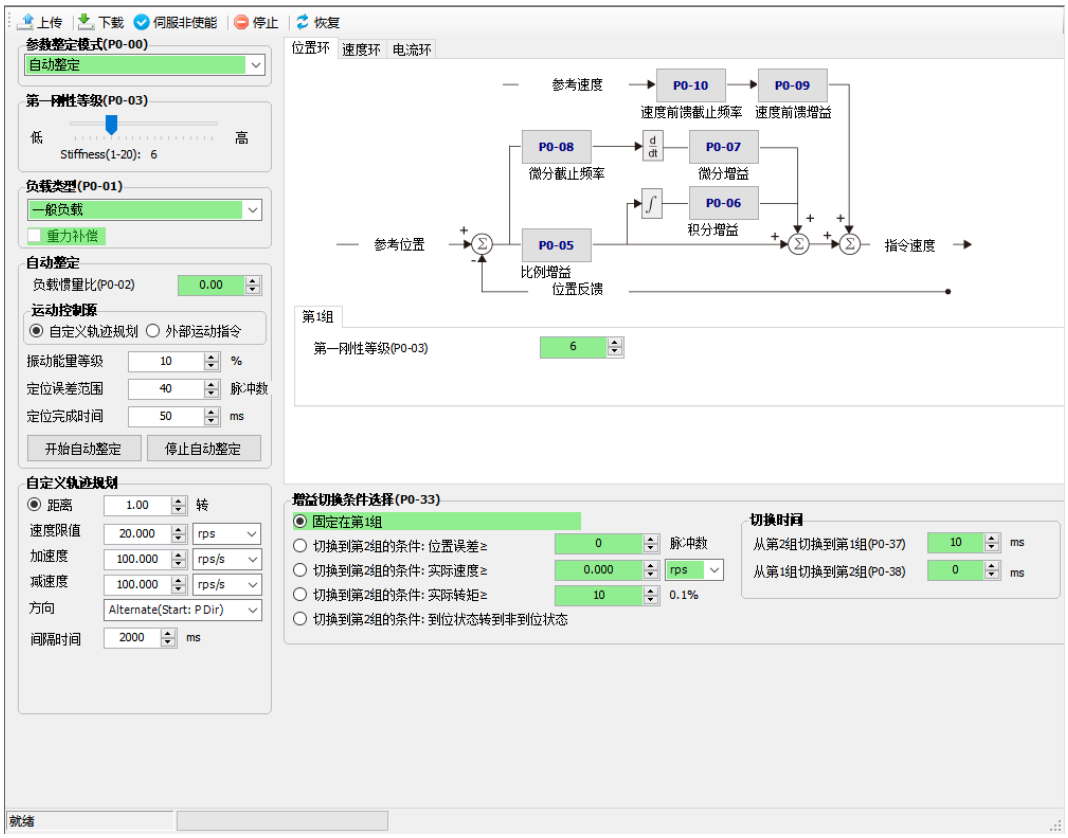
Step 2:The control mode is set to position control



Step 3:Select the "Debug" function in the tree interface on the left



Step 4:In the debugging interface,Set the parameter tuning mode to "automatic tuning"



1)First rigidity level:

Set an appropriate first stiffness level (P0-03),when running for the first time,The general recommended value is "5"

2)Load type

based on current load,Select the corresponding load type

Load type	illustrate
General load	Suitable for most loads except belt loads
rigid load	Horizontal turntable with excellent mechanical rigidity,Ball screw, etc.
Flexible load	Suitable for belts,Loads with poor rigidity such as chains

3)Load to inertia ratio

If the current load to inertia ratio is known,Then input it into "load inertia ratio (P0-02)"middle,Can improve system rigidity,Speed up automatic tuning.If the current load inertia ratio is not known,There is no need to fill in,The system will automatically identify the load inertia ratio.

4)motion control source

Customized trajectory planning:Generate trajectories using the software's "custom trajectory planning"

External motion command:Select this when using the host computer to send motion trajectories

5)Auto-tuning constraints

Vibration ability level:After setting the automatic tuning,The maximum torque vibration value that the servo system needs to meet;The larger the setting value,After automatic tuning, the system becomes more rigid..

Positioning error range:After setting the automatic tuning,The maximum position following error value that the servo system needs to meet;The smaller the setting value,After automatic tuning, the system becomes more rigid..

Positioning completion time:After setting the automatic tuning,The maximum settling time that the servo system needs to meet for positioning completion;The smaller the setting value,After automatic tuning, the system becomes more rigid.

The above parameters generally do not need to be set,Just use the software's default values. Modifying the above parameters can optimize the results of automatic tuning,However, values that are too extreme will cause the tuning effect to deteriorate.,System oscillates and is unstable.

Step 5,Start automatic tuning

After the above configuration selection is completed,Click the "Start Automatic Tuning" button to start automatic parameter tuning..Users can choose to use external motion instructions 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/deceleration:more than the

30rps/s Intervals:more than the1.5Second

1)Use external motion instructions

Click the "Start Auto-Tuning" button,Use the host computer to directly send motion instructions.

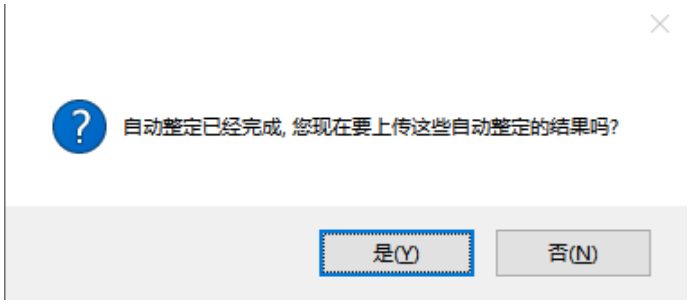
2)Customized trajectory planning

Users can also use custom trajectory planning.

Set a reasonable motion trajectory according to the above motion conditions,Click the "Start Auto-Tuning" button.

3)Complete automatic tuning

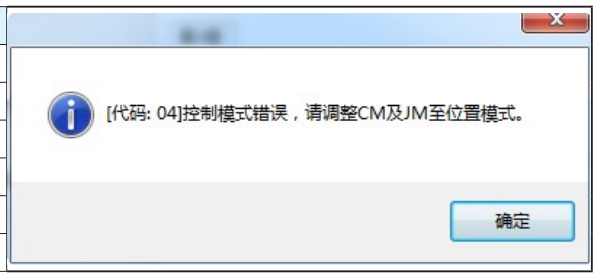
When the automatic tuning is successfully completed,The adjusted parameters will also be automatically saved to the drive.,And the following dialog box prompts.After confirming the upload,It can be seen that the first rigidity level and load inertia ratio have been updated..



4)Error message

If the tuning cannot be completed normally, the following error message box will appear.,represent

error code	reason
01	Positioning time timeout,It is recommended to increase the initial rigidity
02	Exercise interval is too short,It is recommended to increase the waiting time
03	During the tuning process, the rigidity dropped to the lowest point.,It is recommended to gradually increase the vibration energy level
04	Control mode error,Please adjust the control mode to position mode
05	Servo is not enabled,Please turn on the servo enable state
06	Tuning mode error,Please switch to automatic tuning mode



10.4 Advanced tuning mode

Advanced tuning mode is suitable for the following situations:

1)When automatic tuning never completes

2)After automatic adjustment,by adjustingP0-03rigid andP0-02Inertia ratio,The response of the servo system still does not meet the requirements

3)Fully understand the characteristics of the parameters of each servo control loop,You can decide the servo gain parameters by yourself. Use advanced tuning to adjust the servo system gain in more detail.,Meet the need for higher servo system rigidity,Faster response time and minimum settling time in case of.

10.4.1 Introduction to advanced tuning modes

Servo gain is controlled through multiple parameters,For example:Load to inertia ratio,Rigidity level,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 integration time constant, Torque filter frequency (KC).

So-calledPIDParameter tuning is to debug these parameters to meet the performance requirements of the motion system..Normally,Highly rigid machinery can improve responsiveness by increasing servo gain.But for machinery with low rigidity,When increasing the servo gain,May cause vibration, thus failing to improve responsiveness.

1)After the tuning mode is switched from "automatic tuning" to "advanced tuning",The parameter values after automatic tuning will be inherited.,After the adjustment is completed, it needs to be saved manually..

2)Switch directly from "tuning-free mode" to "manual tuning mode",The parameter values of the tuning-free mode will be inherited.,Need to manually adjust the appropriate inertia ratioP0-02.

10.4.2 Parameters in advanced tuning mode

parameter	instruction	name	type
P0-01	LY	Load type	
P0-02	NR	Load to inertia ratio	
P0-03	KG	First rigidity level	First set of gains
P0-04	KX	Second rigidity level	
P0-05	KP	first position loop gain	
P0-07	KD	First position loop differential time constant	
P0-08	KE	First position loop differential filter frequency	
P0-09	KL	Speed feed forward gain	
P0-10	KR	Speed feedforward filter frequency	
P0-11	KF	First command speed gain	First set of gains
P0-12	VP	First speed loop gain	
P0-13	VI	First speed loop integration 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	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	
P0-25	XP	Fully closed loop - position loop gain	When using gain switching The first set of gains under fully closed loop
P0-27	XD	Fully closed loop - position loop differential time constant	
P0-28	XE	Fully closed loop - position loop differential filter frequency	
P0-29	XF	Fully closed loop - command speed gain	
P0-30	XV	Fully closed loop-speed loop gain	
P0-31	XG	Fully closed loop-speed loop integration time constant	
P0-32	XC	Fully closed loop - command torque filter frequency	
P0-39	LR	Speed feedback filter	

Notice:

1)When using gain switching,The second set of gains is effective.

2)When in fully closed loop mode,**P0-25 ~ P0-32**is the first set of gain parameters

10.4.3 Servo system parameter description

The servo system consists of a current loop,speed ring,Position loop composition,The more inner the loop,The greater the need to improve its responsiveness.If this principle is not followed,Will cause poor response or vibration.

When you need to improve response

1)Increase rigidity level

2)Increase position loop gain

3)Increase speed loop gain

4)Reduce the speed loop integration time parameter

The system has overshoot,vibration

1)Reduce rigidity level

2)Reduce position loop gain

3)Reduce speed loop gain

4)Increase the speed loop integration time parameter

5)Reduce torque filter frequency

6)Properly adjust the differential filter frequency

If you change a parameter,Other parameters also need to be readjusted.Please do not make major changes to just one parameter.Generally with5%Left and right as a rough standard,Make slight adjustments to each servo gain.About the steps to change the servo parameters,Generally, please abide by the following content.

10.4.3.1 Gain parameter of position loop:

◆ Position loop gain

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

Set the stiffness gain of position control.Increasing this parameter can improve the responsiveness of the system,Reduce position error,Shorten positioning time. 0Indicates not to use,20000means maximizing the proportional effect. When the position loop proportional gain is too small,Will cause the system to not respond quickly enough,Position error decreases slowly. But if the setting is too large,It 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	default value	scope	unit	Related patterns			
P0-07	KD	First position loop differential time constant	0	0~30000	ms	P	S	T	

Set the position loop differential time constant of position control.

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

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

When the differential time constant (KD)When the setting value is reasonable,The system's ability to suppress vibration is significantly enhanced,and quickly stabilized. When the differential time constant (KD)The setting value is too small,The motion system will be too sensitive,Extremely prone to vibration and noise. When the system vibrates,The differential time constant can be adjusted appropriately,The starting value is recommended to be2000.

10.4.3.2 Gain parameter of speed loop

◆ Speed loop gain

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-12	VP	First speed loop gain	183	0~30000	0.1Hz	P	S	T	

Parameters for setting speed loop responsiveness.The larger the setting value,The faster the speed loop responds.

In order to improve the overall responsiveness of the servo system,without causing system vibration,Need to increase the rigidity of the speed loop.Excessive setting will cause vibration.

The simplest part of the speed loop is the proportional gain orVPitem.The driver applies current to the motor in a manner proportional to the error.For example,If the motor does not move,and turn the shaft by hand or other force,The driver will increase the motor current,until the motor returns "0"speed.Motor from "0"The faster you move,The reverse torque will increase the more.VPitem (also known asVPgain) control for a given speed error (Vn)amount of torque that will be applied .Generally speaking,Greater load inertia or load friction requires greater torque,Therefore a higherVP Gain.

usually,Applications or machines requiring high speed and precision require higher frequency response bandwidth.To improve the overall response of the servo system,Reduce position following error,Need to increase the speed loop gain value.Setting it too high can cause vibration.Speed loop response frequencyP0-12must be higher than the response frequency of the position loopP0-05high4-6times;otherwise,The machine may vibrate or may cause overshoot during positioning

whenP0-02(Automatically estimated or manually set value) is equal to the actual inertia ratio (JL/JM)hour,The actual speed loop frequency response isP0-12set value.

◆ Speed loop integration time constant

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-13	VI	First speed loop integration time constant	189	0~30000	ms	P	S	T	

Set the integral time constant of the speed loop.

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

Under only proportional gain control,Speed error may not return to zero,Or it may take a long time to return to zero.The integration time constant accumulates all errors and works with the 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 setting value is too large,System response will be slower,Poor followability.

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

10.5resonance suppression

Mechanical systems have inherent resonance frequencies,The servo system may run at a mechanical resonance point,causing increased noise.

