SLANVERT

N3RP

Pulse servo drive

Operation manual

Servo drive

N3RP-□SA-E

N3RP-□PA-E

N3RP-□SC-E

Thank you very much for purchasing our servo products

This manual describes the use and maintenance of the "N3RP" series servo driver. Please read this manual carefully before installing, wiring, using, maintaining, and inspecting the product.

Please keep this manual in a safe place and deliver it to the end user.

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Chapter 1 Safety Precautions

■ Safety instructions

- Please read and follow these safety precautions when installing, operating, or maintaining the product.
- For personal and equipment safety, please follow all safety precautions described in the markings and manuals on the product when installing, operating, and maintaining the product.
- The "Caution", "Warning" and "Danger" items in the manual do not represent all safety precautions to be observed, but only in addition to all other safety precautions.
- This product should be used in an environment that meets design specifications, otherwise it may cause a malfunction due to failure to comply with the relevant safety precautions.
- The product quality warranty does not cover abnormal function or damage to parts caused by the regulations.
- We will not bear any legal responsibility for personal safety accidents and property damage caused by illegal operation of the product.

Security Level Definition	
⚠ **Danger**	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
⚠ **Caution**	If not used in accordance with the regulations, may cause fires, serious personal injury, or even death!
⚠ **Warning**	Failure to use in accordance with the regulations may result in moderate personal injury or minor injury, as well as the occurrence of equipment damage!

When products arrive and are stored	
⚠ **Warning**	• If the product and product accessories are damaged when opening the box, please do not install them and contact our company or your supplier immediately. • Check carefully whether the arriving product and the ordered product model match, and whether the product and product accessories are included.
⚠ **Caution**	• Do not stack multiple of this product on top of each other as this may cause injury or malfunction. • Do not store in places exposed to direct sunlight, places where the ambient temperature exceeds the temperature conditions for storage, places where the relative humidity exceeds the humidity condition for storage, places where there is a large temperature difference, places where there is high condensation, places near corrosive gases, places where there are flammable gases, places where there is a large amount of dust, dirt, salt or metal dust, places where water, oil or medicine drip, places where vibration or shock can affect the main body of product; otherwise it can lead to fire, Electric shock or machine damage. • Do not hold the cable or motor shaft for weight holding, as this may result in injury or malfunction.

When designing the system	
Danger	• If the rated load of current is exceeded or the load is short-circuited for a long period of time resulting in over-current, the product may start smoking or catch fire. • Safety devices such as fuses, or circuit breakers should be set externally.
Warning	• Be sure to design safety circuits to ensure that the product system will still work safely if the external power supply is lost, or the product fails. • For safe operation of the equipment, please design external protection circuits and safety mechanisms for output signals related to major accidents.
Caution	• Be sure to install emergency brake circuits, protection circuits, interlock circuits for forward and reverse operation, and position upper and lower limit interlock switches to prevent damage to the machine in the external circuit of the product. • The product may shut down all outputs after detecting abnormalities in its own system; when part of the controller circuit fails, it may cause its output to be uncontrolled. To ensure normal operation, a suitable external control circuit needs to be designed. • If the output unit such as relay or transistor of the product is damaged, the output will not be controlled to the ON or OFF state. • The product is designed to be used in indoor, overvoltage class II electrical environments, and its power system level should have lightning protection devices to ensure that lightning overvoltage is not applied to the product's power input or signal input, control output and other ports to avoid damage to equipment.

When the product is installed	
Danger	• Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should install this product. • For the product with open equipment, please install in the control cabinet with door lock (product cabinet shell protection > IP20), only operators with sufficient electrical knowledge and training related to electrical equipment can open the product cabinet.
Warning	• When disassembling the product, the external power supply used for the system must be completely disconnected before performing the operation. Failure to disconnect all power supplies may result in electric shock or product failure and malfunction. • While dissembling the product, the power and the power indicator must be turned off for at least 5 minutes, before disassembling the driver. Otherwise, the residual voltage may cause electric shock. • Do not use the product in the following places: places with dust, oil fumes, conductive dust, corrosive gases, combustible gases; places exposed to high temperature, condensation, wind, and rain; places with vibration and shock. Electric shock, fire, and misuse can also cause damage and deterioration of the product!
Caution	• Avoid metal shavings and wire tips falling into the ventilation holes of the product during installation, this may cause fire, malfunction, and misoperation. • After installation, ensure that there is no foreign matter on the ventilation surfaces, otherwise it may lead to poor heat dissipation and cause fire, malfunction and misoperation. • When installing, make a tight connection to the respective connector and lock the product connection hook firmly. If the products are not installed properly, it may lead to misoperation, malfunction and dislodgement.

When wiring products	
⚠ **Danger**	• Only maintenance professionals with adequate electrical knowledge and training related to electrical equipment should perform the wiring of this product.
⚠ **Warning**	• During wiring operations, the external supply power used by the system must be completely disconnected before operation. Failure to disconnect all of them may result in electric shock or equipment malfunction or misoperation. • When powering up and running after the wiring operation, the terminal cover that comes with the product must be installed. Failure to install the terminal cover may result in electric shock. • Check the type of interface to be connected before connecting the cable correctly. If the wrong interface is connected or the wiring is incorrect, it may cause the product or external equipment to malfunction. • The cable terminals should be well insulated to ensure that the insulation distance between the cables is not reduced after the cables are installed to the terminal block. Otherwise, it will lead to electric shock or equipment damage. • Avoid metal shavings and wire tips falling into the ventilation holes of the controller when wiring, which may cause fire, malfunction, and misoperation! • The bolts on the terminal blocks should be tightened within the specified torque range. Untightened terminal bolts may result in short circuit, fire, or malfunction. Over-tightening the bolts may damage the bolts and the product, resulting in dislodgement, short circuit, fire, or false operation.
⚠ **Caution**	• The specification and installation method of the external wiring of the equipment should meet the requirements of local power distribution regulations. • To ensure the safety of the equipment and the operator, the equipment needs to be reliably grounded using cables of sufficient wire size. • For connections using connectors and external devices, press fit, crimp, or properly solder using the tool specified by the manufacturer. A poor connection may result in a short circuit, fire, or malfunction. • If the product is labeled to prevent foreign objects from entering the product during wiring, such as the wiring head. Do not remove this label during wiring operations. Before starting system operation, be sure to remove the label to facilitate heat dissipation. • Please do not bundle the control and communication cables with the main circuit or power supply cables, etc. The alignment should be more than 100mm apart, otherwise the noise may lead to misoperation. • For applications with serious interference, please use shielded cables for input or output of high frequency signals to improve the system's anti-interference capability.

Before powering on the product	
⚠ **Danger**	• Before powering on, please make sure the product is well installed, wired firmly and the motor unit is allowed to restart. • Before powering on, please confirm that the power supply meets the product requirements to avoid causing damage to the product or starting a fire. • It is strictly forbidden to open the product cabinet door or product protective cover, touch any terminals of the product, disassemble any device or parts of the product in the energized state, otherwise there is a risk of electric shock.

	• Make sure that no one is around the product, the motor, or the machinery before powering it on, as this may result in injury or death!
Warning	• After the wiring operation and parameter setting are completed, please conduct a test run of the machine to confirm that it can operate safely, otherwise it may lead to injury or equipment damage! • Before powering on, please make sure that the rated voltage of the product is the same as the power supply voltage. If the power supply voltage is used incorrectly, there is a risk of fire!

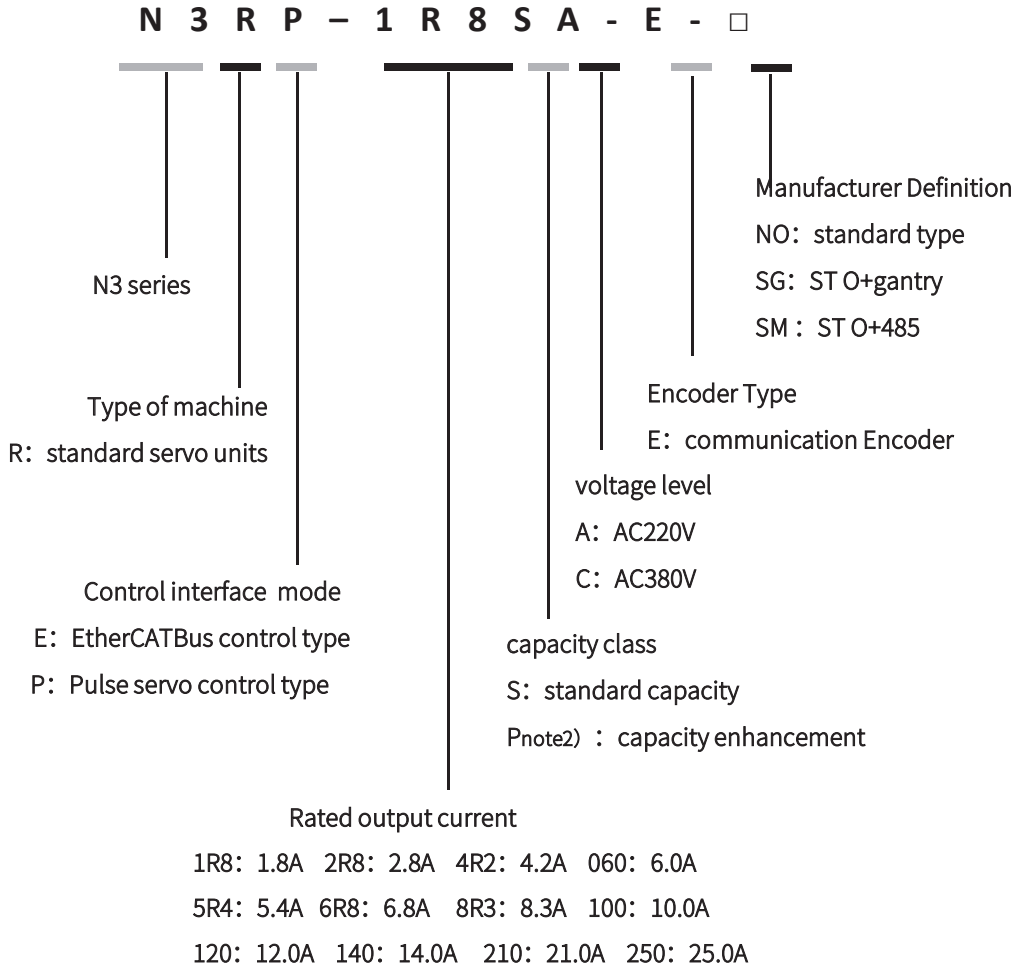
When operating and maintaining	
Danger	• Only maintenance professionals with adequate electrical knowledge and training on electrical equipment can perform the operation and maintenance of the products. • Do not touch the terminals when the power is on, as this may cause electric shock or malfunction. • When the motor or equipment is running, please never touch its rotating parts, otherwise it may lead to serious personal safety accidents.
Warning	• When cleaning the product or retightening the bolts on the terminal block or the connector mounting bolts, the external supply power used by the system must be completely disconnected. Failure to do so may result in electric shock. • When disassembling the product or connecting or removing the communication cable, the external supply power used by the system must be completely disconnected first. Failure to disconnect all of them may result in electric shock or false operation. • While dissembling the product, the power and the power indicator must be turned off for at least 5 minutes, before disassembling the driver. Otherwise, the residual voltage may cause electric shock.
Caution	• For online modification, forced output, RUN, STOP, etc., you must read the user's manual and confirm its safety before performing the relevant operations. • Be sure to disconnect the power before loading and unloading expansion cards, modules, and other components!

When the product is scrapped	
Caution	• Please dispose of them as industrial waste; when disposing of batteries, do so separately according to the ordinances established by each region to avoid property damage or human injury! • End-of-life products should be treated and recycled in accordance with industrial waste treatment standards to avoid polluting the environment.

Chapter 2 Product Introduction

2.1 Introduction to Servo Drives

2.1.1 Description of type



Note: 1) Naming rules are only used for model analysis, and cannot be used for ordering, please consult with Cosel before ordering.

2) Under the same current output capacity, the capacitance capacity is increased to have a stronger output power, which is suitable for the occasion of large current impact.

2.1.2 Servo Drive Specifications

1) Basic parameters of the model

Table: 2.1-1 Basic Parameters of Machine Type

Sports Event			Descriptions
Basic Specifications	control method		IGBT SVPWM control, sine wave current drive method. single-phase or three-phase 220v full wave rectification
	conditions of use	use/storage temperature (note 1	0~55°c (10% reduction for every 5°c of ambient temperature above 45°c)/-20~+70°c
		use/storage humidity	below 90%rh (no condensation)
		vibration/shock resistance	4.9m/s^2/19.6m/s^2
		protection class	Ip20
		contamination level	pd2 level
		altitude	maximum altitude up to 5000m, no derating required for use at 1000m and below, 1% derating for every 100m above 1000m, please contact the manufacturer for altitudes above 2000m
Position Control Mode	performanc e	feed-forward compensation	supports speed feed forward (0~100.0%) setting to eliminate following deviation
		command shaping	position command low-pass filtering, mean value filtering
	crossover output	output pattern	a-phase, b-phase: differential output; z-phase: differential output or open collector output
		crossover range	the motor rotates one revolution and can divide the frequency to produce any pulse in the range of 140 to 1048576
Speed Torque Control Mode	performanc e	current loop dynamic characterization	step response: 187.5us (0~100%); frequency response: -3db amplitude attenuation bandwidth, 2000hz (command signal: ±25%); -90° phase shift bandwidth, 3500hz (command signal: ±25%)
		speed control range	0~12000rpm, for speeds over 6000rpm, please contact the manufacturer
		velocity ring dynamic characterization	step response: 0.5625ms (0~1000rpm) frequency response: -3db amplitude attenuation bandwidth 1000hz (commanded signal: ±500rpm); -90° phase shift bandwidth, around 630hz (commanded signal: ±500rpm)
		torque control accuracy	±2%
Input Output	digital input signal		configurable functions: forward overtravel switch, reverse overtravel switch, home switch, etc
	digital output signal		functions can be configured: servo ready, zero speed signal, speed arrival, position arrival, positioning proximity signal, torque limit in progress, warning, servo fault, etc
Support Features	electronic gear ratios		built-in two sets of electronic gear ratios, support gear ratio switching function
	limit switch		stop immediately when the forward overtravel switch and reverse overtravel switch are actuated
	fault detection		over-current, over-voltage, under-voltage, overload, main circuit detection abnormality, radiator overheating, over-speed, encoder abnormality, parameter abnormality, etc.
	display function		5-digit led display, power indicator charge
	vibration suppression		with 4 traps, 50hz~5000hz, all 4 traps can be set adaptively.
	usability		self-tuning, velocity observer, model tracking
	debugging interface		usb
	else		status display, alarm logging, jog operation, etc.

⚠ Attention：

Note 1: Install the Servo Drive in this range of ambient temperatures. When storing in an electrical cabinet, the temperature inside the cabinet should also not exceed this temperature value.

Note 2: Positive rotation means that the motor shaft rotates counterclockwise when viewed facing the motor flange.

2) Electrical specification parameters

- Servo Drive Specification E1（sizes W*H*D：35*170*155）

Model Number	N3RP-1R8SA-E	N3RP-2R8SA-E
Input Power	AC200V~AC240V	
Frequency	50/60Hz	
Input Current (Arms)	2.3	4
Power (kW)	0.2kW	0.4kW
Rated Output Current (Arms)	1.8	2.8
Maximum Output Current (Arms)	5.8	8.4
Overload Factor	300%	
IO	7 DI, 5 DO	
Built-In Braking Resistor	none	none
Minimum Resistance Of External Braking Resistor	50Ω	50Ω
Cooling Method	natural cooling	

- Servo Drive Specification E2（sizes W*H*D：50*170*155）

Model Number	N3RP-4R2SA-E	N3RP-060PA-E
Input Power	AC200V~AC240V	
Frequency	50/60Hz	
Input Current (Arms)	7.9	9.6
Power (kW)	0.75kW	1kW
Rated Output Current (Arms)	4.2	6
Maximum Output Current (Arms)	12.9	18.2
Overload Factor	300%	
IO	7 DI，5 DO	
Built-In Braking Resistor	none	none
Minimum Resistance Of External Braking Resistor	50Ω	25Ω
Cooling Method	forced air cooling	

- Servo Drive Specification E3（sizes W*H*D：85*165*190）

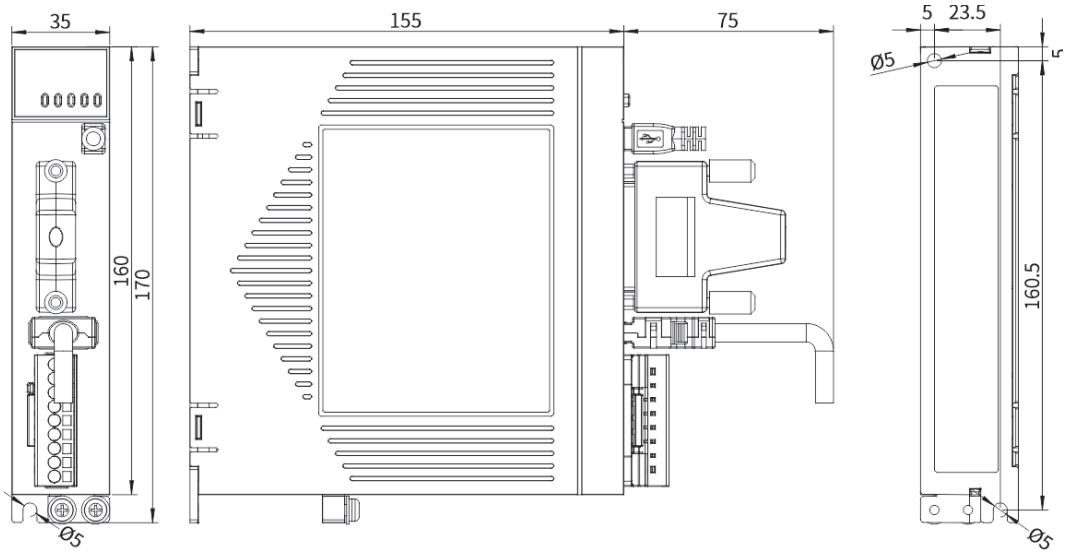
Model Number	N3RP -100SA-E	N3RP -140SA-E	N3RP -5R4SC-E	N3RP -6R8SC-E	N3RP -8R3SC-E	N3RP -100SC-E
Input Power	AC200V-AC240V 50/60Hz		AC380V~440V			
Frequency			50/60Hz			
Input Current (Arms)	12.8	16	3.6	6.6	6.6	8.0
Power (kW)	1.5kW	2kW	2kW	3kW	4kW	5kW
Rated Output Current (Arms)	10	14	5.4	6.8	8.3	10
Maximum Output Current (Arms)	30	42	14	20	20	29.8
Overload Factor	300%	300%	250%	300%	250%	290%
IO	7 DI，5 DO					
Built-In Braking Resistor	25Ω/80W	25Ω/80W	100Ω/80W	50Ω/80W	50Ω/80W	50Ω/80W
Minimum Resistance Of External Braking Resistor	15Ω	15Ω	50Ω	50Ω	50Ω	50Ω
Cooling Method	forced air cooling					

- Servo Drive Specification E4（sizes W*H*D：85*270*251.7）

Model Number	N3RP-180SA-E	N3RP-120SC-E	N3RP-140SC-E	N3RP-210SC-E	N3RP-250SC-E
Input Power	AC200V-AC240V	AC380V~440V			
Frequency	50/60Hz	50/60Hz			
Input Current (Arms)	18.7	12	12	21	21
Power (kW)	4kW	6kW	7kW	9kW	10kW
Rated Output Current (Arms)	18	12	14	21	25
Maximum Output Current (Arms)	45	36	41.3	63	65
Overload Factor	250%	300%	290%	300%	250%
IO	7 DI，5 DO				
Built-In Braking Resistor	20Ω/100W	35Ω/100W			
Minimum Resistance Of External Braking Resistor	10Ω	50Ω	50Ω	20Ω	20Ω
Cooling Method	forced air cooling				

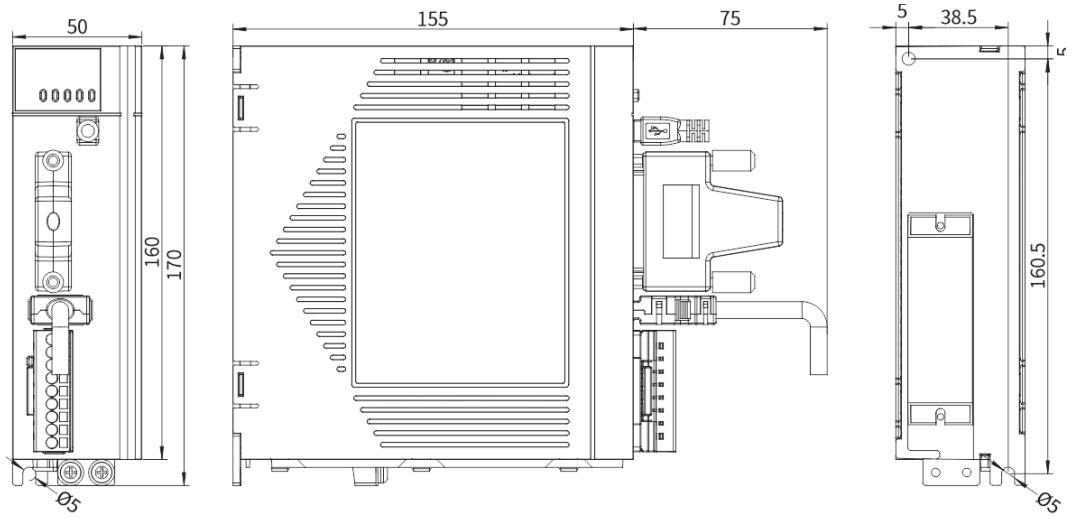
3) Size specification

- E1 specifications（sizes W*H*D：35*170*155）



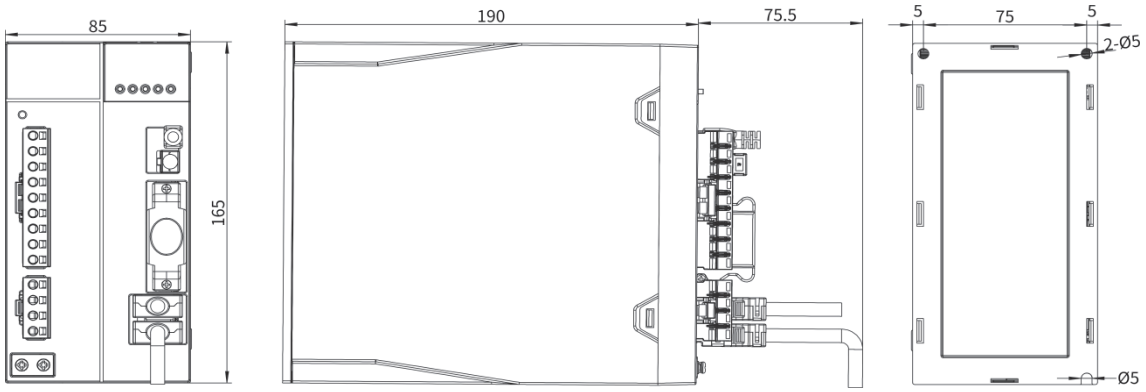
Graph 1：N3RP-1R8SA、N3RP-2R8SA dimension drawing

- E2 Specifications（sizes W*H*D：50*170*155）



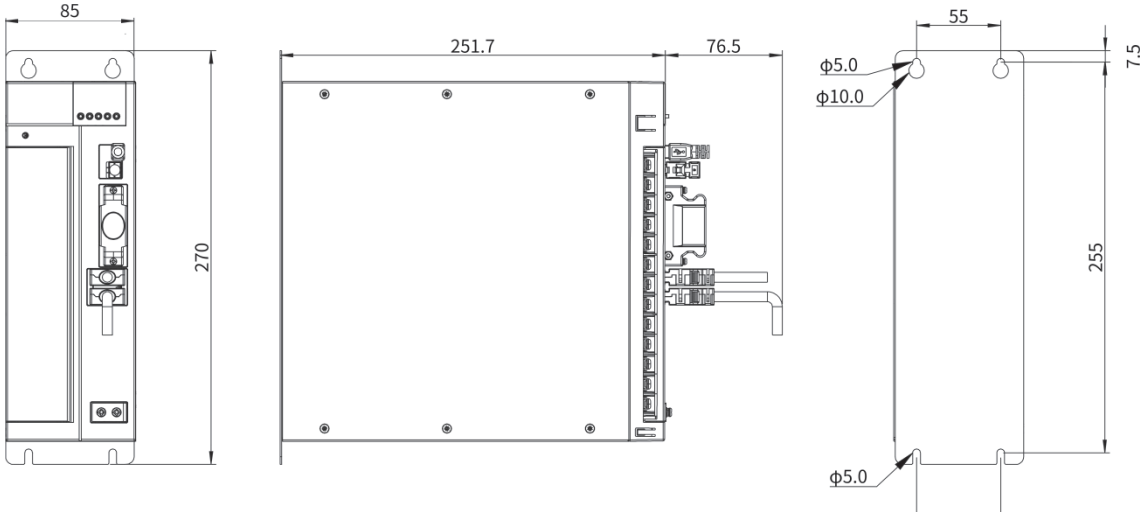
Graph 2：N3RP-4R2SA、N3RP060PA dimension drawing

- E3 Specifications（sizes W*H*D：85*165*190）



Graph 3：N3RP-100SA、N3RP-140SA、N3RP-5R4SC、N3RP-6R8SC、N3RP-8R3SC、N3RP-100SC dimension drawing

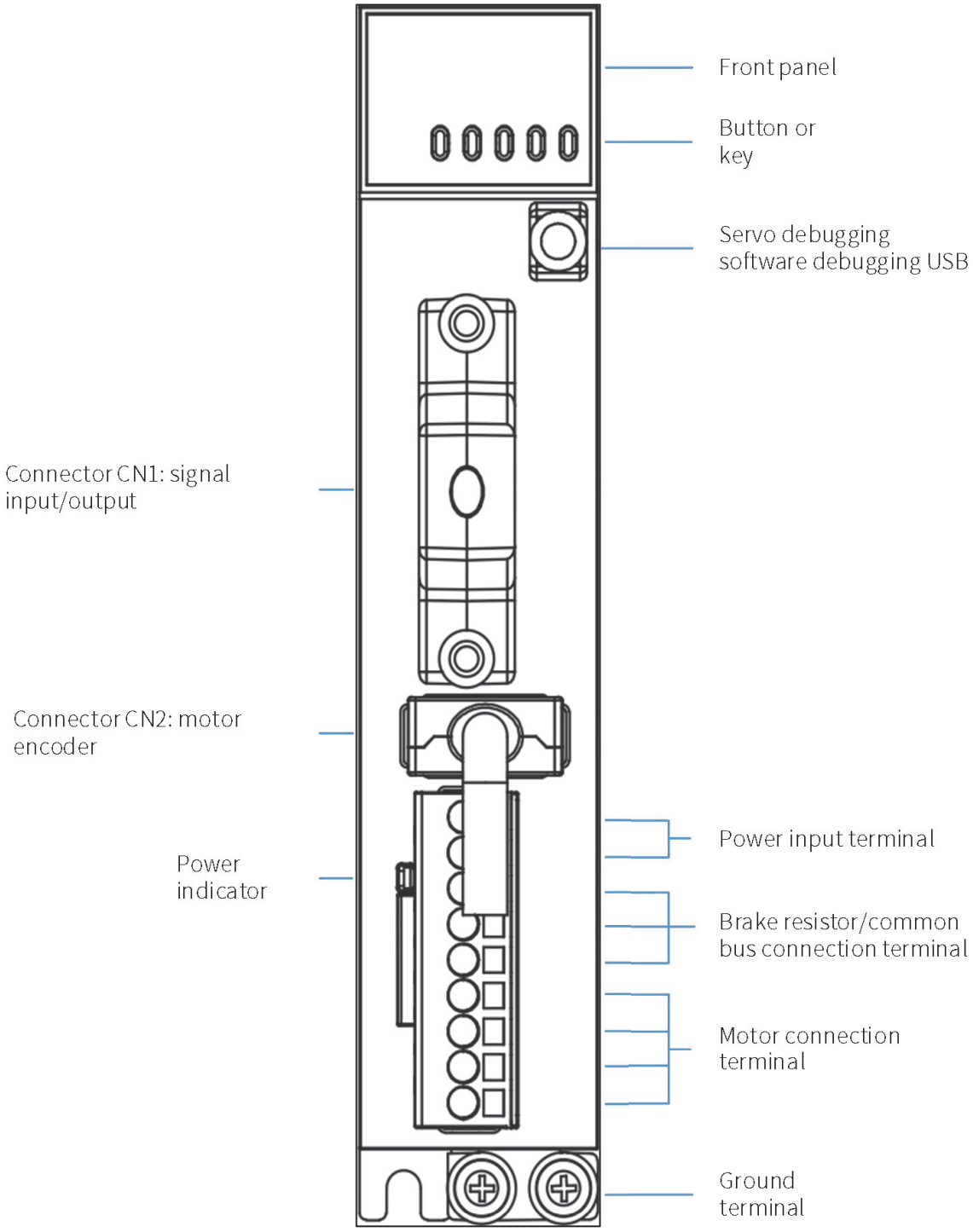
- E4 Specifications（sizes W*H*D：85*270*251.7）



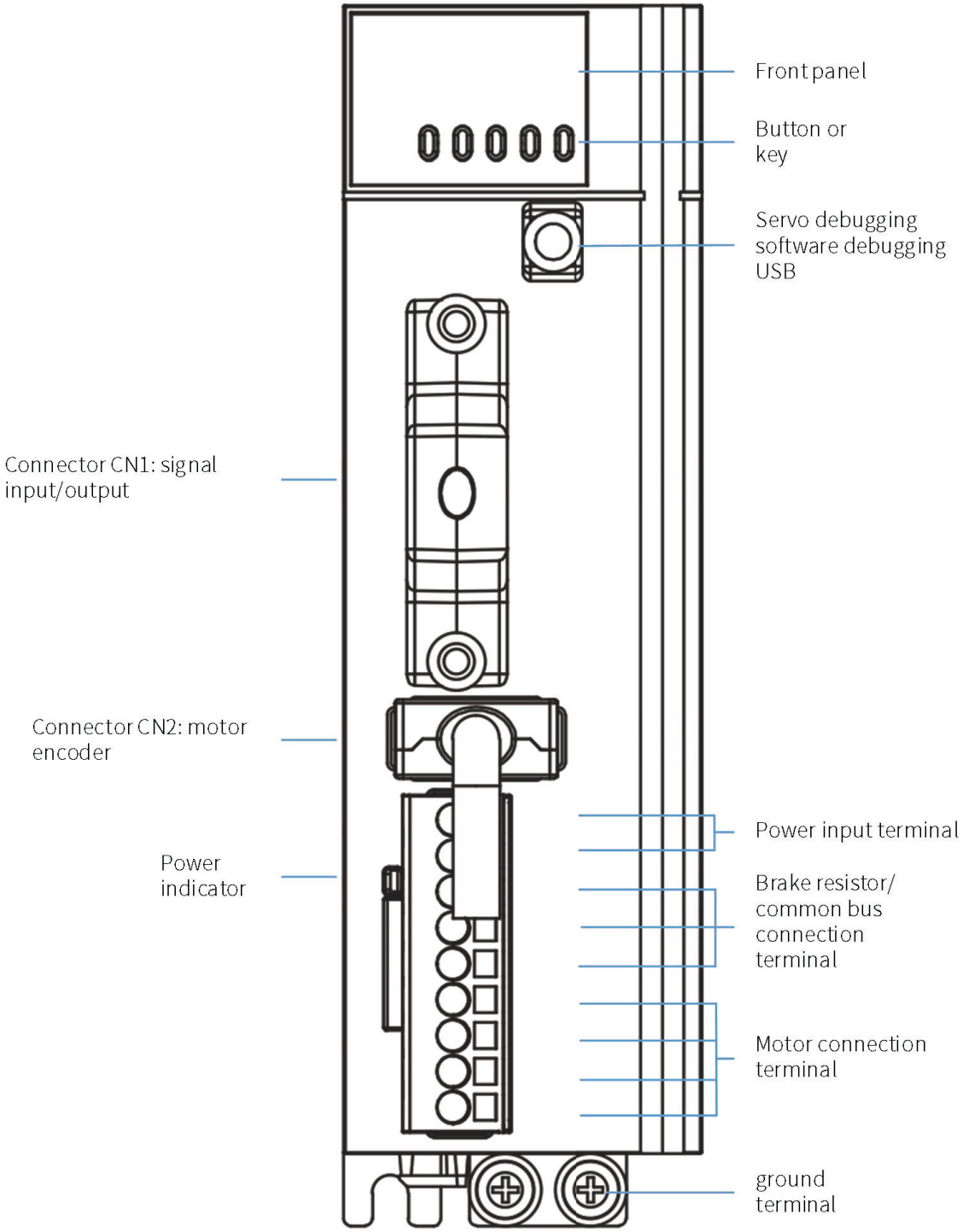
Graph 4：N3RP-180SA、N3RP-120SC、N3RP-140SC、N3RP-210SC、N3RP-250SC dimension drawing

2.1.2 Interface description

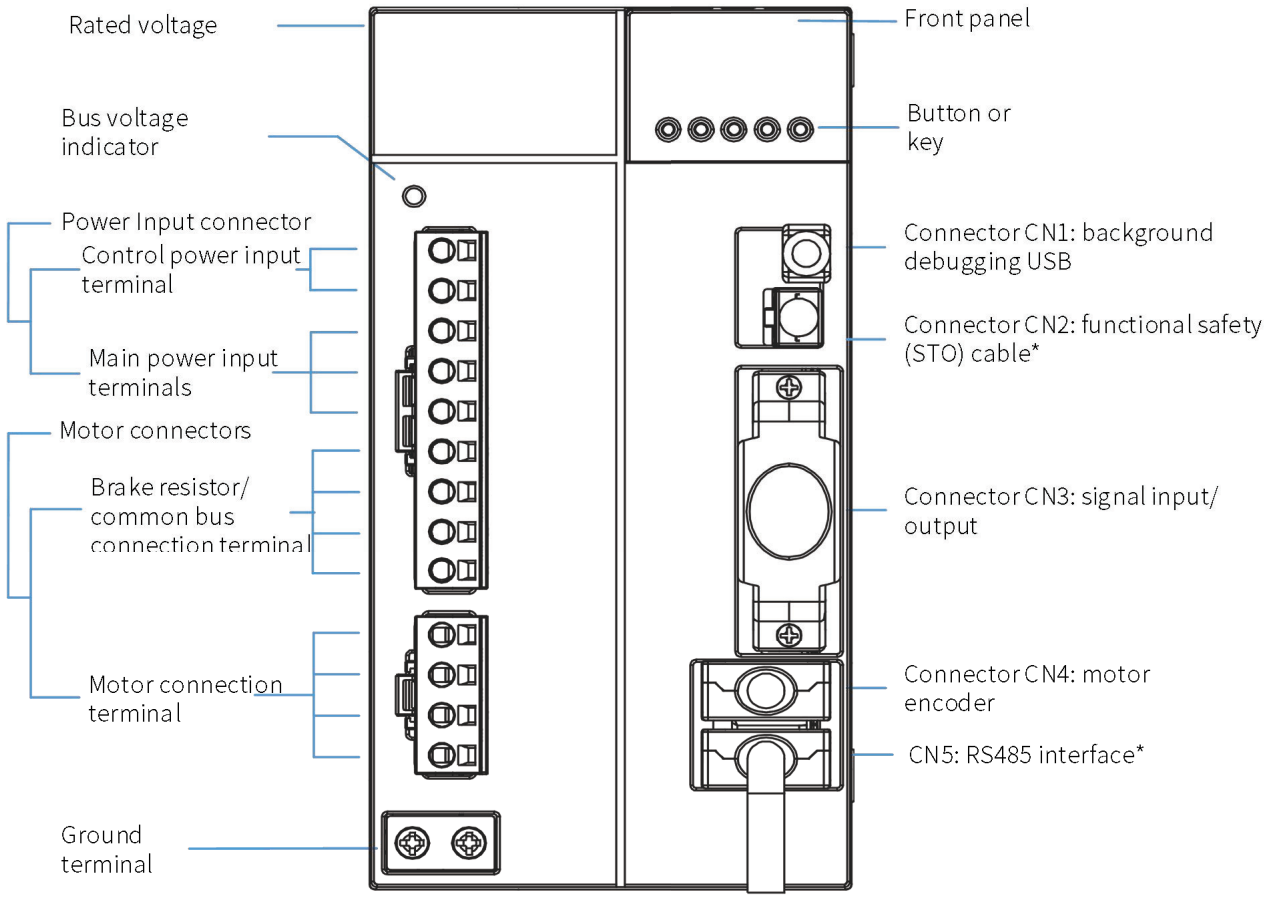
- Interface Naming for E1 Specifications(N3RP-1R8SA、N3RP-2R8SA)



- Interface naming for E2 specifications(N3RP-4R2SA、N3RP-060PA)

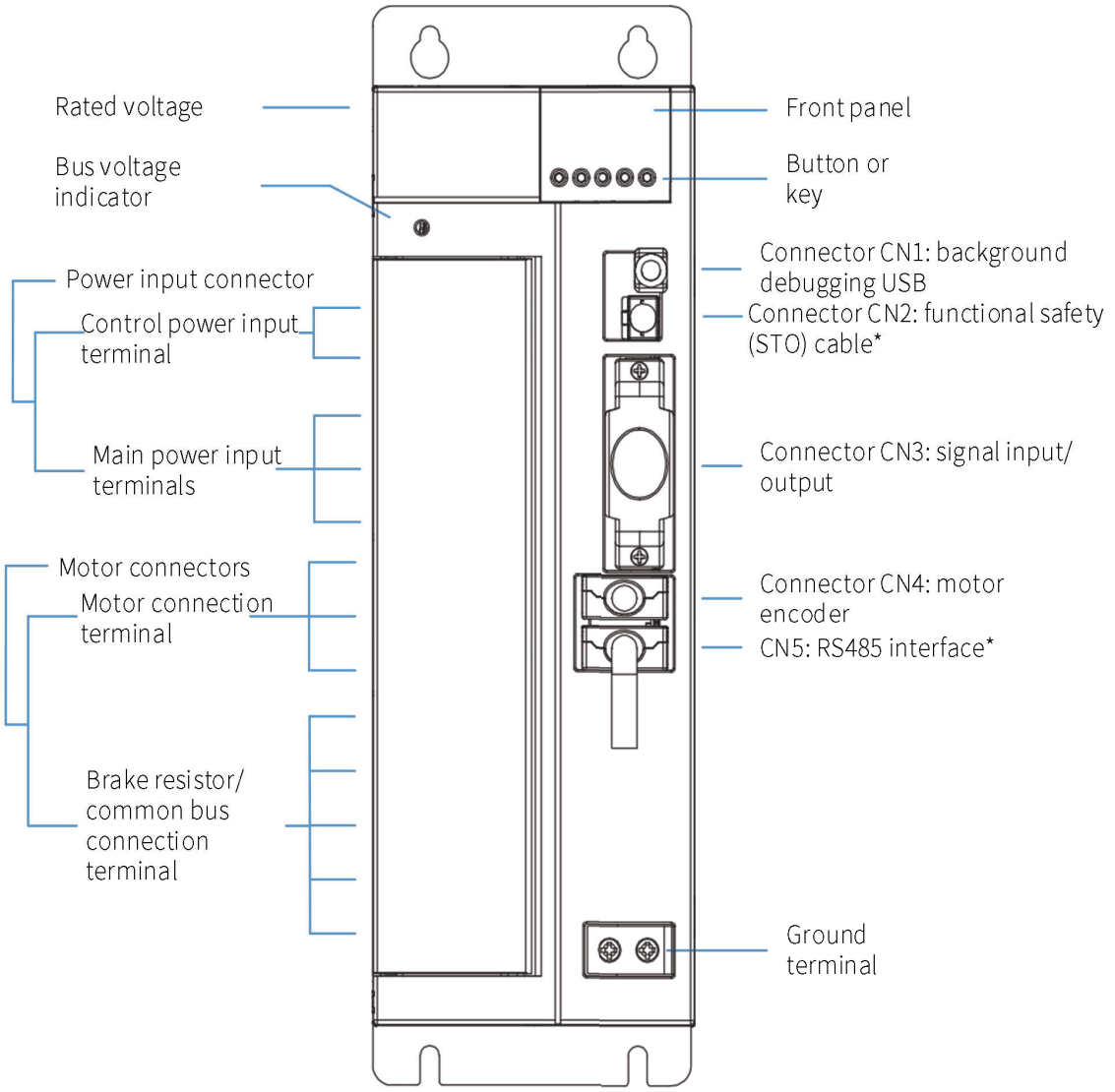

Front panel
Button or key
Servo debugging software debugging USB
Connector CN1: signal input/output
Connector CN2: motor encoder
Power indicator
Power input terminal
Brake resistor/ common bus connection terminal
Motor connection terminal
ground terminal

- Interface naming for E3 specifications(N3RP-100SA、N3RP-140SA、N3RP-5R4SC、N3RP-6R8SC、N3RP-8R3SC、N3RP-100SC)



Note: * indicates that only "-SM" models are available, please contact Cosel for details.

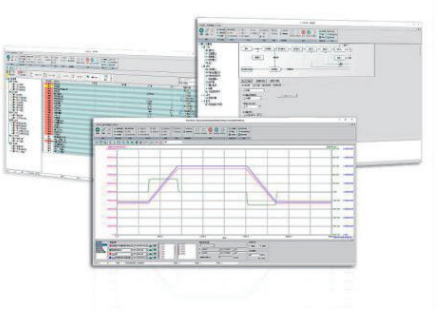
- Interface Naming for E4 Specifications(N3RP-180SA、N3RP-120SC、N3RP-140SC、N3RP-210SC、N3RP-250SC)



Note: * indicates that only "-SM" models are available, please contact Cosel for details.