M54SSeries servo provided4Types of mechanical resonance suppression functions:

1)Torque filter frequency

2)4Group resonance suppression trap

3)End vibration suppression

4)External disturbance suppression

10.5.1 Torque filter frequency

parameter	instruction	name	default value	scope	unit	Related patterns			
P0-16	KC	First command torque filter frequency	1099	0~40000	0.1Hz	P	S	T	

Filter command torque.The smaller the value,It means the lower the filter frequency,The filtering effect is more obvious.

default value1099Can be used in most situations.Torque filter frequency (P0-16)Must be the speed loop gain (P0-12)of3More than times.

This filter is a single output low pass filter,used toPIDThe output of the controller (that is, the reference current) is low-pass filtered.When setting this value, you need to consider the cutoff frequency required for system operation..

Used in some specific situations,For example, there is vibration in the motor or obvious 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 mechanical resonance,The low-pass filter cutoff frequency can be set below the resonance frequency point,This way the output of the control loop does not excite resonance.

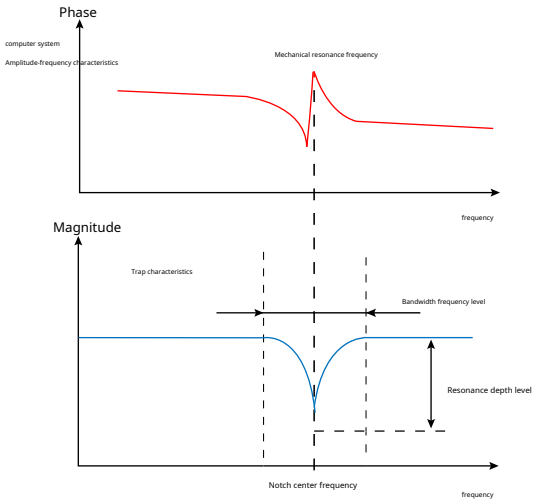
10.5.2 Resonance suppression trap

Lowering the torque command filter frequency can sometimes solve the problem of system resonance.,But it will also reduce the overall response bandwidth of the system,May cause side effects in some cases,On the contrary, resonance cannot be eliminated.If you know the resonance frequency point,Option to use notch filter.

For mechanical high-frequency resonance,Notch filters work by reducing the gain at specific frequencies,Suppress mechanical resonance.Mechanical analysis via open loop,Can detect the resonant frequency of mechanical systems.

If the frequency of the resonance point is not fixed,For example, shifting with time or position,And when the offset is too far from the previous frequency point,,It is not suitable to use a notch filter.

Notice:The center point frequency of the resonance suppression trap must be greater than the torque filter**(P0-16)**of**2**times**.**



supply4group notch filter,Each notch has three parameters,respectively:

- Resonance frequency
- Bandwidth frequency level
- Resonance depth level

The first and second groups are user-defined notch filters.,All parameters need to be set by the user themselves.The third and fourth groups allow you to manually set the parameters of the notch filter.,It can also be set as an adaptive notch filter,At this time, the parameters are detected and automatically set by the driver in real time..

10.5.2.1Adaptive Notch Filter

When a system is suspected of resonance,When 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 resonant frequency is lower than the speed loop gain3times
- 2The distance between resonance points is less than100HzCase

◆ Steps for usage

1)existLunaThe software's "resonance suppression" interface,Set the "resonance suppression filter"3"mode changed to "adaptive",Enable an adaptive filter

2)system runtime,Will automatically detect vibration and take effect immediately.If a new resonance appears,You can choose to turn on the "resonance suppression filter"4"

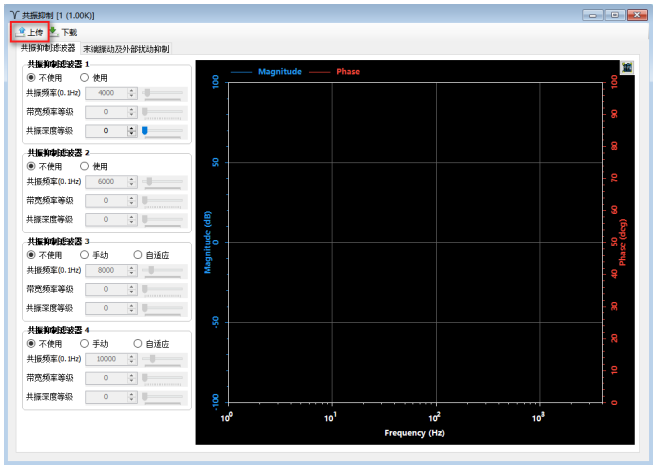
3)system runtime,The third and fourth groups of notch parameters are automatically updated,But it will not be displayed in the software interface.You can view the current resonance frequency point through the software

4)system runtime,The third and fourth groups of notch parameters are automatically updated,but will not save automatically.After the servo system is powered on again,The system is enabled and running,Parameters will be automatically updated again.

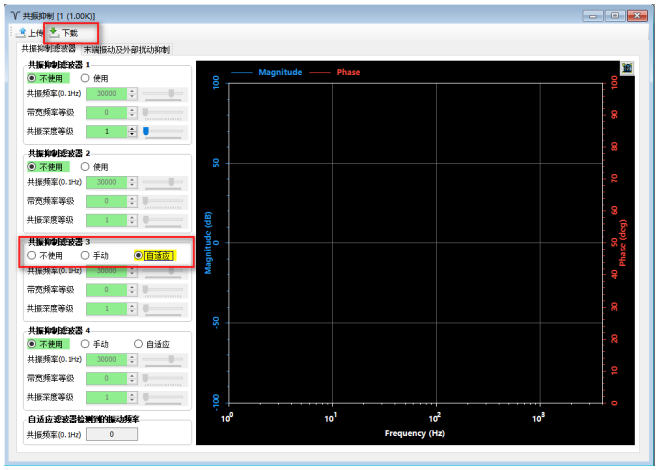
This setting can prevent abnormal operation of the servo system during operation.,Causes notch parameters to be updated to incorrect values,On the contrary, it intensifies the vibration.

◆ 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



Step 2:Set the "resonance suppression filter"3"mode changed to "adaptive",Click download again



third step:After the download is complete,The drive will automatically detect vibration and run immediately.

10.5.3 Mechanical analysis and manual notch filter setting

Analyze resonant frequencies

Manually set notch filter,Need to measure the actual frequency when 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	Analyze servo system resonance in torque mode.Because the loop of the servo controller is not included,Therefore, it can be used to analyze the true resonant frequency of the entire system.,It can even detect vibrations caused by unreasonable parameter settings.	During mechanical open loop analysis,The driver needs to be disabled state,Therefore not suitable for vertical loads
speed closed loop (Velocity Closed-loop)	horizontal load vertical load	Analyzing resonances of mechanical systems in commanded speed mode.At this time, the servo control loop is involved in the work.When using it, make sure that the control parameters of the servo are set appropriately..	◆ The control mode of the drive needs to be at the command speed degree mode,Right nowP1-00The setting value is10. ◆ When performing speed closed loop analysis,The driver needs to be enabled ◆ for vertical loads,When the driver is in the enabled state, ensure that the machine is protected against falling. protective measures.

10.5.3.1 Use mechanical open loop**(Mechanical Open-loop)**How to analyze resonant frequency

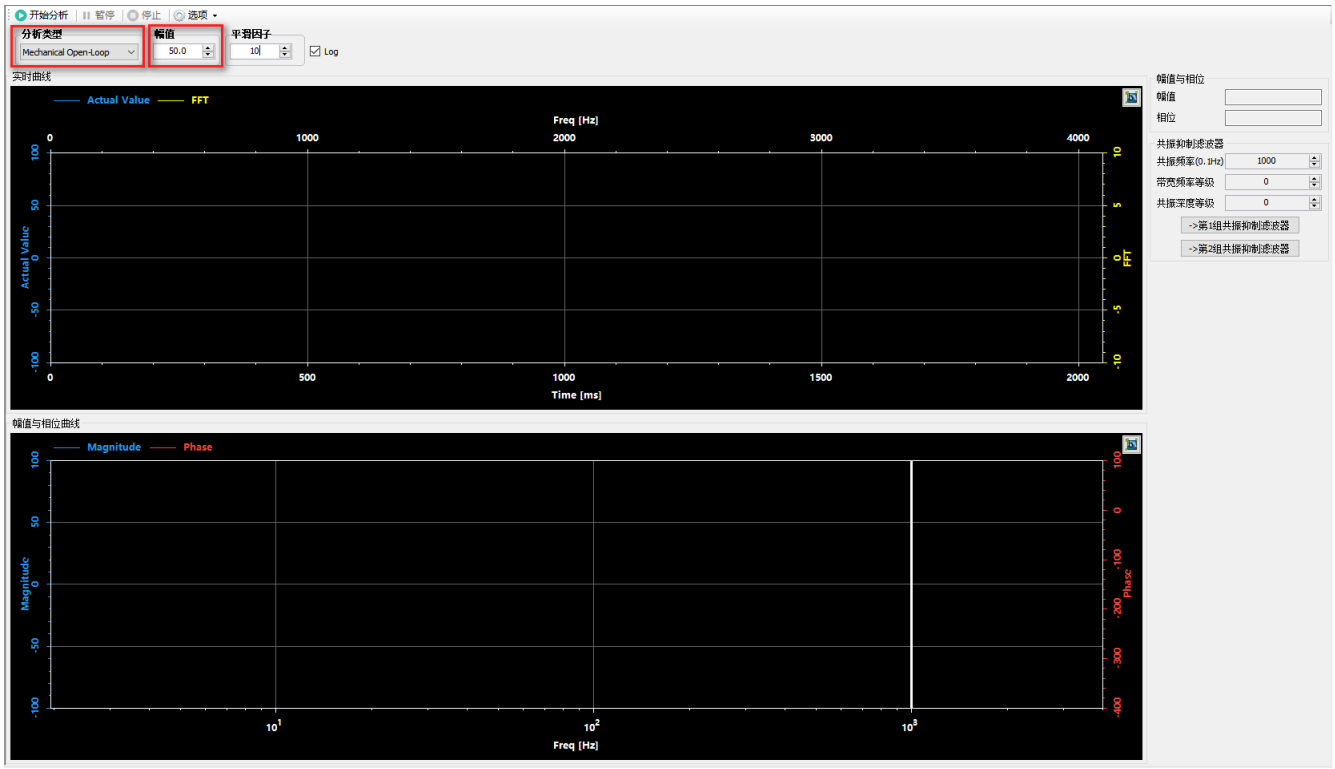
◆ first step

Before performing mechanical open-loop analysis,Need to ensure

- The drive has been commissioned following Chapter 6,The servo system works fine.
- The servo system has completed parameter tuning
- Make sure the drive is not enabled

◆ Step 2

Choose the appropriate amplitude,Let the system vibrate,Note that excessive amplitude may cause mechanical movement.



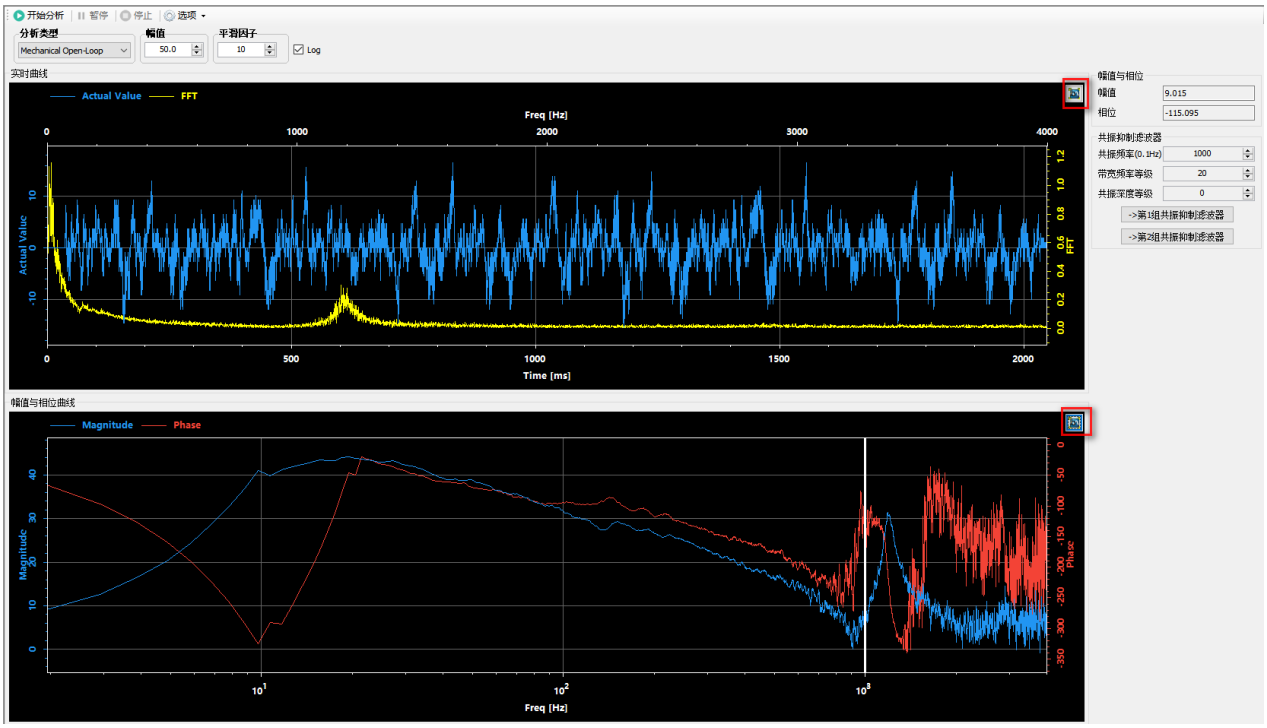
smoothing factor:

Smoothly display the curve,Easy to analyze the frequency point of vibration.The larger the value,The smoother the curve.