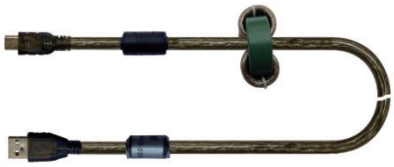
2.1.3 Drive options

1) Debugging software （Servo Tool）



Model Number	Descriptive
KST-SW.02	N3RP series servo system debugging software

2) Debugging Cable



Model Number	Descriptive
KSL-M13-030	N3RP series mini usb debug cable 3m

3) Signal cable

Model Number	Descriptive
KSL-S03-010	N3RP series pulse type servo signal cable 1m (1kw and below)
KSL-S04-010	N3RP series pulse type servo signal cable 1M (1kW or more)

4) Terminal block

Model Number	Descriptive
KSA-TB19.01	N3RP series e1/e2 size terminal block
KSA-TB20.01	N3RP series e3/e4 size terminal block
KSA-TB20.02	N3RP series E3/E4 size terminal block (for "-SM, -SG type" only)

5) Communication network cable

Model Number	Descriptive
KSL-CAT-003.01	N3RP series communication network cable 0.3m
KSL-CAT-005.01	N3RP series communication network cable 0.5m
KSL-CAT-010.01	N3RP series communication network cable 1m
KSL-CAT-030.01	N3RPseries communication network cable 3m
KSL-CAT-050.01	N3RPseries communication network cable5m

2.1.4 Drive installation

2.1.4.1 Place of installation

- Please install in the installation cabinet without sunshine and rain;
- Do not use this product near corrosive and flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gases, acids, alkalis, salts, and combustible materials;
- Do not install in high temperature, humid, dusty, and metal dusty environment;
- No vibration place; Pollution level of the installation place: PD2.

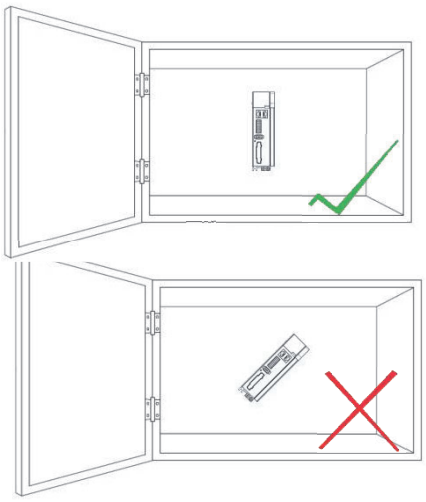
2.1.4.2 Environmental conditions

Sports Event	Descriptive
Ambient Temperature	0~55°c (10% reduction for every 5°c above 45°c ambient temperature)
Ambient Humidity	below 90%rh (no condensation)
Storage Temperature	20~70℃(not freezing)
Storage Humidity	≤90%
Vibratory	4.9m/² the following
Under Attack	19.6m/s² the following
Protection Class	Ip20
Height Above Sea Level	1000m the following (1000m if above, the amount will be reduced by 1.1% for every 100m of elevation, and the maximum use altitude is 2000m)

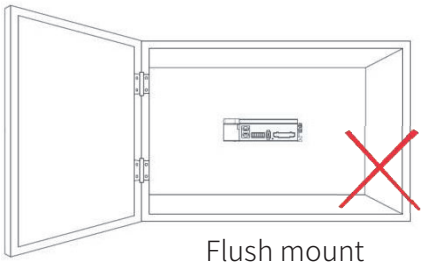
2.1.4.3 Safety Precautions

- Please ensure that the mounting direction is perpendicular to the wall. Use natural convection or a fan to cool the servo drive. Securely fasten the servo drive to the mounting surface through 2 to 4 (the number of mounting holes varies depending on the capacity) mounting holes. Mount the Servo Drive with the front of the Servo Drive facing the operator and perpendicular to the wall.

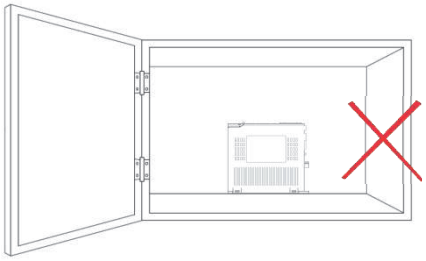
Vertical installation



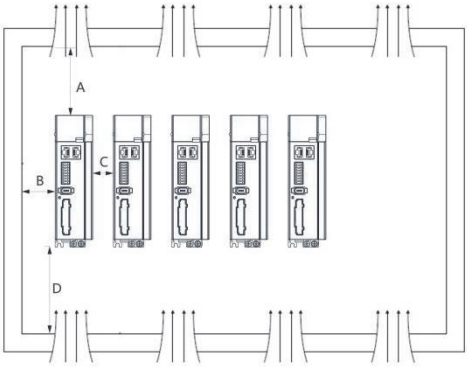
Horizontal mounting

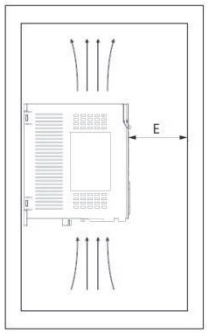


Flush mount



- Cooling To ensure cooling by fan and natural convection, leave enough space around the servo drive as shown in the figure below. Install a cooling fan on the upper part of the servo drive, and keep the temperature inside the cabinet uniform so that the ambient temperature of the servo drive is not locally too high.





Note: A size＞120mm, B size＞50mm, C size＞30mm, D/E size＞120mm in the product specification.

- When is installed side-by-side:

It is recommended to leave at least 30mm of clearance on each side (V1 specification, fanless construction, uses side heat sinks for heat dissipation, so 30mm of clearance must be left). There should be at least 50mm clearance between the first and last drives and the side of the cabinet.

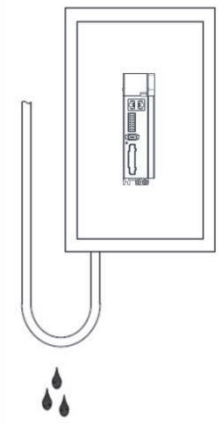
- Grounding:

Be sure to ground the ground terminal, otherwise there may be a risk of electric shock or interference resulting in malfunction.

- Alignment requirements:

When wiring the drive, be careful to avoid having liquids adhering to the surface of the cable in the field,

which could result in liquids flowing along the cable into the interior of the drive.

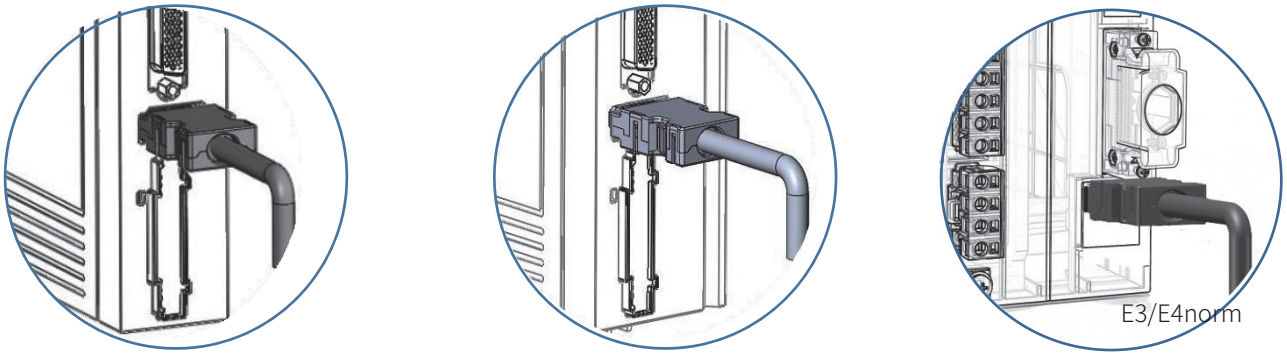


2.1.4.4 Grounding

Be sure to ground the earth terminal, otherwise there may be a risk of electric shock or interference resulting in malfunction. For details on electrical grounding, see 3.12 Grounding and anti-interference measures.

2.1.4.5 Wiring requirements

When wiring the drive, route the cables downward (refer to the figure below) to avoid damage caused by liquids flowing into the drive along the cables at the site.

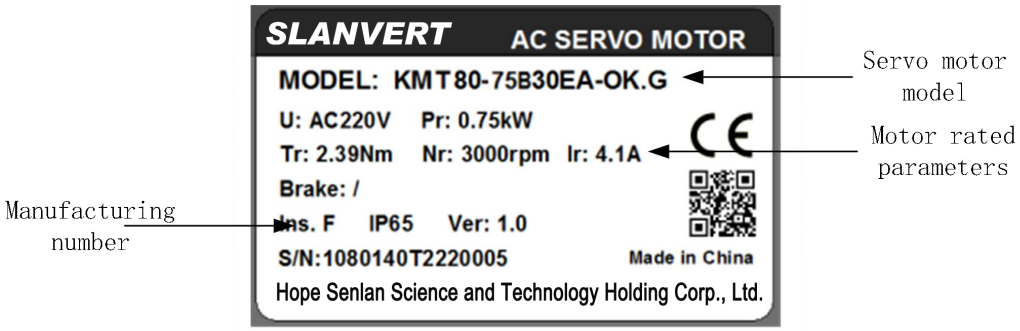


N3RP-1R8SA-E、N3RP-2R8SA-E N3RP-4R2SA-E、N3RP-060PA-E

Figure: 2.4-1 Servo Drive Cable Alignment Requirements Diagram

2.2 KMT Introduction to servo motors

2.2.1 Nameplate and type description



KMT M 130 H - 85B 15 EA - B O K □. □

KMT Series servo motor

Moment of inertia (MOI) of a vehicle
L: low inertia
M: inertia (mechanics)
H: high inertia

Flange rating
40 flangeless; 60 flangeless; 80 flangeless;
100 flangeless; 130 flangeless; 180 flangeless;
200 flangeless; 230 flangeless

Voltage level
none: AC200V
H: AC380V

Rating
B: X10
C: X100
D: X1000
give an example: 40B:400W

Rated speed
15: 1500rpm ; 20: 2000rpm
25: 2500rpm ; 30: 3000rpm

Encoder type
E8: 17-bit multi-turn absolute encoder
EA: 23-bit multi-turn absolute encoder

none : without holding brake
B : with holding brake

none : without oil seal
O : with oil seal

none : optical axis
K : keyed, Threaded Hole

none : (an official) standard
G : plastic housed aerial plug, 40/60/80 flanges only

Type (only for E8-size encoders with 80 flanges and below)
none: splitter
X : synthesis

Note: 1) the naming rules are only used for model analysis, and can not be used for ordering, before ordering, please consult the company;

2)with or without oil seals, with or without brakes, will result in different characteristics of the motor, please pay attention to;

3) the motor data may be changed, for the purpose of designing the use of the motor, please confirm with the company.

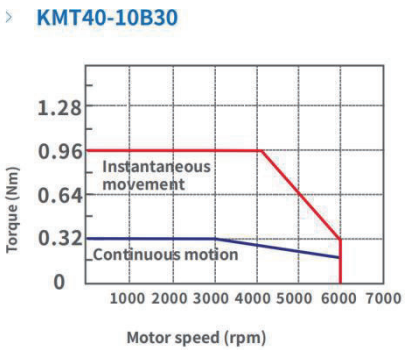
2.2.2 Motor specifications

- 40 Flange motor data (0.1kW)

Motor Model / Sports Event	KMT40-10B30
Voltage U(AC)	AC220V
Rated Power Pr(kW)	0.1
Rated Current Ir(A)	0.93
Rated Torque Tr(Nm)	0.32
Rated Speed Nr(rpm)	3000
Maximum Current Imax(Arms)	2.79
Maximum Torque Tmax(Nm)	0.96
Maximum Speed Nmax(rpm)	6000
Torque Coefficient Kt (Nm/A)	0.342
Moment Of Inertia Jm(10^{-4}Kg.m^2)	0.073(0.075)
Electrical Time Constant Te(ms)	0.81
Mechanical Time Constant Tm (ms)	1.128
Weight (Kg)	0.4(0.6)
Heatsink Size(mm)	aluminum 200×200×6
Holding Voltage Ub(DC)	24V
Holding Current Ib(A)	0.208
Braking Torque Tb(Nm)	＞3.2
Recommended Power Cable Cross Sectional Area (mm^2)	0.5
Recommended Drive Models	N3RP-1R8SA-E

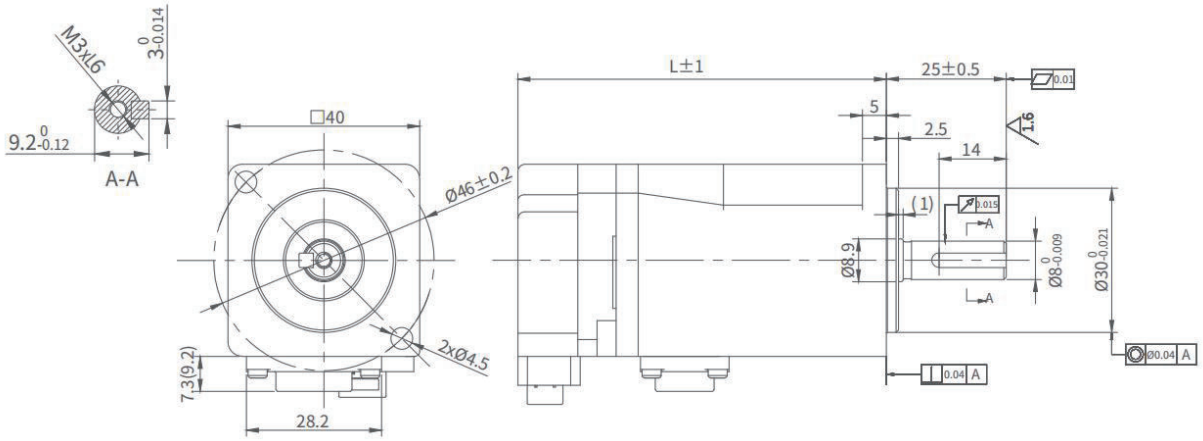
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 40 flange torque speed characteristic chart



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 40 flange motor dimensions



Motor model	L dimensions without holding brake (mm)	L with holding brake size(mm)
KMT40-10B30E□	76.9	104.6

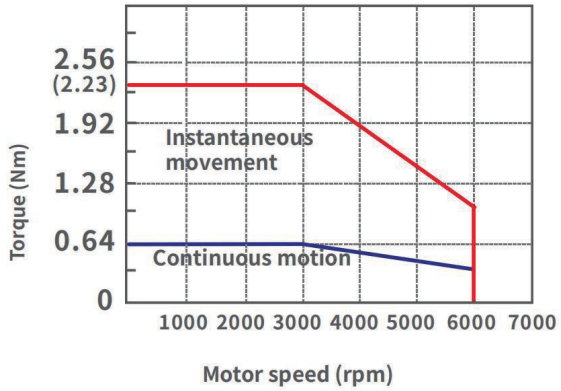
- 60 Flange Motor Data (0.2KW~0.4KW)

Motor Model / Sports Event	KMT60-20B30	KMT60-40B30
Voltage U(AC)	220V	
Rated Power Pr(kW)	0.2	0.4
Rated Current Ir(A)	1.6	2.3
Rated Torque Tr(Nm)	0.64	1.27
Rated Speed Nr(rpm)	3000	3000
Maximum Current Imax(Arms)	5.5	6.5
Maximum Torque Tmax(Nm)	2.23	3.81
Maximum Speed Nmax(rpm)	6000	5000
Torque Coefficient Kt (Nm/A)	0.459	0.645
Moment Of Inertia Jm(10^{-4}Kg.m^2)	0.28(0.30)	0.56(0.58)
Electrical Time Constant Te(ms)	1.95	2.66
Mechanical Time Constant Tm (ms)	1.432	1.151
Weight (Kg)	0.81(1.26)	1.3(1.55)
Heatsink Size(mm)	aluminum 250×250×6	
Holding Voltage Ub(DC)	24V	
Holding Current Ib(A)	0.32	
Braking Torque Tb(Nm)	≥1.5	
Recommended Power Cable Cross Sectional Area (mm^2)	0.5	
Recommended Drive Models	N3RP-1R8SA-E	N3RP-2R8SA-E

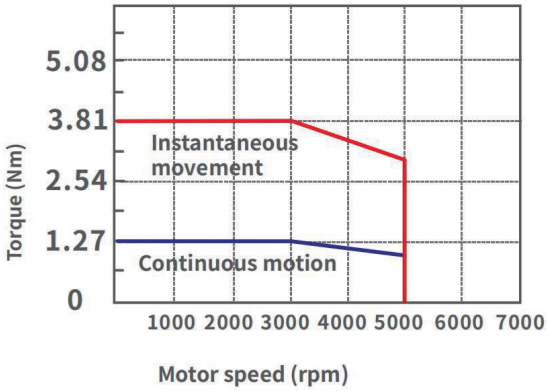
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 60 flange torque speed characteristic chart

KMT60-20B30

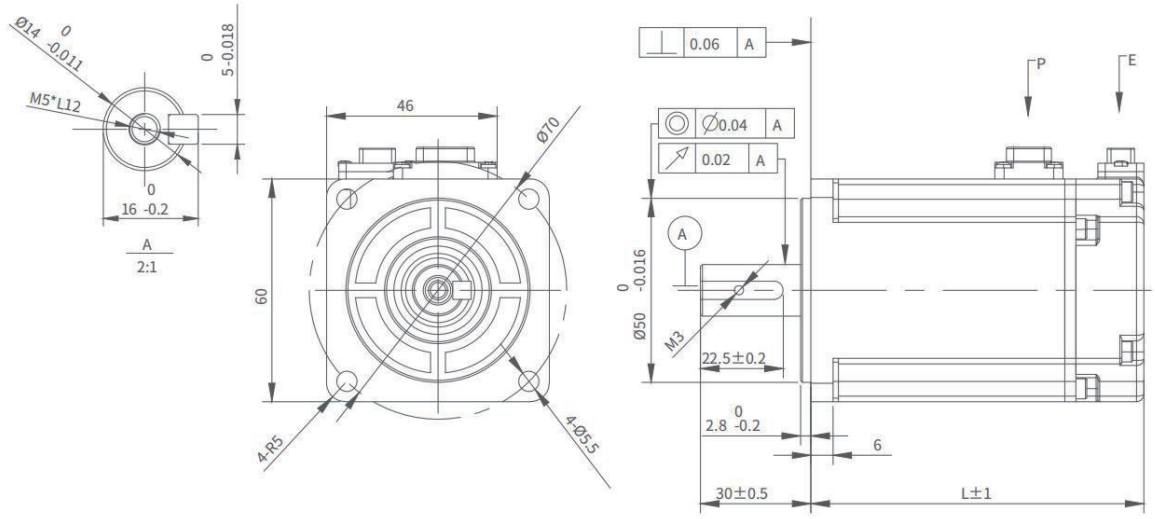


KMT60-40B30



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 60 flange motor dimensions



Motor Model	L Dimensions Without Holding Brake (mm)	L With Holding Brake Size(mm)
KMT60-20B30E□	75.5	106.7
KMT60-40B30E□	93	124.2

- 80 Flange Motor Data (0.75KW~1KW)

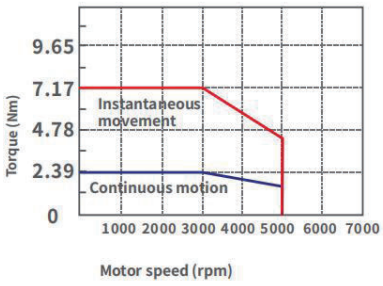
Motor Model / Sports Event	KMT80-75B30	KMT80-10C30	KMT80-10C25*
Voltage U(AC)	220V		
Rated Power Pr(kW)	0.75	1	1
Rated Current Ir(A)	4.1	5.7	6.8
Rated Torque Tr(Nm)	2.39	3.18	4
Rated Speed Nr(rpm)	3000	3000	2500
Maximum Current Imax(Arms)	13.4	17.7	20.4
Maximum Torque Tmax(Nm)	7.17	9.56	12
Maximum Speed Nmax(rpm)	5000	5000	5000
Torque Coefficient Kt (Nm/A)	0.645	0.627	0.604
Moment Of Inertia Jm(10^{-4}Kg.m^2)	1.5(1.65)	2(2.15)	1(1.02)
Electrical Time Constant Te(ms)	4.73	5.56	9.22
Mechanical Time Constant Tm (ms)	0.919	0.822	0.5613
Weight (Kg)	2.2(2.8)	2.8(3.4)	2.56(3.17)
Heatsink Size(mm)	aluminum 250×250×6		
Holding Voltage Ub(DC)	24V		
Holding Current Ib(A)	0.48		
Braking Torque Tb(Nm)	≥3.2		＞3.2
Recommended Power Cable Cross Sectional Area (mm^2)	0.5		0.5
Recommended Drive Models	N3RP-4R2SA-E	N3RP-060PA-E	N3RP-100SA-E

Note: 1) The above are standard models, ( ) are parameters for motors with holding brake;

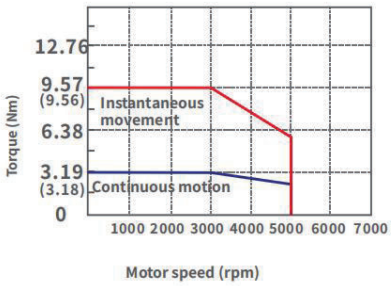
2) * are G models with rem connectors.

- 80 flange torque speed characteristic chart

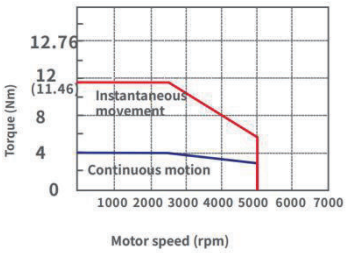
KMT80-75B30



KMT80-10C30

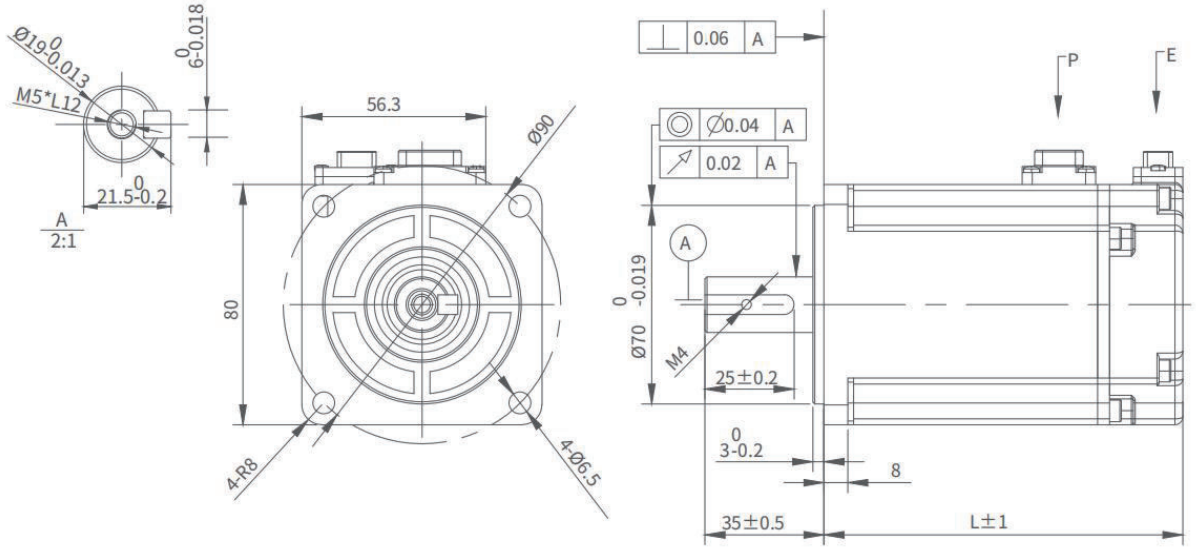


KMT80-10C25

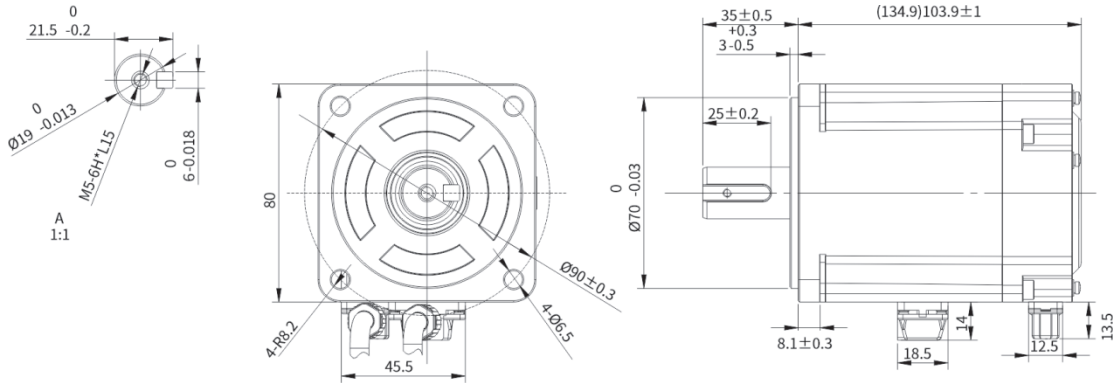


Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 80 flange motor dimensions



Motor Model	L Dimensions Without Holding Brake (mm)	L With Holding Brake Size(mm)
KMT80-75B30E□	95.5	125.5
KMT80-10C30E□	108.5	138.5



Motor Model	L Dimensions Without Holding Brake (mm)	L With Holding Brake Size(mm)
KMT80-10C25E□	103.9	134.9

- 100 Flange Motor Data (1KW~1.5KW)

Motor Model / Sports Event	KMTM100-10C30	KMTM100-15C30
Voltage U(AC)	220V	
Rated Power Pr(kW)	1	1.5
Rated Current Ir(A)	7.7	8.6
Rated Torque Tr(Nm)	3.18	4.77
Rated Speed Nr(rpm)	3000	3000
Maximum Current Imax(Arms)	23.1	25.8
Maximum Torque Tmax(Nm)	9.55	14.32
Maximum Speed Nmax(rpm)	6000	5000
Torque Coefficient Kt (Nm/A)	0.416	0.555
Moment Of Inertia Jm(10^{-4}Kg.m^2)	2.07(2.33)	2.69(2.95)
Electrical Time Constant Te(ms)	6.99	7.02
Mechanical Time Constant Tm (ms)	0.7	0.58
Weight (Kg)	4.5(5.4)	5.0(6.5)
Heatsink Size(mm)	aluminum 400×410×15	
Holding Voltage Ub(DC)	24V	
Holding Current Ib(A)	0.6	
Braking Torque Tb(Nm)	≥9	
Recommended Power Cable Cross Sectional Area (mm^2)	1.5	
Recommended Drive Models	N3RP-100SA-E	N3RP-100SA-E

Note: The above is the standard model, () is the parameter of motor with holding brake ;

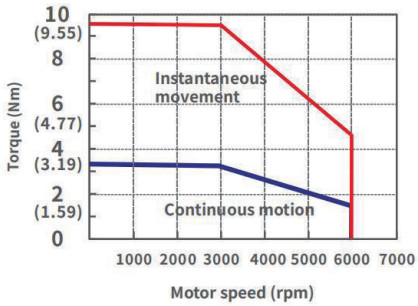
- 100 Flange Motor Data (1KW~2.5KW)

Motor Model / Sports Event	KMTM100H -10C30	KMTM100H -15C30	KMTM100H -20C30	KMTM100H -25C30
Voltage U(AC)	380V			
Rated Power Pr(kW)	1	1.5	2	2.5
Rated Current Ir(A)	4.5	5.7	6.8	8.4
Rated Torque Tr(Nm)	3.18	4.77	6.37	8.0
Rated Speed Nr(rpm)	3000	3000	3000	3000
Maximum Current Imax(Arms)	13.5	17.1	20.4	24
Maximum Torque Tmax(Nm)	9.55	14.32	19.1	22.7
Maximum Speed Nmax(rpm)	6000	5000	5000	5000
Torque Coefficient Kt (Nm/A)	0.707	0.838	0.936	0.947
Moment Of Inertia Jm(10^{-4}Kg.m^2)	2.07(2.33)	2.69(2.95)	3.6(3.86)	4.37(4.55)
Electrical Time Constant Te(ms)	8.63	6.36	6.93	7.50
Mechanical Time Constant Tm (ms)	0.73	0.68	0.56	0.47
Weight (Kg)	4.5(5.4)	5.0(6.5)	6.0(7.5)	7.0(8.5)
Heatsink Size(mm)	aluminum200×200×12			
Holding Voltage Ub(DC)	24V			
Holding Current Ib(A)	0.6			
Braking Torque Tb(Nm)	≥9			
Recommended Power Cable Cross Sectional Area (mm^2)	0.75		1.5	
Recommended Drive Models	N3RP-5R4SC-E	N3RP-6R8SC-E	N3RP-6R8SC-E	N3RP-100SC-E

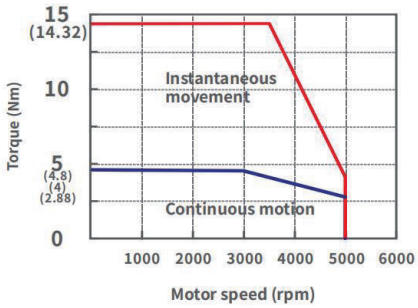
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 100 flange torque speed characteristic chart

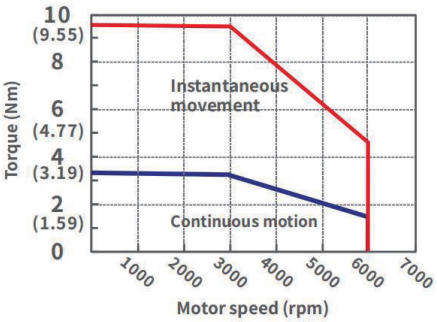
KMTM100-10C30



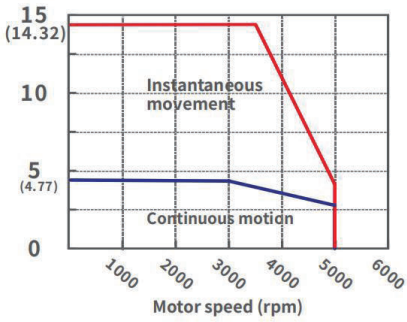
KMTM100-15C30



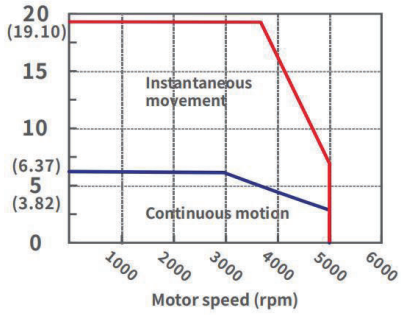
KMTM100H-10C30



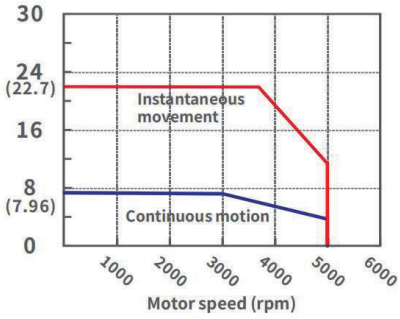
KMTM100H-15C30



KMTM100H-20C30

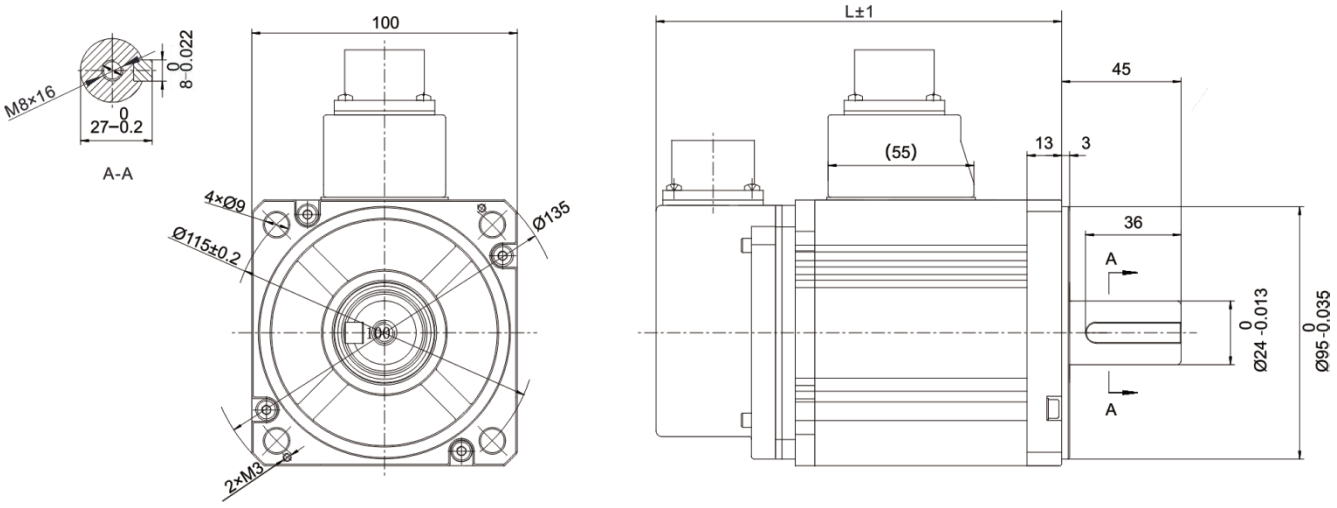


KMTM100H-25C30



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 100 flange motor dimensions



Motor Model	L Dimensions Without Holding Brake (mm)	L With Holding Brake Size(mm)
KMTM100□-10C30E□	146.9	183
KMTM100□-15C30E□	166.9	203
KMTM100H-20C30E□	186.9	223
KMTM100-25C30E□	206.9	243

Note: Motors with the same flange, torque, and speed have the same external dimensions for 380V and 220V class models.

- 130 Flange Motor Data (0.85KW~1.3KW)

Motor Model / Sports Event	KMTM130-85B15	KMTM130-13C15
Voltage U(AC)	220V	
Rated Power Pr(kW)	0.85	1.3
Rated Current Ir(A)	6.12	9.25
Rated Torque Tr(Nm)	5.41	8.27
Rated Speed Nr(rpm)	1500	1500
Maximum Current Imax(Arms)	18.4	27.75
Maximum Torque Tmax(Nm)	16.2	24.81
Maximum Speed Nmax(rpm)	3000	3000
Torque Coefficient Kt (Nm/A)	0.88	0.89
Moment Of Inertia Jm(10^{-4}Kg.m^2)	9(10.5)	13(14.5)
Electrical Time Constant Te(ms)	9.68	10.7
Mechanical Time Constant Tm (ms)	1.6(1.86)	1.42(1.58)
Weight (Kg)	6.0(7.8)	7.4(9.2)
Heatsink Size(mm)	aluminum 300×300×12	
Holding Voltage Ub(DC)	24V	
Holding Current Ib(A)	1	
Braking Torque Tb(Nm)	≥16.5	
Recommended Power Cable Cross Sectional Area (mm^2)	0.75	1.5
Recommended Drive Models	N3RP-060PA-E	N3RP-100SA-E

Note: The above is the standard model, () is the parameter of motor with holding brake ;

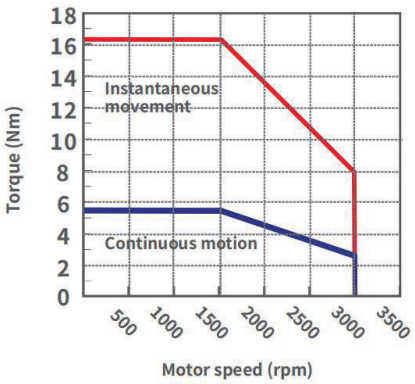
- 130 Flange Motor Data (1KW~1.5KW)

Motor Model / Sports Event	KMTM130-10C20	KMTM130-15C20
Voltage U(AC)	220V	
Rated Power Pr(kW)	1	1.5
Rated Current Ir(A)	5.4	8
Rated Torque Tr(Nm)	4.77	7.16
Rated Speed Nr(rpm)	2000	2000
Maximum Current Imax(Arms)	16.2	24
Maximum Torque Tmax(Nm)	14.3	21.5
Maximum Speed Nmax(rpm)	3000	3000
Torque Coefficient Kt (Nm/A)	0.88	0.89
Moment Of Inertia Jm(10^{-4}Kg.m^2)	9(10.5)	13(14.5)
Electrical Time Constant Te(ms)	9.68	10.7
Mechanical Time Constant Tm (ms)	1.6(1.86)	1.42(1.58)
Weight (Kg)	6.0(7.8)	7.4(9.2)
Heatsink Size(mm)	aluminum 300×300×12	
Holding Voltage Ub(DC)	24V	
Holding Current Ib(A)	1	
Braking Torque Tb(Nm)	≥16.5	
Recommended Power Cable Cross Sectional Area (mm^2)	0.75	1.5
Recommended Drive Models	N3RP-060PA-E	N3RP-100SA-E

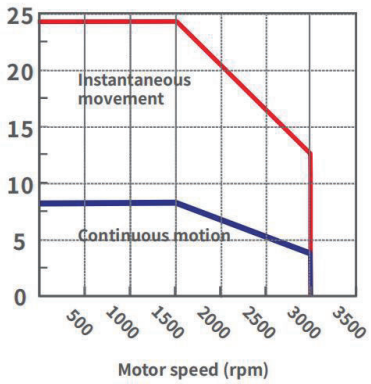
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 130 flange torque speed characteristic chart

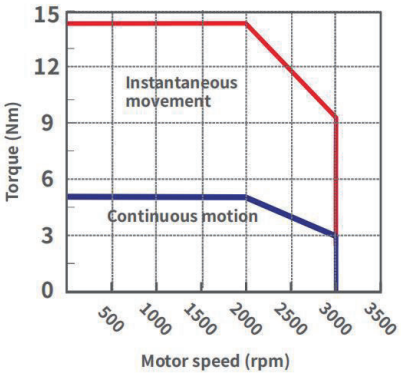
KMTM130-85B15



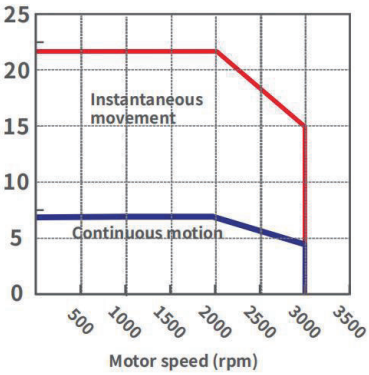
KMTM130-13C15



KMTM130-10C20



KMTM130-15C20



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 130 Flange Motor Data (1KW~1.5KW)

Motor Model / Sports Event	KMTM130-10C25	KMTM130-13C25	KMTM130-15C25
Voltage U(AC)	220V		
Rated Power Pr(kW)	1	1.3	1.5
Rated Current Ir(A)	4.5	5.7	6.8
Rated Torque Tr(Nm)	4	5	6
Rated Speed Nr(rpm)	2500	2500	2500
Maximum Current Imax(Arms)	13.6	17	20.4
Maximum Torque Tmax(Nm)	12	15	18
Maximum Speed Nmax(rpm)	3000	3000	3000
Torque Coefficient Kt (Nm/A)	0.88	0.88	0.88
Moment Of Inertia Jm(10^{-4}Kg.m^2)	9(10.5)	9(10.5)	9(10.5)
Electrical Time Constant Te(ms)	9.68	9.68	9.68
Mechanical Time Constant Tm (ms)	1.6(1.86)	1.6(1.86)	1.6(1.86)
Weight (Kg)	6.0(7.8)	6.0(7.8)	6.0(7.8)
Heatsink Size(mm)	aluminum 300×300×12		
Holding Voltage Ub(DC)	24V		
Holding Current Ib(A)	1		
Braking Torque Tb(Nm)	≥16.5		
Recommended Power Cable Cross Sectional Area (mm^2)	0.75	0.75	1.5
Recommended Drive Models	N3RP-060PA-E	N3RP-100SA-E	N3RP-100SA-E

Note: The above is the standard model, () is the parameter of motor with holding brake ;

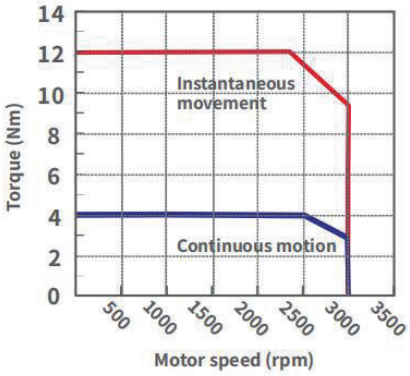
- 130 Flange Motor Data (1.5KW)

Motor Model / Sports Event	KMTM130-15C30
Voltage U(AC)	220V
Rated Power Pr(kW)	1.5
Rated Current Ir(A)	5.4
Rated Torque Tr(Nm)	4.77
Rated Speed Nr(rpm)	3000
Maximum Current Imax(Arms)	16.2
Maximum Torque Tmax(Nm)	14.3
Maximum Speed Nmax(rpm)	3500
Torque Coefficient Kt (Nm/A)	0.88
Moment Of Inertia Jm(10^{-4}Kg.m^2)	9(10.5)
Electrical Time Constant Te(ms)	9.68
Mechanical Time Constant Tm (ms)	1.6(1.86)
Weight (Kg)	6.0(7.8)
Heatsink Size(mm)	aluminum 300×300×12
Holding Voltage Ub(DC)	24V
Holding Current Ib(A)	1
Braking Torque Tb(Nm)	≥16.5
Recommended Power Cable Cross Sectional Area (mm^2)	0.75
Recommended Drive Models	N3RP-100SA-E