◆ third step

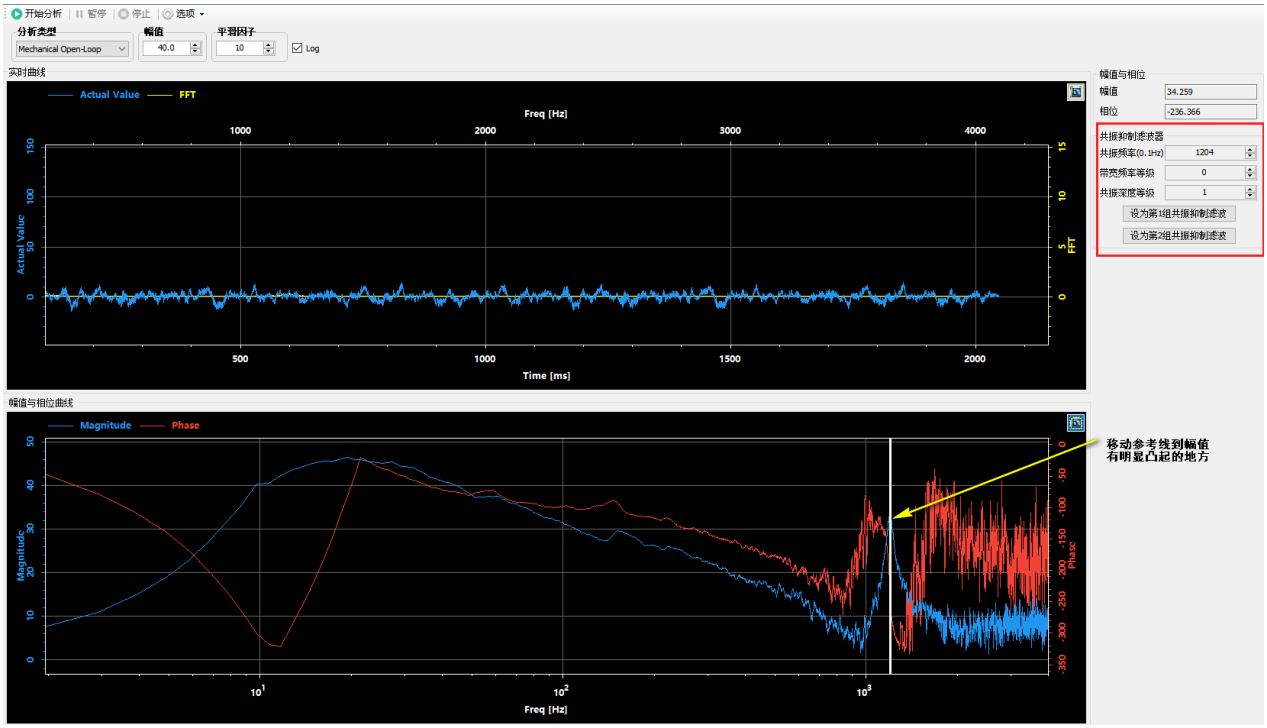
Click the "Start Analysis" button,Servo system starts mechanical open loop analysis,and display the resulting curve. Click the icon in the upper

right corner of the drawing area,Can optimize the display curve.



◆ the fourth step

Move the reference line in the "Amplitude and Phase Curve" to the place where the amplitude curve (blue curve in the figure below) has abnormal protrusions.



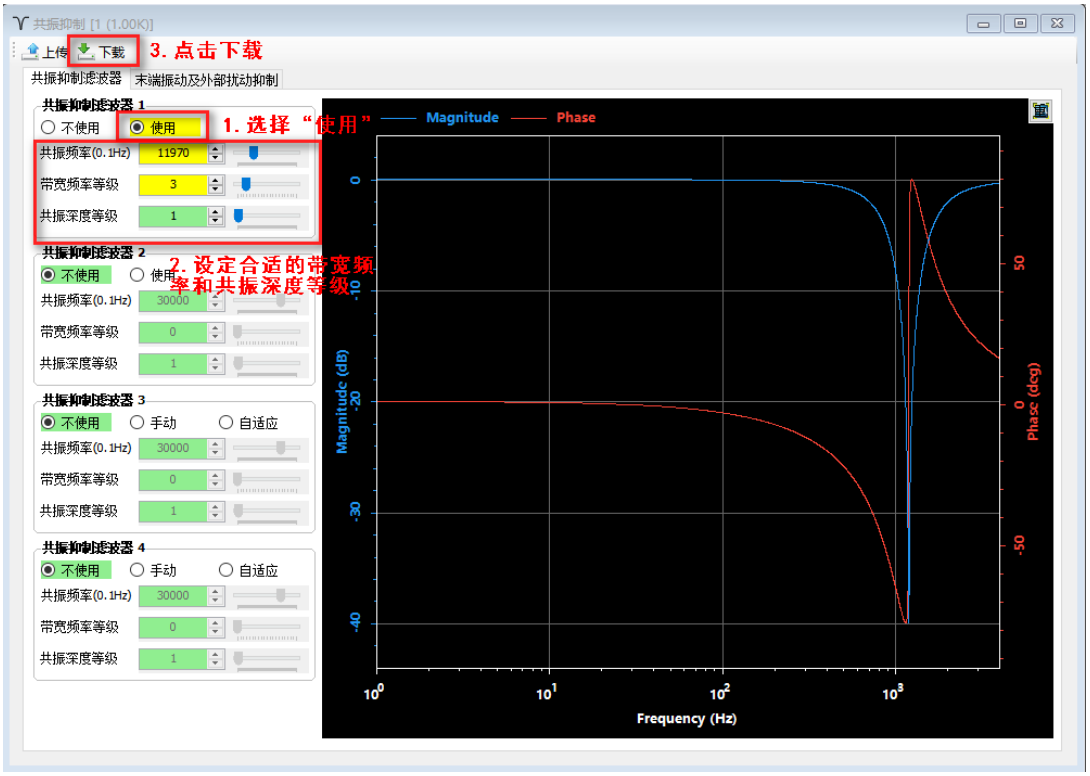
The resonance suppression filter in the red area will display the resonance frequency of the current reference line in real time..

Click "Set as1Group Resonance Suppression Filter" or "Set to1"Group Resonance Suppression Filter" sets the resonance frequency to the resonance suppression filter 1Or

resonance suppression filter2The resonance frequency point of.

◆ the fifth step

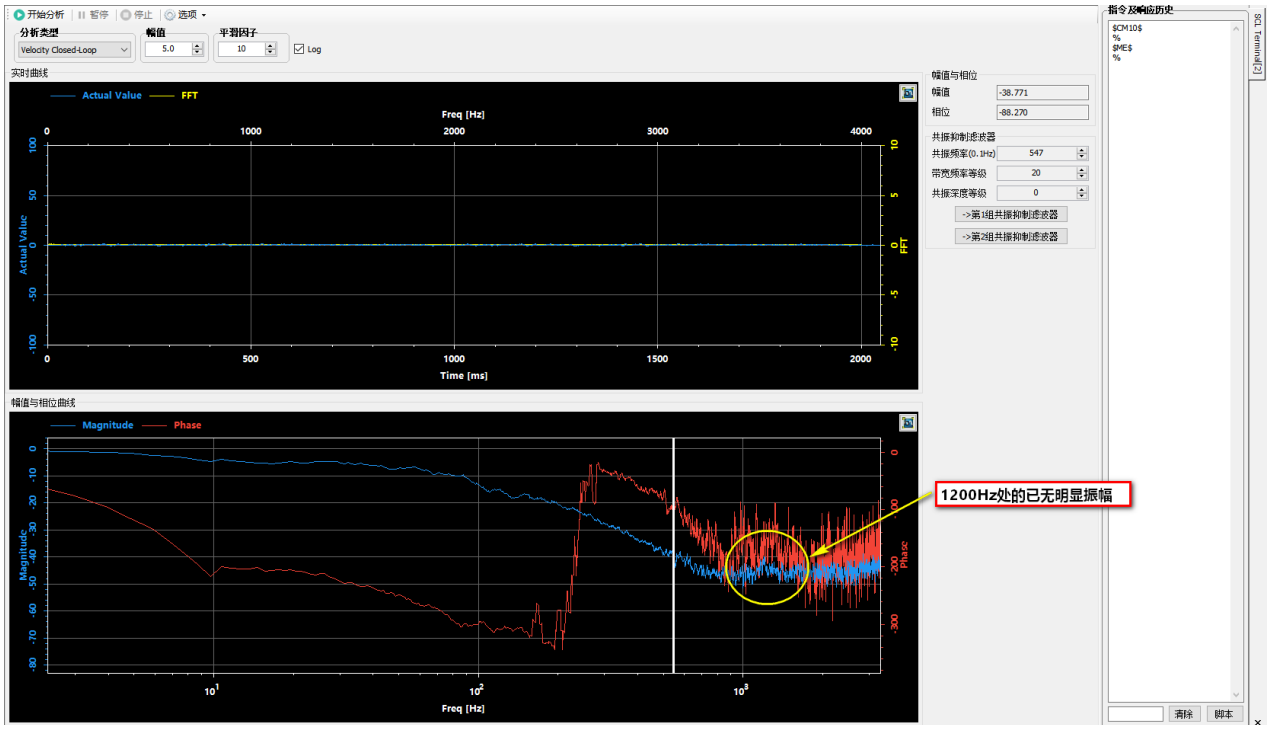
At the resonance suppression interface,Select "Use" to turn on the corresponding resonance suppression filter,Set appropriate "bandwidth frequency level" and "resonance depth level",After clicking "Download",The set resonance suppression trap will start working.



Notice:

1)Mechanical open loop analysis does not include servo controller loops,Therefore, even if the vibration suppression filter is set,When performing mechanical open loop analysis again, The vibration frequency can still be detected.To view the curve after setting vibration suppression,You can use "speed closed loop" for analysis and viewing.

2)The center point frequency of the resonance suppression trap must be greater than the torque filter (P0-16)of2times. The figure below is the result of using "Speed Closed Loop" analysis.



10.5.3.2 Use machine speed closed loop**(Velocity Closed-loop)**How to analyze resonant frequency

◆ first step

Before performing speed closed loop analysis,Need to ensure

- The drive has been commissioned following Chapter 6,The servo system works fine.
- The servo system has completed parameter tuning
- The drive control mode is:Command speed mode
- The drive is enabled
- For vertical axis loads,It is best to use a motor with a brake,Avoid accidental drop of load

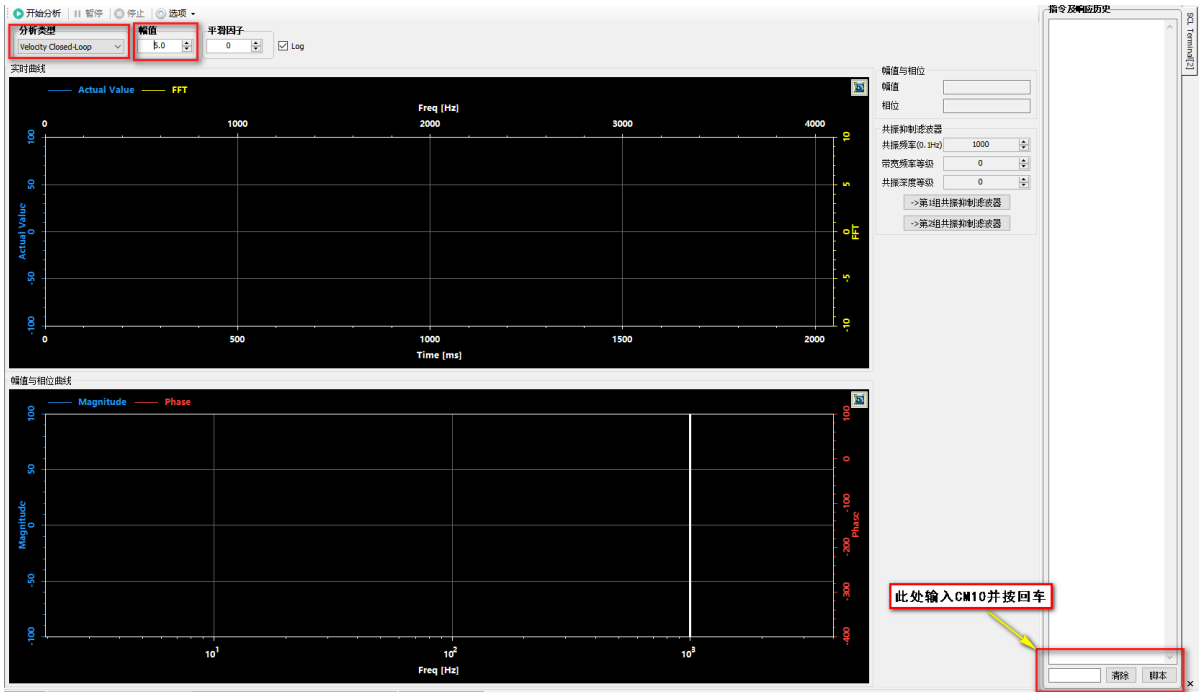
◆ Step 2

1)Choose the appropriate amplitude,Let the system vibrate,Note that excessive amplitude may cause mechanical movement.

2)Open the "Tools" menuSCLterminal"

3)existSCLEnter in the terminal input boxCM10,Set the drive's control mode to:Command speed mode

4)enable driver



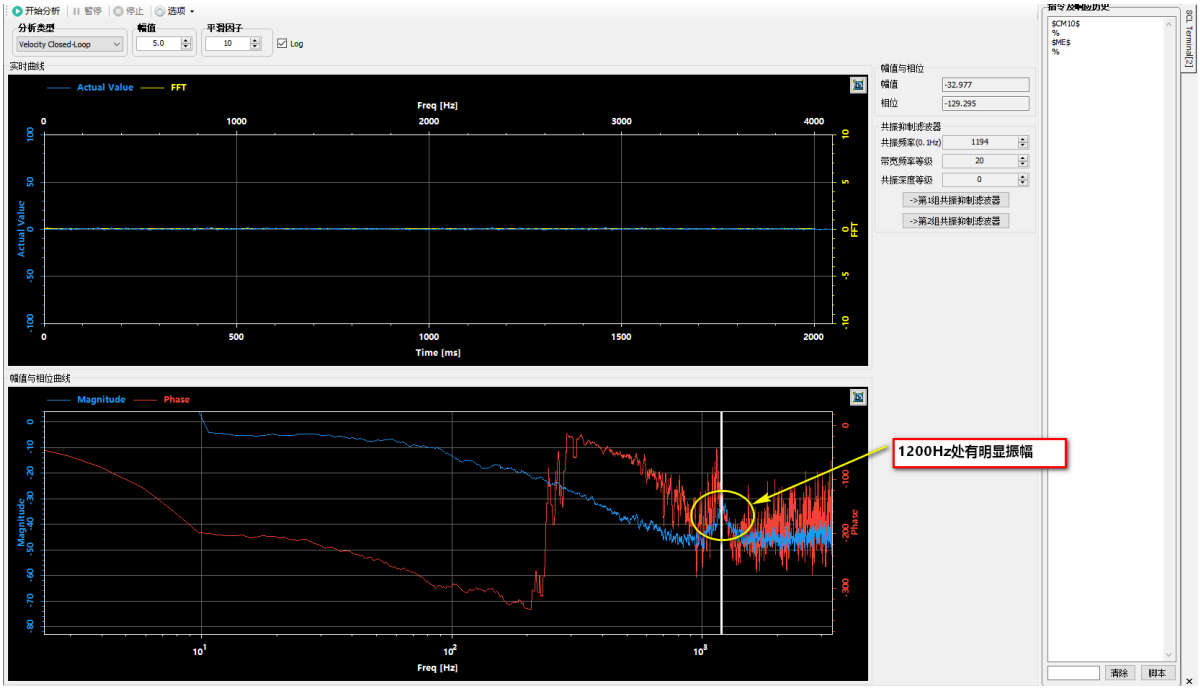
◆ third step

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,Can optimize the display curve.

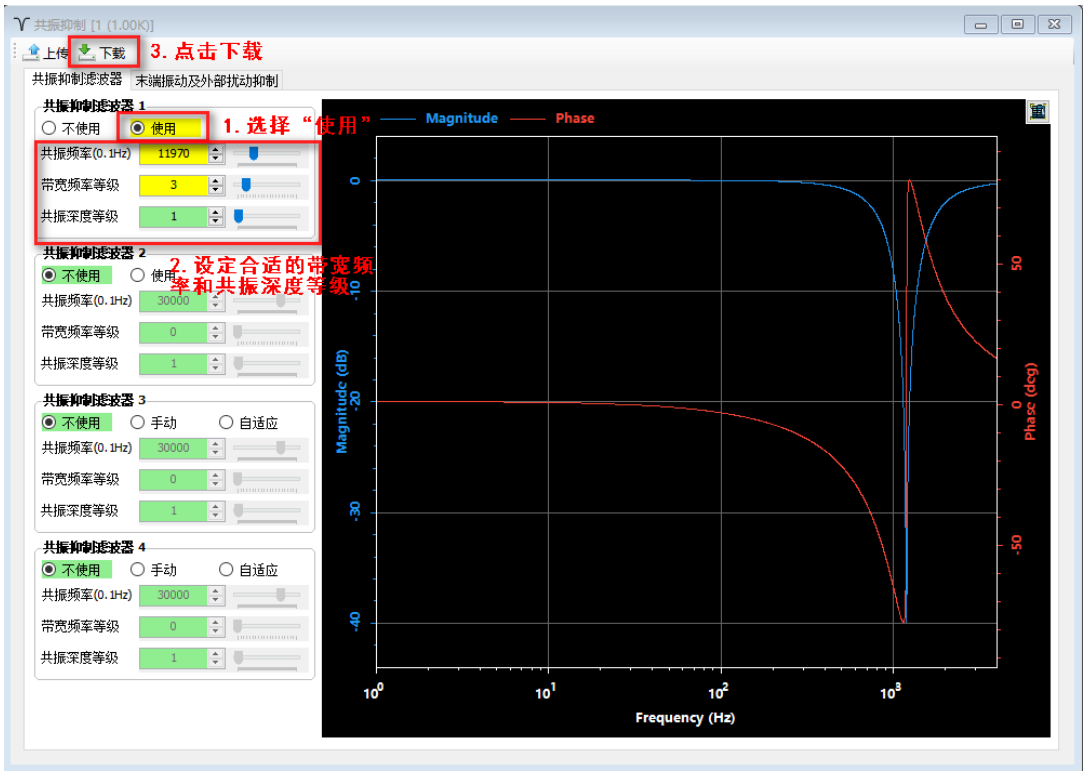
3)Move the reference line in the "Amplitude and Phase Curve" to the place where the amplitude curve (blue curve in the figure below) has abnormal protrusions.

The picture below is in1200HzThere is obvious vibration everywhere,Click "Set as1Group Resonance Suppression Filter" or "Set to1"Group Resonance Suppression Filter" sets the resonance frequency to the resonance suppression filter1Or resonance suppression filter2The resonance frequency point of.



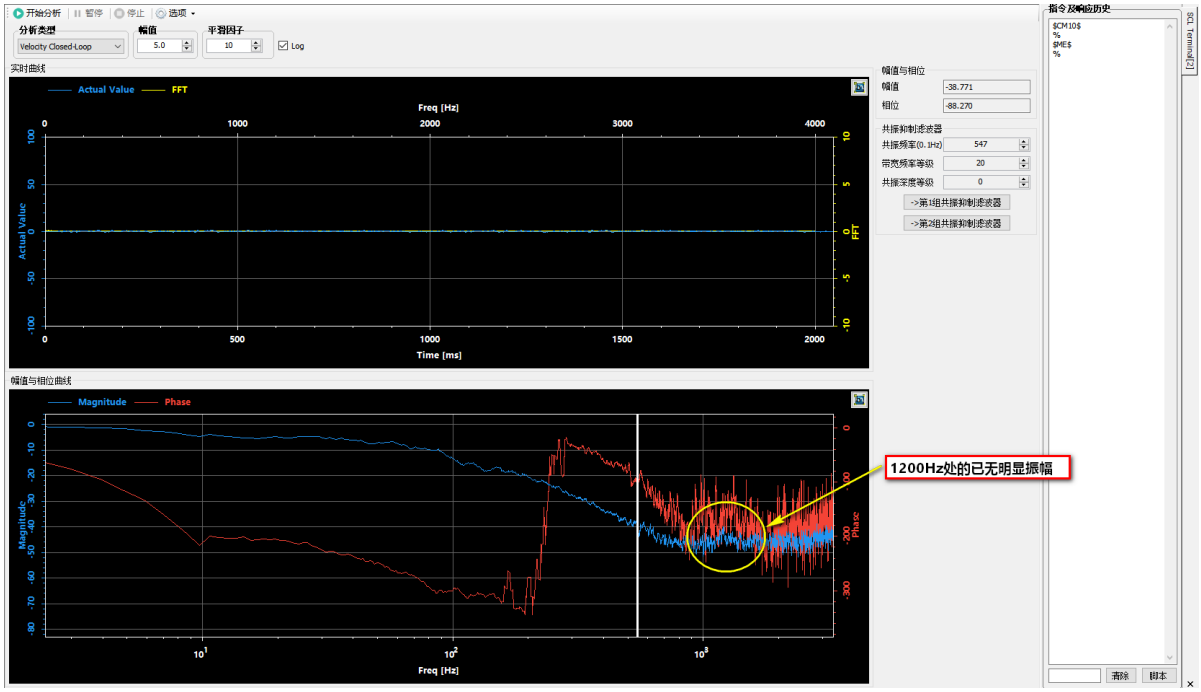
◆ the fourth step

At the resonance suppression interface,Select "Use" to turn on the corresponding resonance suppression filter,Set appropriate "bandwidth frequency level" and "resonance depth level",After clicking "Download",The set resonance suppression trap will start working.



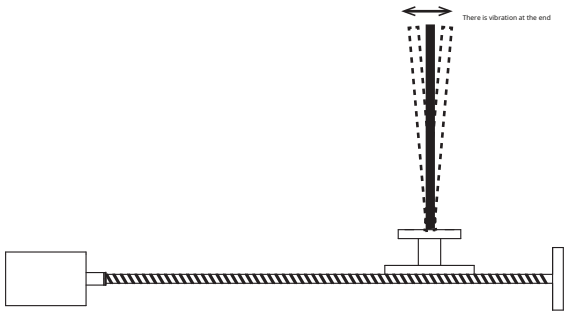
◆ the fifth step

Suppressed results again using Velocity Closed Loop analysis.



10.6 End vibration suppression

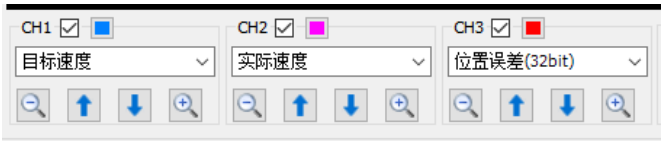
As shown below,The end of the mechanical load due to the longer length,It is easy to produce low-frequency vibration when running and stopping.,This vibration tends to have a lower frequency,Usually in30Hzwithin,But it will affect the positioning accuracy and setting time of the end.



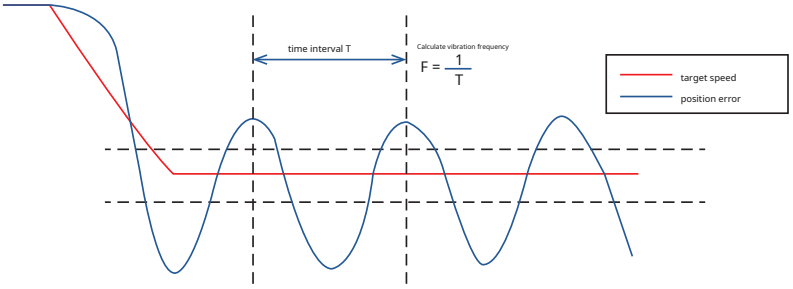
Using end vibration suppression can better suppress such vibrations,Thereby improving the positioning accuracy of the mechanical system and shortening the positioning setting time . Setting method:

◆ first step:Analysis frequency

useLunaOscilloscope function of the software,Observe the curves of "target speed" and "position error" during the motor stop phase.

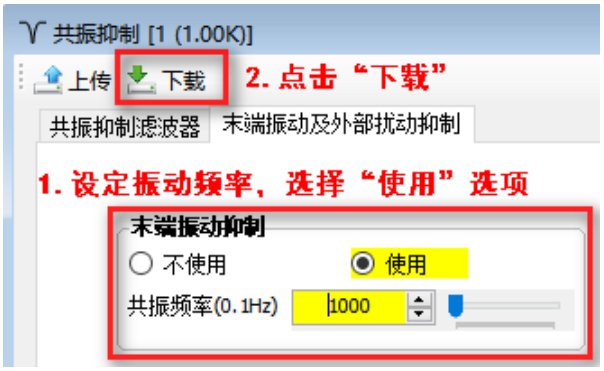


As shown below,After analyzing the target speed as zero,Frequency of position error fluctuations.



◆ Step 2:Set and enable end vibration suppression

existLunaSelect the "Resonance Suppression" function in 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 lead to worse end vibration suppression effect,Even aggravate the vibration
- ◆ only at1-30HzThe vibration frequency within can be well suppressed
- ◆ Vibration caused by reasons other than mechanical terminals,This feature may not work properly

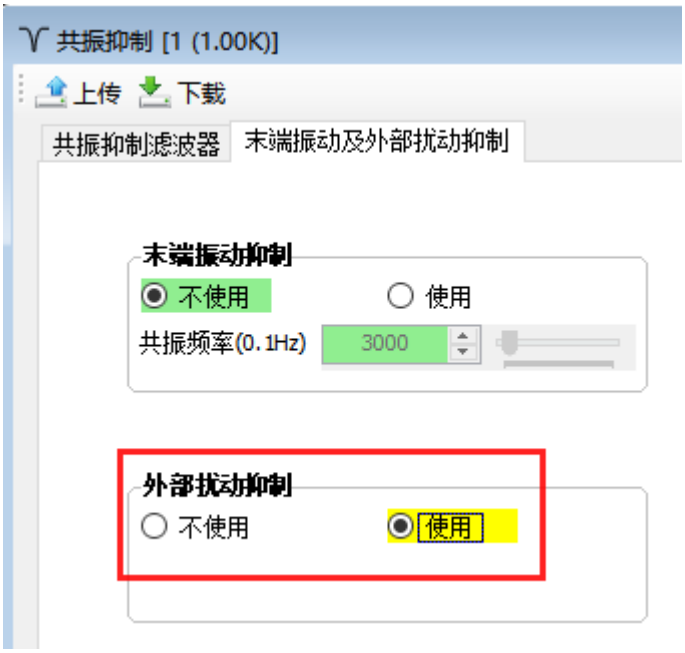
10.7 External disturbance suppression

The 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,causing system instability,Abnormal vibration occurs.