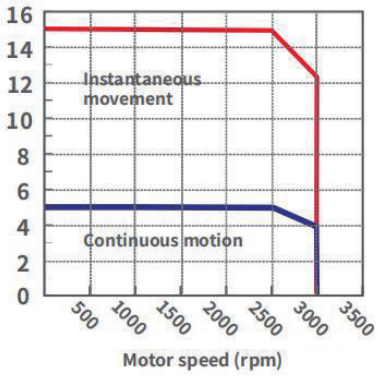
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 130 Flange Torque Speed Characteristics

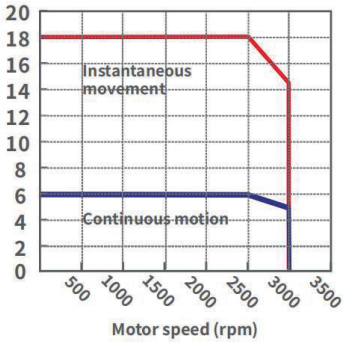
KMTM130-10C25



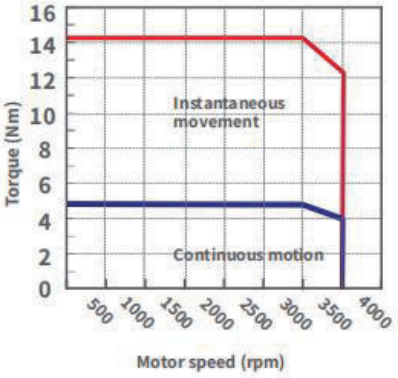
KMTM130-13C25



KMTM130-15C25



KMTM130-15C30



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area

- 130 Flange Motor Data (0.85KW~2.3KW)

Motor Model / Sports Event	KMTM130H -85B15	KMTM130H -13C15	KMTM130H -15C15	KMTM130H -18C15	KMTM130H -23C15
Voltage U(AC)	380V				
Rated Power Pr(kW)	0.85	1.3	1.5	1.8	2.3
Rated Current Ir(A)	3.5	5.1	5.6	6.9	8.7
Rated Torque Tr(Nm)	5.41	8.27	9.55	11.46	15
Rated Speed Nr(rpm)	1500	1500	1500	1500	1500
Maximum Current Imax(Arms)	10.5	15.3	16.8	20.7	26.1
Maximum Torque Tmax(Nm)	16.2	24.8	28.7	31	45
Maximum Speed Nmax(rpm)	3000	3000	3000	3000	3000
Torque Coefficient Kt (Nm/A)	1.69	1.76	1.84	1.79	1.81
Moment Of Inertia Jm(10^{-4}Kg.m^2)	9(10.5)	13(14.5)	17(18.5)	21.7(23.2)	21.7(23.2)
Electrical Time Constant Te(ms)	10.03	11.07	13.13	12.38	12.38
Mechanical Time Constant Tm (ms)	1.6(1.86)	1.35(1.51)	1.2(1.3)	1.14(1.22)	1.14(1.22)
Weight (Kg)	6.0(7.8)	7.4(9.2)	8.8(10.6)	10.4(12.2)	10.4(12.2)
Heatsink Size(mm)	aluminum 300×300×12				
Holding Voltage Ub(DC)	24V				
Holding Current Ib(A)	1				
Braking Torque Tb(Nm)	≥16.5				
Recommended Power Cable Cross Sectional Area (mm^2)	0.75	0.75	0.75	1.5	1.5
Recommended Drive Models	N3RP-5R4SC-E	N3RP-5R4SC-E	N3RP-6R8SC-E	N3RP-6R8SC-E	N3RP-100SC-E

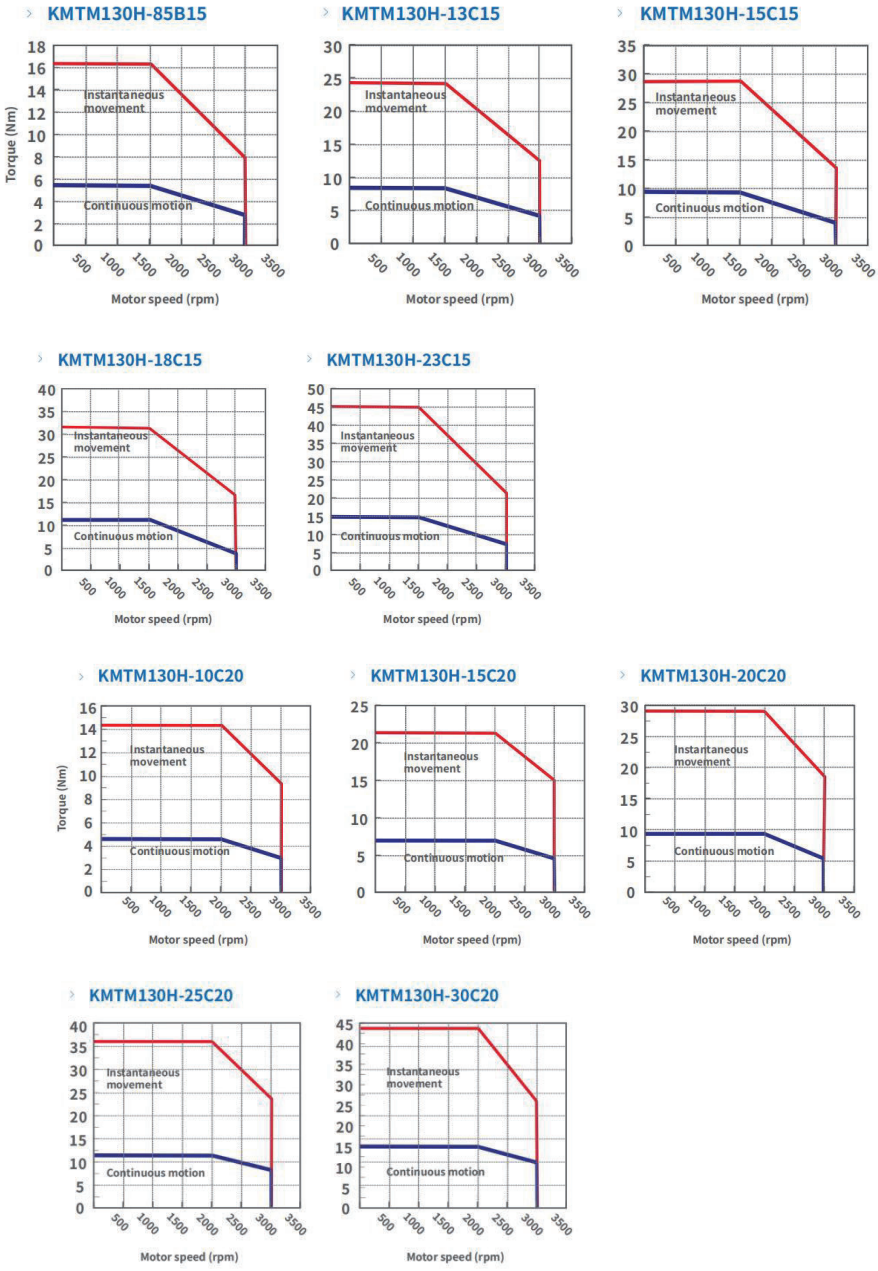
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 130 Flange Motor Data (1KW~3KW)

Motor Model / Sports Event	KMTM130H-10C20	KMTM130H-15C20	KMTM130H-20C20	KMTM130H-25C20	KMTM130H-30C20
Voltage U(AC)	380V				
Rated Power Pr(kW)	1	1.5	2	2.5	3
Rated Current Ir(A)	3.0	4.4	5.6	7.1	8.3
Rated Torque Tr(Nm)	4.77	7.16	9.55	11.9	14.64
Rated Speed Nr(rpm)	2000	2000	2000	2000	2000
Maximum Current Imax(Arms)	9	13.2	16.8	21.3	24.9
Maximum Torque Tmax(Nm)	14.31	21.48	28.65	35.7	43.92
Maximum Speed Nmax(rpm)	3000	3000	3000	3000	3000
Torque Coefficient Kt (Nm/A)	1.7	1.75	1.84	1.78	1.83
Moment Of Inertia Jm(10^{-4}Kg.m²)	9(10.5)	13(14.5)	17(18.5)	21.7(23.2)	21.7(23.2)
Electrical Time Constant Te(ms)	10.03	11.07	13.13	12.38	12.38
Mechanical Time Constant Tm (ms)	1.6(1.86)	1.35(1.51)	1.2(1.3)	1.14(1.22)	1.14(1.22)
Weight (Kg)	6.0(7.8)	7.4(9.2)	8.8(10.6)	10.4(12.2)	10.4(12.2)
Heatsink Size(mm)	aluminum300×300×12				
Holding Voltage Ub(DC)	24V				
Holding Current Ib(A)	1				
Braking Torque Tb(Nm)	≥16.5				
Recommended Power Cable Cross Sectional Area (mm²)	0.75	0.75	0.75	1.5	1.5
Recommended Drive Models	N3RP-5R4SC-E	N3RP-5R4SC-E	N3RP-6R8SC-E	N3RP-100SC-E	N3RP-100SC-E

Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 130 flange torque speed characteristic chart



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 130 Flange Motor Data (1KW~3.8KW)

Motor Model / Sports Event	KMTM130 H-10C25	KMTM130 H-13C25	KMTM130 H-15C25	KMTM130 H-20C25	KMTM130 H-25C25	KMTM130 H-38C25
Voltage U(AC)	380V					
Rated Power Pr(kW)	1	1.3	1.5	2	2.5	3.8
Rated Current Ir(A)	2.7	3.2	3.9	4.8	5.6	8.3
Rated Torque Tr(Nm)	4	5	6	7.7	9.55	15
Rated Speed Nr(rpm)	2500	2500	2500	2500	2500	2500
Maximum Current Imax(Arms)	8.1	9.6	11.7	14.4	16.8	24.9
Maximum Torque Tmax(Nm)	12	15	18	23.1	28.7	45
Maximum Speed Nmax(rpm)	3000	3000	3000	3000	3000	3000
Torque Coefficient Kt (Nm/A)	1.6	1.67	1.67	1.75	1.84	1.81
Moment Of Inertia Jm(10^{-4}Kg.m²)	9(10.5)	9(10.5)	9(10.5)	13(14.5)	17(18.5)	21.7(23.2)
Electrical Time Constant Te(ms)	10.03	10.03	10.03	11.07	13.13	12.38
Mechanical Time Constant Tm (ms)	1.6(1.86)	1.6(1.86)	1.6(1.86)	1.35(1.51)	1.20(1.30)	1.14(1.22)
Weight (Kg)	6.0(7.8)	6.0(7.8)	6.0(7.8)	7.4(9.2)	8.8(10.6)	10.4(12.2)
Heatsink Size(mm)	Aluminum 300×300×12					
Holding Voltage Ub(DC)	24V					
Holding Current Ib(A)	1					
Braking Torque Tb(Nm)	≥16.5					
Recommended Power Cable Cross Sectional Area (mm²)	0.75	0.75	0.75	0.75	1.5	1.5
Recommended Drive Models	N3RP-5R4SC-E	N3RP-5R4SC-E	N3RP-5R4SC-E	N3RP-5R4SC-E	N3RP-6R8SC-E	N3RP-100SC-E

Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 130 Flange Motor Data (1.5KW~2.5KW)

Motor Model / Sports Event	KMTM130H-15C30	KMTM130H-20C30	KMTM130H-25C30
Voltage U(AC)	380V		
Rated Power Pr(kW)	1.5	2	2.5
Rated Current Ir(A)	4.3	5.4	6.9
Rated Torque Tr(Nm)	4.77	6.36	7.95
Rated Speed Nr(rpm)	3000	3000	3000
Maximum Current Imax(Arms)	12.9	16.2	20.7
Maximum Torque Tmax(Nm)	14.31	19.08	23.89
Maximum Speed Nmax(rpm)	4500	4500	4500
Torque Coefficient Kt (Nm/A)	1.19	1.22	1.24
Moment Of Inertia Jm(10^{-4}Kg.m^2)	9(10.5)	9(10.5)	13(14.5)
Electrical Time Constant Te(ms)	8.62	8.62	11.40
Mechanical Time Constant Tm (ms)	1.6(1.86)	1.6(1.86)	1.35(1.51)
Weight (Kg)	6.0(7.8)	6.0(7.8)	7.4(9.2)
Heatsink Size(mm)	aluminum300×300×12		
Holding Voltage Ub(DC)	24V		
Holding Current Ib(A)	1		
Braking Torque Tb(Nm)	≥16.5		
Recommended Power Cable Cross Sectional Area (mm^2)	0.75		
Recommended Drive Models	N3RP-5R4SC-E	N3RP-6R8SC-E	N3RP-6R8SC-E

Note: The above is the standard model, () is the parameter of motor with holding brake ;

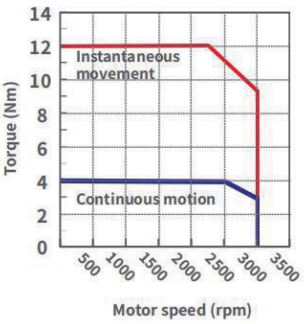
- 130 Flange Motor Data (3KW~5KW)

Motor Model / Sports Event	KMTM130H-30C30	KMTM130H-40C30	KMTM130H-50C30
Voltage U(AC)	380V		
Rated Power Pr(kW)	3	4	5
Rated Current Ir(A)	8.64	10.2	13.2
Rated Torque Tr(Nm)	9.55	12.7	15.92
Rated Speed Nr(rpm)	3000	3000	3000
Maximum Current Imax(Arms)	25.9	30.6	35
Maximum Torque Tmax(Nm)	28.7	38.1	40.3
Maximum Speed Nmax(rpm)	4500	4500	4500
Torque Coefficient Kt (Nm/A)	1.19	1.25	1.27
Moment Of Inertia Jm(10^{-4}Kg.m^2)	17(18.5)	21.7(23.2)	27(28.5)
Electrical Time Constant Te(ms)	11.57	12.04	11.7
Mechanical Time Constant Tm (ms)	1.2(1.3)	1.14(1.22)	2.1(2.2)
Weight (Kg)	8.8(10.6)	10.4(12.2)	14.4(12.5)
Heatsink Size(mm)	aluminum300×300×12		aluminum450×450×25
Holding Voltage Ub(DC)	24V		
Holding Current Ib(A)	1	1	1
Braking Torque Tb(Nm)	≥16.5		
Recommended Power Cable Cross Sectional Area (mm^2)	1.5	1.5	2.5
Recommended Drive Models	N3RP-100SC-E	N3RP-120SC-E	N3RP-140SC-E

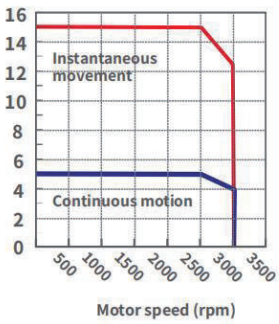
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 130 flange torque speed characteristic chart

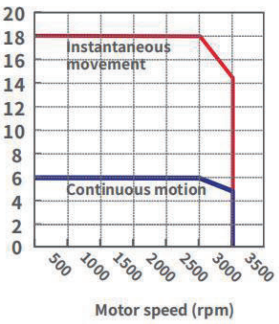
KMTM130H-10C25



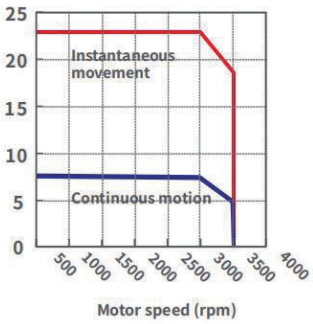
KMTM130H-13C25



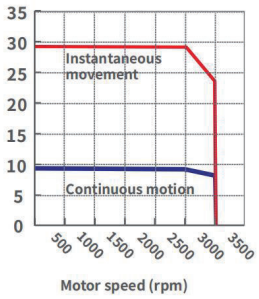
KMTM130H-15C25



KMTM130H-20C25



KMTM130H-25C25



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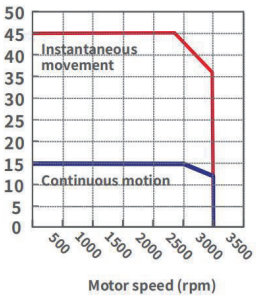
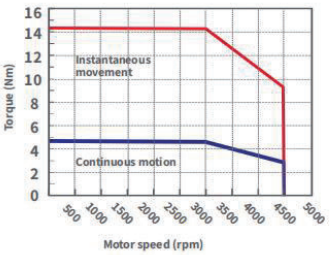


KMTM130H-15C30



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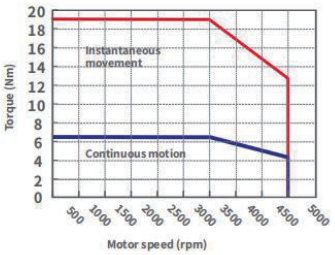

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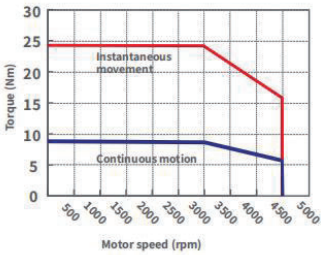
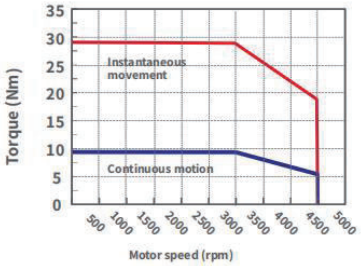
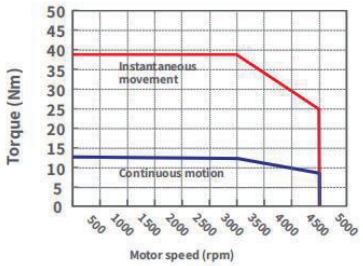


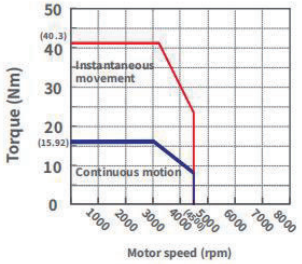
KMTM130H-30C30



KMTM130H-40C30

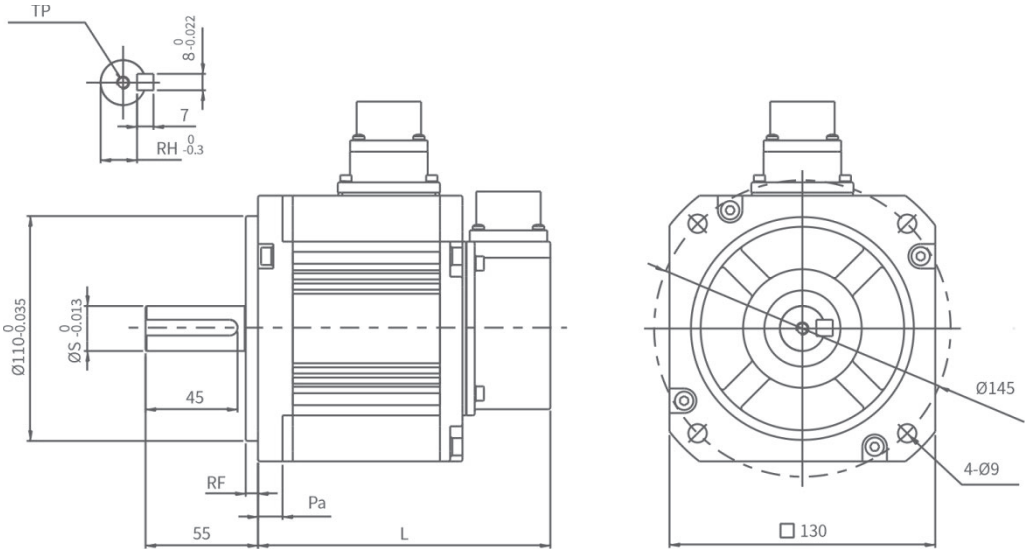


KMTM130H-50C30



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 130 flange motor dimensions



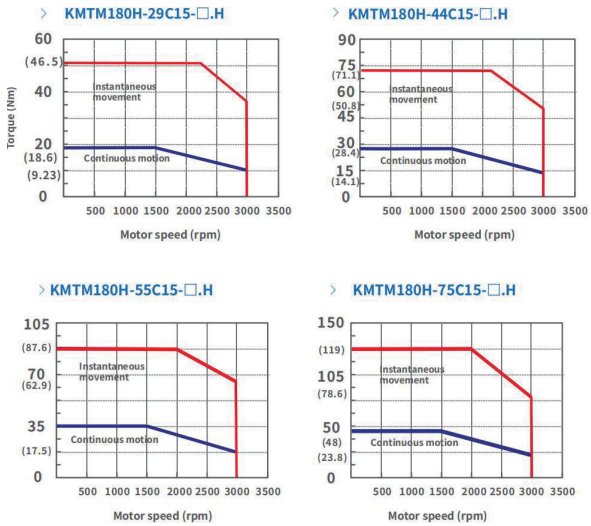
Motor Model	S	RH	TP	RF	Pa	L Without Holding Brake Size(mm)	LWith Holding Brake Dimensions(mm)
KMTM130□-85B15E□	22	18	M6×L20	5	14	142.5	169.3
KMTM130□-10C20E□							
KMTM130□-15C30E□							
KMTM130□-10C25E□							
KMTM130□-13C25E□							
KMTM130□-15C25E□							
KMTM130H-20C30E□							
KMTM130□-13C15E□	22	18	M6×L20	5	14	159.5	186.3
KMTM130□-15C20E□							
KMTM130H-20C25E□							
KMTM130H-25C30E□							
KMTM130H-20C20E□	22	18	M6×L20	5	14	176.5	203.3
KMTM130H-30C30E□							
KMTM130H-25C25E□							
KMTM130H-15C15E□							
KMTM130H-18C15E□	22	18	M6×L20	5	14	196.5	223.3
KMTM130H-25C20E□							
KMTM130H-30C20E□							
KMTM130H-40C30E□							
KMTM130H-23C15E□							
KMTM130H-38C25E□							
KMTM130H-50C30E□	24	20	M8×L20	5	12	218.5	245.3

- 180 Flange Motor Data (2.9KW~7.5KW)

Motor Model / Sports Event	KMTM180H -29C15-□.H	KMTM180H -44C15-□.H	KMTM180H -55C15-□.H	KMTM180H -75C15-□.H
Voltage U(AC)	380V			
Rated Power Pr(kW)	2.9	4.4	5.5	7.5
Rated Current Ir(A)	105	16	20.7	25
Rated Torque Tr(Nm)	18.6	28.4	35	48
Rated Speed Nr(rpm)	1500	1500	1500	1500
Maximum Current Imax(Arms)	29.79	42	52	65
Maximum Torque Tmax(Nm)	46.5	71.1	87.6	119
Maximum Speed Nmax(rpm)	3000	3000	3000	3000
Torque Coefficient Kt (Nm/A)	1.94	1.93	1.92	2
Moment Of Inertia Jm(10^{-4}Kg.m^2)	44.7(52.35)	64.9(72.55)	86.9(94.55)	127.5(135.15)
Electrical Time Constant Te(ms)	24.36	26.09	27.19	25.24
Mechanical Time Constant Tm (ms)	1.5(1.8)	1.4(1.6)	1.5(1.7)	1.6(1.7)
Weight (Kg)	14.1(18.9)	18.1(22.9)	22.7(27.5)	30.3(35.1)
Heatsink Size(mm)	made of iron 550×550×30			
Holding Voltage Ub(DC)	24V			
Holding Current Ib(A)	1.3			
Braking Torque Tb(Nm)	≥50			
Recommended Power Cable Cross Sectional Area (mm^2)	1.5	2.5	2.5	4.0
Recommended Drive Models	N3RP-120SC-E	N3RP-140SC-E	N3RP-210SC-E	N3RP-250SC-E

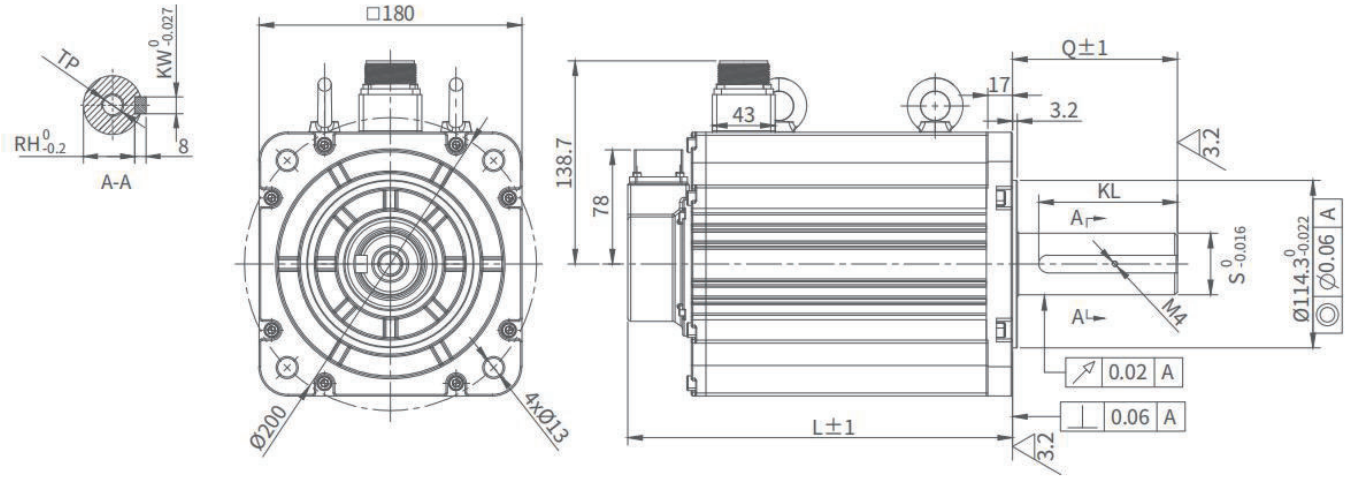
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 180 flange torque speed characteristic chart



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 180 flange motor dimensions



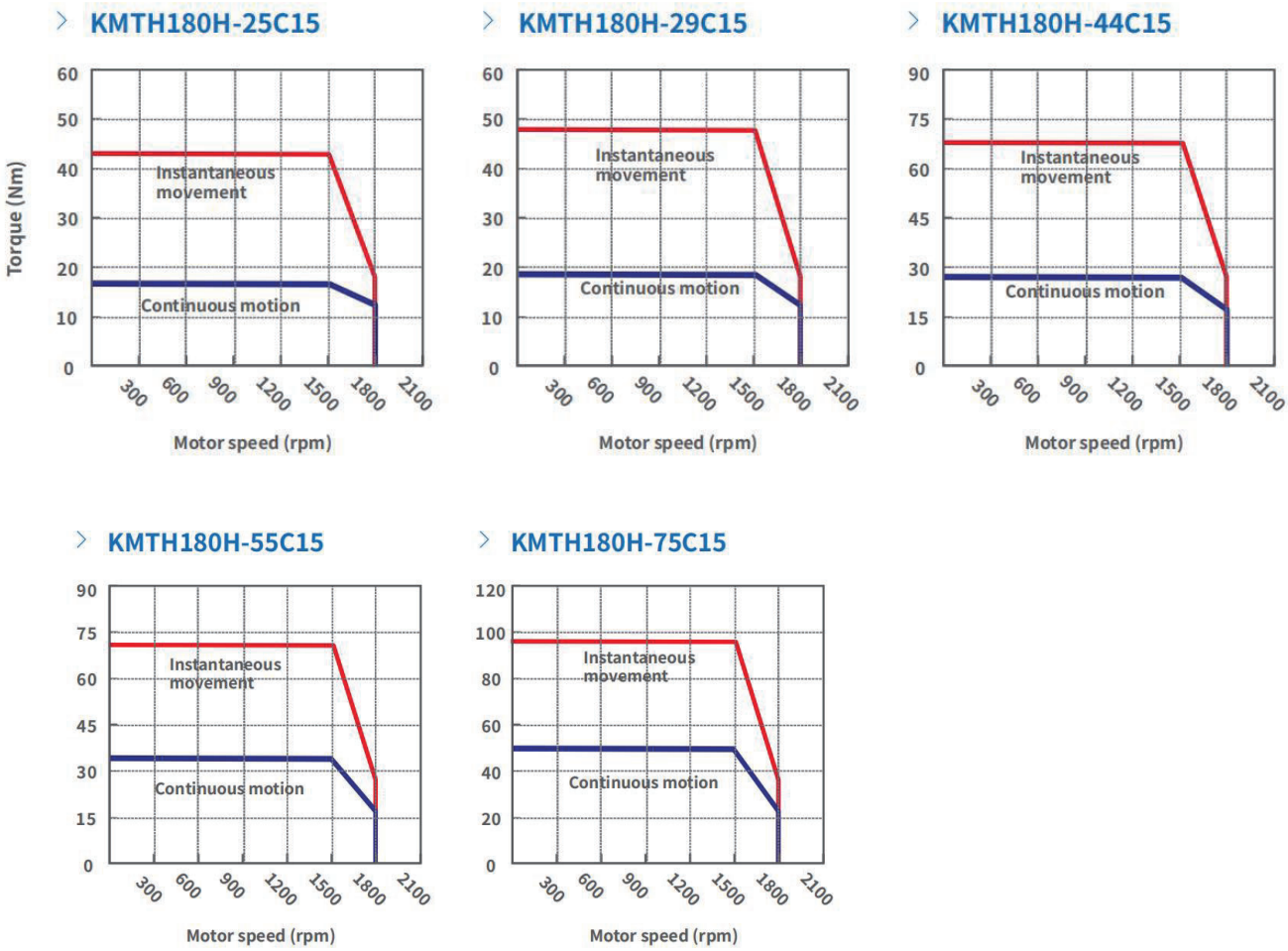
Motor Model	S	Q	KW	KL	RH	TP	L Without Holding Brake Size(mm)	L With Holding Brake Dimensions(mm)
KMTM180H-29C15E□-□.H	35	79	10	63	30	M12xL33.5	169.5	203.3
KMTM180H-44C15E□-□.H	35	79	10	63	30	M12xL33.5	193	226.8
KMTM180H-55C15E□-□.H	42	113	12	95	37	M16xL44	216.5	250.3
KMTM180H-75C15E□-□.H	42	113	12	95	37	M16xL44	263.5	297.3

- 180 Flange Motor Data (2.5KW~7.5KW)

Motor Model / Sports Event	KMTH180H-25C15	KMTH180H-29C15	KMTH180H-44C15	KMTH180H-55C15	KMTH180H-75C15
Voltage U(AC)	380V				
Rated Power Pr(kW)	2.5	2.9	4.4	5.5	7.5
Rated Current Ir(A)	6.5	7.4	10.4	12	20
Rated Torque Tr(Nm)	17	18.5	28	35	48
Rated Speed Nr(rpm)	1500	1500	1500	1500	1500
Maximum Current Imax(Arms)	16.1	19	25	24	40
Maximum Torque Tmax(Nm)	42	47	67	70	96
Maximum Speed Nmax(rpm)	1800	1800	1800	1800	1800
Torque Coefficient Kt (Nm/A)	2.6	2.5	2.7	2.9	2.4
Moment Of Inertia Jm(10^{-4}Kg.m^2)	65(66.1)	70(71.1)	96.4(97.5)	122.5(123.6)	167.2(168.3)
Electrical Time Constant Te(ms)	5.3	6.5	6.3	6.2	6.3
Mechanical Time Constant Tm (ms)	2.5	2.05	1.89	1.69	1.65
Weight (Kg)	19.5(24.5)	20.5(25.5)	25.5(30.5)	30.5(35.5)	40(45)
Heatsink Size(mm)	made of iron：550×550×30				
Holding Voltage Ub(DC)	24V				
Holding Current Ib(A)	1.7				
Braking Torque Tb(Nm)	50				
Recommended Power Cable Cross Sectional Area (mm^2)	1.5	1.5	1.5	1.5	2.5
Recommended Drive Models	N3RP-6R8SC-E	N3RP-8R3SC-E	N3RP-120SC-E	N3RP-140SC-E	N3RP-210SC-E

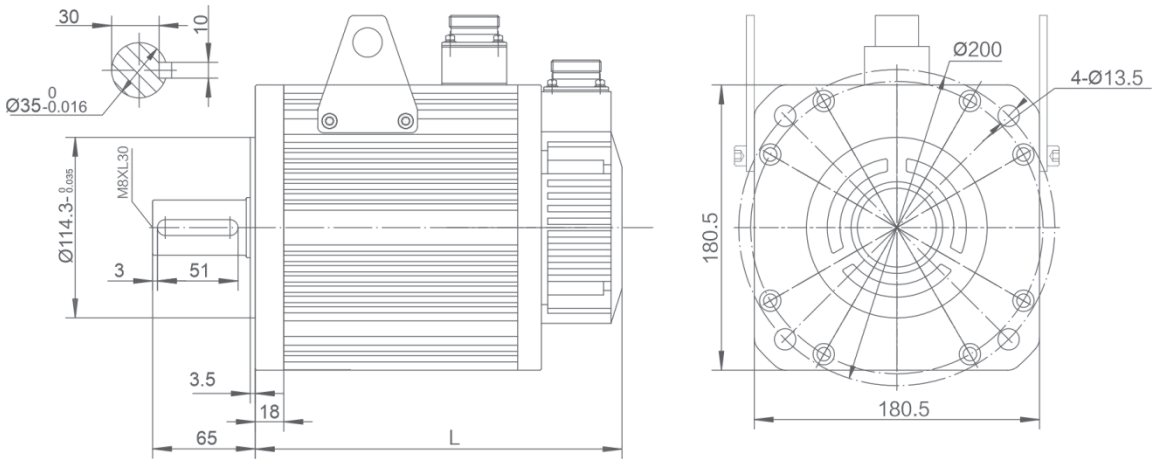
Note: The above is the standard model, () is the parameter of motor with holding brake ;

- 180 flange torque speed characteristic chart



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 180 flange motor dimensions



Motor Model	L Without Holding Brake Size(mm)	L With Holding Brake Size(mm)
KMTM180H-25C15E□	227	301
KMTM180H-29C15E□	233	307
KMTM180H-44C15E□	263	337
KMTM180H-55C15E□	293	367
KMTM180H-75C15E□	347	421

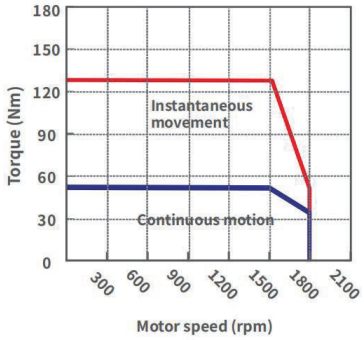
- 200 Flange Motor Data (8.3KW)

Motor Model / Sports Event	KMTM200H-83C15
Voltage U(AC)	380V
Rated Power Pr(kW)	8.3
Rated Current Ir(A)	18
Rated Torque Tr(Nm)	53
Rated Speed Nr(rpm)	1500
Maximum Current Imax(Arms)	42.5
Maximum Torque Tmax(Nm)	125
Maximum Speed Nmax(rpm)	1600
Torque Coefficient Kt (Nm/A)	2.9
Moment Of Inertia Jm(10^{-4}Kg.m^2)	72(73.8)
Electrical Time Constant Te(ms)	12.1
Mechanical Time Constant Tm (ms)	1.49
Weight (Kg)	46(61)
Heatsink Size(mm)	made of iron：650×650×35
Holding Voltage Ub(DC)	24V
Holding Current Ib(A)	4
Braking Torque Tb(Nm)	120
Recommended Power Cable Cross Sectional Area (mm^2)	2.5
Recommended Drive Models	N3RP-210SC-E

Note: The above is the standard model, () is the parameter of motor with holding brake ;

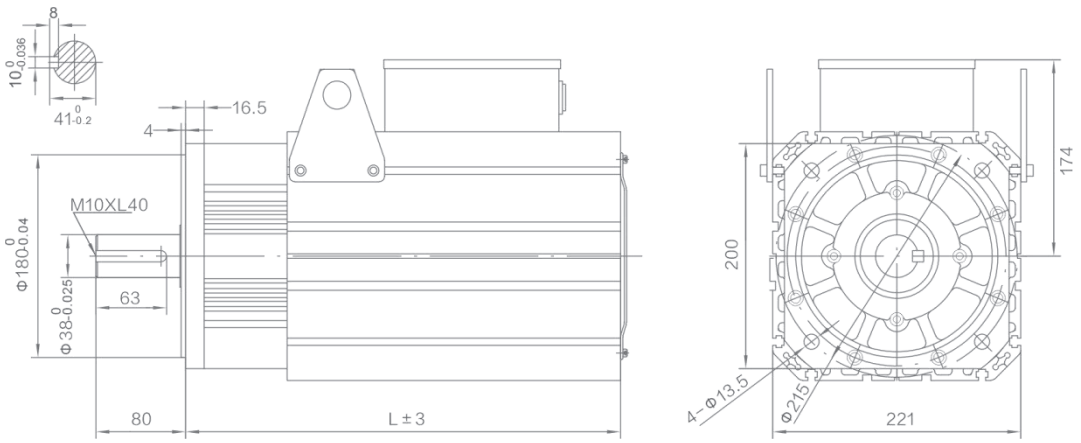
- 200 flange torque speed characteristic chart

KMTM200H-83C15



Note: Characteristics in the instantaneous operating area may vary depending on the supply voltage; if the load torque is within the rated torque, it can be used in the continuous operating area.

- 200 flange motor dimensional drawings



Motor Model	L Without Holding Brake Size(mm)	L With Holding Brake Size(mm)
KMTM200H-83C15E□	392	492

2.2.3 Servo motor mounting

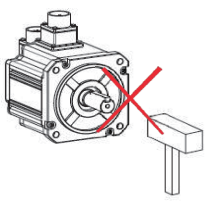
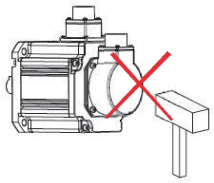
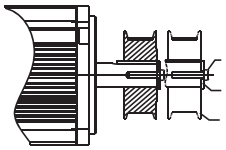
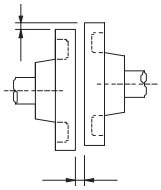
2.2.3.1 Installation site

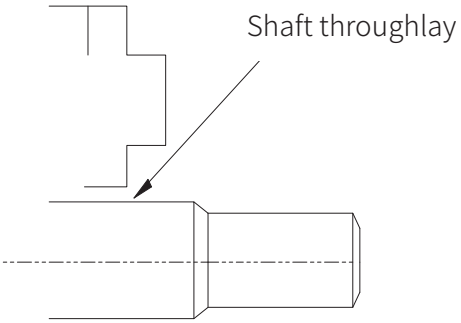
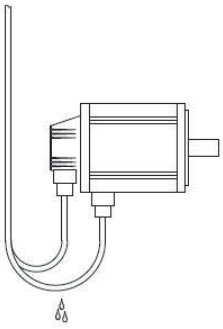
- Do not use this product near corrosive and flammable gas environments such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gases, acids, alkalis, salts, combustible materials, etc;
- Choose models with oil seals in places where there are grinding fluids, oil mists, iron powders, and cutting, etc;
- Keep away from places where there is a source of heat such as a fireplace; Do not use the motor in a closed environment. Closed environment will lead to high temperature of the motor; shorten the service life.

2.2.3.2 Installation environment

Sports event	Descriptive
Ambient temperature	0~40℃ (not freezing)
Ambient humidity	20%~90%RH (no condensation)
Storage temperature	-20℃ ~60℃ (Maximum temperature guarantee: 80℃ for 72 hours)
Storage humidity	20%~90%RH (no condensation)
vibratory	49m/s^2 the following
under attack	490m/s^2 the following
protection class	Motors with 80 flanges or less: IP67 (except for shaft penetration and motor connector connection terminals) Others: IP65 (except for the part of the shaft penetration and the part of the motor connector connecting terminal)
height above sea level	Please use the product at a reduced rate if it is less than 1000m or more than 1000m

2.2.3.3 Installation considerations

<table>
<tr><th>Sports Event</th><th>Descriptive</th></tr>
<tr><td>Rust Prevention</td><td>● Wipe off the rust inhibitor on the servomotor shaft before mounting, and then do the relevant rust prevention treatment.</td></tr>
<tr><td rowspan="2">Encoder Note</td><td>● During installation, it is forbidden to hit the shaft extension and the encoder guard, otherwise the encoder glass optical disk will be broken.
   </td></tr>
<tr><td>● When mounting a pulley on a servomotor shaft with a keyway, use a screw hole in the shaft end.
● In order to install the pulley, first insert a double-headed nail into the screw hole of the shaft, use a washer on the surface of the coupling end and gradually lock it into the pulley with a nut.
 
Shim
Bolts
Flange Coupling, Pulley et al
● For servomotor shafts with keyways, screw holes in the shaft end are used; for shafts without keyways, friction coupling or similar methods are used.
● When dismantling the pulleys, a pulley remover is used to prevent the bearings from being strongly impacted by the load.
● When dismantling the pulleys, a pulley remover is used to prevent the bearings from being strongly impacted by the load.
● To ensure safety, a protective cover or similar device, such as a pulley mounted on the shaft, is installed in the rotating area.
● When connecting to machinery, use a coupling and keep the axis of the servo motor in a straight line with the axis of the machinery. Mount the servomotor so that it meets the centering accuracy requirements shown in the figure to the left. If the centering is not adequate, vibration will occur, and sometimes bearings and encoders, etc. may be damaged.
 
Measurements are taken at four positions around the entire circumference and the maximum and minimum values are guaranteed to be less than 0.03 mm.</td></tr>
</table>

Sports Event	Descriptive
Mounting Direction	● Servo motors can be mounted horizontally or vertically.
Oil and water countermeasures	● Do not use ordinary servo motors and cables immersed in oil or water; ● When used in locations where water, oil or condensation drips, special treatment of the motor is required to meet the protection requirements; however, it is necessary for the motor to be shipped from the factory to meet the protection requirements for the shaft penetration, and the motor model with oil seal should be specified. The shaft penetration is the clearance where the shaft protrudes from the end face of the motor.  ● In applications where liquids are present, install the motor with the wiring port facing downward (as shown below) to prevent liquids from flowing along the cable to the motor body;  ● In places where oil droplets can drop into the shaft through section, please specify the servo motor with oil seal. A servo motor with an oil seal service condition: Make sure that the oil level is lower than the lip of the oil seal; Do not accumulate oil on the oil sealing lip when the servo motor is installed vertically upward.
Cable Tensioning	● When connecting the cable, the bending radius should not be too small, and should not be too much tension on the cable. In particular, the encoder signal line core wire diameter is usually only 0.2, 0.3mm, wiring should not be tensioned too tightly to prevent the cable core tearing.

2.3 Cables and Options

2.3.1 Power cables

LM - 030 -BAF -2.□

Motor Power Cable

Cable Length
Give an example: 3m = 030
Supports up to 60 meters=600

Wire Diameter
S = 0.5mm² ; A = 0.75mm²
B = 1.5mm² ; C = 2.5mm²
D = 4.0mm² ; E = 6mm²

Motor Side Connector Type
AF = Plastic shell inline connector front outlet (AB rear outlet) for 40/60/80 flange motors without holding brake*.
BF = Plastic shell in-line connectors for 40/60/80 flange motors with holding brake Front outlet (BB rear outlet)*
A2 = Plastic shell aerial plug connector for 40/60/80 flange motors without holding brake
B2 = Plastic shell aerial plug connector for 40/60/80 flange motors with holding brake
A4 = Metal aerial plug connector for 100/130 flange motors without holding brake
B4 = Metal aerial plug connector for 100/130 flange motors with holding brake
A7 = Metal aircraft connectors for 180 flange motors
AG = Metal aerial connectors for motors with 180.H flanges without holding brake
BG = Metal aerial plug connector for motors with 180.H flange and holding brake

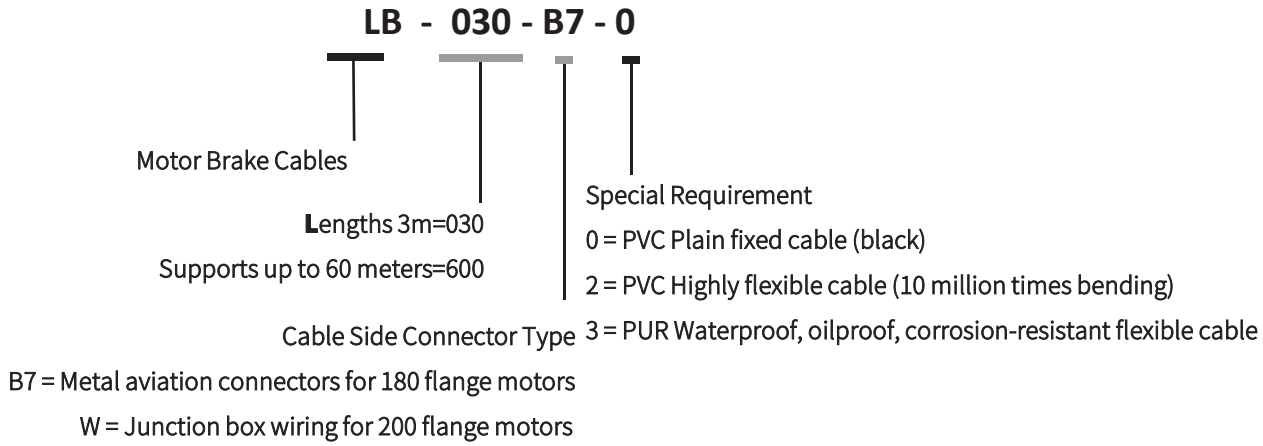
Special Requirement
0 = PVC plain fixed cable (black)
2 = PVC high flexibility cable(10 million times bending)
3 = PUR waterproof, oil and corrosion resistant flexible cable
5 = PVC highly flexible cable with shield (10 million bends)

Manufacturer Definition
none = Driver side dump type without connector
S =Adapted to N3 drives

Motor Side Connector Type	Cable Side Connector Model
AF/AB	SC-MC6S-AE20-01
BF/BB	SC-MC6S-AE20-01
A2	CP-GM1311/S-4B
B2	CP-GM1311/S-6B
A4	CMS3108A20-4SI
B4	CMS3108A20-18SI
A7	YD32-4
AG/BG	CMS3108A22-A6SI

Note: 1)the standard cable length of 3m, 5m, 7m, 10m, 15m, 20m, the rest of the length to be customized.
2)*Molded case direct plug adapted to the cable length of up to support 40m.

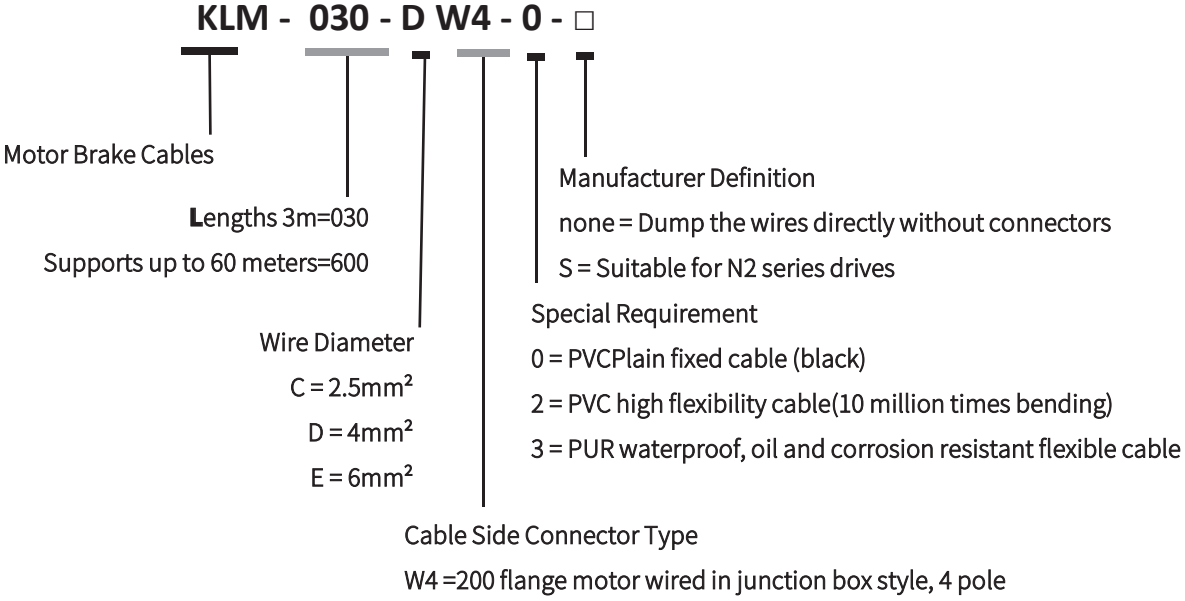
2.3.2 Naming rules for holding cables



Motor Side Connector Type	Cable Side Connector Model
B7	CB-WS16J2TQ
W	Junction box method

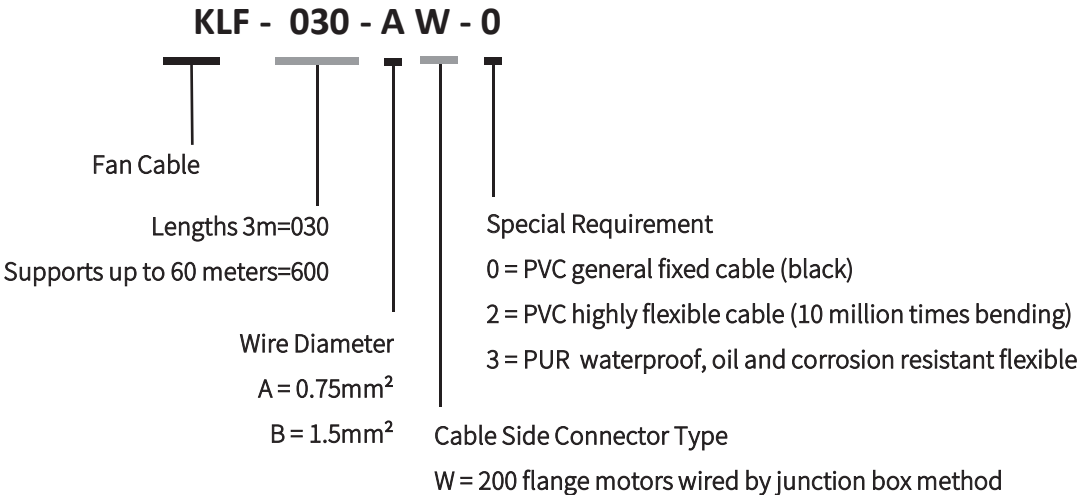
Note: Standard cable lengths are 3m, 5m, 7m, 10m, 15m, 20m, and the rest of the lengths need to be customized.

2.3.3 Junction box power cable naming rules



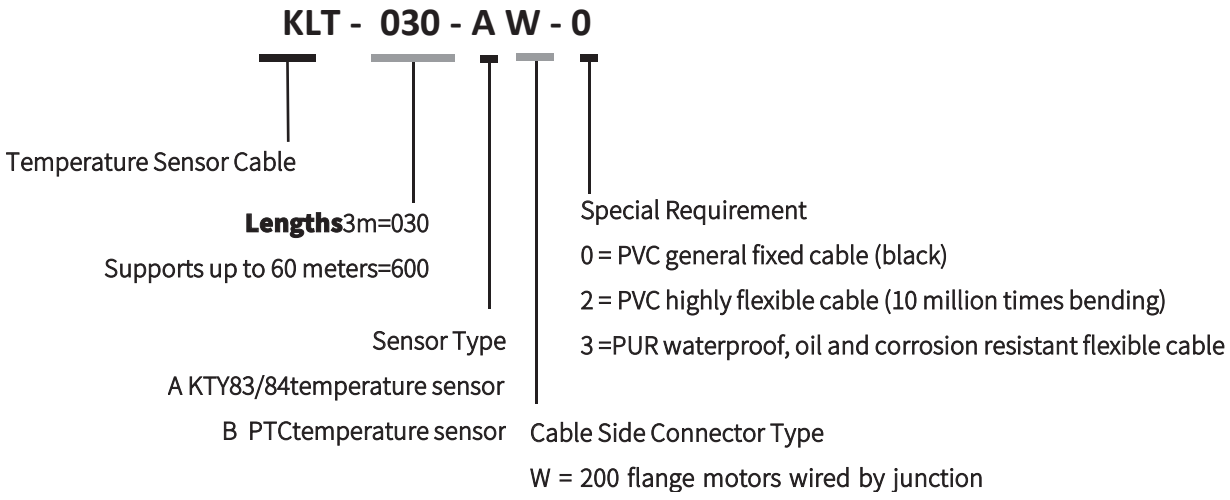
Note: For 200 flange motors connected by means of a junction box power cable

2.3.4 Naming rules for fan cables



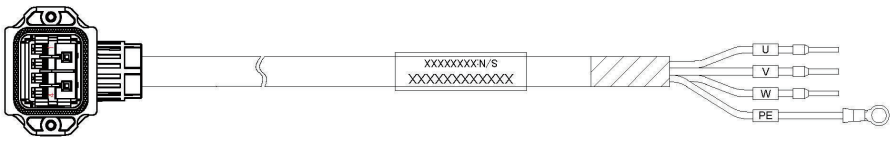
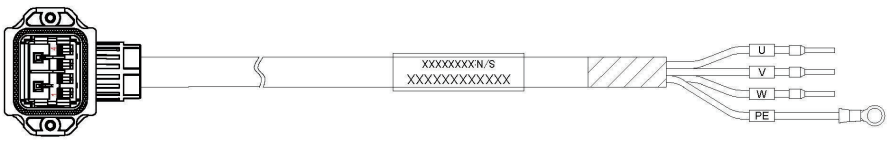
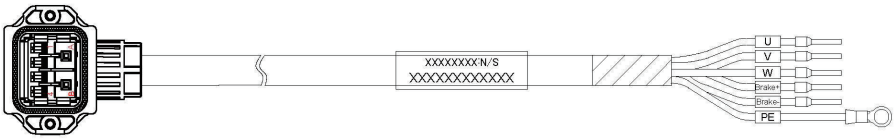
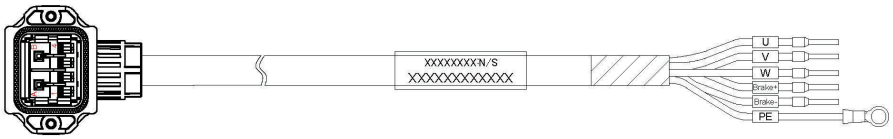
Note: Forced cooling fan for 200 flange motors.

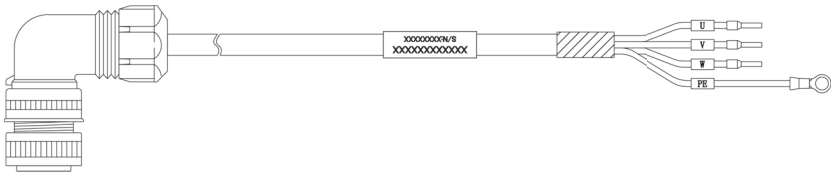
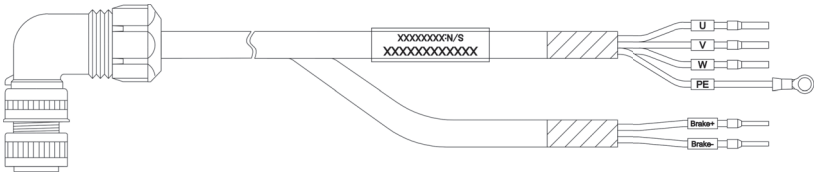
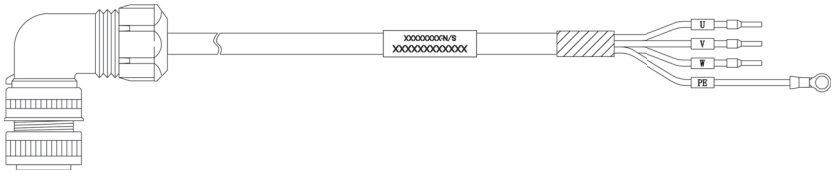
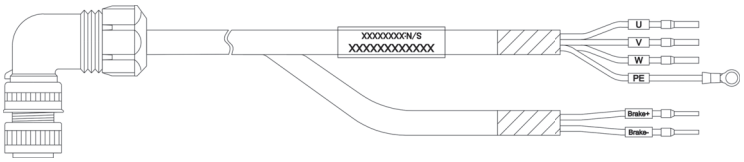
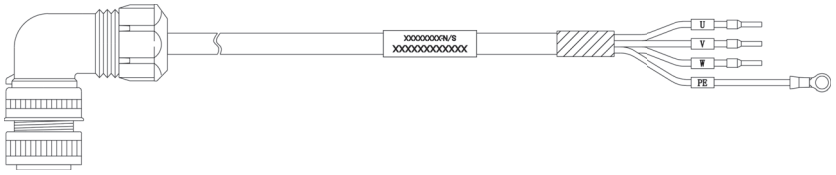
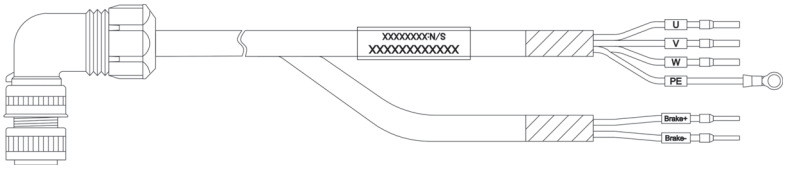
2.3.5 Temperature sensor cable naming rules

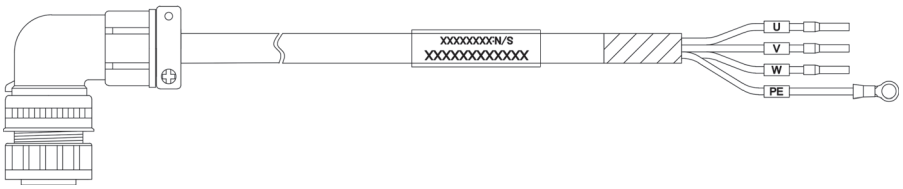
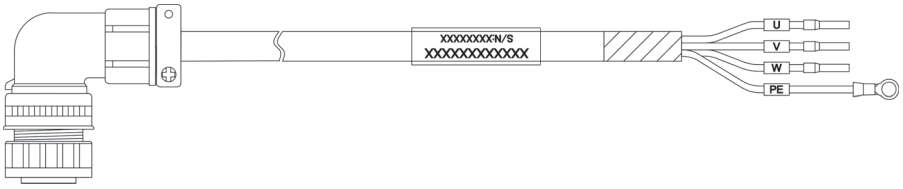
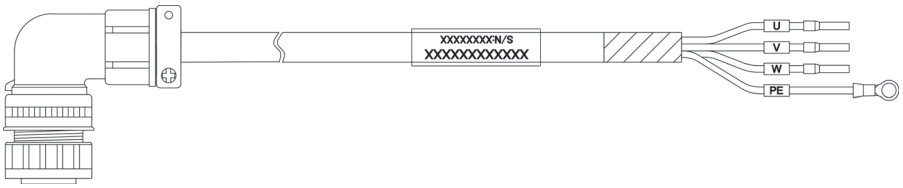
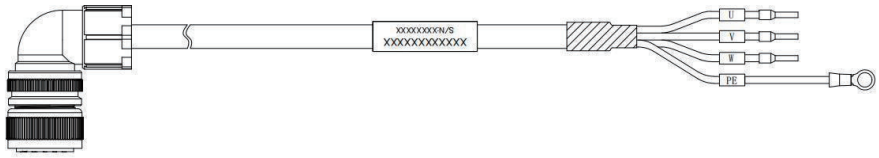
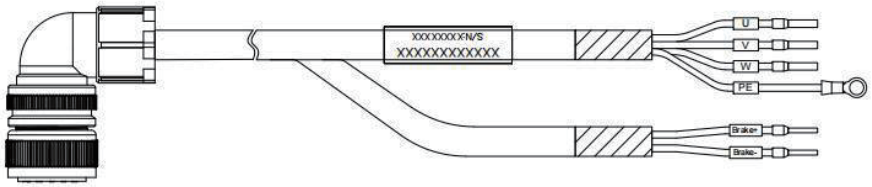
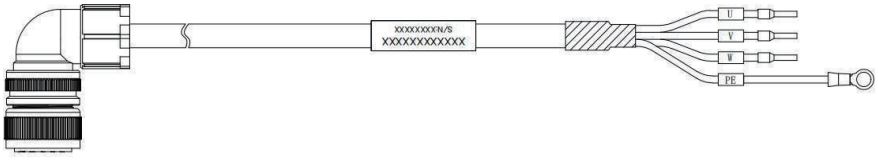


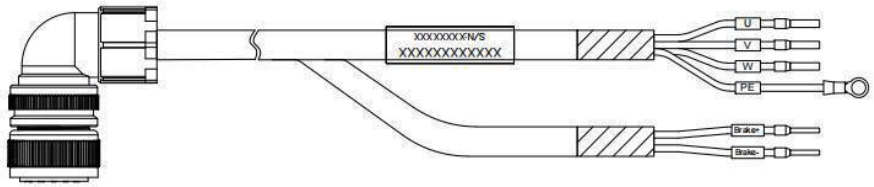
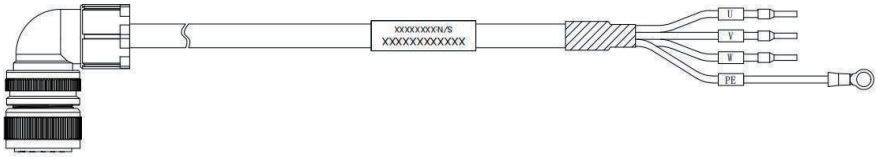
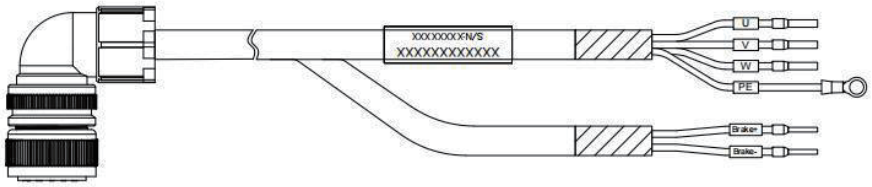
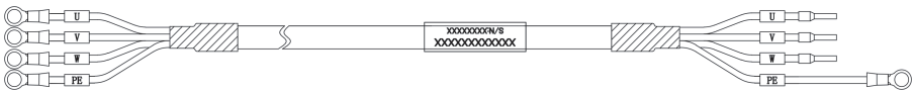
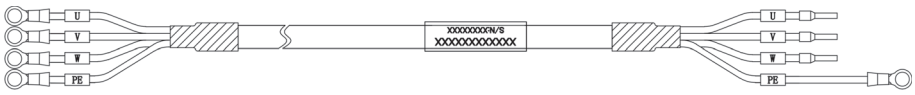
Note: Temperature sensor feedback for 200-flange motors;

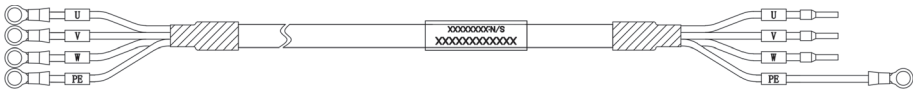
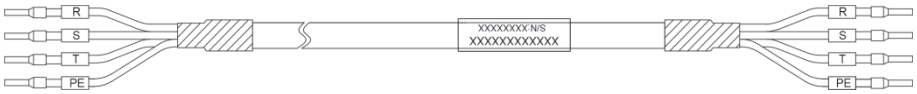
1) Power cable specifications

Model Number	Element
LM-***-SAF-☐.S	 Connector Type：SC-MC6S-AE20-01 Port： E0508(3PCS) + RVS1.25-4(1PCS)
LM-***-SAB-☐.S	 Connector Type：SC-MC6S-AE20-01 Port： E0508(3PCS) + RVS1.25-4(1PCS)
LM-***-SBF-☐.S	 Connector Type：SC-MC6S-AE20-01 Port：E0508(5PCS) + RVS1.25-4(1PCS)
LM-***-SBB-☐.S	 Connector Type：SC-MC6S-AE20-01 Port：E0508(5PCS) + RVS1.25-4(1PCS)

Model Number	Element
LM-***-AA4-☐.S	 Connector Type：CMS3108A20-4SI Port： E7508(3PCS) +RVS 2-4(1PCS)
LM-***-AB4-☐.S	 Connector Type：CMS3108A20-18SI Port： E7508(3PCS)+E0508(2PCS) +RVS 2-4(1PCS)
LM-***-BA4-☐.S	 Connector Type：CMS3108A20-4SI Port： E1508(3PCS) +RVS 2-4(1PCS)
LM-***-BB4-☐.S	 Connector Type：CMS3108A20-18SI Port：E1508(3PCS)+E0508(2PCS) +RVS 2-4(1PCS)
LM-***-CA4-☐.S	 Connector Type：CMS3108A20-4SI Port： E2508(3PCS) +RV 3.5-4(1PCS)
LM-***-CB4-☐.S	 Connector Type：CMS3108A20-18SI Port：E2508(3PCS)+E0508(2PCS) +R3.5-4(1PCS
Model Number	**Element**

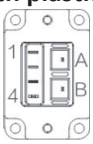
LM-***-BA7-☐.S	 Connector Type：YD32-4 Port： E1508(3PCS) +RVS 2-4(1PCS)
LM-***-CA7-☐.S	 Connector Type：YD32-4 Port: E2508(3PCS)+RVS 2-4(1PCS)
LM-***-DA7-☐.S	 Connector Type：YD32-4 Port： E4009(3PCS) +RVS 5.5-4(1PCS)
LM-***-BAG-☐.S	 Connector Type：CMS3108A22-A6SI Port： E1508(3PCS) +RVS 2-4(1PCS)
LM-***-BBG-☐.S	 Connector Type：CMS3108A22-A6SI Port：E1508(3PCS)+E0508(2PCS) +RVS2-4(1PCS)
LM-***-CAG-☐.S	 Connector Type：CMS3108A22-A6SI Port：E2508(3PCS) +RVS 3.5-4(1PCS)
Model Number	**Element**

LM-***-CBG-☐.S	 Connector Type：CMS3108A22-A6SI Port：E2508(3PCS)+E0508(2PCS) +RVS5.5-4(1PCS)
LM-***-DAG-☐.S	 Connector Type：CMS3108A22-A6SI Port：E4009(3PCS) +RVS 3.5-4(1PCS)
LM-***-DBG-☐.S	 Connector Type：CMS3108A22-A6SI Port：E4009(3PCS)+E0508(2PCS) +RVS 5.5-4(1PCS)
LB-***-B7-□-0	 Connector Type：CB-WS16J2TQ Port： E0508(2PCS)
KLM-***-CW4-☐.S	 Port： RV 5.5-6 (4PCS)+E2508(3PCS)+RV 3.5-4(1PCS)
KLM-***-DW4-☐.S	 Port： RV 5.5-6(4PCS)+E4009(3PCS)+RVS 5.5-4(1PCS)

Model Number	Element
KLM-***-EW4-☐.S	 Port： RV 5.5-6(4PCS)+E6010(3PCS)+RVS 5.5-4(1PCS)
KLF-***-AW-□-0	 Port： E7508(3PCS)
KLT-***-BW-□-0	 Port： E0508(4PCS)

2) Power Cable Pin Definition

40/60/80 flange in-line connectors for motors with plastic housing



SC-MC6S-AE20-01

SC-MC6S-AE20-01:

pinout	1	2	3	4	A	B
signal	U	V	W	PE	Brake-	Brake+

40/60/80 flange plastic shell plug-in connectors for motors

CP-GM1311/S-4B

CP-GM1311/S-6B

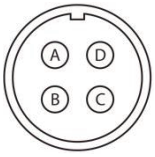
CP-GM1311/S-4B:

pinout	1	2	3	4
signal	V	U	W	PE

CP-GM1311/S-6B:

pinout	1	2	3	4	5	6
signal	V	U	W	PE	Brake+	Brake-

100/130 flange metal aerial plug connectors for motors



CMS3108A20-4SI

CMS3108A20-18SI

Without holding brake

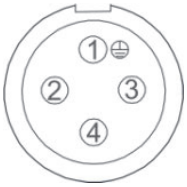
CMS3108A20-4SI:

pinout	A	B	C	D
signal	U	V	W	PE

CMS3108A20-18SI:

pinout	G	H	F	I	B	E
signal	Brake+	Brake-	U	V	W	PE

180 flange metal aircraft connectors for motors

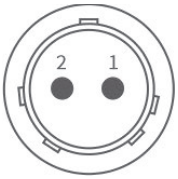


YD32-4

YD32-4:

pinout	1	2	3	4
signal	PE	U	V	W

180 flange metal aircraft connectors for motors

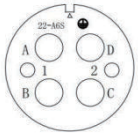


CB-WS16J2TQ

CB-WS16J2TQ:

pinout	1	2
signal	Brake+	Brake-

180.H flange metal aircraft connectors for electric motors



CMS3108A22-A6SI

CMS3108A22-A6SI:

pinout	A	B	C	D	1	2
signal	U	V	W	PE	Brake+	Brake-

2.3.6 Encoder cable

LE - 030 - 4 P 4 - 1 . □

Motor Encoder Cables

Cable Length
Give an example: 3m = 030
10m = 100
Maximum support 60m

Encoder Specifications
Fill in according to the selected motor encoder type
4： Multi-turn absolute (6-core with battery dump 2, without battery)
(used when the encoder is absolute)

Motor Side Connector Type
PF : Plastic shell inline connector for 40/60/80 flange motors without holding brake Front outlet (PB is rear outlet)*
P2 : Plastic shell aerial connector for 40/60/80 flange motors
P4 : Metal aerial connector for 100/130/180.H flange motors
P6 : Metal aerial connector for 180/200 motors

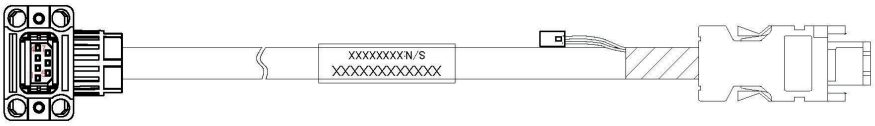
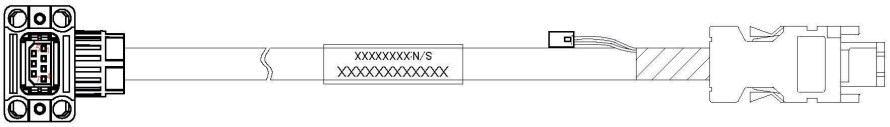
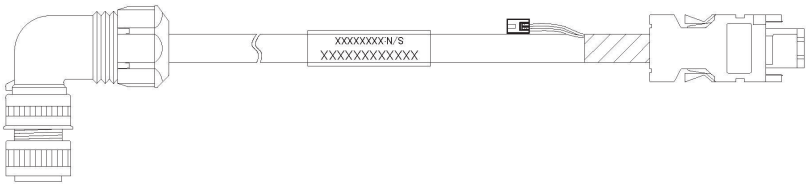
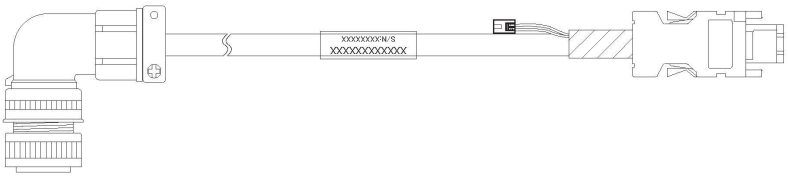
Special Requirement
0 = PVC with fixed cable (black)
2 = PVC with highly flexible cable (10 million bends)
3 = PUR with water-, oil- and corrosion-resistant flexible cable

Manufacturer Definition
none = drive side dump type without connector
V= adapted to N3RP drives (1kW and below)
P= adapted to N3RP drives (above 1kW)

Motor Side Connector Type	Cable Side Connector Model
PF/PB	SC-MC7S-A820-P1
P2	CP-GM1311/S-9
P4	CMS3108A20-29SI
P6	YD28-7

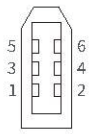
Note: 1)the standard cable length of 3m, 5m, 7m, 10m, 15m, 20m, the rest of the length to be customized.
2)Molded case direct plug adapted to the cable length of up to support 40m.

1) Encoder cable specifications

Model Number	Element
LE-***-4PF-*.V	 Connector Type：SC-MC7S-A820-P1 Connector Type：KSA-1394a6P.01 Battery Box Leads
LE-***-4PB-*0.V	 Connector Type：SC-MC7S-A820-P1 Connector Type：KSA-1394a6P.01 Battery Box Leads
LE-***-4P4-*0.P	 Connector Type：CMS3108A20-29SI Connector Type：KSA-1394a10p.01 Battery Box Leads
LE-***-4P6-*0.P	 Connector Type：YD28-7 Connector Type：KSA-1394a10p.01 Battery Box Leads

2) Encoder Cable Pin Definition

N3 driver side pin definitions

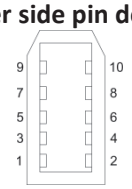


KSA-1394a6p.01

KSA-1394a6p.01：

pinout	1	2	3	4	5	6
signal	5V	GND	--	--	SD+	SD-

N3 driver side pin definitions

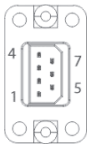


KSA-1394a10p.01

KSA-1394a10p.01：

pinout	1	2	3	4	5	6	7	8	9	10
signal	5V	0V	--	--	--	--	--	--	SD+	SD-

40/60/80 fange in-line connectors for motors with plastic housing

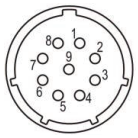


SC-MC7S-A820-P1

SC-MC7S-A820-P1:

pinout	1	2	3	4	5	6	7
signal	PE	5V	0V	SD+	SD-	BAT+	BAT-

40/60/80 flange plastic shell plug-in connectors for electric motors

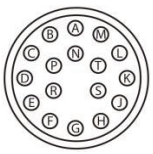


CP-GM1311/S-9

CP-GM1311/S-9:

pinout	1	2	3	6	7	8	9
signal	SD+	SD-	BAT+	5V	0V	BAT-	PE

100/130/180.H flange metal aircraft plug connector for motors

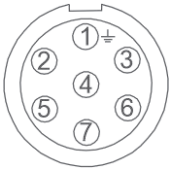


CMS3108A20-

CMS3108A20-29SI:

pinout	G	H	J	K	L	S	T
signal	0V	5V	PE	SD+	SD-	BAT-	BAT+

180 flange metal aircraft connectors for motors

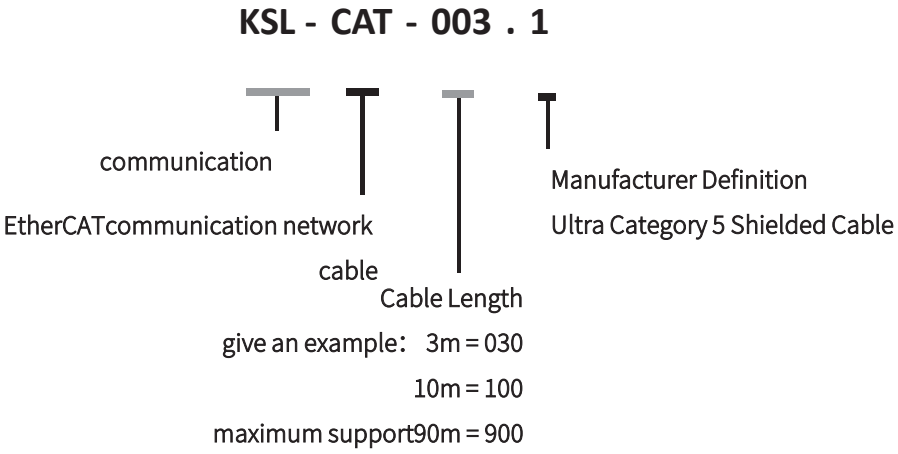


YD28-7

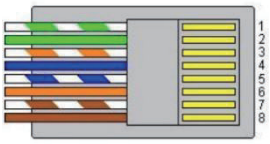
YD28-7:

pinout	1	2	3	4	5	6	7
signal	PE	5V	0V	SD+	SD-	BAT+	BAT-

2.3.7 Communication cables



2.3.8 Bus Communication Cable Pin Definitions



pinout	1	2	3	4	5	6	7	8	housings
signal	TD +	TD-	RD+	/	/	RD-	/	/	screen

2.4 Recommended Model Comparison Table

Electrical Machinery		Cord (Computer)		Drives
Flangeless	Motor Model	Power & Brake Cable Models	Encoder Cable Type	Drive Model
40	KMT40-10B30E□-OK	LM- □□□-SAF/SAB- □ .S	LE- □□□- 4PF/4PB-□.V	N3RP-1R8SA-E
	KMT40-10B30E□-BOK	LM- □□□-SBF/SBB- □ .S		
60	KMT60-20B30E□-OK	LM- □□□-SAF/SAB- □ .S	LE- □□□- 4PF/4PB-□.V	N3RP-1R8SA-E
	KMT60-20B30E□-BOK	LM- □□□-SBF/SBB- □ .S		
	KMT60-40B30E□-OK	LM- □□□-SAF/SAB- □ .S	LE- □□□- 4PF/4PB-□.V	N3RP-2R8SA-E
	KMT60-40B30E□-BOK	LM- □□□-SBF/SBB- □ .S		
80	KMT80-75B30E□-OK	LM- □□□-SAF/SAB- □ .S	LE- □□□- 4PF/4PB-□.V	N3RP-4R2SA-E
	KMT80-75B30E□-BOK	LM- □□□-SBF/SBB- □ .S		
	KMT80-10C30E□-OK	LM- □□□-SAF/SAB- □ .S	LE- □□□- 4PF/4PB-□.V	N3RP-060PA-E
	KMT80-10C30E□-BOK	LM- □□□-SBF/SBB- □ .S		
	KMT80-10C25E□-OK.G	LM- □□□-AA2- □ .S	LE- □□□-4P2-□ .P	N3RP-100SA-E
	KMT80-10C25E□-BOK.G	LM- □□□-AB2- □ .S		
100	KMTM100-10C30E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□ .P	N3RP-100SA-E
	KMTM100-10C30E□-BOK	LM- □□□-BB4- □ .S		
	KMTM100-15C30E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□ .P	N3RP-100SA-E
	KMTM100-15C30E□-BOK	LM- □□□-BB4- □ .S		
	KMTM100H-10C30E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□ .P	N3RP-5R4SC-E
	KMTM100H-10C30E□-BOK	LM- □□□-AB4- □ .S		
	KMTM100H-15C30E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□ .P	N3RP-6R8SC-E
	KMTM100H-15C30E□-BOK	LM- □□□-AB4- □ .S		
	KMTM100H-20C30E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□ .P	N3RP-6R8SC-E
	KMTM100H-20C30E□-BOK	LM- □□□-AB4- □ .S		
	KMTM100H-25C30E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SC-E
	KMTM100H-25C30E□-BOK	LM- □□□-BB4- □ .S		
130	KMTM130-85B15E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.V	N3RP-060PA-E
	KMTM130-85B15E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130-13C15E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SA-E
	KMTM130-13C15E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130-10C20E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.V	N3RP-060PA-E
	KMTM130-10C20E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130-15C20E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SA-E
	KMTM130-15C20E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130-10C25E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□ .V	N3RP-060PA-E
	KMTM130-10C25E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130-13C25E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□ .P	N3RP-100SA-E
	KMTM130-13C25E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130-15C25E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□ .P	N3RP-100SA-E
	KMTM130-15C25E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130-15C30E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□ .P	N3RP-100SA-E
	KMTM130-15C30E□-BOK	LM- □□□-BB4- □ .S		
130	KMTM130H-85B15E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-85B15E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-13C15E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E

Electrical Machinery		Cord (Computer)		Drives
Flangeless	Motor Model	Power & Brake Cable Models	Encoder Cable Type	Drive Model
	KMTM130H-13C15E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-15C15E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-6R8SC-E
	KMTM130H-15C15E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-18C15E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-6R8SC-E
	KMTM130H-18C15E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130H-23C15E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SC-E
	KMTM130H-23C15E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130H-10C20E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-10C20E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-15C20E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-15C20E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-20C20E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-6R8SC-E
	KMTM130H-20C20E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-25C20E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SC-E
	KMTM130H-25C20E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130H-30C20E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SC-E
	KMTM130H-30C20E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130H-10C25E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-10C25E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-13C25E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-13C25E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-15C25E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-15C25E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-20C25E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-20C25E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-25C25E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-6R8SC-E
	KMTM130H-25C25E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130H-38C25E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SCE
	KMTM130H-38C25E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130H-15C30E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-5R4SC-E
	KMTM130H-15C30E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-20C30E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-6R8SC-E
	KMTM130H-20C30E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-25C30E□-OK	LM- □□□-AA4- □ .S	LE- □□□-4P4-□.P	N3RP-6R8SC-E
	KMTM130H-25C30E□-BOK	LM- □□□-AB4- □ .S		
	KMTM130H-30C30E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-100SC-E
	KMTM130H-30C30E□-BOK	LM- □□□-BB4- □ .S		
130	KMTM130H-40C30E□-OK	LM- □□□-BA4- □ .S	LE- □□□-4P4-□.P	N3RP-120SC-E
	KMTM130H-40C30E□-BOK	LM- □□□-BB4- □ .S		
	KMTM130H-50C30E□-OK	LM- □□□-CA4- □ .S	LE- □□□-4P4-□.P	N3RP-140SC-E
	KMTM130H-50C30E□-BOK	LM- □□□-CB4- □ .S		
180	KMTM180H-29C15E□-OK.H	LM- □□□-BAG- □ .S	LE- □□□-4P4-□.P	N3RP-100SC-E
	KMTM180H-29C15E□-BOK.H	LM- □□□-BBG- □ .S		
	KMTM180H-44C15E□-OK.H	LM- □□□-CAG- □ .S	LE- □□□-4P4-□ .P	N3RP-140SC-E
	KMTM180H-44C15E□-BOK.H	LM- □□□-CBG- □ .S		
	KMTM180H-55C15E□-OK.H	LM- □□□-CAG- □ .S	LE- □□□-4P4-□ .P	N3RP-210SC-E

Electrical Machinery		Cord (Computer)		Drives
Flangeless	Motor Model	Power & Brake Cable Models	Encoder Cable Type	Drive Model
	KMTM180H-55C15E□-BOK.H	LM- □□□-CBG- □ .S		
	KMTM180H-75C15E□-OK.H	LM- □□□-DAG- □ .S	LE- □□□-4P4-□ .P	N3RP-250SC-E
	KMTM180H-75C15E□-BOK.H	LM- □□□-DBG- □ .S		
	KMTH180H-25C15E□-OK.H	LM- □□□-BA7- □ .S	LE- □□□-4P6-□ .P	N3RP-6R8SC-E
	KMTH180H-25C15E□-BOK	LM- □□□-BA7- □ .S		
		LB- □□□-B7- □		
	KMTH180H-29C15E□-OK	LM- □□□-BA7- □ .S	LE- □□□-4P6-□ .P	N3RP-8R3SC-E
	KMTH180H-29C15E□-BOK	LM- □□□-BA7- □ .S		
		LB- □□□-B7- □		
	KMTH180H-44C15E□-OK	LM- □□□-BA7- □ .S	LE- □□□-4P6-□ .P	N3RP-120SC-E
	KMTH180H-44C15E□-BOK	LM- □□□-BA7- □ .S		
		LB- □□□-B7- □		
	KMTH180H-55C15E□-OK	LM- □□□-BA7- □ .S	LE- □□□-4P6-□ .P	N3RP-140SC-E
	KMTH180H-55C15E□-BOK	LM- □□□-BA7- □ .S		
		LB- □□□-B7- □		
	KMTH180H-75C15E□-OK	LM- □□□-CA7- □ .S	LE- □□□-4P6-□ .P	N3RP-210SC-E
	KMTH180H-75C15E□-BOK	LM- □□□-CA7- □ .S		
		LB- □□□-B7- □		
200	KMTM200H-83C15E□-OK	KLM- □□□-CW4- □ .S	LE- □□□-4P6-□ .P	N3RP-210SC-E
	KMTM200H-83C15E□-BOK	KLM- □□□-CW4- □ .S		
		LB-□□□-W-□		

Note: 200 flange motor, in the cable selection, need to be adapted to the fan, temperature sensor cable, please refer to the motor accessories section selection.