External disturbance suppression function can eliminate such disturbances,and improve system response.

Instructions

existLunaSelect the "Resonance Suppression" function in 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,Terminal disturbance suppression will take effect.



11 ModBus/RTUcommunication

ModBusCommunication has two communication methods,ASCII (American Standard Code for information interchange)Pattern and RTU (Remote Terminal Unit)model,It defines the method of packaging and decoding data transmitted on the bus.M54SSeries AC servo only supportsRTUmodel.

11.1 Modbus/RTUConfiguration

11.1.1Data encoding

The drive uses "Big-Endian”or""Little-Endian"express32Bit data storage.existM54Smiddle,Each register is16 bit word,So in storage32bit data,Need to occupy2register address.

Big-Endian: That is, the high-order bytes are arranged at the low address end of the memory.,The low-order bytes are placed at the high address end of memory.

For example:in register address40011and40012Store one in32bits of data0x12345678,in0x1234is the high byte, 0x5678is the low byte.useBig-EndianDuring storage:

but40031 = 0x1234

40032 = 0x5678

So:To send0x12345678hour,The first byte sent is0x1234,After that0x5678.

Little-Endian:That is, the low-order bytes are arranged at the low address end of the memory.,The high-order byte is placed at the high address end of memory.

For example:in register address40011and40012Store one in32bits of data0x12345678,in0x1234is the high byte, 0x5678is the low byte.useBig-EndianDuring storage:

but40031 = 0x5678

40032 = 0x1234

So:To send0x12345678,The first byte sent is0x5678,After that0x1234. existM54SMedium

parameterP1-13(PR)Defines the encoding type for data transfer to. P1-13(PR) = 5represent

Big-Endian P1-13(PR) = 133representLittle-Endian

11.1.2mailing address

Each slave device in the network must be assigned a unique address,Only slave devices that meet the address requirements will respond to commands issued by the master device.existModbusaddress"0”is the broadcast address,Cannot be used as slave address.Modbus RTU/ASCIIThe next slave station address is from1arrive31 .

parameterP1-16(DA)to setRS-485Slave address in the communication network.

11.1.3 Communication speed and communication protocol

M54SThe communication format of series AC servo is fixed as

- 8,N,1.i.e. data bits:8,Stop bit:1,parity check:None.
- 8,N,2.i.e. data bits:8,Stop bit:2,parity check:None. parameterP1-15(BR)

Defines the baud rate for communication.

Baud rate effective after power-on in serial communication.This value will be saved immediately after being configured but will not take effect immediately.,It will not take effect until the next power-on, Therefore, the host computer software can configure this value at any time..

1 = 9600bps
2 = 19200bps
3 = 38400bps
4 = 57600bps
5 = 115200bps

11.1.4Power-on working mode

parameterP1-02(PM)Configure the power-on working mode of the drive.at presentM54SThe power-on working modes supported by the driver are as follows:: 8 = Modbus/RTUmodel,QProgram does not execute automatically.Automatically enabled when the drive is powered on 9 = Modbus/RTUmodel,QAutomatic program execution.Automatically enabled when the drive is powered on

10 = Modbus/RTUmodel,QProgram does not execute automatically.The driver is in a non-enabled state when powered on.

11.2 Modbus/RTUmessage frame

Modbus RTUThe protocol passes the slave device address (or broadcast),Define the function code for the requested operation,data to be sent andCRCThe check is put into the host query to build the query message;The response message of the slave device also usesModbus RTUMessage structure,Includes slave device address,Function code to request operation,data to be sent andCRCcheck;If an error occurs while receiving the message,Or the slave device does not perform the requested operation.,The slave device will respond by sending an exception message.Modbus RTUThe data frame structure is as follows:

address field	function code	data	CRCcheck
1 BYTE	1 BYTE	n BYTES	2 BYTES

11.3 ModbusSupported function codes

MOONS'driver supportedModbusThe function code is as follows:

- 0x03:Read holding register
- 0x06:Write to a single register
- 0x10:Write multiple registers

11.3.1function code0x03:Read holding register

Read single or multiple holding registers,Maximum reads allowed50register,Broadcast commands are not supported.

example:Read the slave address as1drive status,The register address is40002,Assume that the register value is0x0009.

Host sends data:Command Message(Master)				Return data from the station:Response Message(Slave)		
Function	data	Number of bytes		Function	data	Number of bytes
Slave Address slave address	01H	1		Slave Address slave address	01H	1
Function Code function code	03H	1		Function Code function code	03H	1
Starting Data Address Data starting address (register40002)	00H(High) 01H(Low)	2		Number of Data (In Byte) Number of data	04H	1
Number of Data (In word) Number of data	00(High) 01(Low)	2		Content of Starting Data Address 40002 initial address40002The data	00H(High) 09H(Low)	2
CRC Check Low CRCCheck low byte	D5H	1		CRC Check Low CRCCheck low byte	78H	1
CRC Check High CRCCheck high byte	CAH	1		CRC Check High CRCCheck high byte	42H	1

Host sends:01 03 00 01 00 01 D5 CA

Return from station:01 03 02 00 09 78 42

The data format returned by the exception is:01 83 XX CRC_L

CRC_H in:

- XX = 01H:Reading function codes is not supported03H
- XX = 02H:Illegal register
- XX = 03H:Illegal data area
- XX = 11H:The register does not support reading

Host sendsModbus RTU/TCPThe message is as follows:

Modbusagreement type	MBAPMessage header	address code	function code	Register address	Number of registers	CRCcheck
Modbus RTU	none	01	03	00 01	00 01	D5CA
Modbus TCP	00 00 00 00 00 06 01	none	03	00 01	00 01	none

Return from station deviceModbus RTU/TCPThe message is as follows:

Modbusagreement type	MBAPMessage header	address code	function code	Number of bytes	Data content	CRCcheck
Modbus RTU	none	01	03	02	00 09	78 42
Modbus TCP	00 00 00 00 00 05 01	none	03	02	00 09	none

11.3.2function code**0x06**:Write to a single register

Write to a single holding register,When using broadcast instructions,All slave devices on the bus perform write operations to the same registers. example:

The slave device address is11The drive writes the motor operating speed,The register address is40030,Assume that the motor speed is set to 12.5rps,Then write the data bit12.5 x 240 = 3000,converted to16The base system is12CH.

Host sends data:Command Message(Master)				Return data from the station:Response Message(slave)		
Function	data	Number of bytes		Function	data	Number of bytes
Slave Address slave address	0BH	1		Slave Address slave address	0BH	1
Function Code function code	06H	1		Function Code function code	06H	1
Starting Data Address Data starting address (register40030)	00H(High) 1DH(Low)	2		Starting Data Address Data starting address (register40030)	00H(High) 1DH(Low)	2
Content of Data Data content	01(High) 2C(Low)	2		Content of Data Data content	01(High) 2C(Low)	2
CRC Check Low CRCCheck low byte	19H	1		CRC Check Low CRCCheck low byte	19H	1
CRC Check High CRCCheck high byte	2BH	1		CRC Check High CRCCheck high byte	2BH	1

Host sends:0B 06 00 1D 01 2C 19 2B Return from station:0B 06 00 1D 01 2C 19 2B

The data format returned by the exception is:0B 86 XX CRC_L CRC_H in:

- XX = 01H:Writing function codes is not supported06H
- XX = 02H:Illegal register
- XX = 03H:Illegal data area
- XX = 12H:Register does not support writing
- XX = 13H:The setting value is out of range

Host sendsModbus RTU/TCPThe message is as follows:

Modbusagreement type	MBAPMessage header	address code	function code	Register address	Data content	CRCcheck
Modbus RTU	none	0B	06	00 1D	01 2C	19 2B
Modbus TCP	00 00 00 00 00 06 0B	none	06	00 1D	01 2C	none

Return from station deviceModbus RTU/TCPThe message is as follows:

Modbusagreement type	MBAPMessage header	address code	function code	Register address	Data content	CRCcheck
Modbus RTU	none	0B	06	00 1D	01 2C	19 2B
Modbus TCP	00 00 00 00 00 06 0B	none	06	00 1D	01 2C	none

11.3.3function code**0x10**:Write multiple registers

Write to single or multiple holding registers,Maximum allowed to write50register;When using broadcast instructions,All slave devices on the bus perform write operations to the same registers.

example:The address to the slave station is10drive write target distance,The register address is40031and40032,Assume that the target distance is set to 30000,converted to16The base system is7530H.byBig Endianencoded transmission.

Host sends data:Command Message(Master)				Return data from the station:Response Message(slave)		
Function	data	Number of bytes		Function	data	Number of bytes
Slave Address slave address	0AH	1		Slave Address slave address	0AH	1
Function Code function code	10H	1		Function Code function code	10H	1
Starting Data Address Data starting address (send memory40031)	00H(High) 1EH(Low)	2		Starting Data Address Data starting address (send memory40031)	00H(High) 1EH(Low)	2
Number of Data (In word) number Number of data	00H(High) 02H(Low)	2		Number of Data (In word) number Number of data	00(High) 02(Low)	2
Number of Data (In bytes) number Number of data	04H	1		CRC Check Low CRCCheck low byte	20H	1
Content of First Data Address The data content of the first address	00H(High) 00H(Low)	2		CRC Check High CRCCheck high byte	B5H	1
Content of Second Data Address The data content of the second address	75H(High) 30H(Low)	2				
CRC Check Low CRCCheck low byte	70H	1				
CRC Check High CRCCheck high byte	8FH	1				

Host sends:0A 10 00 1E 00 02 04 00 00 75 30 70 8F Return from station:0A 10 00 1E 00 02 20 B5 The data format returned by the exception is:0A 90 XX CRC_L CRC_H

in:

- XX = 01H:Writing function codes is not supported10H
- XX = 02H:Illegal register
- XX = 03H:Illegal data area
- XX = 12H:Register does not support writing
- XX = 13H:The set value exceeds the range and is sent by the host.Modbus RTU/TCPThe message is as follows:

Modbusprotocol type	MBAPMessage header	address code	function code	register address	register quantity	Number of bytes	Data content	CRCcheck
Modbus RTU	none	0A	10	00 1E	00 02	04	00 00 75 30	70 8F
Modbus TCP	00 00 00 00 00 0B 0A	none	10	00 1E	00 02	04	00 00 75 30	none

Return from station deviceModbus RTU/TCPThe message is as follows:

Modbusprotocol type	MBAPMessage header	address code	function code	Register location site	Number of registers quantity	CRCcheck
Modbus RTU	none	0A	10	00 1E	00 02	20 B5
Modbus TCP	00 00 00 00 00 06 0A	none	10	00 1E	00 02	none

11.4 SCL Instruction encoding table

11.4.1opcode

Modbusregister in register table40125is defined as the opcode register,Towards40125Register writes the corresponding opcode,That is, execute the action of the corresponding opcode,The supported opcodes are as follows::

SCL Command Encoding Table

Function	SCL	Opcode	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Alarm ResetAlarm clear	AX	0xBA	×	×	×	×	×
Start JoggingClick to start	CJ	0x96	×	×	×	×	×
Stop JoggingJog to stop	SJ	0xD8	×	×	×	×	×
Encoder PositionEncoder position	EP	0x98	Position	Position	×	×	×
Feed to Length with Speed Change[2*]With variable speed Fixed length movement	FC	0x6D	I/O Point	Condition	×	×	×
Feed to Lengthrelative positioning	FL	0x66	×	×	×	×	×
Feed to Sensor with Mask DistanceWith shielding distance of movement to the sensor	FM	0x6A	I/O Point	Condition	×	×	×
Feed and Set OutputMove fixed length and output signal	FO	0x68	I/O Point	Condition	×	×	×
Feed to Positionabsolute positioning	FP	0x67	×	×	×	×	×
Feed to Sensormove to sensor	FS	0x6B	I/O Point	Condition	×	×	×
Feed to Sensor with Safety DistanceWith safety belt degree of movement to the sensor	FY	0x6C	I/O Point	Condition	×	×	×
Motor DisableMotor disable	MD	0x9E	×	×	×	×	×
Motor EnableMotor enable	ME	0x9F	×	×	×	×	×
Seek HomeFind the origin	SH	0x6E	I/O Point	Condition	×	×	×
Set PositionSet current location	SP	0xA5	Position	Position	×	×	×
Full Closed-loop Control SwitchFully closed loop mode Change the switch	XM	0x54	0..1	×	×	×	×
Set OutputSet digital output	SO	0x8B	I/O Point	Condition	×	×	×
Wait for InputWaiting for digital input	WI	0x70	×	×	×	×	×
Queue Load & ExecuteimplementQprogram	QX	0x78	1..12	×	×	×	×
Wait Timetiming	WT	0x6F	0.01 seconds	×	×	×	×
Find Home[3*]Find the origin	FH	0xDB	- 4..35	×	×	×	×
Stop Move & Kill Buffer, Max Decel Stop now	SK	0xE1	×	×	×	×	×
Stop Move & Kill Buffer, Normal Decel Stop with deceleration	SKD	0xE2	×	×	×	×	×

Remark:In the table "**×**" symbol indicates not to use

[1*]:**M54S**Series products do not support this opcode product [2*]:Only applies to**STF-D**,**M54S**Series products [3*]:Only applies to**M54S**Series products

example:existMOONS'productSCLIn the command "FL"The instruction indicates the execution of relative position control,existModbusinside,register 40125Write "0x66"(Right nowFLin the coding tableOpcode)That is, perform relative position control. Detailed opcode functionality,Please refer toHOST COMMAND REFERENCEmanual. Detailed usage routines,Please refer toModbusmanual.