Chapter 3 Wiring

3.1 Description of system wiring

- E1、E2Specification drive system wiring diagram

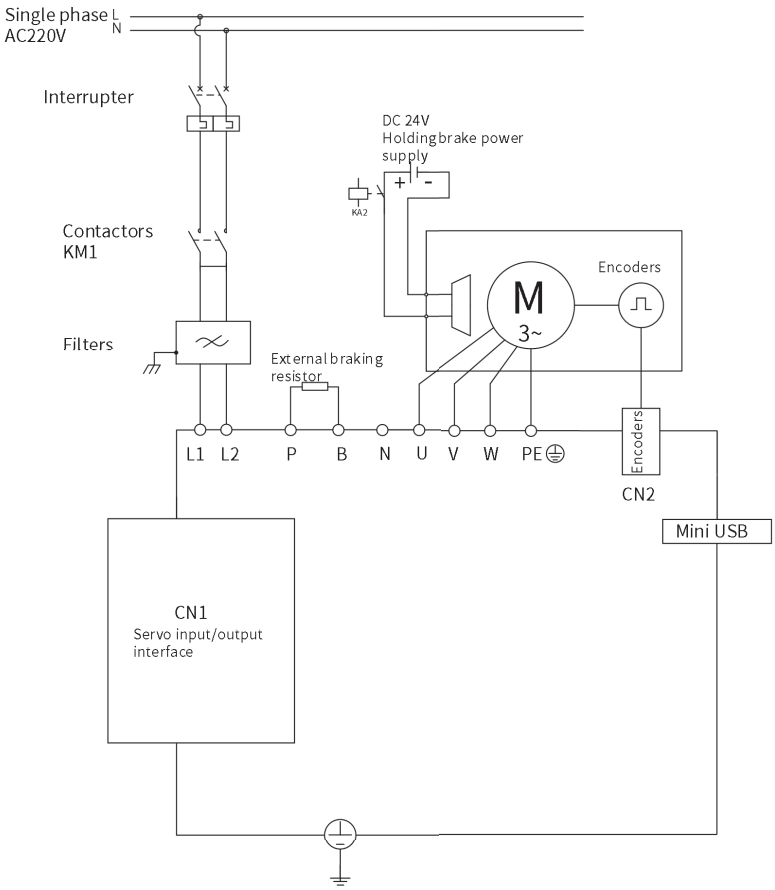


Figure 3.1-1: N3RP-1R8SA-E, N3RP-2R8SA-E, N3RP-4R2SA-E, N3RP-060PA-E System Wiring Diagrams

1) Use a circuit breaker with earth leakage protection and a noise filter between the power supply and the main power terminals.

2) The voltage and power of the holding brake power supply should meet the requirements of the motor holding brake parameters.

3) N3RP-1R8SA-E, N3RP-2R8SA-E, N3RP-4R2SA-E, N3RP-060PA-E There is no built-in braking resistor, and an external braking resistor is required;

Please refer to section 3.5.2 to select a suitable resistor. Do not use a resistor smaller than the minimum external resistance allowed by Table: 3.5-1, or damage to the driver may result.

- E3 specification 220V drive system wiring diagram

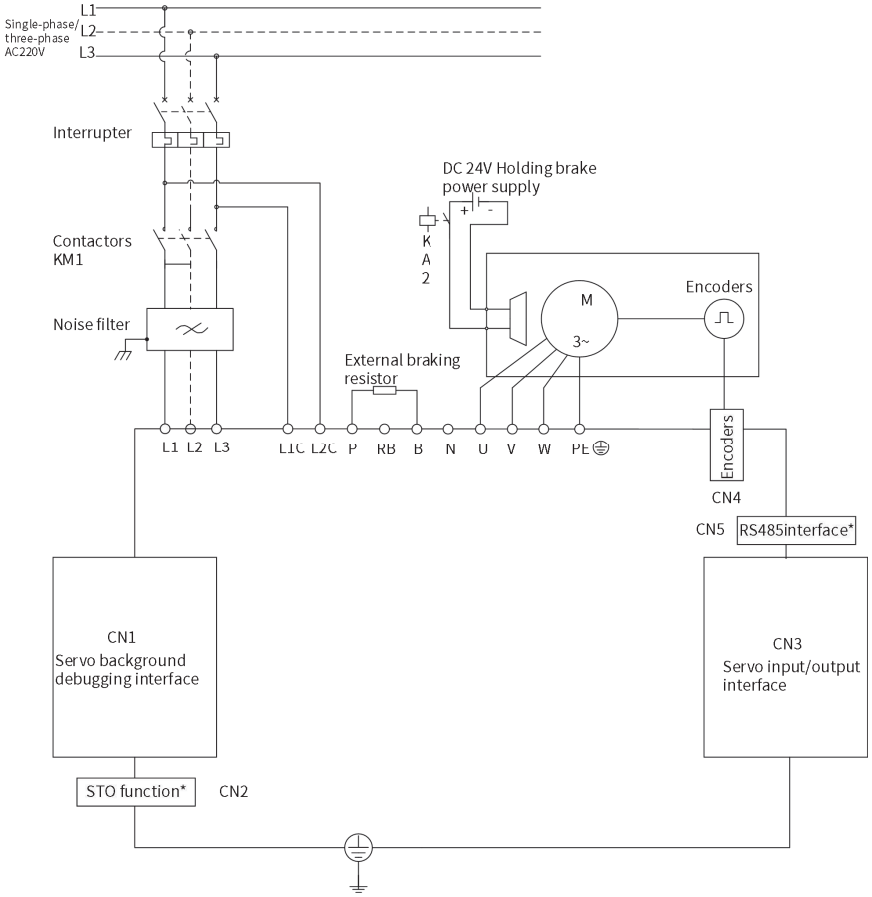


Figure 3.1-2: N3RP-100SA-E, N3RP-140SA-E System Wiring Diagrams

Note: * indicates that only "-SM" models are available, please contact Cosel for details.

1) For N3RP-100SA-E, N3RP-140SA-E, when single-phase power supply is input, the power motor can be connected to any two of terminals L1, L2 and L3.

2) Please use a circuit breaker with leakage protection and a noise filter between the power supply and the main power supply terminals.

3) By default, N3RP-100SA-E and N3RP-140SA-E have shorted connections between P and RB, and use the built-in braking resistor; when an external braking resistor is required, please remove the shorted connection between P and RB and plug the external braking resistor between P and B. Please refer to chapter 3.5.2 to select the appropriate resistor. braking resistor; when it is necessary to use external braking resistor, please remove the short connection between P and RB, and connect the external braking resistor between P and B;

please refer to chapter 3.5.2 to select the appropriate resistor, do not be smaller than the minimum resistance value of the external connection permitted by Table: 3.5-1, or it may result in damage to the driver.

- E3 size 380V drive system wiring diagram

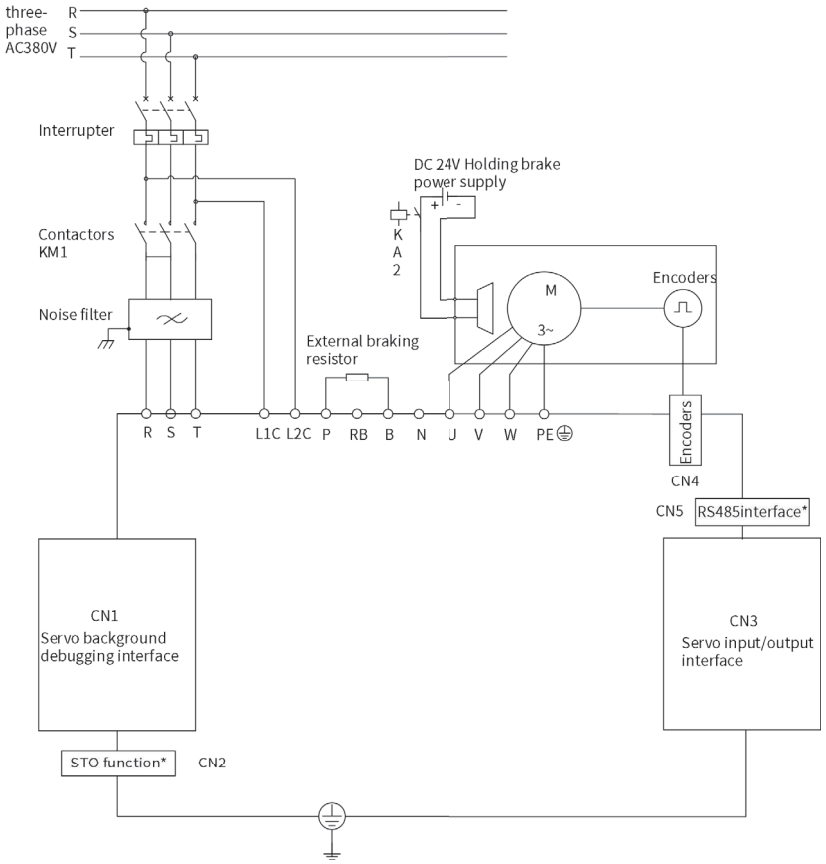


Figure 3.1-3: N3RP-5R4SC-E, N3RP-6R8SC-E, N3RP-8R3SC-E, N3RP-100SC-E System Wiring Diagrams

Note: * indicates that only "-SM" models are available, please contact Cosel for details.

1) Please use a circuit breaker with leakage protection and a noise filter between the power supply and the main power terminals;

2) N3RP-5R4SC-E, N3RP-6R8SC-E, N3RP-8R3SC-E, N3RP-100SC-E defaults to shorting between P and RB, and using the built-in braking resistor; when an external braking resistor is required, remove the shorting wire between P and RB, and connect the external braking resistor between P and B; refer to chapter 3.5.2 to select the appropriate resistor, please do not smaller than the minimum external resistance allowed by Table 3.5-1, otherwise it may cause damage to the drive. When external braking resistor is needed, please remove the short wire between P and RB, and connect the external braking resistor between P and B. Please refer to section 3.5.2 to select the appropriate resistor, and do not lower than the minimum external resistance allowed by Table 3.5-1, or it may result in damage to the driver.

- E4 specification 220V drive system wiring diagram

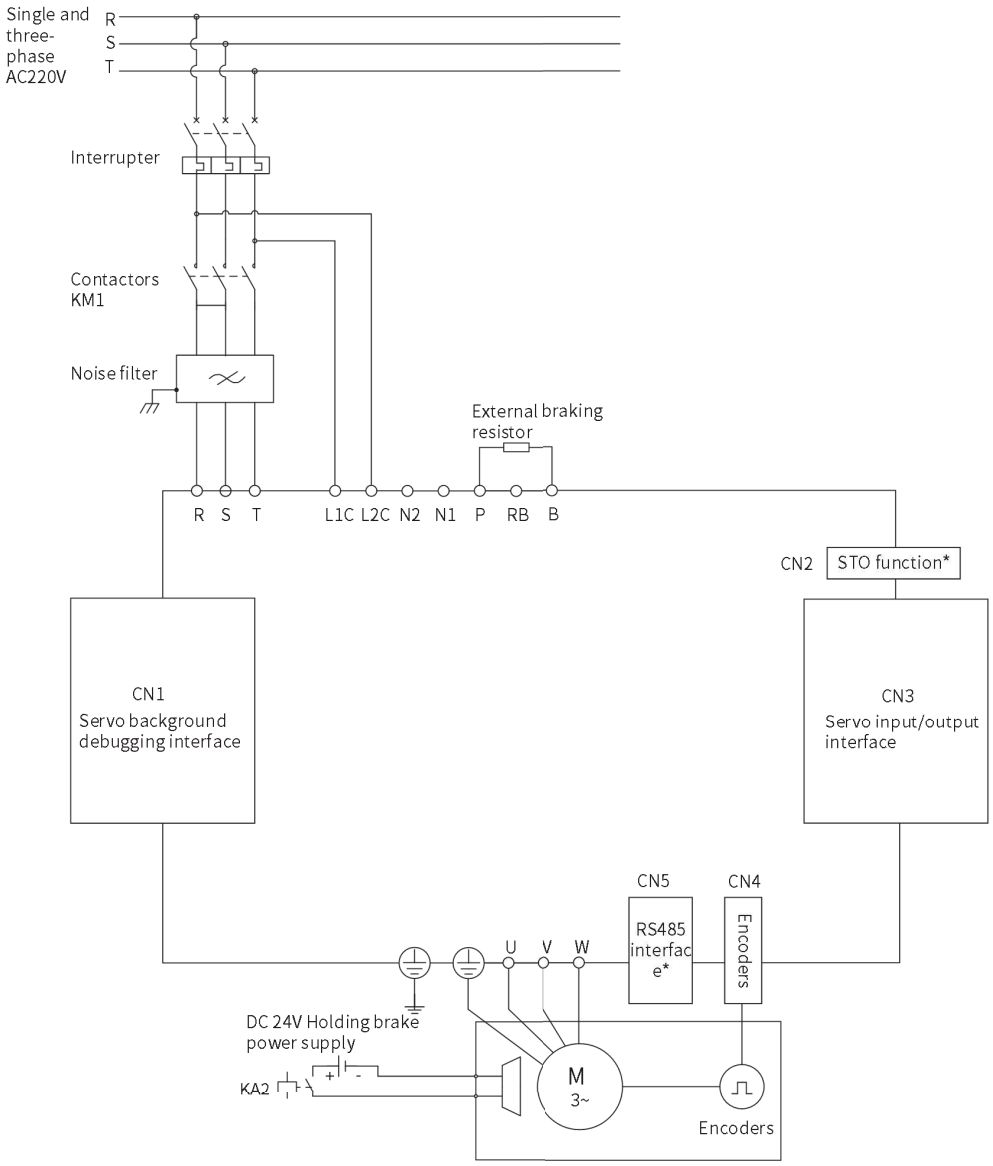


Figure 3.1-4: N3RP-180SA-E System Wiring Diagram

Note: * indicates that only "-SM" models are available, please contact Cosel for details.

1) Please use a circuit breaker with leakage protection and a noise filter between the power supply and the main power terminals;

2) N3RP-180SA-E defaults to shorting between P and RB to use the built-in braking resistor; when an external braking resistor is required, remove the shorting wire between P and RB, and connect the external braking resistor between P and B; please refer to the section 3.5.2 to select the appropriate resistor, and do not use a resistor smaller than that shown in Table: Please refer to section 3.5.2 to select the appropriate resistor, and do not connect the external brake resistor smaller than the minimum resistance value allowed in Table 3.5-1, otherwise the driver may be damaged.

- E4 size 380V drive system wiring diagram

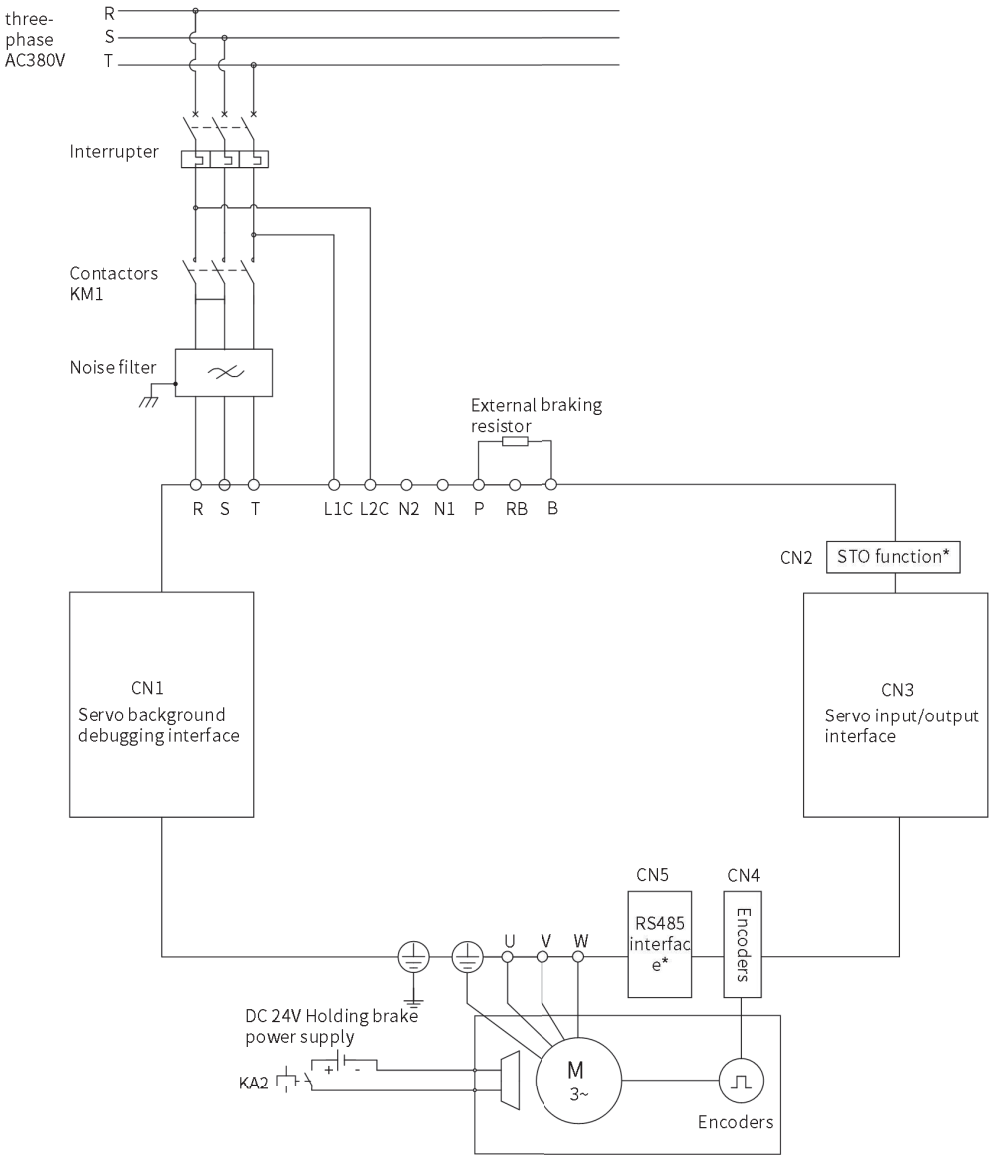


Figure 3.1-5: N3RP-120SC-E, N3RP-140SC-E, N3RP-210SC-E, N3RP-250SC-E System Wiring Diagrams

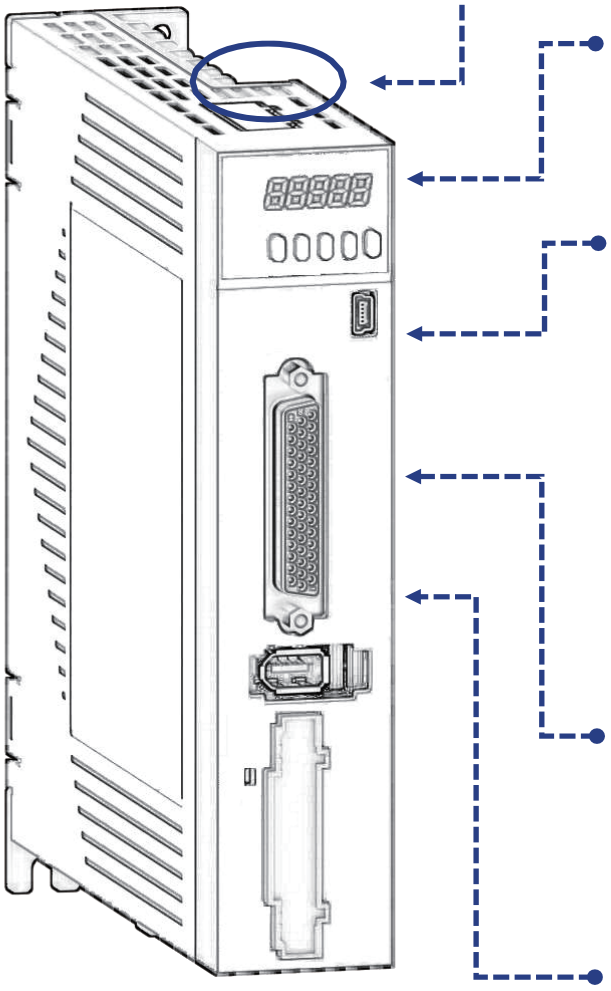
Note: * indicates that only "-SM" models are available, please contact Cosel for details.

1) Please use a circuit breaker with leakage protection and a noise filter between the power supply and the main power terminals;

2) N3RP-180SA-E, N3RP-120SC-E, N3RP-140SC-E, N3RP-210SC-E, N3RP-250SC-E Default P and RB are shorted, and use the built-in braking resistor; when an external braking resistor is required. When external braking resistor is needed, please remove the short wire between P and RB, and connect the external braking resistor between P and B. Please refer to section 3.5.2 to select the appropriate resistor, and do not use a resistor smaller than the minimum resistance allowed by Table 3.5-1, or it may result in damage to the driver.

3.2 Control Signal Port Definition

- E1、E2 specification drive control signal port definitions



	CN3（IN）		CN4(OUT)	
	pin number	Signal Name	pin number	Signal Name
RS485 Communication terminal	4	RS485+	4	RS485+
	5	RS485-	5	RS485-
	8	GND	8	GND

	pin number	Signal Name
MINI USB	1	VBUS
	2	D-
	3	D+
	4	-
	5	GND

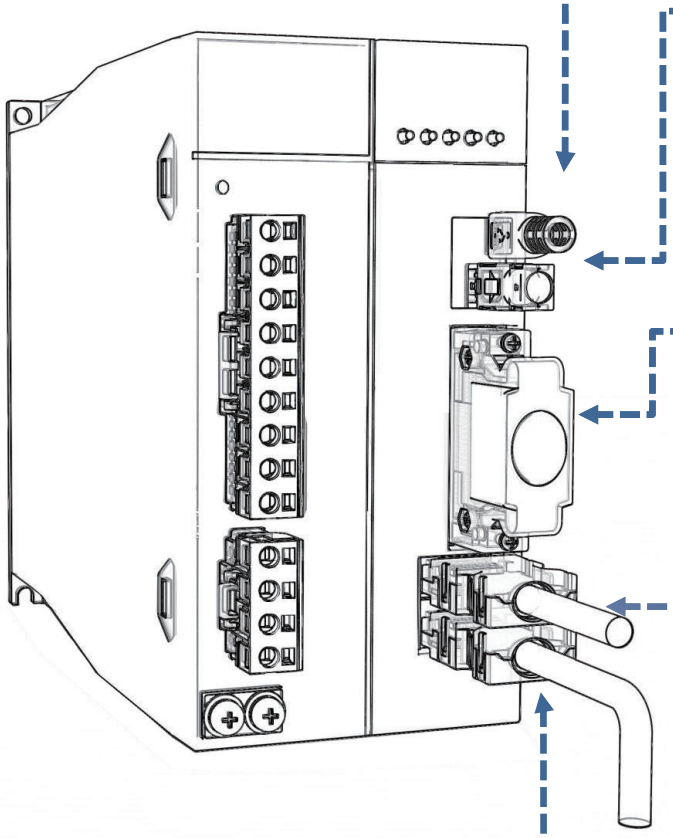
CN1	pin number	Signal Name	pin number	Signal Name	pin number	Signal Name
IO connectors DB44	1	DO4+	16	GND	31	DI7
	2	DO3-	17	+24V	32	DI6
	3	DO3+	18	AI2	33	DI5
	4	DO2-	19	GND	34	DI3
	5	DO2+	20	AI1	35	PULLHI
	6	DO1-	21	PAO+	36	HPULSE-
	7	DO1+	22	PAO-	37	SIGN+
	8	DI4	23	PBO-	38	HPULSE+
	9	DI1	24	PZO-	39	SIGN-
	10	DI2	25	PBO+	40	HSIGN-
	11	COM+	26	DO4-	41	PULSE+
	12	-	27	DO5-	42	HSIGN+
	13	PZO+	28	DO5+	43	PULSE-
	14	COM-	29	GND	44	OCZ
	15	-	30	DI8		

CN2	pin number	Signal Name
Encoders Connectors1 394-6P	1	5V
	2	GND
	3	-
	4	-
	5	SD+
	6	SD-

terminal markings	Terminal name
L1、L2	Main circuit power input terminal
P、B、N	detent function
U、V、W、PE	Servo Motor Connection Terminal

- E3、E4 specification drive control signal port definitions

Annotation：E3、E4Consistent control signal port definitions，E3 size drive as an example



CN1	pin number	Signal Name
MINI USB	1	VBUS
	2	D-
	3	D+
	4	-
	5	GND

CN2	pin number	Signal Name
Recommended Models TE:2013595-1	1	Internal power supply negative
	2	Positive internal power supply
	3	STO1-
	4	STO1+
	5	STO2-
	6	STO2+
	7	STO_OUT-
	8	STO_OUT+

CN3	pin number	Signal Name	pin number	Signal Name
IO Connectors SCSI-50P	1	DI1	28	PBO-
	2	DI2	29	PBO+
	3	DI3	30	PAO-
	4	DI_COM	31	PAO+
	5	DI4	32	OCZ
	6	DI5	33	GND
	7	DI6	34	PULSE+
	8	DI7	35	PULSE-
	9	HDI1	36	SIGN+
	10	HDI2	37	SIGN-
	11	DO1-	38	PULLHI
	12	DO1+	39	GND
	13	DO2-	40	HPULSE+
	14	DO2+	41	HPULSE-
	15	DO3-	42	HSIGN+
	16	DO3+	43	HSIGN-
	17	DO4-	44	GND
	18	DO4+	45	AI1
	19	DO5-	46	AI2
	20	DO5+	47	AO2
	26	PZO-	48	AO1
	27	PZO+	49	GND

CN4	pin number	Signal Name
Recommended Models3M:36210-0100PL	1	5V
	2	GND
	3	-
	4	-
	5	-
	6	-
	7	-
	8	-
	9	SD+
	10	SD-

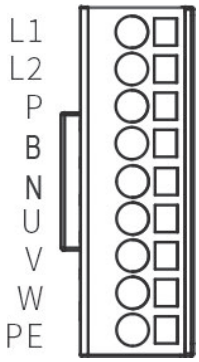
CN5	pin number	Signal Name
RS485	1	-
	2	GND
	3	485+
	4	485-
	5	-
	6	-
	7	-
	8	-
	9	-
	10	-

3.3 Power Terminal Definitions and Wiring Instructions

3.3.1 Power and motor terminal definitions

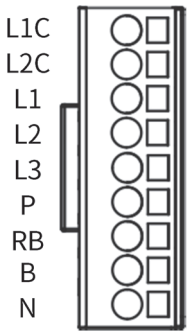
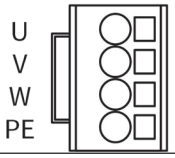
- N3RP Drive E1/E2 Specifications

Table: 3.3-1 Main Circuit Terminal Definitions

Connectors	Terminal Serial Number	Terminal Marking	Terminal Functions	Explanation
	1	L1	Mains power input	single phase AC200V-240V,-10 ～ +10%,50/60Hz
	2	L2		
	3	P	detent function	For brake function applications, use terminals P and B, see section 3.5 for details.
	4	B		
	5	N		
	6	U	motor drive	Connect the servo motor U, V, W three-phase and motor PE terminals.
	7	V		
	8	W		
	9	PE		

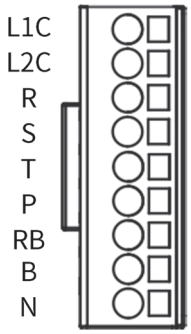
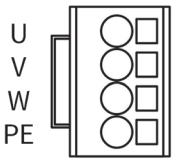
- N3RP drive E3 size 220V

Table: 3.3-2 Main Circuit Terminal Definitions

Connectors	Terminal Serial Number	Terminal Marking	Terminal Functions	Explanation
	1	L1C	Control power input	single phase AC200V-240V, -10 ～+10%,50/60Hz
	2	L2C		
	3	L1	Mains power input	single phase AC200V-240V, -10 ～+10%,50/60Hz
	4	L2		
	5	L3		
	6	P	Brake function and DC bus terminals	for brake function applications, use terminals P, RB, and B. See section 3.5 for details.
	7	RB		
	8	B		for common DC bus applications, use the P (DC+) and N (DC-) terminals as detailed in section 3.4.
	9	N		
	1	U	motor drive	connect the servo motor U, V, W three-phase and ground PE terminals.
	2	V		
	3	W		
	4	PE		

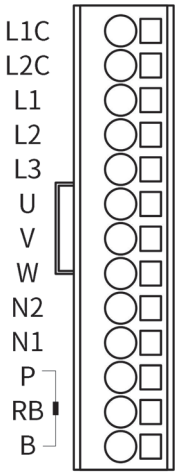
- N3RP drives E3 size 380V

Table: 3.3-3 Main Circuit Terminal Definitions

Connectors	Terminal Serial Number	Terminal Marking	Terminal Functions	Explanation
	1	L1C	Control power input	single phase 380V~440VAC，-10～+10%，50/60Hz
	2	L2C		
	3	R	Mains power input	three-phase 380V~440VAC，-10～+10%，50/60Hz
	4	S		
	5	T		
	6	P	Brake function and DC bus terminals	for brake function applications, use terminals P, RB, and B. See section 3.5 for details.
	7	RB		
	8	B		for common DC bus applications, use the P (DC+) and N (DC-) terminals as detailed in section 3.4.
	9	N		
	1	U	motor drive	connect the servo motor U, V, W three-phase and ground PE terminals.
	2	V		
	3	W		
	4	PE		

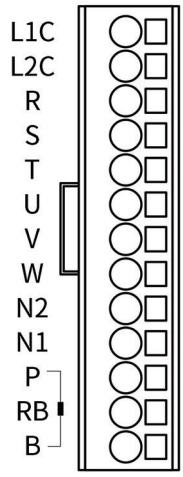
- N3RP drive E4 size 220V

Table: 3.3-3 Main Circuit Terminal Definitions

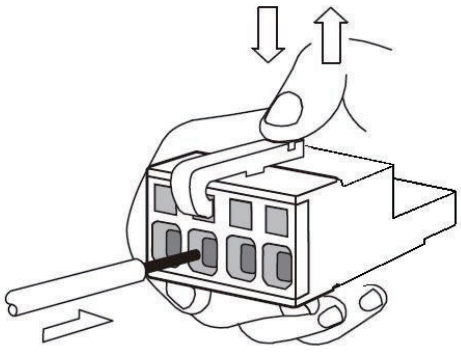
Connectors	Terminal Serial Number	Terminal Marking	Terminal Functions	Explanation
	1	L1C	Control power supply Input	single phase AC200V-AC240V，-10～+10%，50/60Hz
	2	L2C		
	3	L1	Main power input	three-phase AC200V-AC240V，-10～+10%，50/60Hz
	4	L2		
	5	L3		
	6	U	motor drive	Connect the servo motor U, V and W phases.
	7	V		
	8	W		
	9	N2	Braking function, common DC bus terminals, external reactance	For brake function applications, use terminals P, RB, and B. See section 3.5 for details.
	10	N1		For common bus applications, use P (DC+) and N2 (DC-) terminals as detailed in section 3.4.
	11	P		
	12	RB		N1 and N2 are shorted by default. When it is necessary to suppress the high harmonics of the power supply, remove the shorted wires and connect an external DC resistor between N1 and N2.
	13	B		

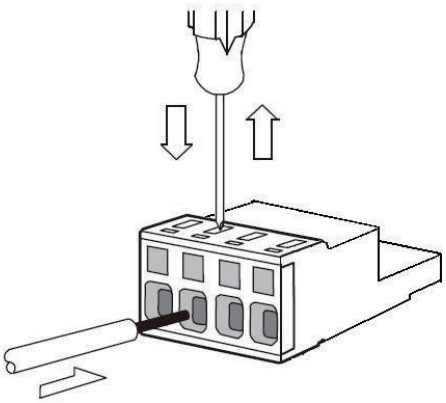
- N3RP drive E4 size 380V

Table: 3.3-4 Main Circuit Terminal Definitions

Connectors	Terminal Serial Number	Terminal Marking	Terminal Functions	Explanation
	1	L1C	Control power supply Input	single phase 380V~440VAC，-10～+10%，50/60Hz
	2	L2C		
	3	R	Mains power input	three-phase 380V~440VAC，-10～+10%，50/60Hz
	4	S		
	5	T		
	6	U	motor drive	Connect the servo motor U, V and W phases.
	7	V		
	8	W		
	9	N2	Braking function, common DC bus terminals, external reactance	For brake function applications, use terminals P, RB, and B. See section 3.5 for details.
	10	N1		For common bus applications, use P (DC+) and N2 (DC-) terminals as detailed in section 3.4.
	11	P		
	12	RB		N1 and N2 are shorted by default. When it is necessary to suppress the high harmonics of the power supply, remove the shorted wires and connect an external DC resistor between N1 and N2.
	13	B		

3.3.2 Use of wiring tools





3.3.3 Main circuit wiring example

(1) Single-phase AC220V class driver E1/E2/E3 specifications

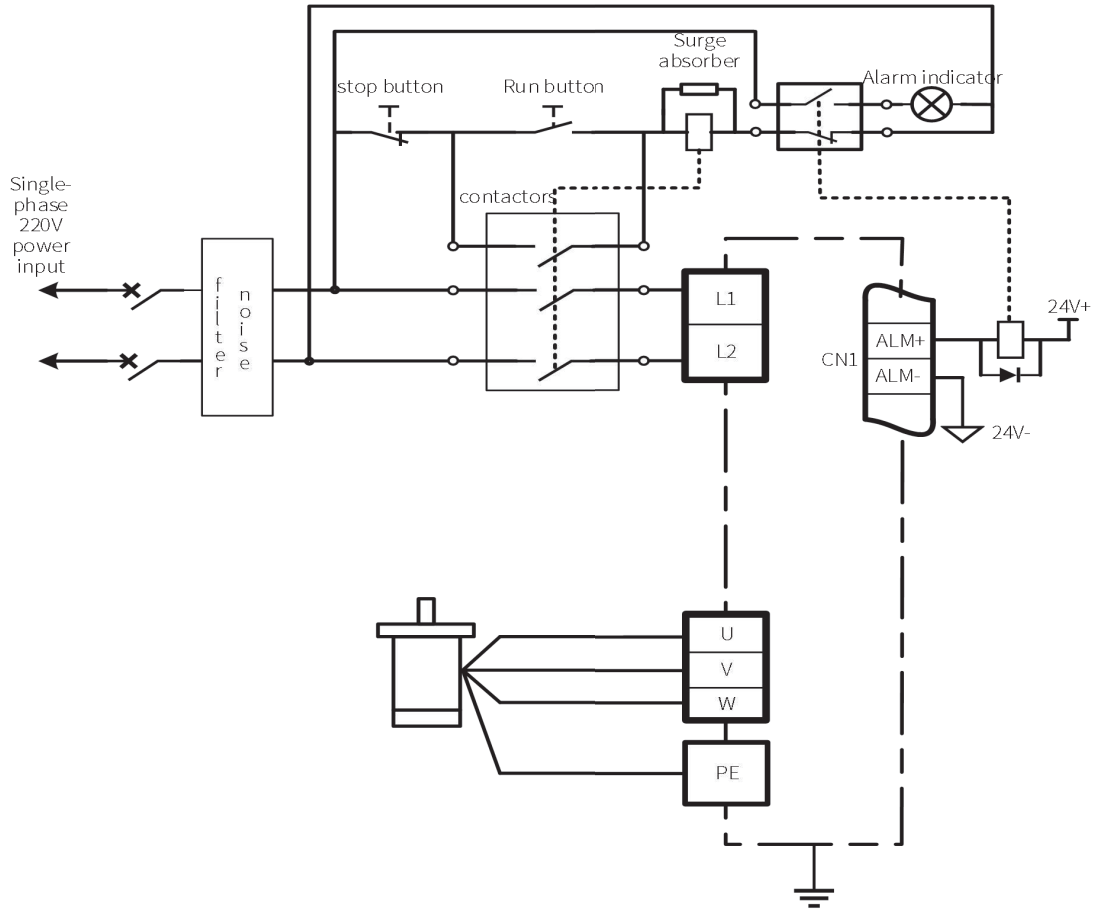


Figure: 3.3-1 Main Circuit Wiring Example

- Do not connect the power input (L1,L2) to the output terminals (U,V,W) of the motor;
- The wiring of the output terminals (U,V,W) of the motor is consistent with that of the motor (U,V,W) and should not be in the wrong order;
- Do not connect the braking resistor to the P and N terminals, or it may cause damage to the servo, Do not connect the braking resistor to the P and N terminals, otherwise it may cause damage to the servo and the braking resistor, or even cause a fire due to overheating of the braking resistor;
- Do not wire the power and signal wires together, and keep a distance of more than 30cm between them;
- Do not switch on and off the servo power supply too often, otherwise it will cause frequent charging of capacitors inside the servo, and the precharging circuit will be overloaded, which will result in the degradation of the performance. The frequency of switching should be controlled at less than 1 time per minute;
- After the servo is powered off, there may still be residual high voltage inside the servo, after the power is turned off for 15 minutes, and after the power indicator is off, wiring and other operations can be carried out only after the servo is powered off.

(2) Three-phase AC220V/AC380V class driver E3/E4 specification

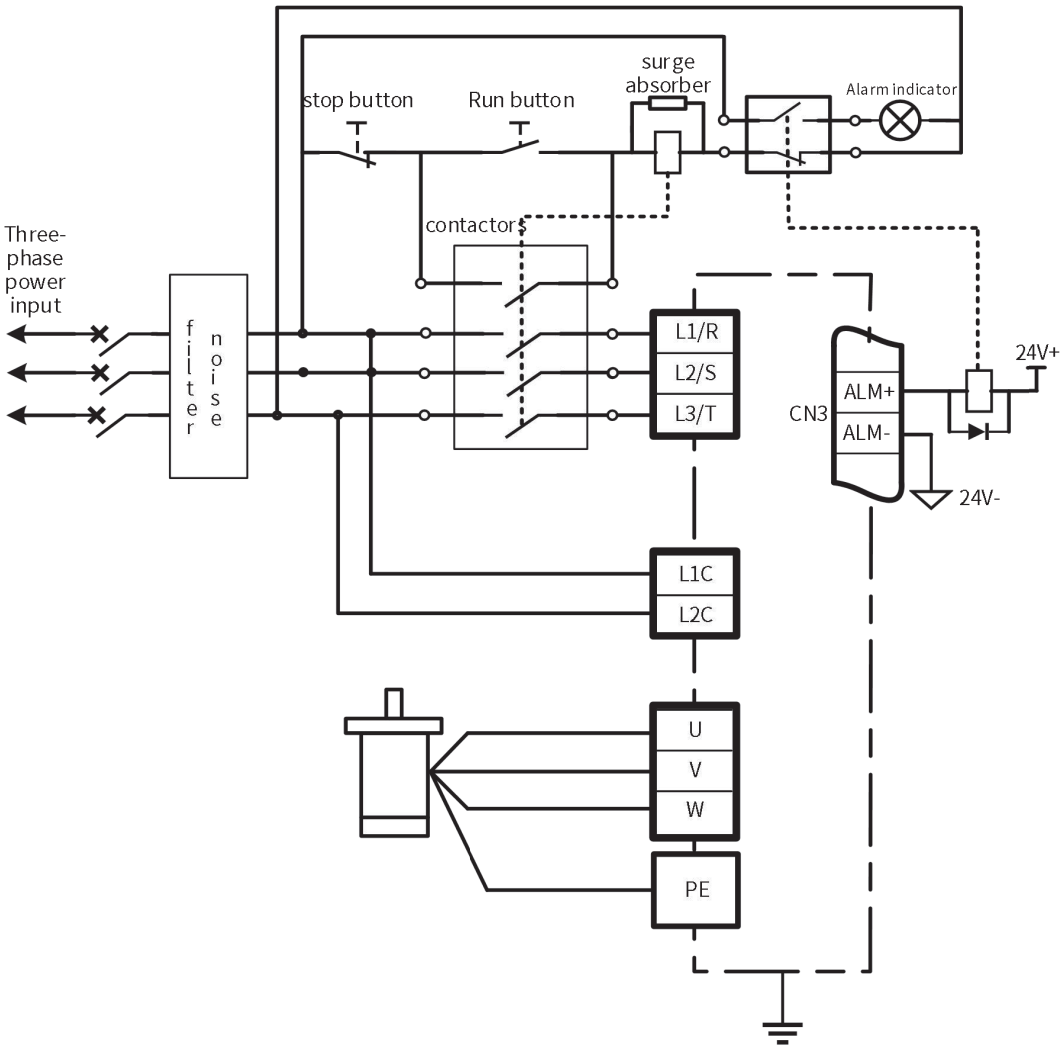


Figure: 3.3-2 Main Circuit Wiring Example

- Do not connect the power input (L1, L2, L3) to the output terminals (U, V, W) for the motor;
- The wiring of the motor output terminals (U, V, W) is consistent with the motor (U, V, W) and cannot be in the wrong order;
- Do not connect the braking resistor to the P, N terminals, or it may cause damage to the servo and braking resistor, or even cause fire due to overheating;
- Do not wire the power and signal wires together, and keep a distance of more than cm between them;
- Do not frequently switch the servo power supply. Do not connect the braking resistor to the P and N terminals, otherwise it may cause damage to the servo and braking resistor, or even cause fire due to overheating of the braking resistor;
- Do not wire the power and signal wires together, and keep a distance of more than 30cm between them;
- Do not switch the servo power supply frequently, or else it will cause the servo to charge the capacitor frequently, and the pre-charged circuit will be overloaded, which will cause a decline in the performance. Switching frequency should be controlled at less than 1 time per minute;
- After the servo is powered off, there may still be residual high voltage inside the servo, after the power is turned off for 15 minutes and the power indicator light is turned off, then wiring and other operations can be carried out.

3.3.4 Main circuit cable specifications

Table: 3.3-4 Recommended Cable Specifications for Main Circuits

Range	Drive Model	L1、L2、L3		P、B		U、V、W		PE	
		mm^2	AWG	mm^2	AWG	mm^2	AWG	mm^2	AWG
220V									
N3 Series	N3RP-1R8SA-E	2x0.75	18	2x0.75	18	3x0.75	18	0.75	18
	N3RP-2R8SA-E	2x0.75	18	2x0.75	18	3x0.75	18	0.75	18
	N3RP-4R2SA-E	2x0.75	18	2x0.75	18	3x0.75	18	0.75	18
	N3RP-060PA-E	2x1.00	17	2x1.00	17	3x1.00	17	1.00	17
	N3RP-100SA-E	2x1.50	15	2x1.50	15	3x1.50	15	1.50	15
	N3RP-140SA-E	3x2.50	13	3x2.50	13	3x2.50	13	2.50	13
	N3RP-180SA-E	3x2.50	13	3x2.50	13	3x2.50	13	2.50	13
380V									
N3 Series	N3RP-5R4SC-E	3x0.75	18	2x0.75	18	3x0.75	18	0.75	18
	N3RP-6R8SC-E	3x0.75	18	2x1.00	17	3x1.00	17	1.00	17
	N3RP-8R3SC-E	3x0.75	18	2x1.00	17	3x1.00	17	1.00	17
	N3RP-100SC-E	3x1.00	17	2x1.50	15	3x1.50	15	1.50	15
	N3RP-120SC-E	3x1.50	15	3x2.00	14	3x2.00	14	2.00	14
	N3RP-140SC-E	3x1.50	15	3x2.00	14	3x2.00	14	2.00	14
	N3RP-210SC-E	3x4.00	11	2x4.00	11	3x4.00	11	4.00	11
	N3RP-250SC-E	3x4.00	11	2x4.00	11	3x4.00	11	4.00	11

3.4 Common DC bus wiring instructions (E3 size 380V class only)

In some multi-axis application scenarios, the motion state of each axis is different, and some servo motors work in the braking power generation state, while others work in the electric energy consumption state. By adopting the common DC bus technology for energy interaction, the energy generated by the braking motor can be supplied to the electric energy-consuming motors without having to be dissipated through the braking resistor, thus achieving energy-saving effects.

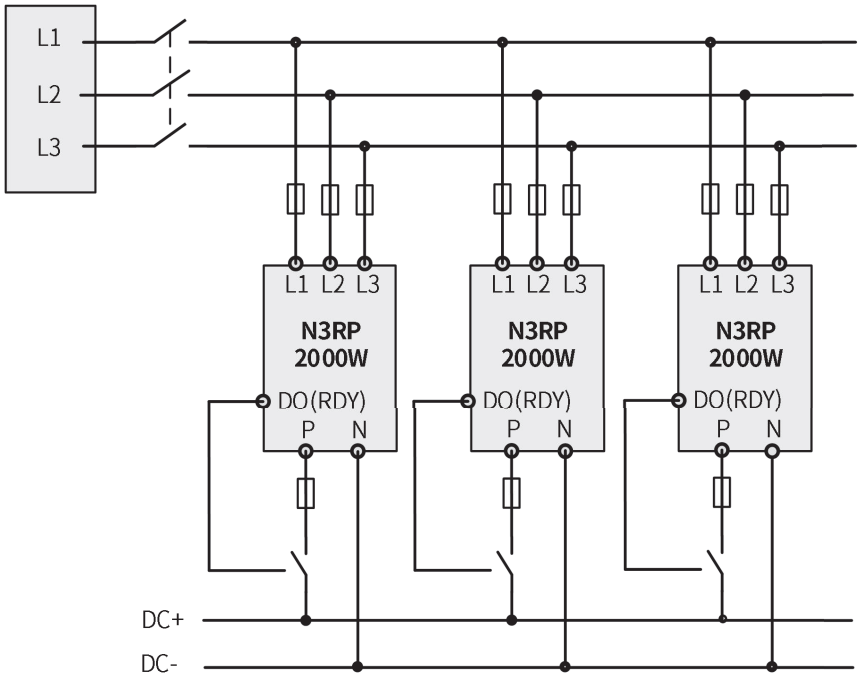


Fig. 3.4-1 Servo Common Bus Example

- Only allow the same specification drives to be common bus in this way. The DC bus P and N of the servo are connected in parallel to realize the energy transfer between the drives;
- All drives must use the same power input, and must not use power supplies with different voltages and phases, or they may cause damage to the drives;
- All drives must be powered up and down at the same time, or they may cause damage to the drives;
- All common bus of the drive voltage level and phase sequence to maintain the same, otherwise it will be possible to damage the drive, causing a fire;
- Common bus use, each drive must all complete the common bus configuration before allowing the servo drive to run;
- Drive power-up, when the drive appears Rdy state When the drive is powered on, when the drive is in Rdy state, the DO of the drive outputs a ready signal, which controls the relay to absorb, realizing the common bus connection; When the drive PN is connected to the bus, in order to avoid excessive current when a single drive is abnormal, please connect a fast fuse between the bus.

3.5 Braking resistor wiring instructions

3.5.1 Braking Resistor Wiring

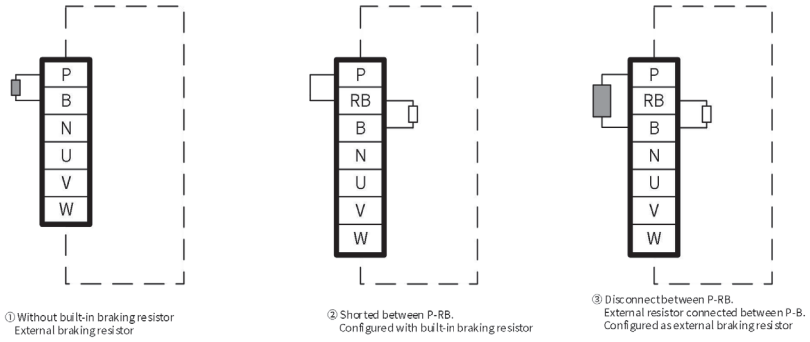


Figure: 3.5-1 Braking Resistor Wiring

- For models without built-in braking resistor, the external braking resistor is connected between P-B;
- For models with built-in braking resistor, when using the built-in resistor, the P-RB terminals should be shorted; when using the external resistor, remove the shorting wire between P-RB, and connect the external resistor between P-B;
- It is necessary to When using external braking resistor, please refer to section 3.5.3 to select the appropriate resistor, please do not smaller than the minimum resistance value of external connection allowed by Table: 3.5-1, otherwise it may lead to damage of the drive;
- external braking resistor is connected between P-B;
- do not connect the braking resistor to the busbar between P, N, otherwise it may lead to drive damage and cause a fire;
- use the external resistor to connect between P-B;
- use the external resistor to connect between P, N and P-B, otherwise it may lead to drive damage and cause a fire. Otherwise, it may cause damage to the drive and fire;
- Before using the servo, please make sure that the parameters related to the external braking resistor have been set correctly: P02.34 (Braking Resistor Selection), P02.39 (External Braking Resistor Power), P02.40 (External Braking Resistor Resistance Value).

3.5.2 Specification of braking resistor

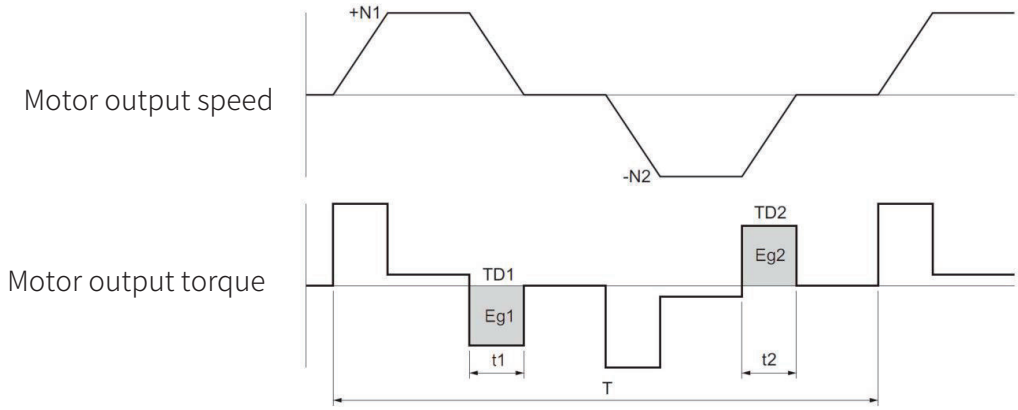
Table: 3.5-1 Braking Resistor Specifications

Servo Drive Rated Voltage, Current		Minimum External Resistance Value	Maximum Braking Energy Absorbed By The Capacitor Ec
Single/three-phase220V	N3RP-1R8SA-E	50Ω/50W	10J
	N3RP-2R8SA-E	50Ω/50W	15J
	N3RP-4R2SA-E	50Ω/50W	26J
	N3RP-060PA-E	25Ω/80W	26J
	N3RP-100SA-E	15Ω/80W	47J
	N3RP-140SA-E	15Ω/80W	57J
	N3RP-180SA-E	10Ω/100W	64J
three-phase 380V	N3RP-5R4SC-E	60Ω/80W	39J
	N3RP-6R8SC-E	45Ω/80W	57J
	N3RP-8R3SC-E	45Ω/80W	57J
	N3RP-100SC-E	45Ω/80W	57J
	N3RP-120SC-E	35Ω/100W	114J
	N3RP-140SC-E	35Ω/100W	114J
	N3RP-210SC-E	25Ω/100W	114J
	N3RP-250SC-E	25Ω/100W	114J

3.5.3 Calculation of braking resistor selection

1. Calculation of regenerative energy

- Horizontal Axis Regenerative Energy Calculator



$$Eg1 = \frac{1}{2} \times \frac{2\pi}{60} \times N1 \times TD1 \times t1 \quad [J]$$

$$Eg2 = \frac{1}{2} \times \frac{2\pi}{60} \times N2 \times TD2 \times t2 \quad [J]$$

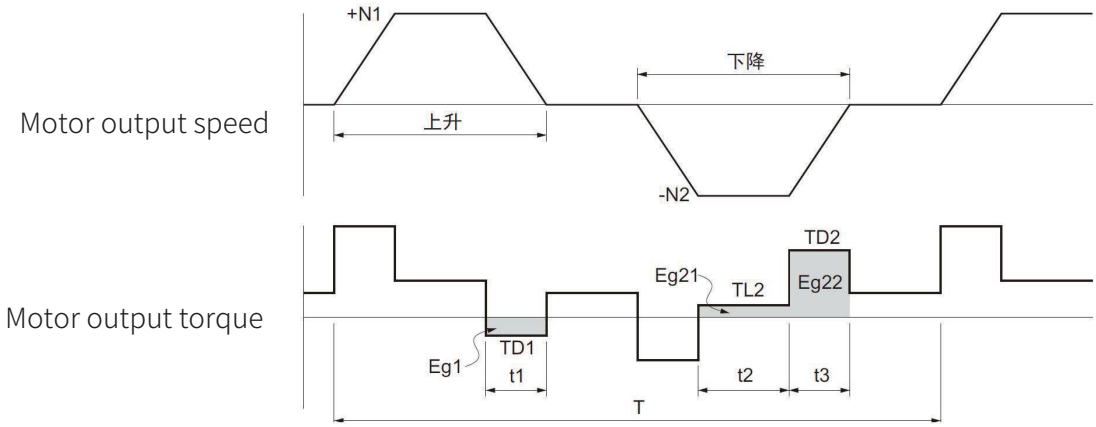
N1、N2 ： Speed at the beginning of deceleration（r/min）

TD1、TD2： Reduction torque （N·m）

t1、t2 ： deceleration time （s）

Note: The actual regenerative energy is only about 90% of the value calculated in the above formula, due to the losses caused by the motor coil resistance and the driver.

- Vertical axis regeneration energy calculation method：



$$Eg1 = \frac{1}{2} \times \frac{2\pi}{60} \times N1 \times TD1 \times t1 \quad [J]$$

$$Eg21 = \frac{2\pi}{60} \times N2 \times TL2 \times t2 \quad [J]$$

$$Eg22 = \frac{1}{2} \times \frac{2\pi}{60} \times N2 \times TD2 \times t3 \quad [J]$$

$$Eg2 = Eg21 + Eg22 \quad [J]$$

N1、N2 ： Speed at the beginning of deceleration （r/min）

TD1、TD2： Reduction torque （N·M）

TL2 ： Torque on descent （N·M）

t1、t3 ： deceleration time （s）

t2 ： Uniform running time during descent （s）

Note: The actual regenerative energy is only about 90% of the value calculated in the above formula, due to the losses caused by the motor coil resistance and the driver.

2. Selection of braking resistor

If either of the above Eg1 or Eg2 is lower than the regenerative energy Ec that can be absorbed by the internal capacitor of the servo driver, the regenerative energy can be handled by the internal capacitor alone. If either Eg1 or Eg2 exceeds the regenerative energy Ec that can be absorbed by the internal capacitor of the servo driver, it is necessary to use a regenerative resistor to release the energy, and the average regenerative power Pr(W) of the regenerative resistor can be obtained by the following formula.

$$Eg = (Eg1 - Ec) + (Eg2 - Ec) \quad [J]$$

$$Pr = Eg / T \quad [W]$$

Pr： Regenerative power that must be absorbed in 1 cycle of operation (in W)

Eg： Regenerative energy that must be absorbed in 1 cycle of action (in J)

Ec： Regenerative energy that can be absorbed by the capacitors inside the drive (in J)

T ： Action cycle time (in s)

Note： when $Eg1 - Ec < 0$， calculated at 0， when $Eg2 - Ec < 0$， calculated at 0

3.6 Wiring instructions for holding brake

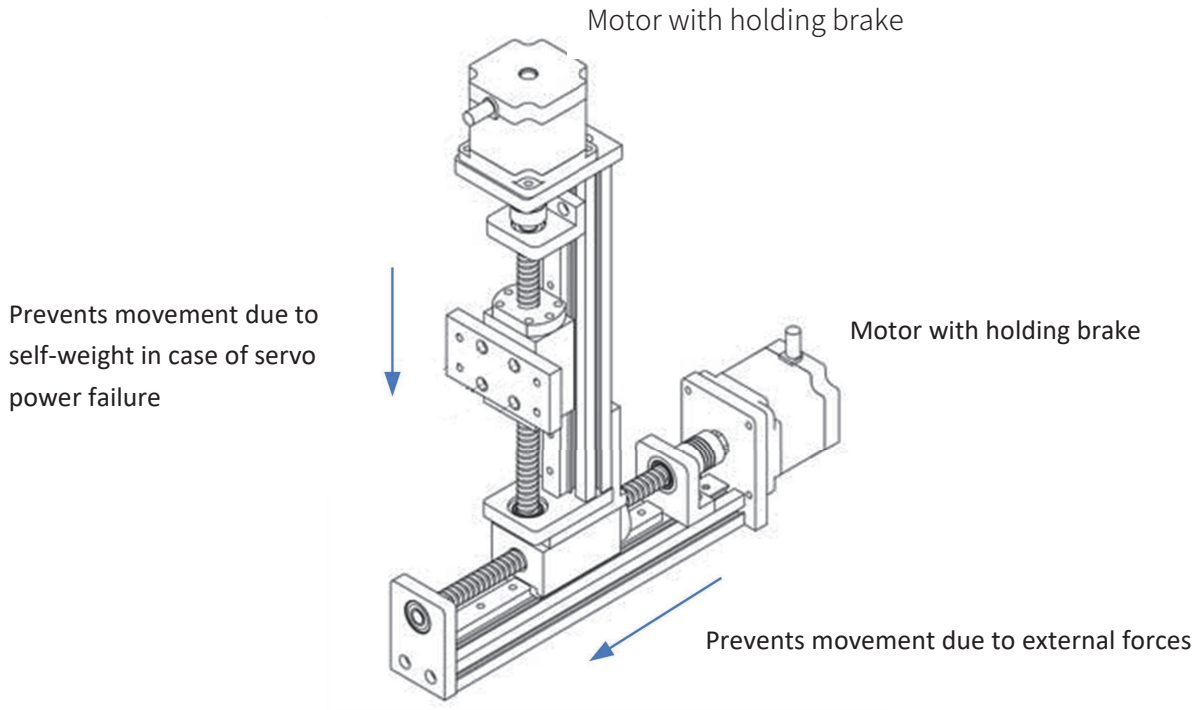


Fig. 3.6-1 Schematic diagram of holding brake application

Motor holding brake is used to stop unintended movement of a moving load (e.g. dropping under gravity) when the servo system is not activated (e.g. servo system power failure), and to prevent unintended movement of a servomotor that may occur after a power failure due to its own weight or due to an external force.

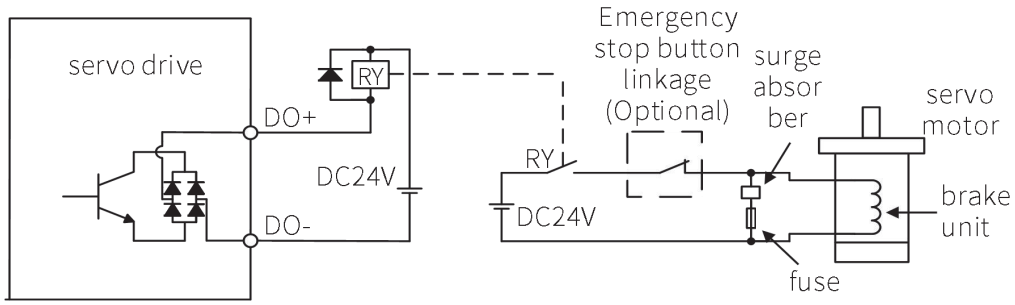


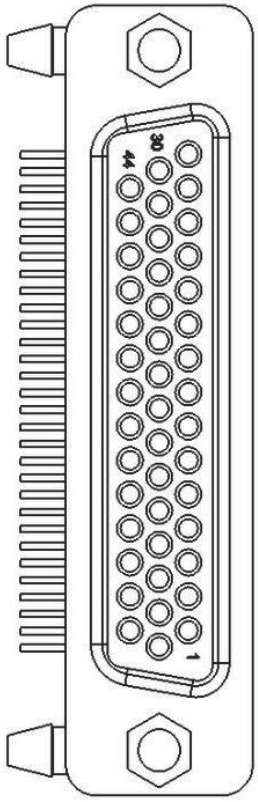
Figure: 3.6-2 Wiring Diagram for Holding Brake

- The holding brake mechanism built into the servo motor is only used for stopping the motor to hold the brake, and frequent use of the motor holding brake for emergency stop operation will shorten its service life. When the speed of the servo motor is less than 20rpm, it is allowed to disconnect the power supply of the holding brake;
- It is recommended to use an independent power supply for the holding brake to prevent the voltage from decreasing due to the abnormalities of other electrical appliances, resulting in the false operation of the holding brake; Use different power supplies to supply power to the holding brake and the control signal of the holding brake separately to avoid electromagnetic interference with the electronic devices.

3.7 Control Signals for E1 and E2 Specifications CN1 Port Definition and Wiring Description

3.7.1 Control Signal CN1 Port Definition

Table: 3.7-1 Control Signal CN1 Port Definition

IO Interface Connector (CN1)	Module Name	Signal Name	Pin Number	Default Function
	digital input	DI1	9	positive limit
		DI2	10	reverse limit
		DI3	34	home switch
		DI4	8	servo enable
		DI5	33	fault reset
		DI6	32	positional error clearing
		DI7	31	zero-speed hold
		DI8	30	undefined
		COM+	11	DIpublic side
	digital output	DO1+	7	Brake output
		DO1-	6	
		DO2+	5	servo operation
		DO2-	4	
		DO3+	3	servo fault output
		DO3-	2	
		DO4+	1	location arrival
		DO4-	26	
		DO5+	28	return to zero complete
		DO5-	27	
	crossover output	PAO+	21	A-phase crossover output signal
		PAO-	22	
		PBO+	25	B-phase crossover output signal
		PBO-	23	
		PZO+	13	Z-phase split frequency output signal
		PZO-	24	
		OCZ	44	encoder Z-phase open collector output signal
		GND	29	crossover output signal ground
	position command	PULSE+	41	low-speed pulse command input interface
		PULSE-	43	
		SIGN+	37	
		SIGN-	39	
		PULLHI	35	power input connector for command pulses
		HPULSE+	38	high-speed input pulse command
		HPULSE-	36	
		HSIGN+	42	high-speed position symbols
		HSIGN-	40	
	analog input	AI1	20	analog input signal 1
		AI2	18	analog input signal 2

		GND-AI	16	analog input signal ground
	housings	-	-	connecting cable shield

3.7.2 Digital Input Wiring Instructions

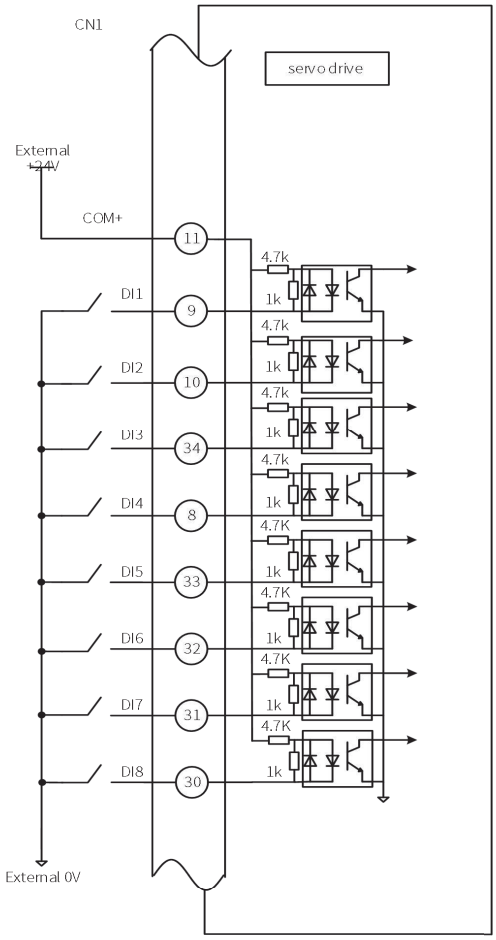


Figure: 3.7-1 Digital Input Wiring

(1) When the upper unit is a relay output

- When is used with an external power supply

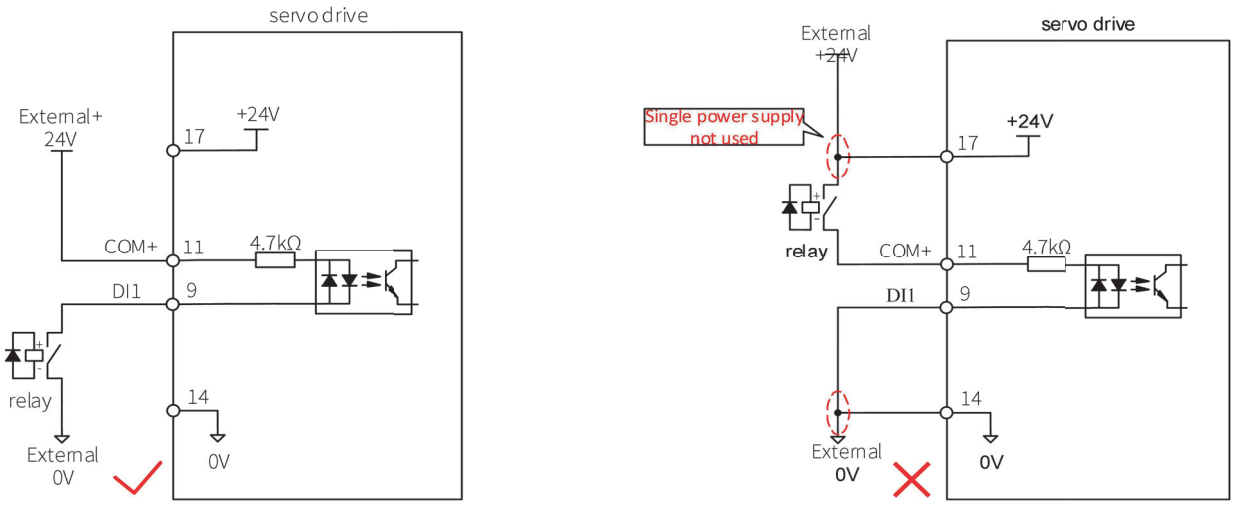


Figure: 3.7-2 Digital Input Wiring Schematic (Relay Output, Using External Power Supply)

(2) When the upper unit is open collector

- When uses an external 24V power supply

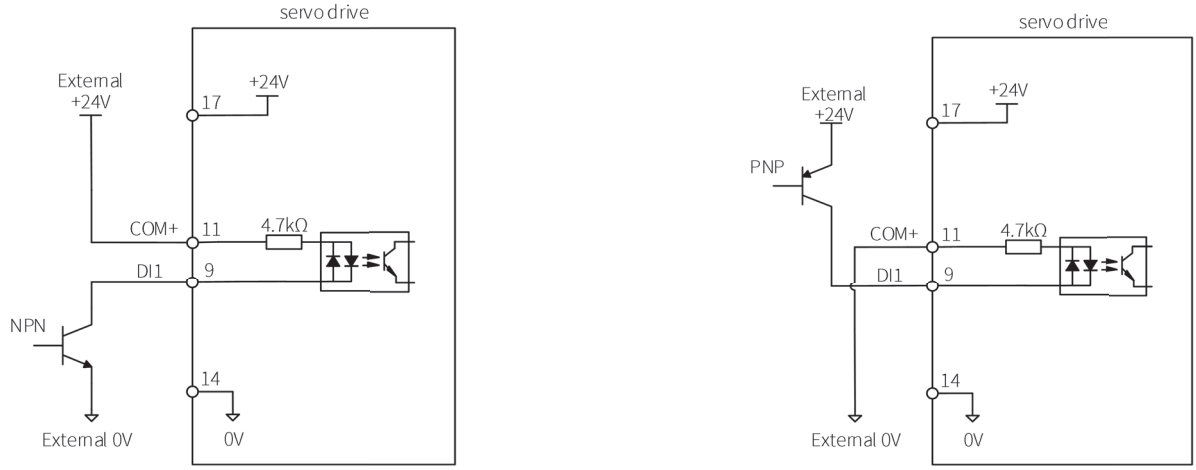


Figure: 3.7-3 Digital Input Wiring Schematic (Open Collector, Using External Power Supply)

Note: Mixed use of PNP and NPN inputs is not supported.

3.7.3 Digital Output Wiring Instructions

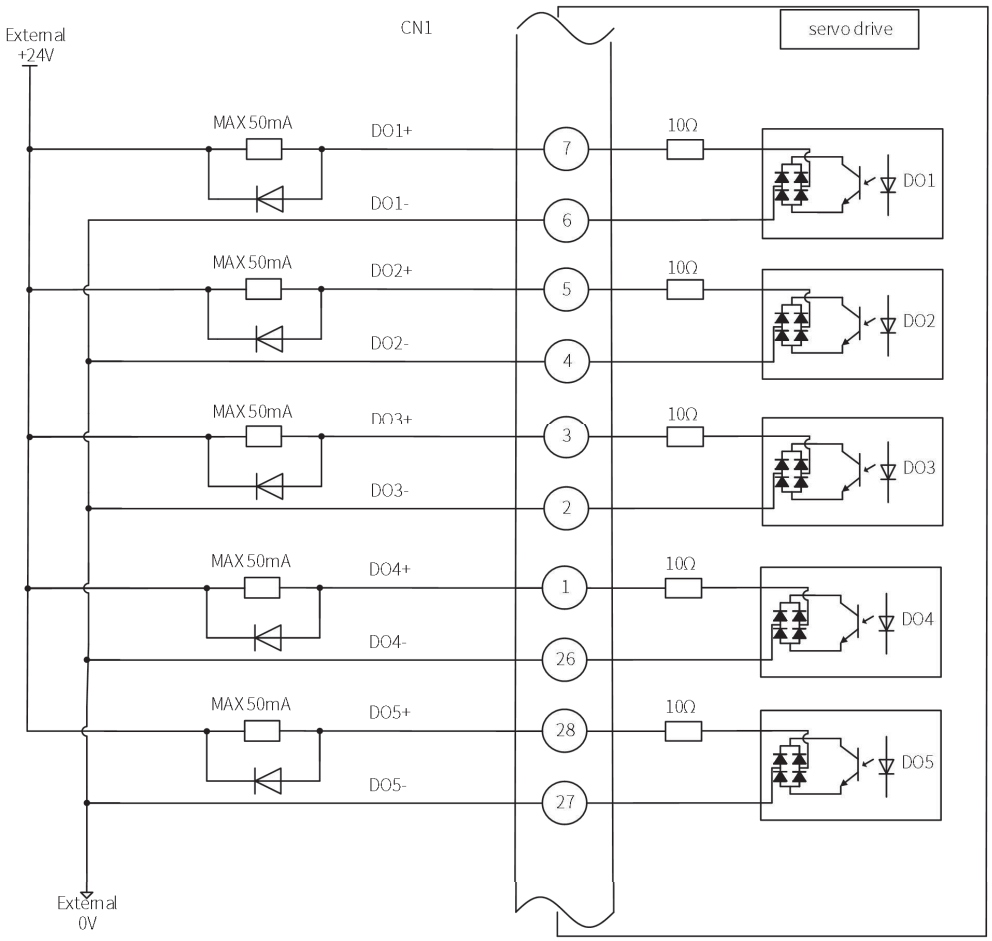


Figure: 3.7-4 Digital Output Wiring

The maximum allowable voltage and current capacity of the servo driver's internal optocoupler output circuit is as follows:

- Voltage: DC30V (max)
- Current: DC50mA(max)

(1) When the upper unit is a relay input

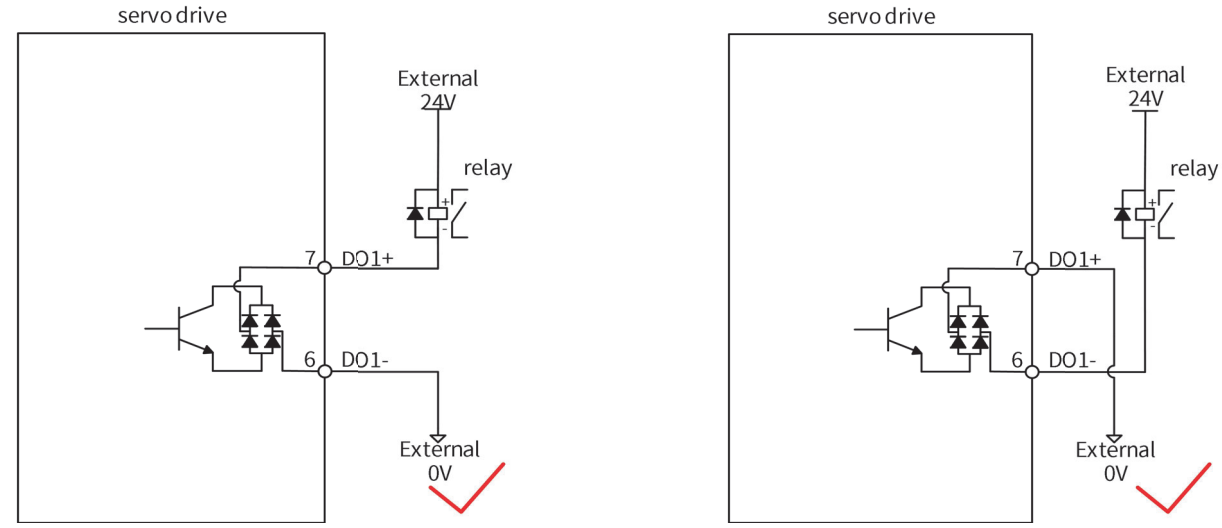


Figure: 3.7-5 Digital Output Wiring Diagram (Relay Input, Correct Wiring)

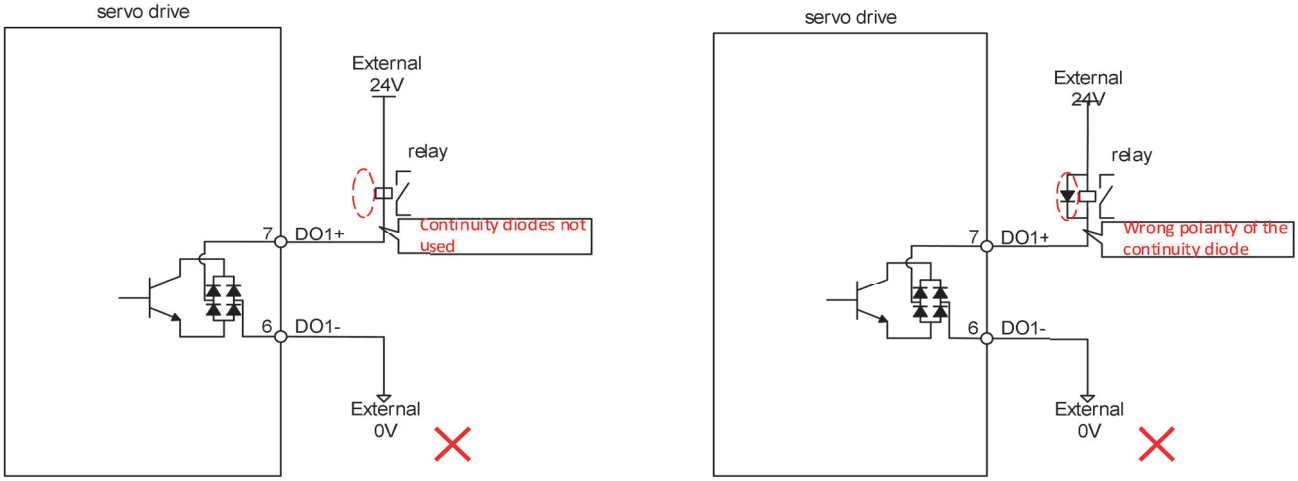


Figure: 3.7-6 Digital Output Wiring Diagram (Relay Input, Incorrect Wiring)

(2) When the upper unit is an optocoupler input

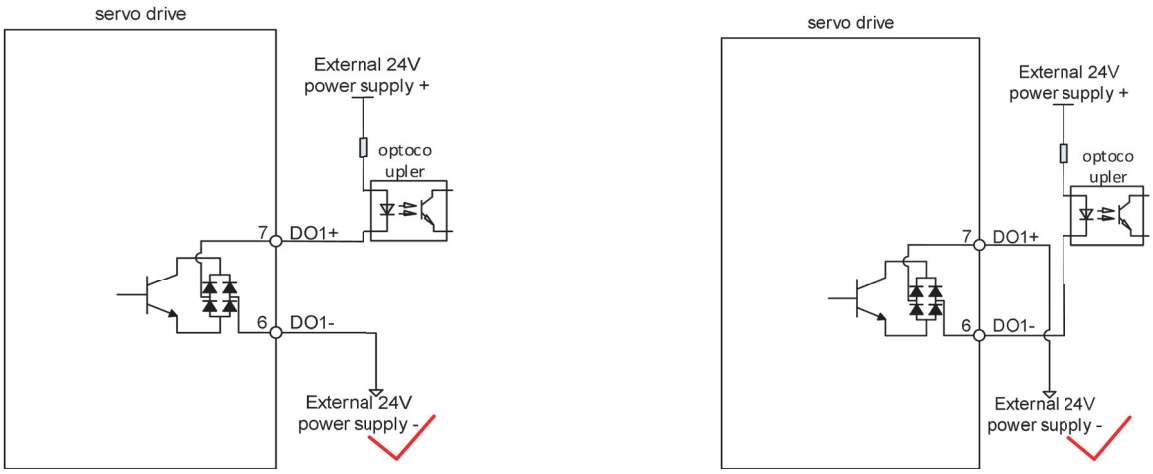


Figure: 3.7-7 Digital Output Wiring Diagram (Optocoupler Input, Correct Wiring)

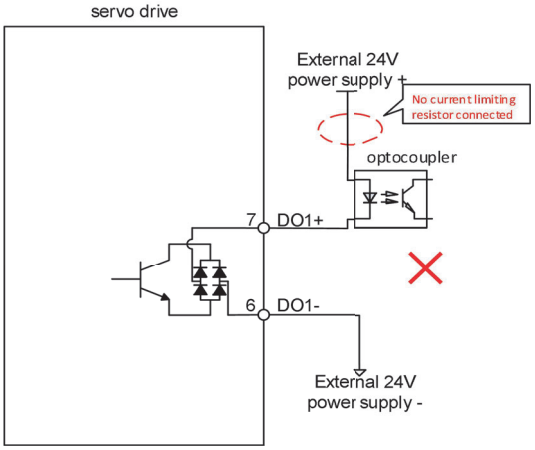


Figure: 3.7-8 Digital Output Wiring Diagram (Optocoupler Input, Wrong Wiring)

3.7.4 Crossover Output Wiring Instructions

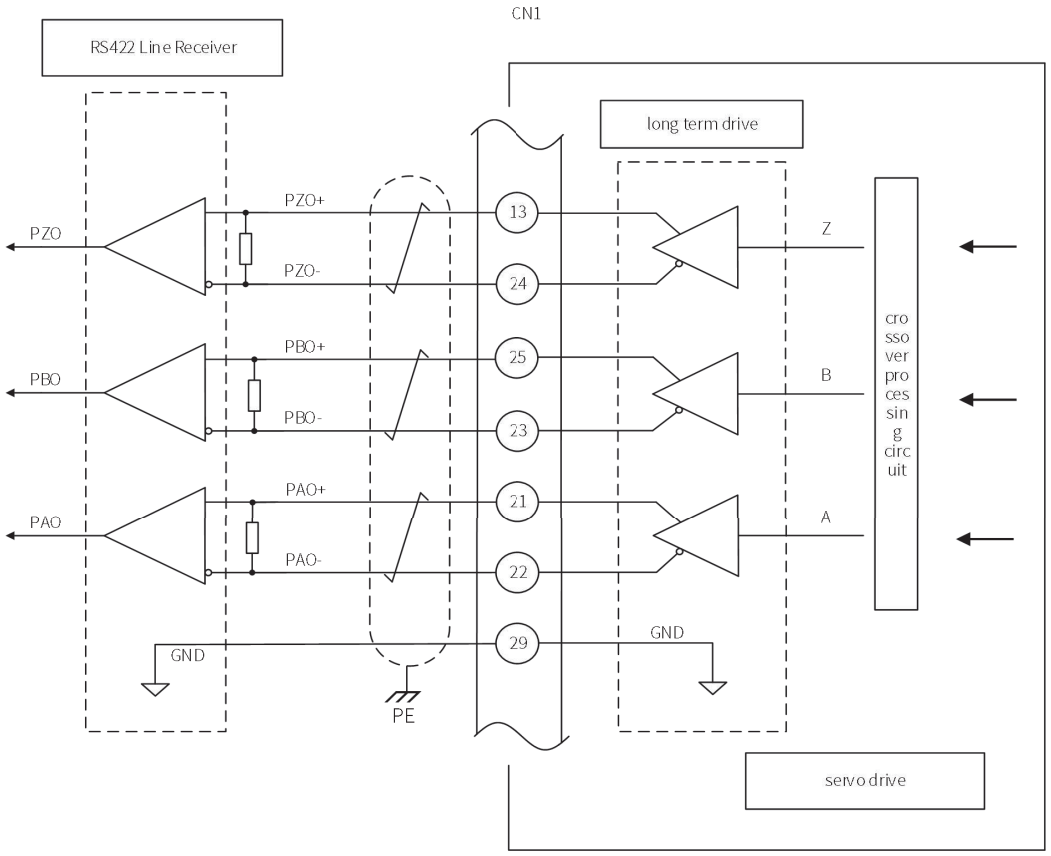


Figure: 3.7-9 Crossover Output Wiring

- receive signals for output pulses, use an RS422 long wire receiver (AM26C32 or equivalent).
- The crossover output has a maximum output current of 20mA; the
- cable using twisted shielded wire, the shield connected to PE, crossover output signal ground connected to the ground of the receiving end.
- encoder Z-phase open collector outputs, on the upper unit side, should be received using an optocoupler circuit, relay current, or bus receiver circuit.