11.4.2 I/Oinstruction encoding

Encoding of digital input/output ports and status,The specific codes are as follows:.

character	hexadecimal	describe
'0'	0x30	EncoderZBelieve the signal
'1'	0x31	Digital input/output port1
'2'	0x32	Digital input/output port2
'3'	0x33	Digital input/output port3
'4'	0x34	Digital input/output port4
'5'	0x35	Digital input/output port5
'6'	0x36	Digital input/output port6
'7'	0x37	Digital input/output port7
'8'	0x38	Digital input/output port8
'9'	0x39	Digital input/output port9
':'	0x3A	Digital input/output port10
';'	0x3B	Digital input/output port11
'<'	0x3C	Digital input/output port12
'L'	0x4C	Low level (optocoupler conduction)
'H'	0x48	High level (optocoupler disconnected)
'R'	0x52	Signal rising edge
'F'	0x46	Signal falling edge

example:existMOONS'productSCLIn the command "FS1F”,existModbusinside,register40125Write "0x6B”,40126Write "0x31”,40127Write "0x46”i.e. perform the same control.

11.5 M54Sseries**Modbus**Communication register address table

11.5.1 M54SSeries General Purpose Register

11.5.1 M54SSeries General Purpose Register					
Register	**Access**	**Data Type**	**Units**	**Description**	**SCL Register**
40001..002	Read Only	LONG	— —	Alarm Code (AL) Alarm code (main code)	f
40003..004	Read Only	LONG	— —	Status Code (SC) status code	s
40005	Read Only	SHORT	— —	Digital Output Status (IO) Digital output port status	y
40006	Read Only	SHORT	— —	Digital Input Status (IS) Digital input port status	i
40007..008	Read Only	LONG	pulses	Immediate Absolute Position (IP) reference position	l
40009..010	Read Only	LONG	pulses	Secondary Encoder Position (EQ) Second encoder position	
40011..012	Read Only	LONG	pulses	Encoder Position (EP) Motor encoder position	e
40013..014	Read Only	LONG	pulses	internal use	
40015	R/W	SHORT		Reserved	
40016	Read Only	SHORT	rev	Encoder Multi-turn Data Absolute encoder multiturn data	
40017	Read Only	SHORT	1/240rps	Immediate Actual Velocity (IV) instantaneous actual speed	v
40018	Read Only	SHORT	1/240rps	Immediate Target Velocity (IV1) Instantaneous command speed	w
40019	Read Only	SHORT	0.1℃	Immediate Drive Temperature (IT) Instantaneous drive temperature	t
40020	Read Only	SHORT	0.1℃	Immediate DSP Temperature (IT1) InstantaneousDSPtemperature	
40021	Read Only	SHORT	0.1℃	Immediate Encoder Temperature (IT2) Instantaneous motor temperature	
40022	Read Only	SHORT	0.1V	Immediate DC_Bus Voltage (IU) InstantaneousDCbus voltage	u
40023..024	Read Only	LONG	pulses	Immediate Position Error (IX) instantaneous position error	x
40025	R/W	SHORT		Reserved	
40026	Read Only	SHORT	mv	Analog Input 1 (IA1) Analog input1Voltage	j
40027	Read Only	SHORT	mv	Analog Input 2 (IA2) Analog input2Voltage	k
40028	R/W	SHORT	mv	Analog Output 1 (OA1) Analog output1Voltage	T
40029	R/W	SHORT	mv	Analog Output 2 (OA2) Analog output2Voltage	W (capital)Capital

11.5.1 M54S Series General Purpose Register

Register	Access	Data Type	Units	Description	SCL Register
40030	Read Only	SHORT	— —	Q Program Line Number QThe line number of the program currently executing	b
40031	Read Only	SHORT	0.1%	Immediate Current Command (IC) instantaneous actual current	c
40032	Read Only	SHORT	0.1%	Q Current (IQ) InstantaneousQAxis current	q
40033..034	Read Only	LONG	pulses	Relative Distance (ID) relative position	d
40035..036	Read Only	LONG	pulses	Sensor Position sensor location	g
40037	Read Only	SHORT	— —	Condition Code Compare status codes	h
40038	Read Only	SHORT	— —	Control Mode control mode	m
40039	Read Only	SHORT	— —	Velocity Move State Current motion status of speed mode	n
40040	Read Only	SHORT	— —	Point-to-Point Move State Point-to- point mode current movement status	o
40041	Read Only	SHORT	— —	Q Segment Number QThe segment number of the program currently executed	p
40042	Read Only	SHORT	— —	Model Number Drive model code	
40043	Read Only	SHORT	— —	Sub Model Drive model subcode	
40044	Read Only	SHORT	— —	DSP Firmware Version DSPFirmware version number	
40045	Read Only	SHORT	— —	FPGA Firmware Version NO FPGAFirmware version number1	
40046	Read Only	SHORT	— —	FPGA Firmware Version LA FPGAFirmware version number2	
40047..048	R/W	LONG	pulses	Input Counter Enter count	I (capital) Capital
40049..050	R/W	LONG	pulses	Pulse Counter Pulse input count	S (capital) Capital
40051	R/W	SHORT	— —	internal use	
40052..053	Read Only	LONG	s	Power Up Seconds Drive run time	
40054..055	Read Only	LONG	times	Power On Times Drive startup count	
40056	Read Only	SHORT	— —	Encoder Firmware Version Encoder firmware version number	
40057	R/W	SHORT	— —	internal use	
40058	Read Only	SHORT	— —	internal use	
40059	Read	SHORT	— —	internal use	

11.5.1 M54S Series General Purpose Register

Register	Access	Data Type	Units	Description	SCL Register
40060	R/W	SHORT	1%	internal use	
40061	R/W	SHORT	pulses	internal use	
40062	R/W	SHORT	ms	internal use	
40063	R/W	SHORT	— —	internal use	
40064	R/W	SHORT	— —	internal use	
40065	R/W	SHORT	0~3000	Torque Limit Dynamic CW CWDirectional dynamic torque limit	Y
40066	R/W	SHORT	0~3000	Torque Limit Dynamic CCW CCWDirectional dynamic torque limit	Z(uppercase) (Capital)
40067..68	Read Only	LONG	— —	Alarm Code Alarm code (auxiliary code)	r
40069	Read Only	SHORT	— —	Alarm Buffer 0 Driver error code record8	
40070	Read Only	SHORT	— —	Alarm Buffer 1 Driver error code record1	
40071	Read Only	SHORT	— —	Alarm Buffer 2 Driver error code record2	
40072	Read Only	SHORT	— —	Alarm Buffer 3 Driver error code record3	
40073	Read Only	SHORT	— —	Alarm Buffer 4 Driver error code record4	
40074	Read Only	SHORT	— —	Alarm Buffer 5 Driver error code record5	
40075	Read Only	SHORT	— —	Alarm Buffer 6 Driver error code record6	
40076	Read Only	SHORT	— —	Alarm Buffer 7 Driver error code record7	
40077..78	Read Only	LONG	s	Alarm Buffer 8 Driver error code record8Generation time	
40079..80	Read Only	LONG	s	Alarm Buffer 9 Driver error code record1Generation time	
40081..82	Read Only	LONG	s	Alarm Buffer 10 Driver error code record2Generation time	
40083..84	Read Only	LONG	s	Alarm Buffer 11 Driver error code record3Generation time	
40085..86	Read Only	LONG	s	Alarm Buffer 12 Driver error code record4Generation time	
40087..88	Read Only	LONG	s	Alarm Buffer 13 Driver error code record5Generation time	
40089..90	Read Only	LONG	s	Alarm Buffer 14 Driver error code record6Generation time	
40091..92	Read Only	LONG	s	Alarm Buffer 15 Driver error code record7Generation time	

11.5.1 M54S Series General Purpose Register

Register	Access	Data Type	Units	Description	SCL Register
40093..94	Read Only	LONG	— —	Alarm Buffer 16	
40095..96	Read Only	LONG	— —	Alarm Buffer 17	
40097..98	Read Only	LONG	— —	Alarm Buffer 18	
40099..100	Read	LONG	— —	Alarm Buffer 19	
40101..102	Read Only	LONG	— —	Alarm Buffer 20	
40103..104	Read Only	LONG	— —	Alarm Buffer 21	
40105..106	Read Only	LONG	— —	Alarm Buffer 22	
40107..108	Read Only	LONG	— —	Alarm Buffer 23	
40109..110	Read Only	LONG	— —	Alarm Buffer 24 Driver error code record8generate time error value	
40111..112	Read Only	LONG	— —	Alarm Buffer 25 Driver error code record1generate time error value	
40113..114	Read Only	LONG	— —	Alarm Buffer 26 Driver error code record2generate time error value	
40115..116	Read Only	LONG	— —	Alarm Buffer 27 Driver error code record3generate time error value	
40117..118	Read Only	LONG	— —	Alarm Buffer 28 Driver error code record4generate time error value	
40119..120	Read Only	LONG	— —	Alarm Buffer 29 Driver error code record5generate time error value	
40121..122	Read Only	LONG	— —	Alarm Buffer 30 Driver error code record6generate time error value	
40123..124	Read Only	LONG	— —	Alarm Buffer 31 Driver error code record7generate time error value	
40125	R/W	SHORT	— —	Command Opcode	
40126	R/W	SHORT	— —	Parameter 1	
40127	R/W	SHORT	— —	Parameter 2	
40128	R/W	SHORT	— —	Parameter 3	
40129	R/W	SHORT	— —	Parameter 4	
40130	R/W	SHORT	— —	Parameter 5	
40131..132	Read Only	LONG	— —	Accumulator accumulator	0
40133..134	R/W	LONG	— —	User Register 1 User-defined register1	1
40135..136	R/W	LONG	— —	User Register 2 User-defined register2	2
40137..138	R/W	LONG	— —	User Register 3 User-defined register3	3

11.5.1 M54SSeries General Purpose Register					
Register	**Access**	**Data Type**	**Units**	**Description**	**SCL Register**
40139..140	R/W	LONG	— —	User Register 4 User-defined register4	4
40141..142	R/W	LONG	— —	User Register 5 User-defined register5	5
40143..144	R/W	LONG	— —	User Register 6 User-defined register6	6
40145..146	R/W	LONG	— —	User Register 7 User-defined register7	7
40147..148	R/W	LONG	— —	User Register 8 User-defined register8	8
40149..150	R/W	LONG	— —	User Register 9 User-defined register9	9
40151..152	R/W	LONG	— —	User Register 10 User-defined register10	:
40153..154	R/W	LONG	— —	User Register 11 User-defined register11	;
40155..156	R/W	LONG	— —	User Register 12 User-defined register12	<
40157..158	R/W	LONG	— —	User Register 13 User-defined register13	=
40159..160	R/W	LONG	— —	User Register 14 User-defined register14	>
40161..162	R/W	LONG	— —	User Register 15 User-defined register15	?
40163..164	R/W	LONG	— —	User Register 16 User-defined register16	@
40165..166	R/W	LONG	— —	User Register 17 User-defined register17	[
40167..168	R/W	LONG	— —	User Register 18 User-defined register18	\
40169..170	R/W	LONG	— —	User Register 19 User-defined register19	]
40171..172	R/W	LONG	— —	User Register 20 User-defined register20	^
40173..174	R/W	LONG	— —	User Register 21 User-defined registertwenty one	_
40175..176	R/W	LONG	— —	User Register 22 User-defined registertwenty two	`