3.7.5 Position Command Wiring Instructions

(1) Low-speed pulse command input

- when differential

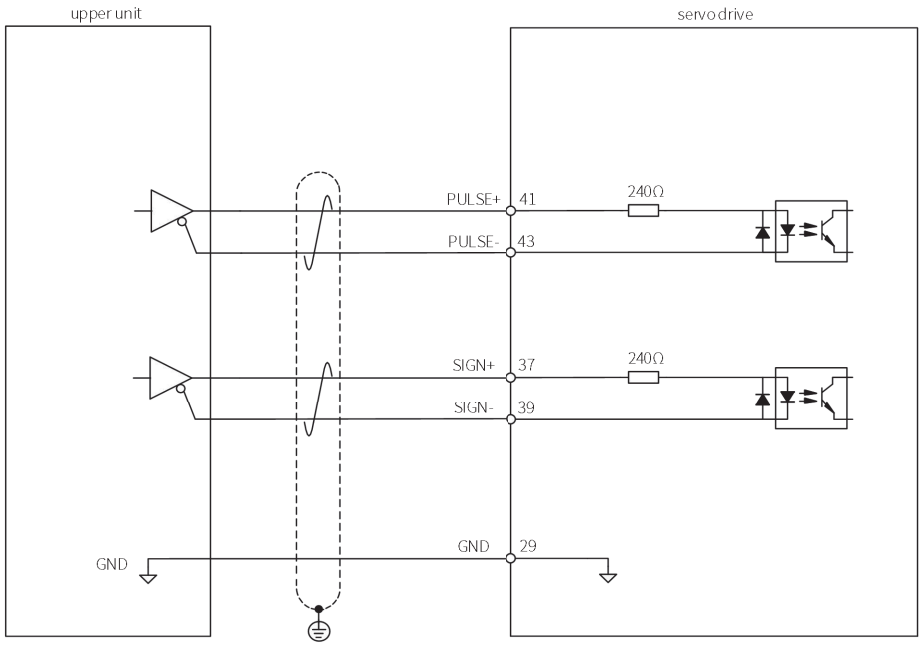


Figure: 3.7-10 Low-speed Pulse Command Input Wiring Diagram (Differential Method)

- When the collector

Option 1: Use the servo driver's internal resistor

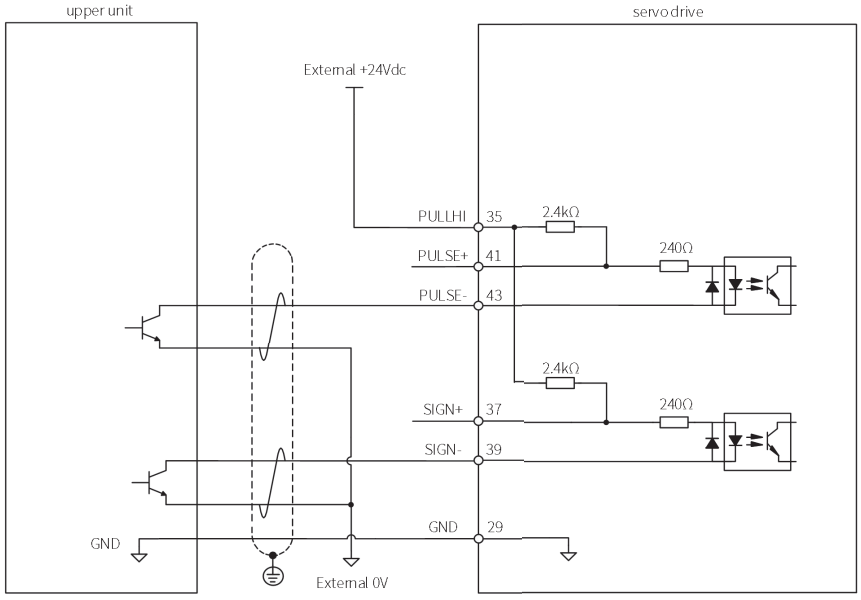


Figure: 3.7-11 Low-speed Pulse Command Input Wiring Schematic (Open Collector Method - Upper NPN Type - Using Internal Resistor)

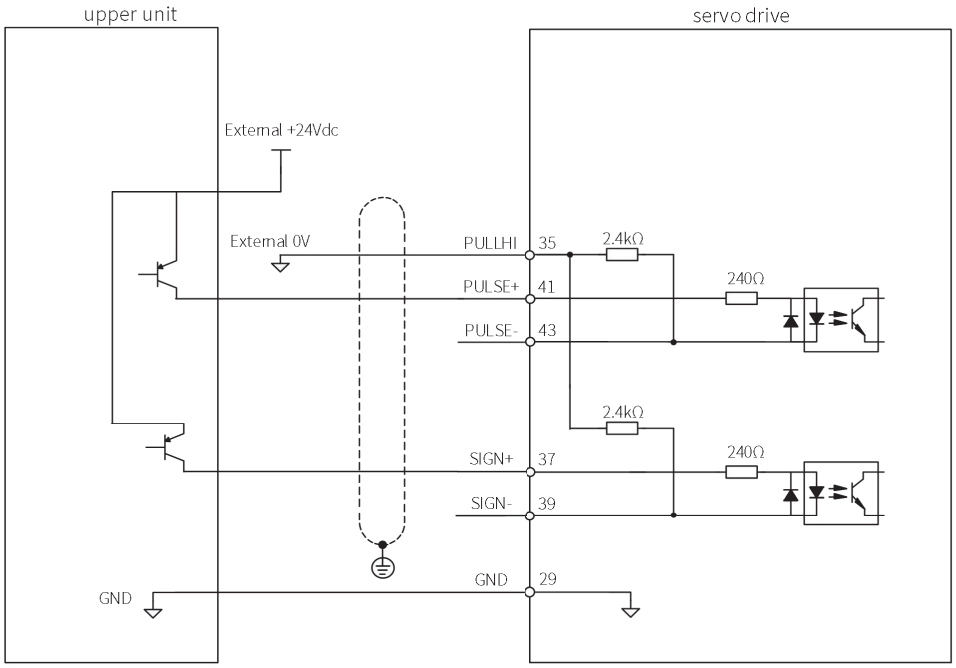


Fig. 3.7-12 Low-speed Pulse Command Input Wiring Schematic (Open Collector Method - Upper PNP Type - Using Internal Resistor)

Selection of resistance R1 needs to satisfy the formula: $\frac{Vcc-1.5}{R1+240}$ =10mA

Table: 3.7-2 Recommended R1 Resistance Values

Vcc Input Voltage	R1 Numerical Value Of Electrical Impedance	R1 Power (Output)
24V	2.4kΩ	0.5kW
12V	1.5kΩ	0.5kW

(2) Example of wiring error

- Error 1: Unconnected current-limiting resistor, causing port burnout

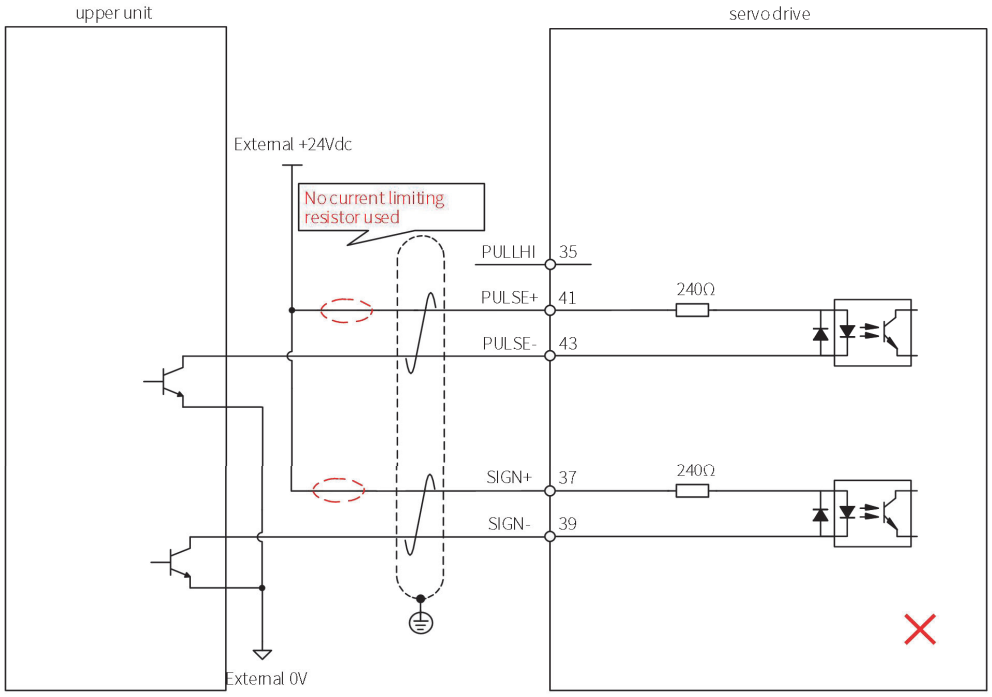


Figure: 3.7-13 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 1)

- Error 2: Multiple ports share current limiting resistors, resulting in pulse acceptance errors

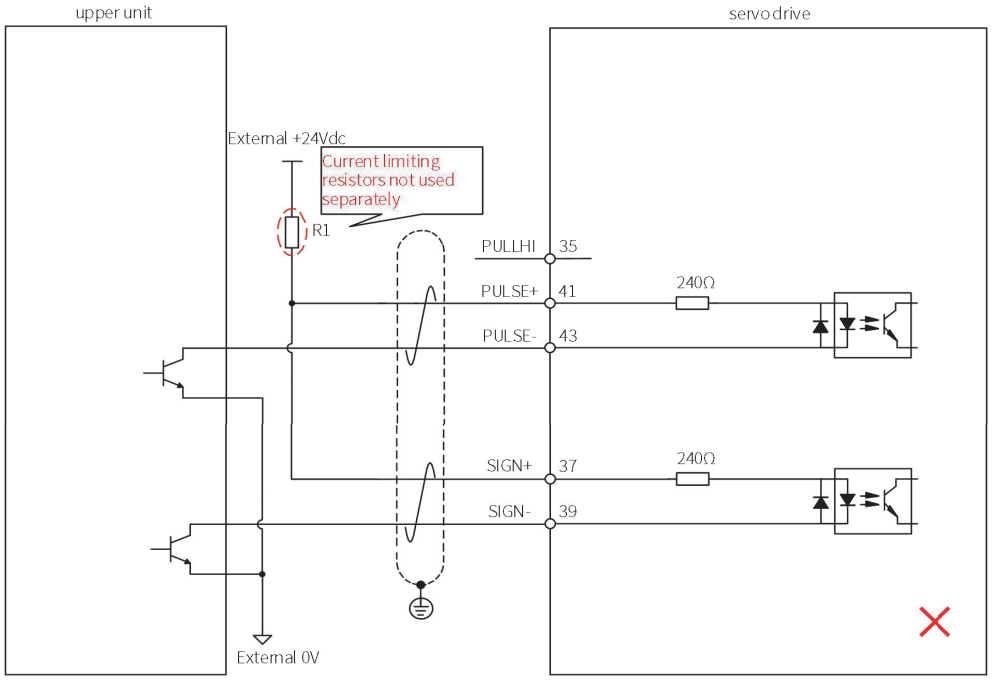


Figure: 3.7-14 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 2)

- Error 3: The SIGN port is not connected, causing these two ports to receive no pulses

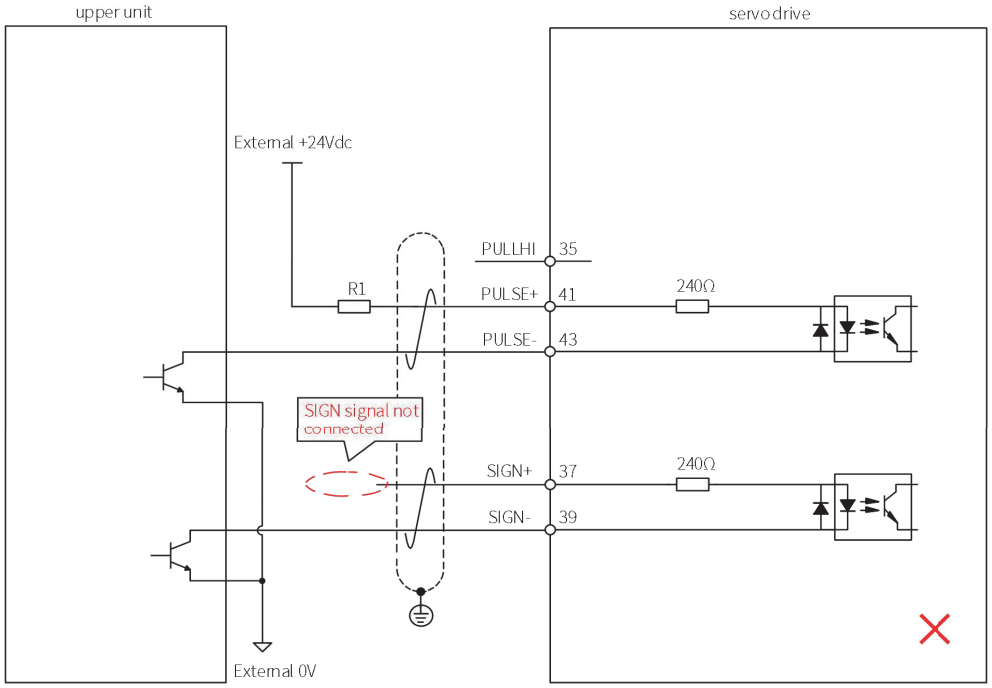


Fig. 3.7-15 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 3)

- Error 4: Port is connected incorrectly, resulting in port burnout

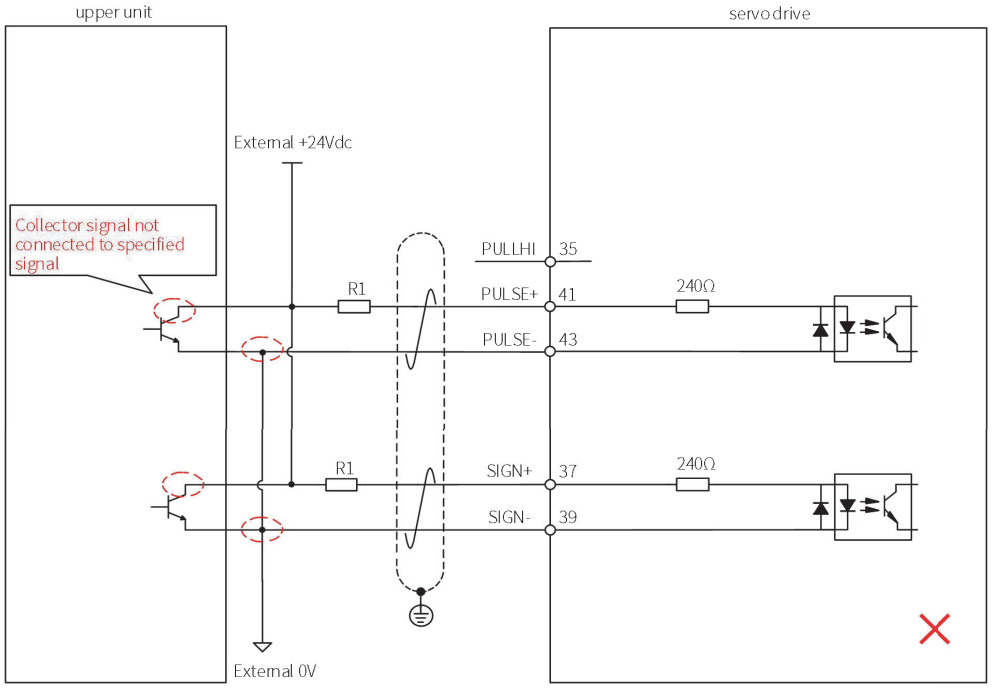


Fig. 3.7-16 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 4)

- Error 5: Multiple ports share current limiting resistors, resulting in pulse reception errors

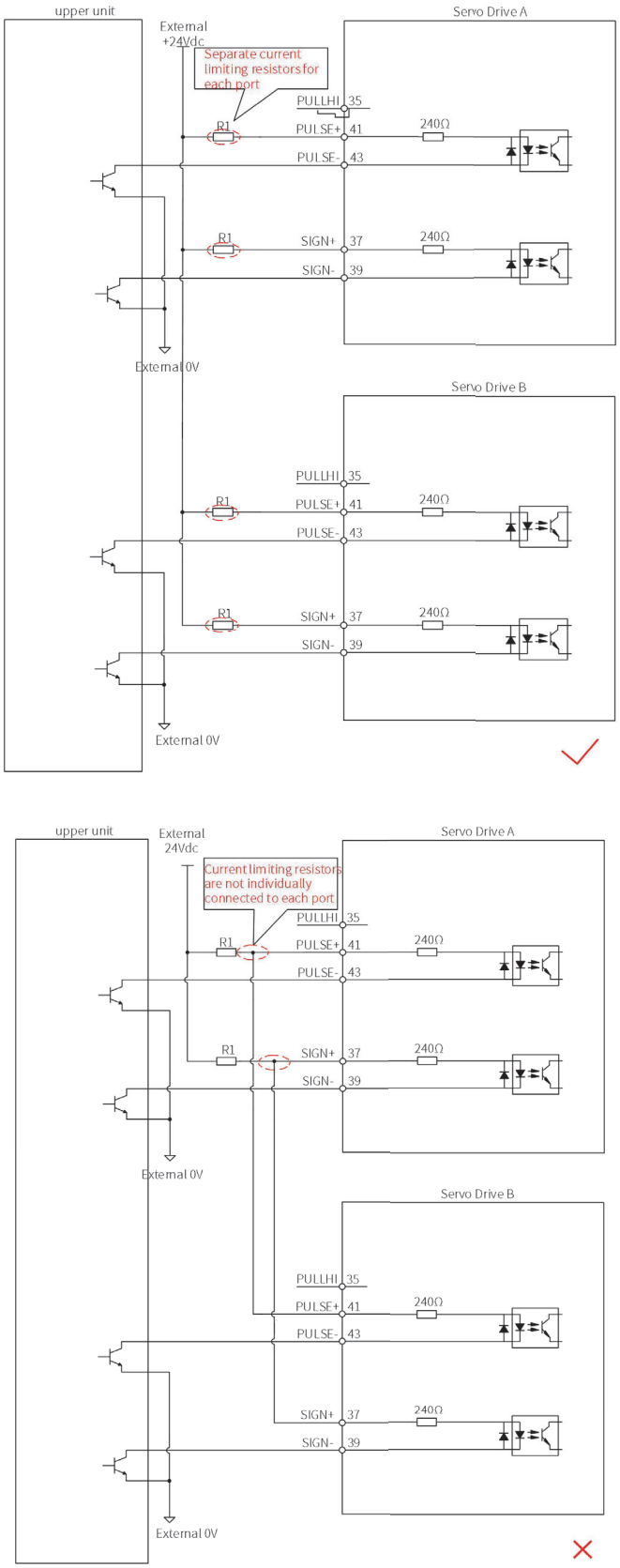


Fig. 3.7-17 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 5)

(3) High-speed Pulse Command Input

The output circuit for high-speed command pulses and symbols on the upper unit side can only be output to the servo driver through the differential driver.

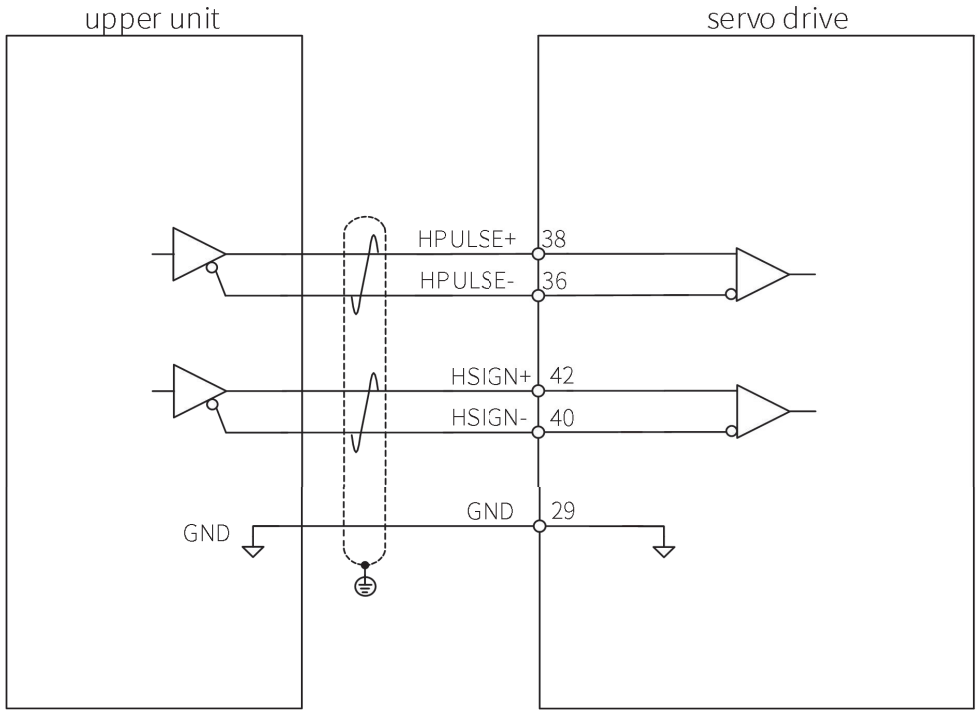


Figure: 3.7-18 High-Speed Pulse Command Input Wiring Diagram

Caution:

1. Please make sure that the differential input is 5V system, otherwise the input pulse of the servo driver is not stable. It will lead to the following situations:

- Is experiencing pulse loss when entering command pulses;
- Shows command reversal when entering the direction of the command;
- Be sure to connect the upper unit's 5V system ground to the drive's GND to reduce noise interference.

2. If using high-speed differential wiring, the pulse instruction type should be selected "CW + CCW", using "pulse + direction" will appear in the case of commutation loss of pulse.

3.7.6 Analog Input Wiring Instructions

The speed and torque analog signal input ports are AI1 and AI2.

- Voltage Input Range: -10V to +10V;
- Maximum permissible voltage: ±12V.
- Input impedance approx. 9kΩ.

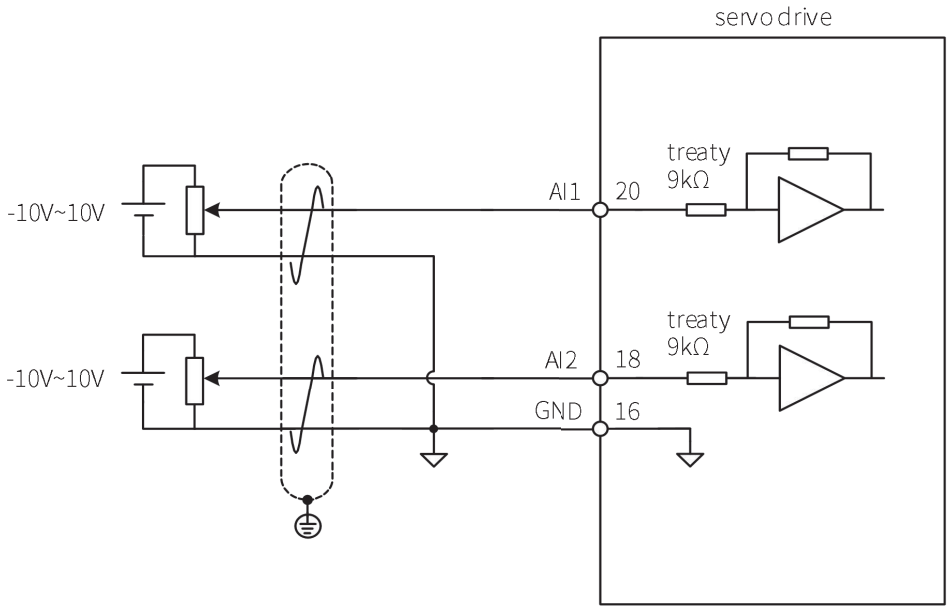
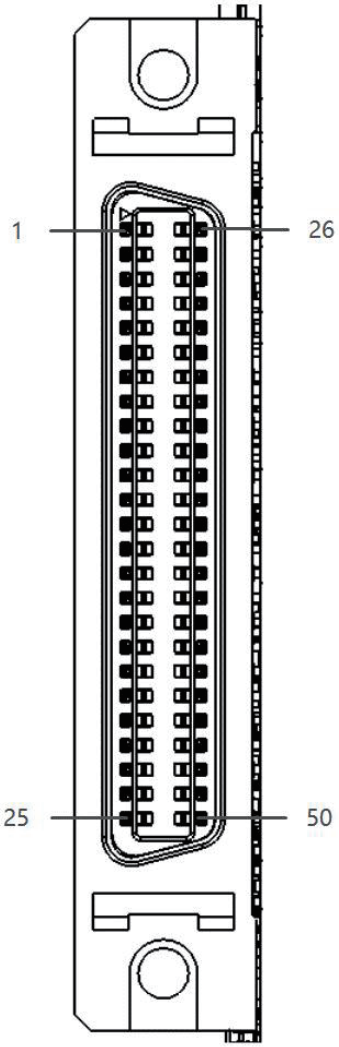


Figure: 3.7-19 Analog Input Wiring Diagram

3.8 Control Signal CN3 Port Definition and Wiring Description for E3 and E4 Specifications

3.8.1 Control Signal CN3 Port Definition

Table: 3.8-1 Control Signal CN3 Port Definition

IFinterface Connector (CN3)	Module Name	Signal Name	Pin Number	Default Function
	digital input	DI1	1	positive limit
		DI2	2	reverse limit
		DI3	3	home switch
		DI4	5	servo enable
		DI5	6	fault reset
		DI6	7	positional error clearing
		DI7	8	zero-speed hold
		HDI1	9	undefined
		HDI2	10	undefined
		DI_COM	4	DI public side
	digital output	DO1+	12	holding brake control
		DO1-	11	
		DO2+	14	servo operation
		DO2-	13	
		DO3+	16	servo fault output
		DO3-	15	
		DO4+	18	location arrival
		DO4-	17	
		DO5+	20	return to zero complete.
		DO5-	19	
	crossover	PAO+	31	A-phase crossover output signal

IFinterface Connector (CN3)	Module Name	Signal Name	Pin Number	Default Function
	output	PAO-	30	
		PBO+	29	B-phase crossover output signal
		PBO-	28	
		PZO+	27	Z-phase split frequency output signal
		PZO-	26	
		OCZ	32	encoder Z-phase open collector output signal
		GND	33	crossover output signal ground
	position command	PULSE+	34	low-speed pulse command input interface
		PULSE-	35	
		SIGN+	36	
		SIGN-	37	
		PULLHI	38	power input connector for command pulses
		GND	39	pulse command signal ground
		HPULSE+	40	high-speed input pulse command
		HPULSE-	41	
		HSIGN+	42	high-speed position symbols
		HSIGN-	43	
	analog input	AI1	45	analog input signal 1
		AI2	46	analog input signal 2
		GND	44	analog input signal ground
	analog output	AO1	48	analog output signal 1
		AO2	47	analog output signal 2
		GND	49	analog output signal ground
	housings	—	—	connecting cable shield

3.8.2 Digital Input Wiring Instructions

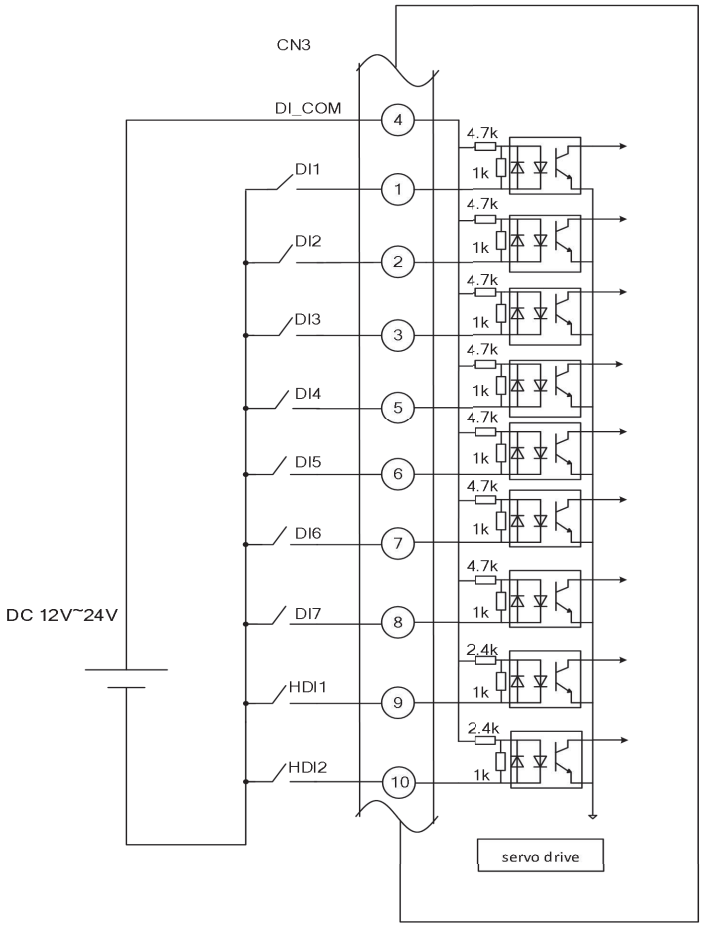


Figure: 3.8-1 Digital Input Wiring

(1) When the upper unit is a relay output

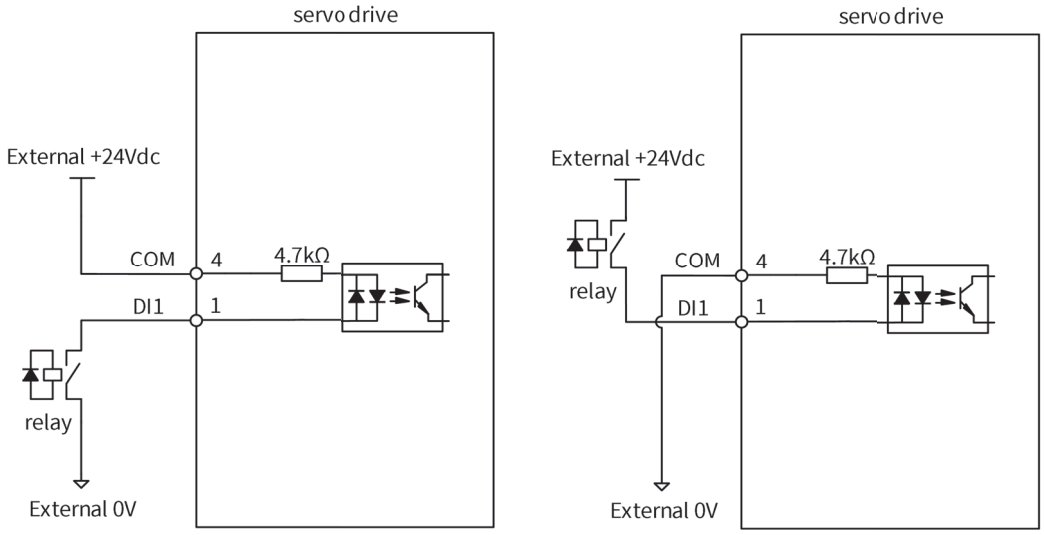


Figure: 3.8-2 Digital Input Wiring Diagram (Relay Output)

(2) When the upper unit is open collector

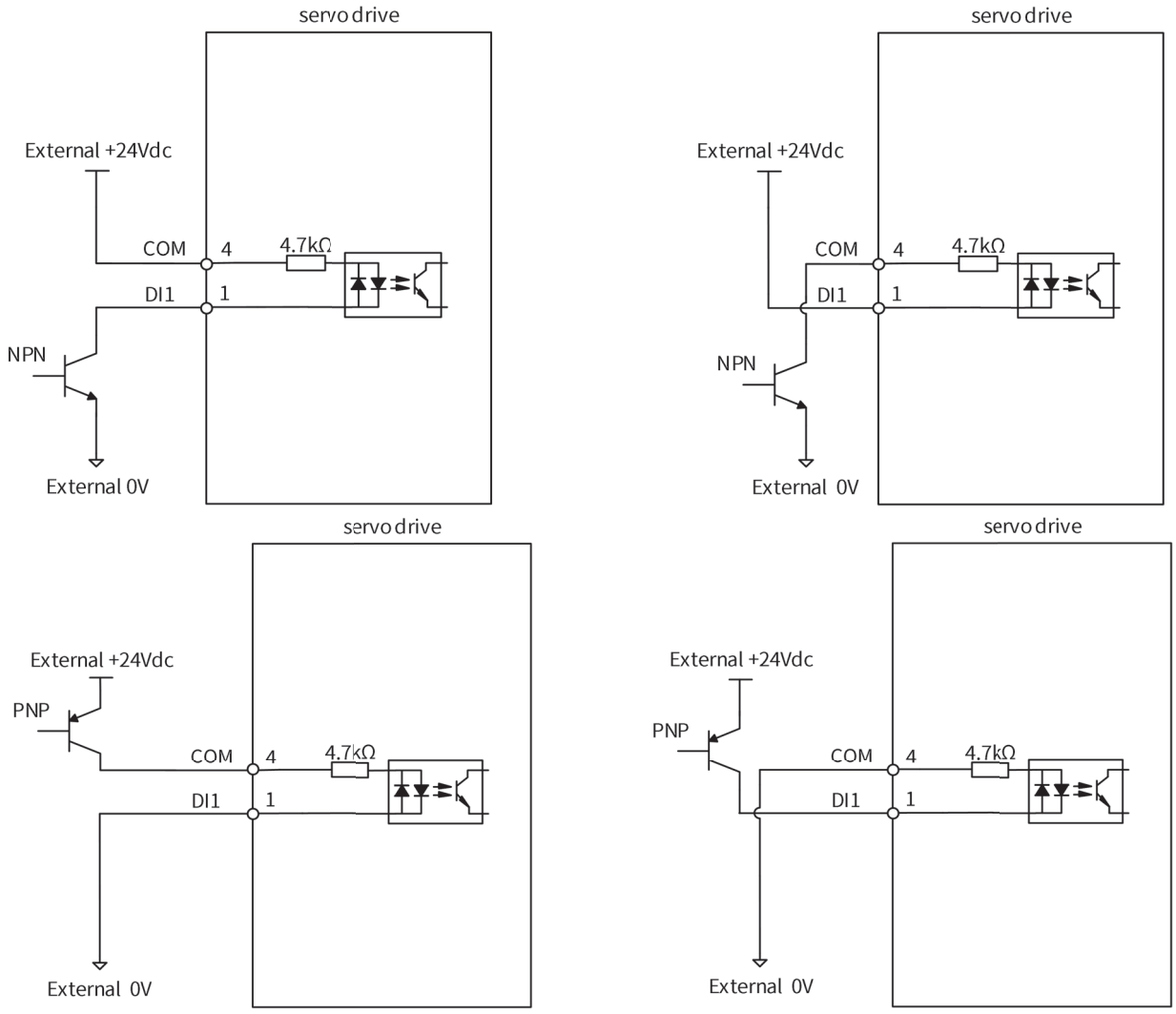


Figure: 3.8-3 Digital Input Wiring Schematic (Open Collector)

Note: The case of mixing PNP and NPN inputs is not supported.

3.8.3 Digital Output Wiring Instructions

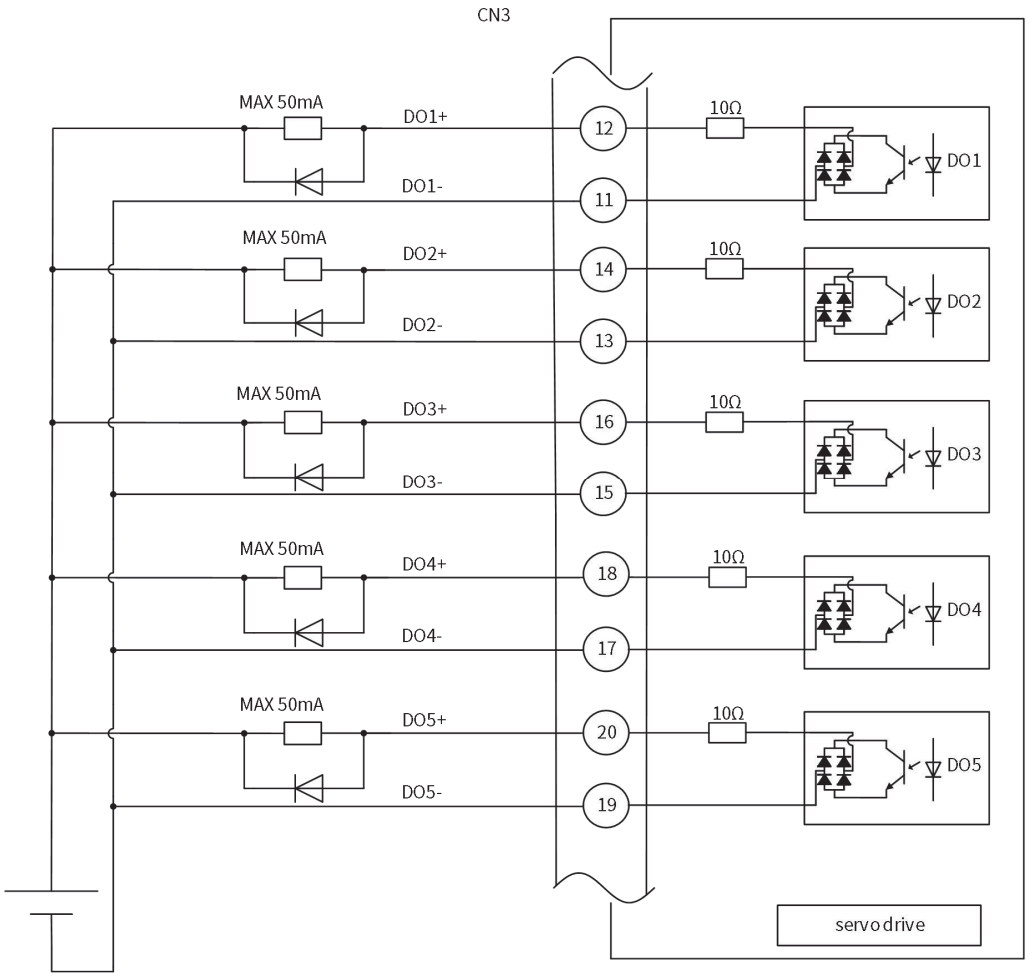


Figure: 3.8-4 Digital Output Wiring

The maximum allowable voltage and current capacity of the servo driver's internal optocoupler output circuit is as follows:

- Voltage: DC30V (max);
- Current: DC50mA (max).