11.5.2 M54Sseries-P0Group(PID)

11.5.2 M54Sseries-P0Group(PID)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40177..178	R/W	LONG	— —	0~2	Tuning Mode Selection (UM) Parameter tuning mode	
40179..180	R/W	LONG	— —	0~10	Load Type (LY) Load type	
40181..182	R/W	LONG	— —	0~100	Inertia Ratio (NR) Load to inertia ratio	
40183..184	R/W	LONG	— —	1~20	1st Mechanical Stiffness Level (KG) First rigidity level	
40185..186	R/W	LONG	— —	1~20	2nd Mechanical Stiffness Level (KX) Second rigidity level	
40187..188	R/W	LONG	0.1Hz	0~20000	1st Position Loop Gain (KP) first position loop gain	
40189..190	R/W	LONG	ms	0~30000	1st Position Loop Integral Time Constant (KI) First position loop integration time constant	
40191..192	R/W	LONG	ms	0~30000	1st Position Loop Derivative Time Constant (KD) First position loop differential time constant	
40193..194	R/W	LONG	0.1Hz	0~40000	1st Position Loop Derivative Filter (KE) First position loop differential filter frequency	
40195..196	R/W	LONG	0.01%	- 30000~30000	Velocity Feedforward Gain (KL) Speed feed forward gain	
40197..198	R/W	LONG	0.1Hz	0~40000	Velocity Feedforward Filter (KR) Speed feedforward filter frequency	
40199..200	R/W	LONG	0.01%	- 30000~30000	1st Velocity Command Gain (KF) First command speed gain	
40201..202	R/W	LONG	0.1Hz	0~30000	1st Velocity Loop Gain (VP) First speed loop gain	
40203..204	R/W	LONG	ms	0~30000	1st Velocity Loop Integral Time Constant (VI) First speed loop integration time constant	
40205..206	R/W	LONG	0.01%	0~20000	Acceleration Feedforward Gain (KK) Acceleration feedforward gain	
40207..208	R/W	LONG	0.1Hz	0~40000	Acceleration Feedforward Filter (KT) Acceleration feedforward filter frequency	
40209..210	R/W	LONG	0.1Hz	0~40000	1st Torque Command Filter (KC) First command torque filter frequency	
40211..212	R/W	LONG	0.1Hz	0~20000	2nd Position Loop Gain (UP) Second position loop gain	
40213..214	R/W	LONG	ms	0~30000	2nd Position Loop Integral Time Constant (UI) Second position loop integration time constant	

11.5.2 M54Sseries-**P0**Group**(PID)**

Register	Access	Data Type	Units	Range	Description	SCL Register
40215..216	R/W	LONG	ms	0~30000	2nd Position Loop Derivative Time Constant (UD) Second position loop differential time constant	
40217..218	R/W	LONG	0.1Hz	0~40000	2nd Position Loop Derivative Filter (UE) Second position loop differential filter frequency	
40219..220	R/W	LONG	0.01%	- 30000~30000	2nd Velocity Command Gain (UF) Second command speed gain	
40221..222	R/W	LONG	0.1Hz	0~30000	2nd Velocity Loop Gain (UV) Second speed loop gain	
40223..224	R/W	LONG	ms	0~30000	2nd Velocity Loop Integral Time Constant (UG) Second speed loop integral time constant	
40225..226	R/W	LONG	0.1Hz	0~40000	2nd Torque Command Filter (UC) Second command torque filter frequency	
40227..228	R/W	LONG	0.1Hz	0~20000	Full Closed-loop Position Loop Gain (XP) Fully closed loop - position loop gain	
40229..230	R/W	LONG	ms	0~30000	Full Closed-loop Position Loop Integral Time Constant(XI) Fully closed loop - position loop integration time constant	
40231..232	R/W	LONG	ms	0~32767	Full Closed-loop Position Loop Derivative Time Constant (XD) Fully closed loop - position loop differential time constant	
40233..234	R/W	LONG	0.1Hz	0~40000	Full Closed-loop Position Loop Derivative Filter (XE) Fully closed loop - position loop differential filter frequency	
40235..236	R/W	LONG	0.01%	- 30000~30000	Full Closed-loop Velocity Command Gain (XF) Fully closed loop - command speed gain	
40237..238	R/W	LONG	0.1Hz	0~30000	Full Closed-loop Velocity Loop Gain (XV) Fully closed loop-speed loop gain	
40239..240	R/W	LONG	ms	0~30000	Full Closed-loop Velocity Loop Integral Time Constant(XG) Fully closed loop-speed loop integration time constant	
40241..242	R/W	LONG	0.1Hz	0~40000	Full Closed-loop Torque Command Filter (XC) Fully closed loop - command torque filter frequency	
40243..244	R/W	LONG	— —	0~4	Automatic Gain Switching Method (SD) Gain switching condition selection	O (capital) Capital
40245..246	R/W	LONG	pulses	0~2147483647	Use Position Error as the Condition (PN) Gain switching condition-position	

11.5.2 M54Sseries-**P0**Group**(PID)**

Register	Access	Data Type	Units	Range	Description	SCL Register
40247..248	R/W	LONG	1/240rps	0~24000	Use Actual Speed as the Condition (VN) Gain switching condition - speed	
40249..250	R/W	LONG	0.1%	0~3000	Use Actual Torque as the Condition (TN) Gain switching condition - torque	
40251..252	R/W	LONG	ms	0~10000	Gain Switching Waiting Time 1 (SE1) Second gain switch to first gain delay time	
40253..254	R/W	LONG	ms	0~10000	Gain Switching Waiting Time 2 (SE2) First gain switching to second gain delay time	
40255..256	R/W	LONG	— —	0~3	Velocity Feedback Filter (LR) Speed feedback filter	
40257..258	R/W	LONG	— —	0~1	Self-adapting Filter Switch (AE) Adaptive filter switch	
40259..260	R/W	LONG			Reserved	

11.5.3 M54Sseries-P1Group(Configuration)

11.5.3 M54Sseries-P1Group(Configuration)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40261..262	R/W	LONG			Reserved	
40263..264	R/W	LONG	— —	1,2,7,11,15,21	Main Control Mode (CM) master control mode	
40265..266	R/W	LONG	— —	1,2,7,11,15,21	Secondary Control Mode (CN) Second control mode	
40267..268	R/W	LONG	— —	8~10	Operation Mode When Power-up (PM) Power-on working mode	
40269..270	R/W	LONG	— —	1~2	Speed Control Clamp Mode (JM) Speed control clamp mode	
40271..272	R/W	LONG	— —	0~1	Full Closed-loop Control Switch (XM) Full closed loop mode switch	
40273..274	R/W	LONG	0.1%	- 3000~3000	Torque Command of Internal Torque Mode (GC) Command torque in internal torque mode	G
40275..276	R/W	LONG	0.1%	0~3000	1st Torque Limit (CC) first torque limit	
40277..278	R/W	LONG	0.1%	0~3000	Target Value of Torque Arrival (CV) Determine when the torque reaches the target value	
40279..280	R/W	LONG	0.1%	0~3000	Torque Limit of Hardstop Homing (HC) Torque limit of hard limit return to origin mode	
40281..282	R/W	LONG	ms	0~30000	Current Foldback Continuous Time (CL) Torque overload duration	
40283..284	R/W	LONG	— —	0~5	Torque Limit Method (LD) Torque limiting method	
40285..286	R/W	LONG	— —	0~1	Rotational Direction Setup (RN) Motor rotation direction selection	
40287..288	R/W	LONG			Reserved	
40289..290	R/W	LONG	— —	1~511	Communication Protocol (PR) Protocol	
40291..292	R/W	LONG	ms	0~20	Transmit Delay (TD) response delay	
40293..294	R/W	LONG	— —	1~5	RS-485 Baud Rate (BR) RS-485Communication baud rate	
40295..296	R/W	LONG	— —	0~32	RS-485 Address (DA) RS-485mailing address	
40297..298	R/W	LONG	— —	1~127	Node ID (CO) CANopen/IPCommunication node address	
40299..300	R/W	LONG	— —	0~7	CANopen Baud Rate CANopenCommunication baud rate	
40301..302	R/W	LONG	Ω	10~32000	Regeneration Resistor Value (ZR) Regenerative absorption resistor value	

11.5.3 M54Sseries-**P1**Group**(Configuration)**

Register	Access	Data Type	Units	Range	Description	SCL Register
40303..304	R/W	LONG	W	1~32000	Regeneration Resistor Wattage (ZW) Regenerative absorbed resistor power	
40305..306	R/W	LONG	ms	0~8000	Regeneration Resistor Time Constant (ZT) Regeneration absorption time constant	
40307..308	R/W	LONG	— —	0~1	Keypad Setting Lock (PK) Button setting lock	
40309..310	R/W	LONG	— —	0~20	Default Display (DD) ledDefault display items	
40311..312	R/W	LONG	— —	0~4294967295	Alarm Mask (MA) Alarm shielding	
40313..314	R/W	LONG	0.1%	0~3000	2nd Torque Limit (CX) Second torque limit	
40315..316	R/W	LONG	0.1%	0~3000	3rd Torque Limit (CY) Third torque limit	
40317..318	R/W	LONG	0.1%	0~3000	4th Torque Limit (CZ) Fourth torque limit	
40319..320	R/W	LONG	ms	0~30000	Motor Stall Protection Time (HT) Motor stall protection time	
40321..322	R/W	LONG	— —	0~5	Dynamic Brake Sequence when Servo Off (YV) Dynamic brake action when disabled	
40323..324	R/W	LONG	— —	0~3	Dynamic Brake Sequence when Fault Occurs (YR) The action of dynamic braking when an error is reported	
40325..326	R/W	LONG	ms	0~30000	Dynamic Brake Action Time during Deceleration of Servo Off (YM) Dynamic braking during deceleration with deactivation Maximum action time	
40327..328	R/W	LONG	ms	0~30000	Dynamic Brake Action Time during Deceleration when Fault Occurs (YN) Dynamic braking is the best during the deceleration process when an error is reported. long action time	
40329..330	R/W	LONG	— —	0~1	Main Power Phase Lost Detecting (OT) Driver main circuit power input phase loss detection is on close	
40331..332	R/W	LONG	0.1%	0~3000	Current Ramp Limit (RT) Driver Output Current Transient Limit	
40333	R/W	SHORT			Reserved	
40334	R/W	SHORT			Reserved	

11.5.4 M54Sseries-P2Group(Trajectory)

11.5.4 M54Sseries-P2Group(Trajectory)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40335..336	R/W	LONG	1/6(rps/s)	1~30000	Max Brake Deceleration (AM) Servo brake deceleration	
40337..338	R/W	LONG	1/240rps	0~24000	Max Velocity (VM) Maximum speed	M
40339..340	R/W	LONG	1/6(rps/s)	1~30000	Jog Accel (JA) Internal speed mode acceleration	K (capital) Capital
40341..342	R/W	LONG	1/6(rps/s)	1~30000	Jog Decel (JL) Internal speed mode deceleration	L
40343..344	R/W	LONG	1/240rps	- 24000~24000	Jog Velocity (JS) Internal speed mode target speed	J
40345..346	R/W	LONG	1/6(rps/s)	1~30000	Point-to-Point Accel (AC) Acceleration in internal point-to-point mode	A
40347..348	R/W	LONG	1/6(rps/s)	1~30000	Point-to-Point Decel (DE) Deceleration in internal point-to-point mode	B
40349..350	R/W	LONG	1/240rps	0~24000	Point-to-Point Velocity (VE) Speed in internal point-to-point mode	V (capital) Capital
40351..352	R/W	LONG	pulses	- 2147483647~ 2147483647	Point-to-Point Distance (DI) Distance (position) in internal point-to-point mode	D
40353..354	R/W	LONG	pulses	- 2147483647~ 2147483647	Point-to-Point Change Distance (DC) Distance adjustment in internal point-to-point mode	C (capital) Capital
40355..356	R/W	LONG	1/240rps	0~24000	Point-to-Point Change Velocity (VC) Speed regulation in internal point-to-point mode	U (capital) Capital
40357..358	R/W	LONG	1/6(rps/s)	1~30000	Homing Accel /Decel (HA1) Return to origin acceleration/deceleration	
40359..360	R/W	LONG			Reserved	
40361..362	R/W	LONG	1/240rps	0~24000	Homing Velocity 1 (HV1) Return to origin first speed	
40363..364	R/W	LONG	1/240rps	0~24000	Homing Velocity 2 (HV2) Return to origin second speed	
40365..366	R/W	LONG	pulses	- 2147483647~ 2147483647	Homing Offset (HO) Return to origin offset	
40367..368	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 1 (JC1) Multi-stage speed control: No.1gear speed	
40369..370	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 2 (JC2) Multi-stage speed control: No.2gear speed	
40371..372	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 3 (JC3) Multi-stage speed control: No.3gear speed	

11.5.4 M54Sseries-**P2**Group**(Trajectory)**

Register	Access	Data Type	Units	Range	Description	SCL Register
40373..374	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 4 (JC4) Multi-stage speed control: No.4gear speed	
40375..376	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 5 (JC5) Multi-stage speed control: No.5gear speed	
40377..378	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 6 (JC6) Multi-stage speed control: No.6gear speed	
40379..380	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 7 (JC7) Multi-stage speed control: No.7gear speed	
40381..382	R/W	LONG	1/240rps	- 24000~24000	Internal Velocity Control: Speed 8 (JC8) Multi-stage speed control: No.8gear speed	
40383..384	R/W	LONG	ms	0~125	Jerk Time (JT) Jerk time	
40385..386	R/W	LONG	ms	0~1000	Jerk Filter (KJ) low pass smoothing filter	
40387..388	R/W	LONG	ms	0~125	Interpolation Filter (FF) interpolation filter	
40389..390	R/W	LONG	1/240rps	0~24000	Velocity Limit of Torque Mode (VT) Speed limit in torque mode	
40391	R/W	SHORT			Reserved	
40392	R/W	SHORT			Reserved	
40393	R/W	SHORT			Reserved	
40394	R/W	SHORT			Reserved	
40395	R/W	SHORT			Reserved	
40396	R/W	SHORT			Reserved	
40397	R/W	SHORT			Reserved	
40398	R/W	SHORT			Reserved	

11.5.5 M54Sseries-P3Group(Encoder & Step/Dir)

11.5.5 M54Sseries-P3Group(Encoder & Step/Dir)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40399..400	R/W	LONG	— —	1~2147483647	Electronic Gear Ratio – Numerator (EN) electronic gear ratio numerator	
40401..402	R/W	LONG	— —	1~2147483647	Electronic Gear Ratio - Denominator (EU) Electronic gear ratio denominator	
40403..404	R/W	LONG	0.1μs	0~32000	Pulse Input Noise Filter (SZ) Pulse input filter width	
40405..406	R/W	LONG	— —	0~31	Pulse Input Setting (PT) Pulse input setting	
40407..408	R/W	LONG	pulses	0~2147483647	Position Error Limit (PF) Position error alarm threshold	
40409..410	R/W	LONG	pulses/rev	200~131072	Command Pulses per Revolution (EG) Number of pulses required per revolution	R
40411..412	R/W	LONG	— —	0~1	Second Encoder Direction (PV) Second encoder direction	
40413..414	R/W	LONG			Reserved	
40415..416	R/W	LONG			Reserved	
40417..418	R/W	LONG	rev	1~100	Hybrid Deviation Clear Setting (XT) Hybrid deviation clearing setting in fully closed loop mode	
40419..420	R/W	LONG	pulses	0~2147483647	Hybrid Deviation Fault Threshold (XO) Position error alarm threshold in fully closed loop mode	
40421..422	R/W	LONG	pulses/rev	200~100000	Second Encoder Resolution (XR) Second encoder resolution	
40423..424	R/W	LONG	— —	0~256	Pulses Output Mode (PO) Pulse frequency division output mode	
40425..426	R/W	LONG	— —	0~13107200	Pulse Output Gear Ratio-Numerator (ON) Pulse frequency division output ratio numerator	
40427..428	R/W	LONG	— —	0~13107200	Pulse Output Gear Ratio - Denominator (OD) Pulse frequency division output ratio denominator	
40429..430	R/W	LONG	— —	0~3	Absolute Encoder Usage (ES) Absolute encoder usage mode	
40431..432	R/W	LONG	— —	0~1	Electronic Gearing Switch (PU) Electronic gear ratio switch	
40433	R/W	SHORT			Reserved	
40434	R/W	SHORT			Reserved	
40435	R/W	SHORT			Reserved	
40436	R/W	SHORT			Reserved	
40437	R/W	SHORT			Reserved	
40438	R/W	SHORT			Reserved	
40439	R/W	SHORT			Reserved	
40440	R/W	SHORT			Reserved	

11.5.6 M54Sseries-P4Group(Analog)

11.5.6 M54Sseries-P4Group(Analog)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40441..442	R/W	LONG			Reserved	
40443..444	R/W	LONG	1/240rps	0~24000	Analog Input Velocity Gain (AG) Analog input speed scaling	
40445..446	R/W	LONG	0.1%	0~3000	Analog Input Torque Gain (AN) Analog input torque scaling	
40447..448	R/W	LONG	mv	- 10000~10000	Analog Input 1 Offset (AV1) Analog input1Offset	
40449..450	R/W	LONG	mv	- 10000~10000	Analog Input 2 Offset (AV2) Analog input2Offset	
40451..452	R/W	LONG	mv	0~255	Analog Input 1 Deadband (AD1) Analog input1dead zone	
40453..454	R/W	LONG	mv	0~255	Analog Input 2 Deadband (AD2) Analog input2dead zone	
40455..456	R/W	LONG	0.1Hz	1~20000	Analog Input 1 Filter (AF1) Analog input1low pass filter	
40457..458	R/W	LONG	0.1Hz	1~20000	Analog Input 2 Filter (AF2) Analog input2low pass filter	
40459..460	R/W	LONG	mv	- 10000~10000	Analog Input 1 Threshold (AT1) Analog input1trigger threshold	
40461..462	R/W	LONG	mv	- 10000~10000	Analog Input 2 Threshold (AT2) Analog input2trigger threshold	
40463..464	R/W	LONG	— —	0~1	Velocity Limit Setting of Torque Control (FA1) Speed limit source setting	
40465..466	R/W	LONG			Reserved	
40467..468	R/W	LONG			Reserved	
40469..470	R/W	LONG			Reserved	
40471..472	R/W	LONG			Reserved	
40473..474	R/W	LONG	— —	1~32000	Analog Output 1 Scale (OS1) Analog output1target	
40475..476	R/W	LONG	— —	1~32000	Analog Output 2 Scale (OS2) Analog output2target	
40477..478	R/W	LONG	— —	0~5	Analog Output 1 Function (XA1) Analog output1Function definition	
40479..480	R/W	LONG	— —	0~5	Analog Output 2 Function (XA2) Analog output2Function definition	
40481	R/W	SHORT			Reserved	
40482	R/W	SHORT			Reserved	
40483	R/W	SHORT			Reserved	
40484	R/W	SHORT			Reserved	
40485	R/W	SHORT			Reserved	

11.5.6 M54Sseries-P4Group(Analog)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40486	R/W	SHORT			Reserved	
40487	R/W	SHORT			Reserved	
40488	R/W	SHORT			Reserved	
40489	R/W	SHORT			Reserved	
40490	R/W	SHORT			Reserved	

11.5.7 M54Sseries-P5Group(I/O)

11.5.7 M54Sseries-P5Group(I/O)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40491..492	R/W	LONG	— —	0~46	Digital Input 1 Function (MU1) Digital input port1Function	
40493..494	R/W	LONG	— —	0~46	Digital Input 2 Function (MU2) Digital input port2Function	
40495..496	R/W	LONG	— —	0~46	Digital Input 3 Function (MU3) Digital input port3Function	
40497..498	R/W	LONG	— —	0~46	Digital Input 4 Function (MU4) Digital input port4Function	
40499..500	R/W	LONG	— —	0~46	Digital Input 5 Function (MU5) Digital input port5Function	
40501..502	R/W	LONG	— —	0~46	Digital Input 6 Function (MU6) Digital input port6Function	
40503..504	R/W	LONG	— —	0~46	Digital Input 7 Function (MU7) Digital input port7Function	
40505..506	R/W	LONG	— —	0~46	Digital Input 8 Function (MU8) Digital input port8Function	
40507..508	R/W	LONG	— —	0~46	Digital Input 9 Function (MU9) Digital input port9Function	
40509..510	R/W	LONG	— —	0~46	Digital Input 10 Function (MUA) Digital input port10Function	
40511	R/W	SHORT			Reserved	
40512	R/W	SHORT			Reserved	
40513	R/W	SHORT			Reserved	
40514	R/W	SHORT			Reserved	
40515	R/W	SHORT			Reserved	
40516	R/W	SHORT			Reserved	
40517	R/W	SHORT			Reserved	
40518	R/W	SHORT			Reserved	
40519..520	R/W	LONG	— —	0~36	Digital Output 1 Function (MO1) Digital output port1Function	
40521..522	R/W	LONG	— —	0~36	Digital Output 2 Function (MO2) Digital output port2Function	
40523..524	R/W	LONG	— —	0~36	Digital Output 3 Function (MO3) Digital output port3Function	
40525..526	R/W	LONG	— —	0~36	Digital Output 4 Function (MO4) Digital output port4Function	
40527..528	R/W	LONG	— —	0~36	Digital Output 5 Function (MO5) Digital output port5Function	
40529..530	R/W	LONG	— —	0~36	Digital Output 6 Function (MO6) Digital output port6Function	

11.5.7 M54Sseries-P5Group(I/O)						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40531	R/W	SHORT			Reserved	
40532	R/W	SHORT			Reserved	
40533	R/W	SHORT			Reserved	
40534	R/W	SHORT			Reserved	
40535	R/W	SHORT			Reserved	
40536	R/W	SHORT			Reserved	
40537	R/W	SHORT			Reserved	
40538	R/W	SHORT			Reserved	
40539..540	R/W	LONG	ms	0~32000	Move Command Waiting Time When Brake Release (BD) brake release After release,motion waiting time	
40541..542	R/W	LONG	ms	0~32000	Servo-off Brake Engage Waiting Time (BE) After braking,Motor disable waiting delay	
40543..544	R/W	LONG			Reserved	
40545..546	R/W	LONG	— —	0~10	Home Sensor (HX) origin sensor	
40547..548	R/W	LONG	ms	0~8000	Digital Input 1 Filter (FI1) digital input1filter	
40549..550	R/W	LONG	ms	0~8000	Digital Input 2 Filter (FI2) digital input2filter	
40551..552	R/W	LONG	ms	0~8000	Digital Input 3 Filter (FI3) digital input3filter	
40553..554	R/W	LONG	ms	0~8000	Digital Input 4 Filter (FI4) digital input4filter	
40555..556	R/W	LONG	ms	0~8000	Digital Input 5 Filter (FI5) digital input5filter	
40557..558	R/W	LONG	ms	0~8000	Digital Input 6 Filter(FI6) digital input6filter	
40559..560	R/W	LONG	ms	0~8000	Digital Input 7 Filter (FI7) digital input7filter	
40561..562	R/W	LONG	ms	0~8000	Digital Input 8 Filter (FI8) digital input8filter	
40563..564	R/W	LONG	ms	0~8000	Digital Input 9 Filter (FI9) digital input9filter	
40565..566	R/W	LONG	ms	0~8000	Digital Input 10 Filter (FIA) digital input10filter	
40567..568	R/W	LONG	pulses	0~2147483647	Dynamic Follow Error Threshold (PL) Dynamic following error threshold	

11.5.7 M54Sseries-**P5**Group**(I/O)**						
Register	**Access**	**Data Type**	**Units**	**Range**	**Description**	**SCL Register**
40569..570	R/W	LONG	pulses	0~32000	In-position Output Threshold (PD) Positioning completion signal position error threshold	
40571..572	R/W	LONG	ms	0~32000	Time Constant of Motion Output Condition (PE) Motion judgment condition counting time	
40573..574	R/W	LONG	ms	0~20000	Pulse Complete Timing (TT) Pulse input completion detection time	
40575..576	R/W	LONG	1/240rps	twenty four~480	Zero Speed Width (ZV) Zero speed judgment threshold	
40577..578	R/W	LONG	1/240rps	twenty four~24000	Speed Coincidence Width (VR) Consistent speed fluctuation range	
40579..580	R/W	LONG	1/240rps	0~24000	Target Value of AT-speed (VV) Determine the speed reaches the target value	
40581..582	R/W	LONG	0.1%	0~3000	Torque Arrival Width (TV) Torque reaches the fluctuation range	
40583..584	R/W	LONG	pulses	- 2147483647~ 2147483647	Near Target Position (DG) Absolutely reach the location	
40585..586	R/W	LONG	pulses	- 2147483647~ 2147483647	Positive Software Limit (LP) Positive soft limit	
40587..588	R/W	LONG	pulses	- 2147483647~ 2147483647	Negative Software Limit (LM) Reverse soft limit	
40589..590	R/W	LONG	— —	- 4~35	Homing Method (HE) Return to origin mode	

11.6 M54SDrive alarm code(main code)surface:

register	Bit	illustrate		Bit	illustrate
40001 40002	0	*Position error exceeds limit*		16	The drive main circuit power input phase is missing.
	1	Reverse prohibition limit		17	*Safe torque is prohibited**(STO)***
	2	Forward prohibition limit		18	reserved
	3	*Overtemperature*		19	*Motor speed exceeds limit*
	4	*internal error*		20	Driver undervoltage
	5	*Power supply voltage out of range*		twenty one	*emergency stop*
	6	reserved		twenty two	*Second encoder not connected*
	7	*Driver overcurrent*		twenty three	*Fully closed loop hybrid deviation exceeds limit*
	8	reserved		twenty four	Absolute encoder battery is under voltage
	9	*Motor encoder not connected*		25	Absolute position lost
	10	Communication abnormality		26	Absolute position overflow
	11	reserved		27	reserved
	12	Bleed failure		28	*Absolute encoder multiturn error*
	13	Motor overload protection		29	*Motor operation abnormality protection*
	14	reserved		30	***EtherCAT**Communication error*
	15	Unconventional start alarm		31	Return-to-origin parameter configuration error

Servo system**M54S**Drive alarm code(auxiliary code)surface:

register **(40001..02)** Bit	illustrate	register **(40067..68)** Bit	illustrate
3	*Overtemperature*	***5***	*Drive processor overtemperature*
		6	*Drive power module over temperature*
		7	*Motor overtemperature*
4	*internal error*	***8***	*Parameter reading failed*
		9	*Internal voltage error*
		10	*Reserved functions,remain as "**0**"*
		11	*Reserved functions,remain as "**0**"*
		12	***FPGA**mistake*
		13	*Parameter saving failed*
		14	*Motor encoder communication error*
5	*Power supply voltage out of range*	***15***	*Drive overvoltage*
		16	*driver low voltage*
7	*Overcurrent*	***2***	*Low-side overcurrent*
		3	*High-end overcurrent*
		4	*Reading overcurrent*
15	Unusual startup warning	17	calledQProgram section is empty
		18	Command the motor to run when it is not enabled
		19	I/OSignal function reuse
29	*Motor operation abnormality protection*	***twenty four***	*Motor stall protection*
		25	*Motor anti-collision protection*

12appendix**1**:**led**Display character lookup 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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