(1) When the upper unit is a relay input

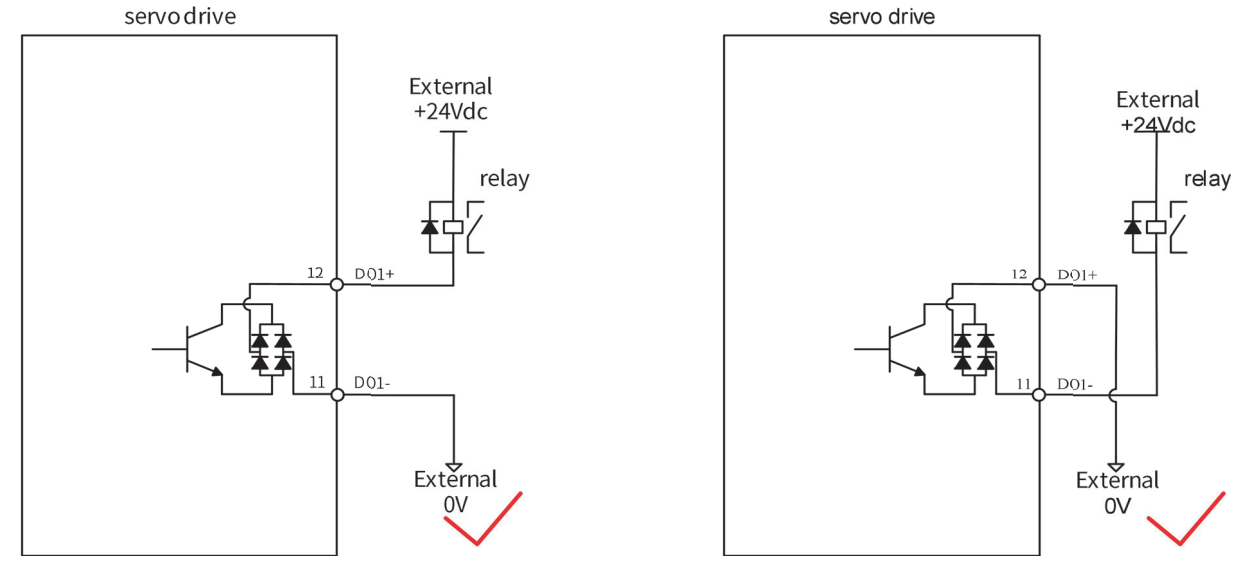


Figure: 3.8-5 Digital Output Wiring Diagram (Relay Input, Correct Wiring)

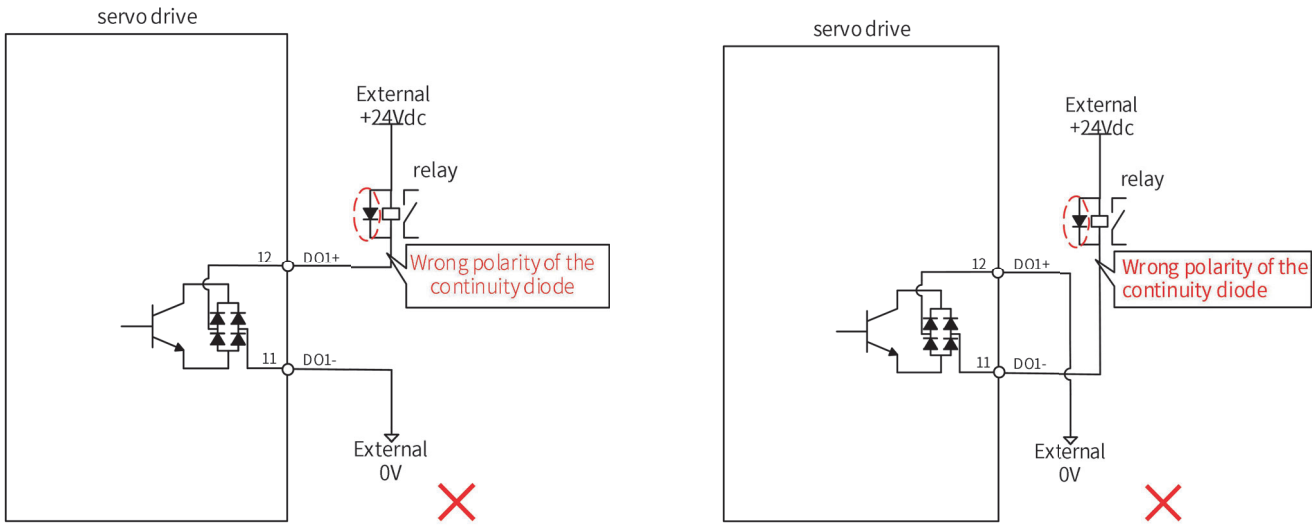


Figure: 3.8-6 Digital Output Wiring Diagram (Relay Input, Incorrect Wiring)

(2) When the upper unit is an optocoupler input

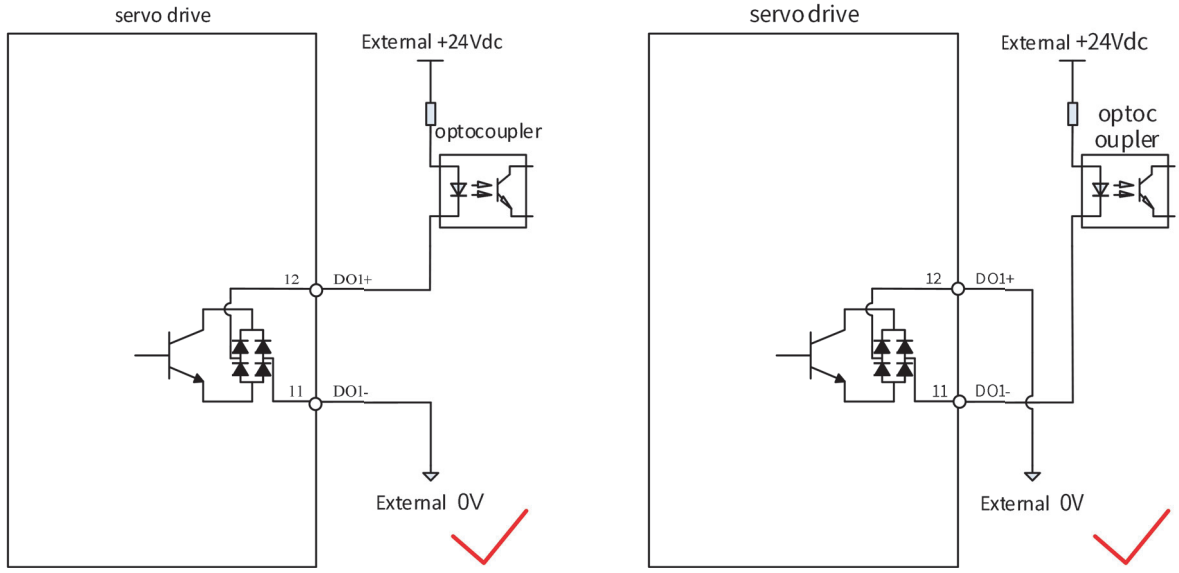


Figure: 3.8-7 Digital output wiring diagram (optocoupler input, correct wiring)

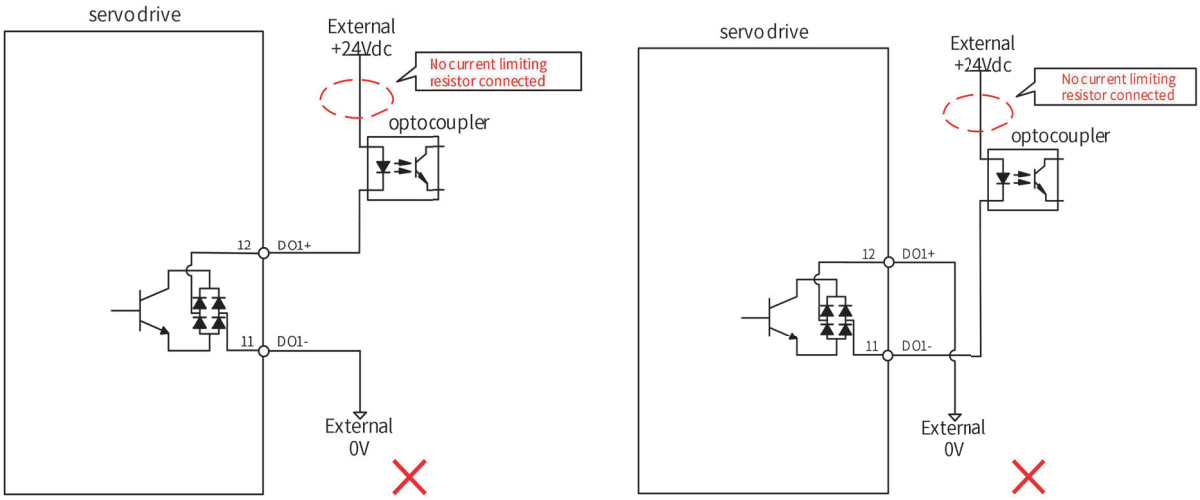


Figure: 3.8-8 Digital Output Wiring Schematic (Optocoupler Input, Correct Wiring)

3.8.4 Crossover Output Wiring Instructions

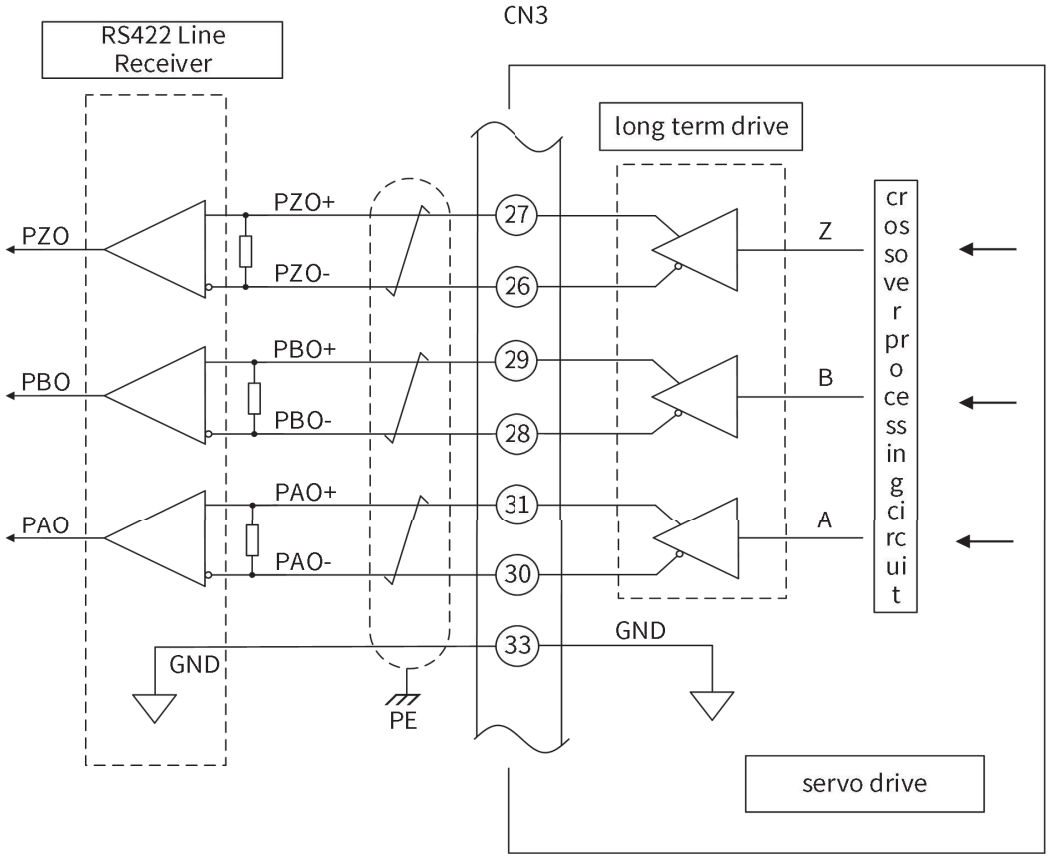


Figure: 3.8-9 Crossover Output Wiring

- For the receive signal of the output pulses, use an RS422 long wire receiver (AM26C32 or equivalent);
- The crossover output has a maximum output current of 20mA;
- The cable uses a twisted shielded cable with the shield connected to PE, and the crossover output signal ground is connected to the ground of the receiving end.

3.8.5 Position Command Wiring Instructions

(1) Low-speed pulse command input

- when differential

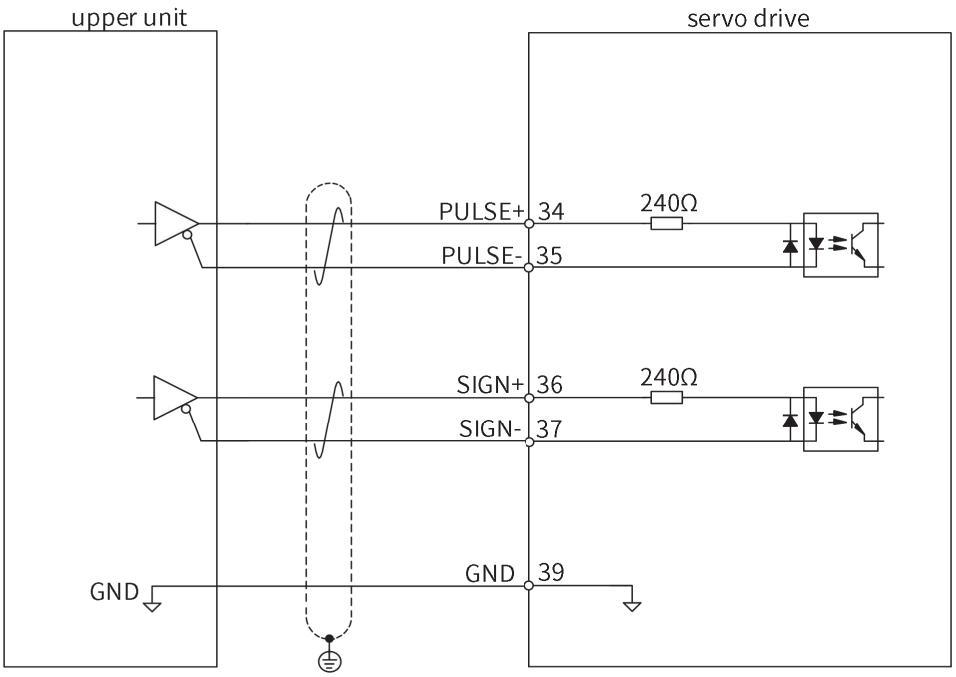


Fig. 3.8-10 Low-speed Pulse Command Input Wiring Diagram (Differential Method)

- When open collector mode: Use the servo driver's internal resistor.

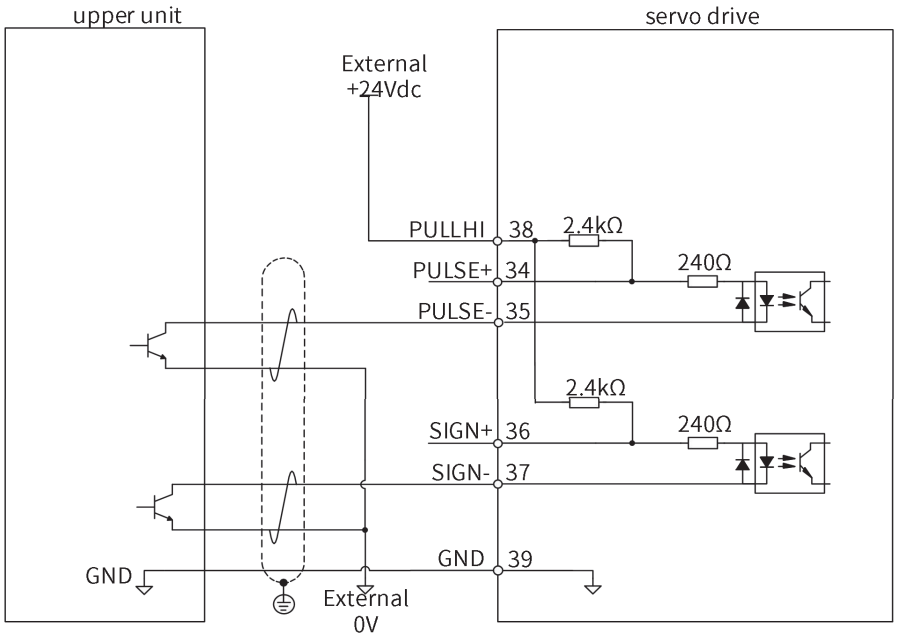


Figure: 3.8-11 Low-speed Pulse Command Input Wiring Schematic (Open Collector Method - Upper NPN Type - Using Internal Resistor)

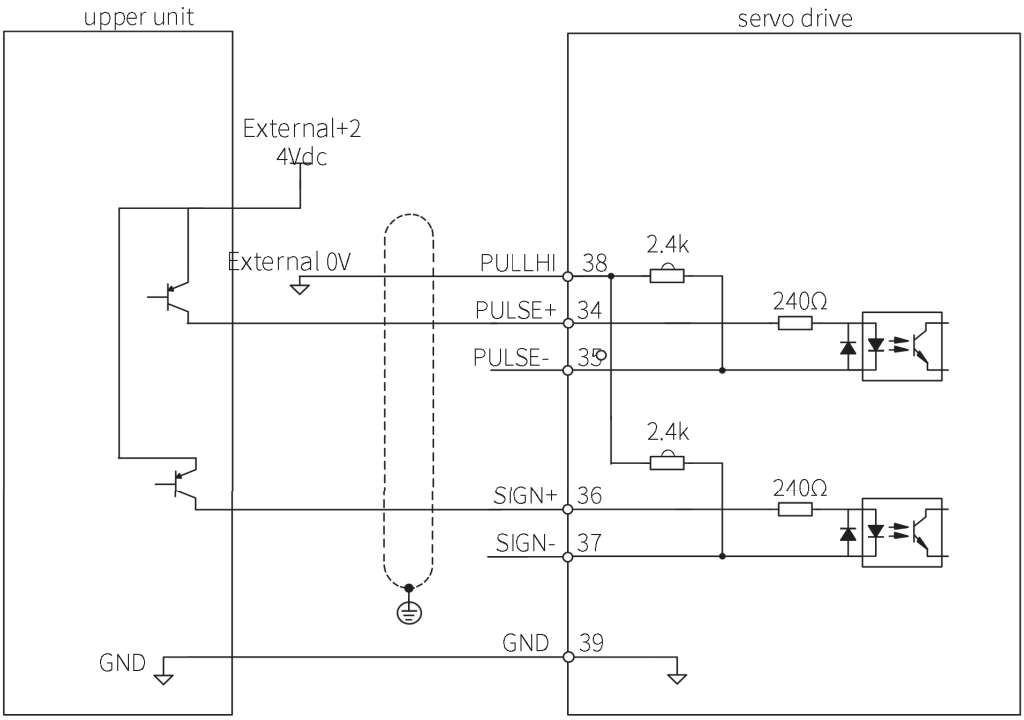


Figure: 3.8-12 Low-speed Pulse Command Input Wiring Schematic (Open Collector Method - Upper PNP Type - Using Internal Resistor)

Selection of resistance R1 needs to satisfy the formula: $\frac{Vcc-1.5}{R1+240}$=10mA

Table: 3.8-2 Recommended R1 Resistance Value

Vcc Input Voltage	R1 numerical Value Of Electrical Impedance	R1 Power (Output)
24V	2.4kΩ	0.5kΩ
12V	1.5kΩ	0.5kΩ

Wiring Error Example:

◆ Error 1: Unconnected current-limiting resistor, causing port burnout

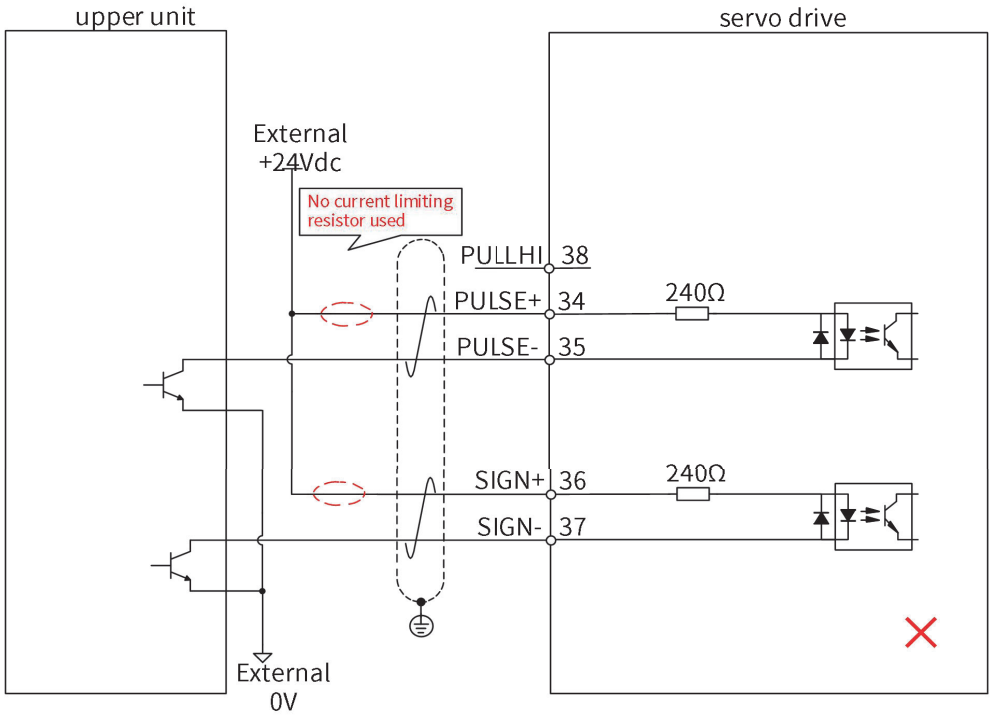


Figure: 3.8-13 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 1)

◆ Error 2: Multiple ports share current limiting resistors, resulting in pulse acceptance errors

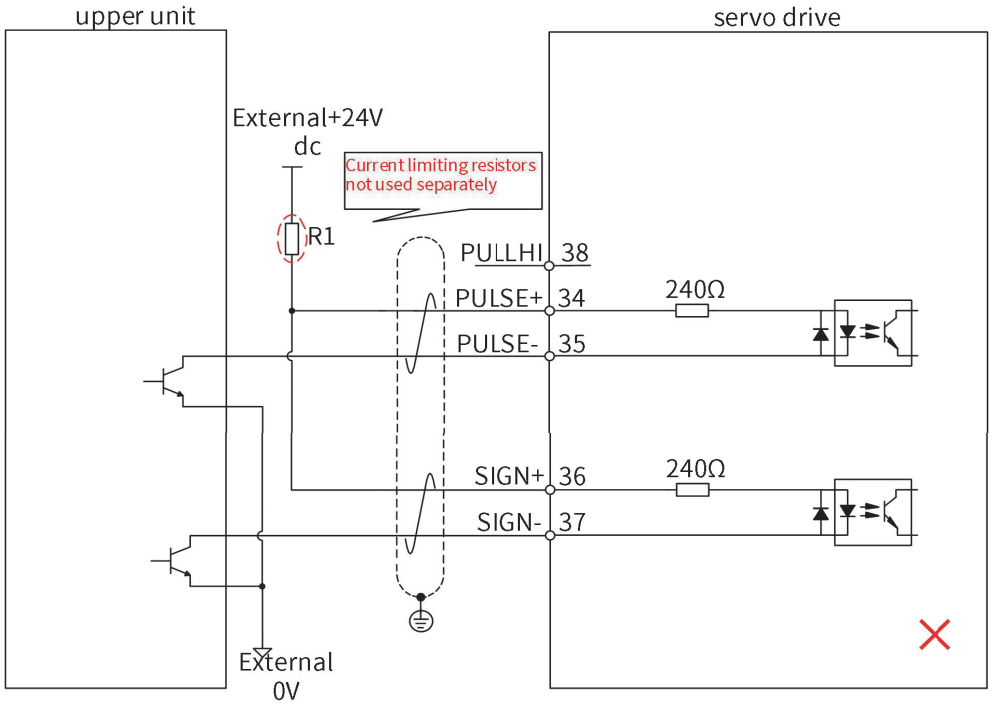


Fig. 3.8-14 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 2)

◆ Error 3: The SIGN port is not connected, causing these two ports to receive no pulses

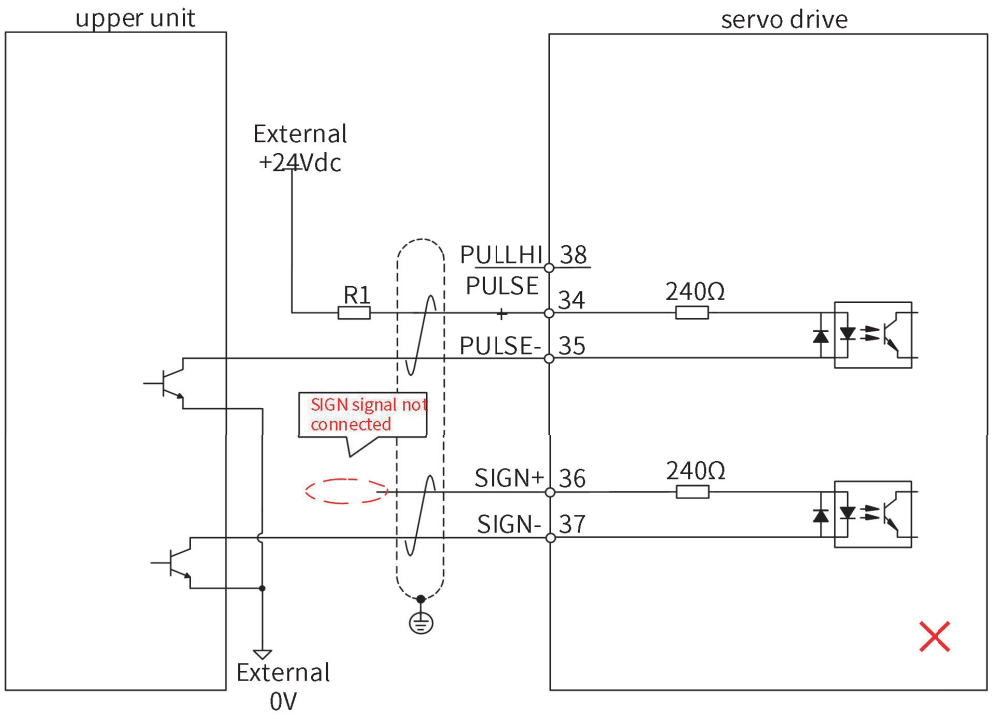


Fig. 3.8-15 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 3)

◆ Error 4: Port is connected incorrectly, causing port burnout

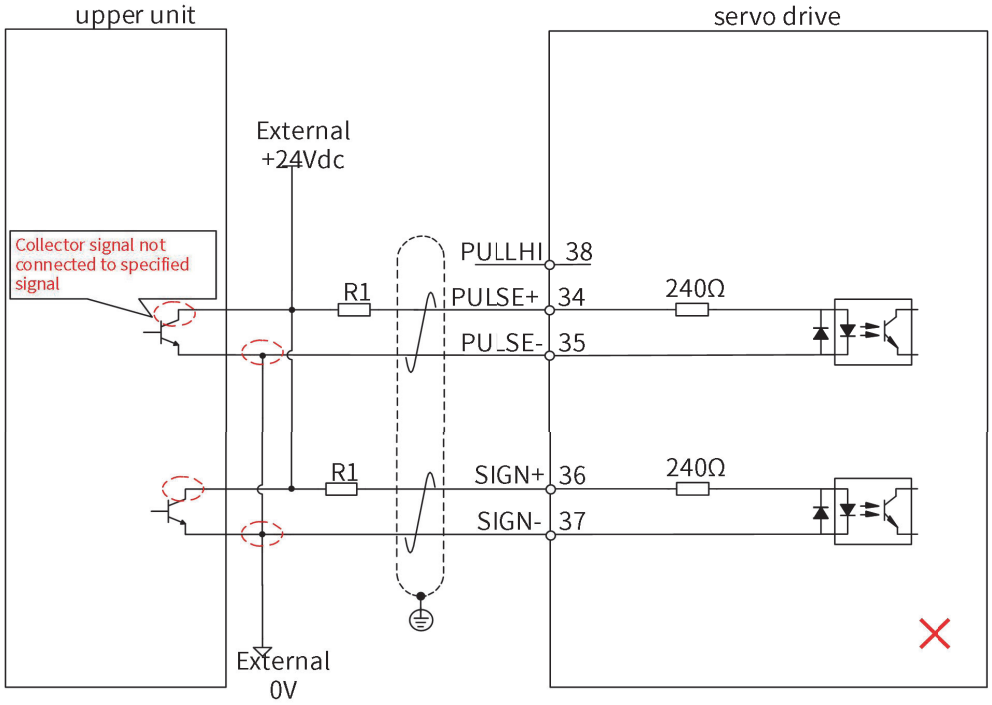


Fig. 3.8-16 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 4)

◆ Error 5: Multiple ports share current limiting resistors, resulting in pulse reception errors

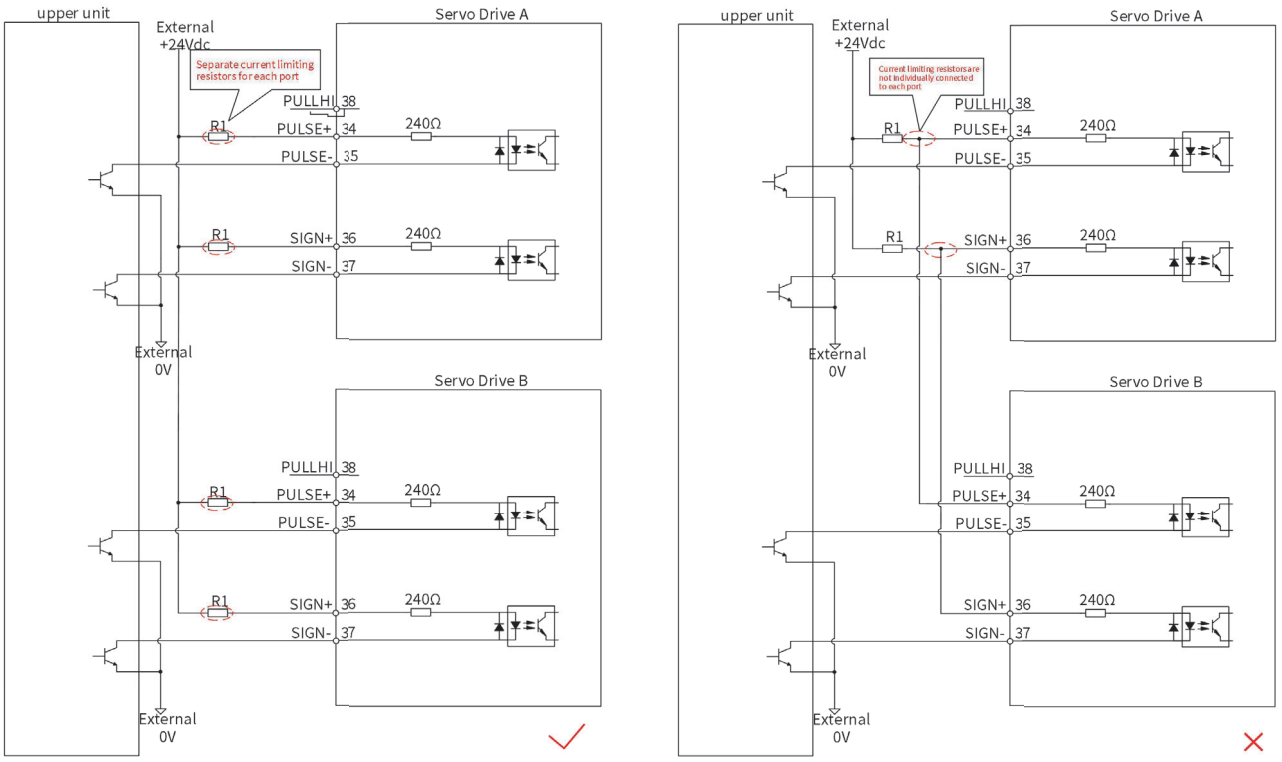


Fig. 3.8-17 Low-speed Pulse Command Input Wiring Diagram (Wrong Connection 5)

(2) High-speed Pulse Command Input

The output circuit for high-speed command pulses and symbols on the upper unit side can only be output to the servo driver through the differential driver.

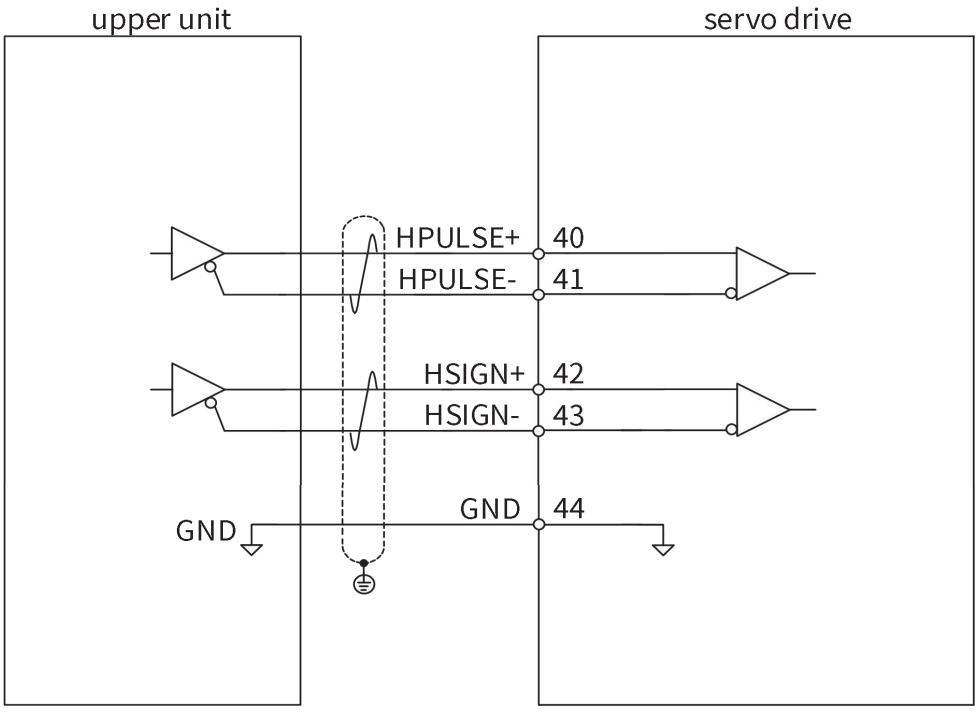


Figure: 3.8-18 High-Speed Pulse Command Input Wiring Diagram

Caution:

1. Please make sure that the differential input is 5V system, otherwise the input pulse of the servo driver is not stable. It will lead to the following situations:

- Is experiencing pulse loss when entering command pulses;
- Shows command reversal when entering the direction of the command;
- Be sure to connect the upper unit's 5V system ground to the drive's GND to reduce noise interference.

2. If you use high-speed differential wiring, select "CW+CCW" for the pulse command type, and use "Pulse+Direction" for commutation loss of pulses.

3.8.6 Analog Input Wiring Description

The speed and torque analog signal input ports are AI1 and AI2.

- Voltage input range: -10V to +10V;
- Maximum allowable voltage: ±12V;
- Input impedance approx: 9kΩ.

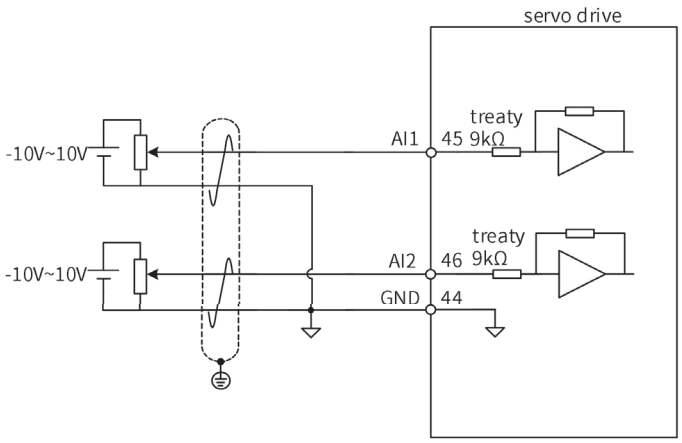


Figure: 3.8-19 Analog Input Wiring Diagram

3.8.7 Analog output wiring instructions

The speed and torque analog signal output ports are AO1 and AO2.

- Analog output: -10V to +10V;
- Maximum output: 1mA;

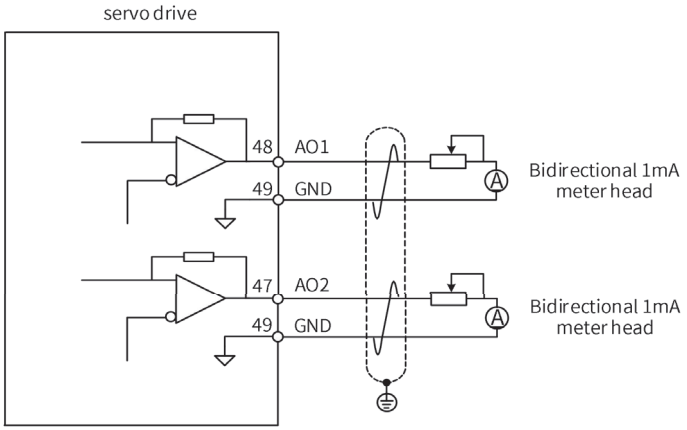


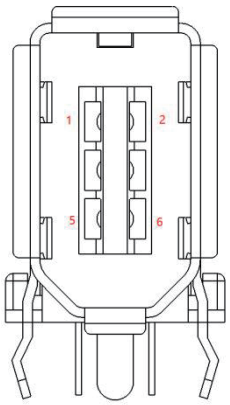
Figure: 3.8-20 analog output wiring diagram

3.8.8 Encoder terminal definition and wiring instructions

3.8.9 Motor encoder

(1) N3RP Driver E1/E2 Specifications

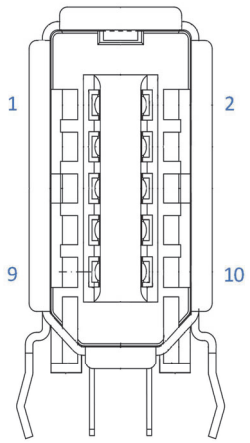
Table: 3.9-1 Motor Encoder Interface Definitions

Motor Encoder Connector (CN2)	Module Name	Signal Name	Pin Number	Wiring Method	Functionality
 IEEE 13946P	Motors Encoders	5V	1	unshielded twisted pair	Encoder power supply
		GND	2		
			3		
			4		
		SD+	5	unshielded twisted pair	17bit-23bit Tamagawa Encoder Protocol Encoder Interface
		SD-	6		
		PE	housings	Connecting Cable Shield	block

- This port is used to connect the driver to the motor encoder. During use, the cable and the main circuit wiring should be 30cm apart.
- The cable length of the encoder needs to take into account the voltage drop caused by line resistance and the signal attenuation caused by distributed capacitance, and the recommended cable length is within 10m.

(2) N3RP drive E3 / E4 specification

Table: 3.9-2 Definition of the motor encoder interface

Motor Encoder Connector (CN4)	Module Name	Signal Name	Pin Number	Wiring Method	Functionality
 IEEE 1394 10P	Motor Encoder	5V	1	unshielded twisted pair	encoder power supply
		GND	2		
		—	3		—
		—	4		—
		—	5		—
		—	6		—
		—	7		—
		—	8		—
		SD+	9	unshielded twisted pair	BISS ABZ encoder protocol encoder interface
		SD-	10		
		housing s	—	connecting cable shield	block

- This port is used for drive and motor encoder connection, during use, cables and main circuit wiring need to be 30cm apart;
- The encoder uses UL2464 compliant twisted shielded cable of 26AWG gauge or larger;
- encoder cable length needs to consider the line resistance caused by the voltage drop, the signal attenuation caused by the distribution capacitance, the recommended cable length of 10m or less.

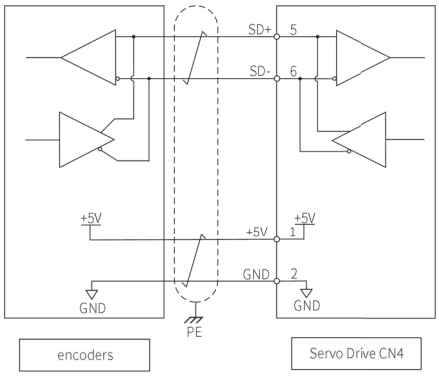


Fig. 3.9-1 Motor Encoder Signal Inputs

3.8.10 Motor Temperature Sensor Inputs

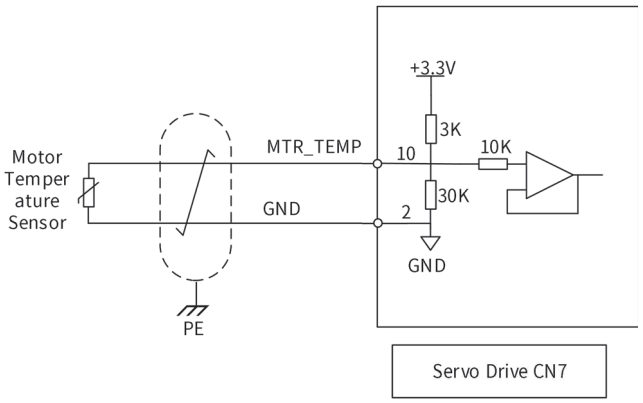


Figure: 3.9-2 Motor Temperature Sensor Wiring Diagram

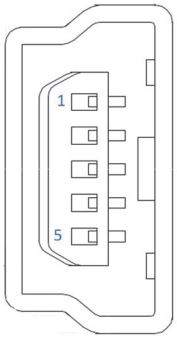
Note: 1. Only applicable to AC380V class models, please consult Cosel for details.

2.Support different types of motor temperature sensors such as PTC, NTC and switch type. Please make sure the function codes P00.05, P08.31, P08.33 , P08.34 are set correctly.

3.9 **Definition of communication terminals**

3.9.1 Background debugging terminal

Table: 3.10-1 Definition of background debugging terminals

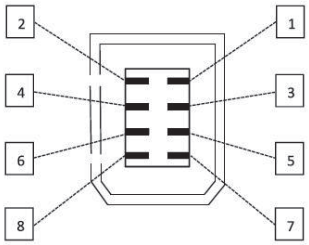
Backend Commissioning Connector	Module Name	Signal Name	Pin Number	Functionality
 MINI USB	Backend Debugging Port	VBUS	1	USBnewsletter
		D-	2	
		D+	3	
		-	4	
		GND	5	
		PE	housings	

This port is used for the connection between the driver and the computer, and the background debugging software can be used to perform trial operation, parameter adjustment, waveform acquisition and other operations on the driver.

3.10 Functional Safety Terminal Definitions and Wiring Instructions

3.10.1 Definition of functional safety terminals

Table: 3.11-1 Functional Safety Terminal Definitions

Functional Safety Connectors (CN2)	Module Name	Signal Name	Pin Number	Functionality
	functional safety	Internal power supply negative	1	Internal power supply (do not use)
		Positive internal power supply	2	
		STO1-	3	STO1
		STO1+	4	
		STO2-	5	STO2
		STO2+	6	
		STO_OUT-	7	STOstatus output
		STO_OUT+	8	
		housings	—	block

3.10.2 Functional safety wiring instructions

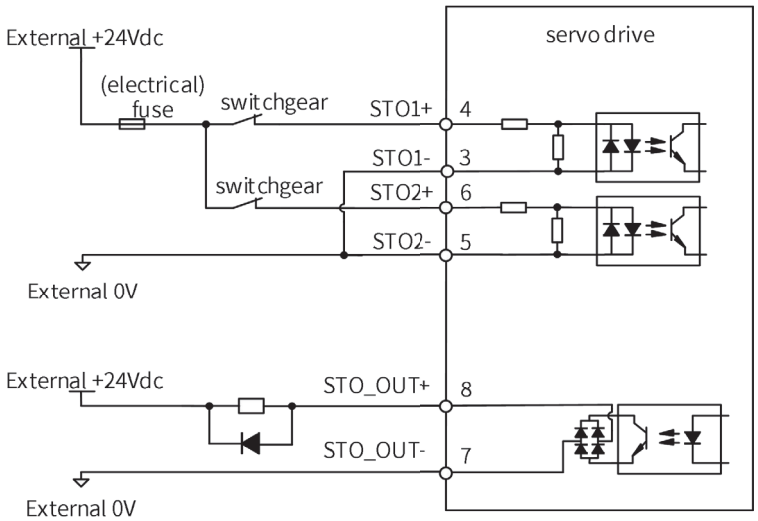


Figure: 3.11-1 Functional Safety Wiring Description

Note: For "-SM" models only.

3.10.3 STO Input-Output Signal Relationships

Table: 3.11-2 STO Input-Output Signal Relationships

STO1 State Of Affairs	STO2 State Of Affairs	STO_OUT State Of Affairs	Motor Energized State
null	null	conduction	discharged
null	efficiently	shut down	discharged
efficiently	null	shut down	discharged
efficiently	efficiently	shut down	electrify

3.11 Grounding and anti-interference measures

3.11.1 Earthing measures

Table: 3.11-1 Precautions for Grounding the Servo Controller

Mounting the drive on a metal enclosure (control cabinet)
Connect the ground terminal of the servo motor to the ground terminal PE of the servo driver, and ground the PE terminal reliably.
Drive must be single point grounded
Use thick wires (2.0mm² or more) for grounding as much as possible, and use thick wires (3.5mm² or more) for connecting to the outer box for grounding, braided copper wires are recommended.
Recommended grounding of D or higher (grounding resistance value of 100Ω or less)
Be sure to connect the ground terminal of the driver and the ground wire (PE) of the control cabinet to avoid electric shock.
There are two protective earth terminals, so when connecting the protective earth terminals (PE), do not connect the wires all together.

3.11.2 Anti-interference measures

This servo drive will be due to peripheral wiring, grounding, anti-jamming devices used in different, there may be switching noise affecting the normal operation of the system. Therefore, must use the correct grounding method and anti-interference measures to deal with, the following figure for the servo drive anti-interference measures schematic diagram.

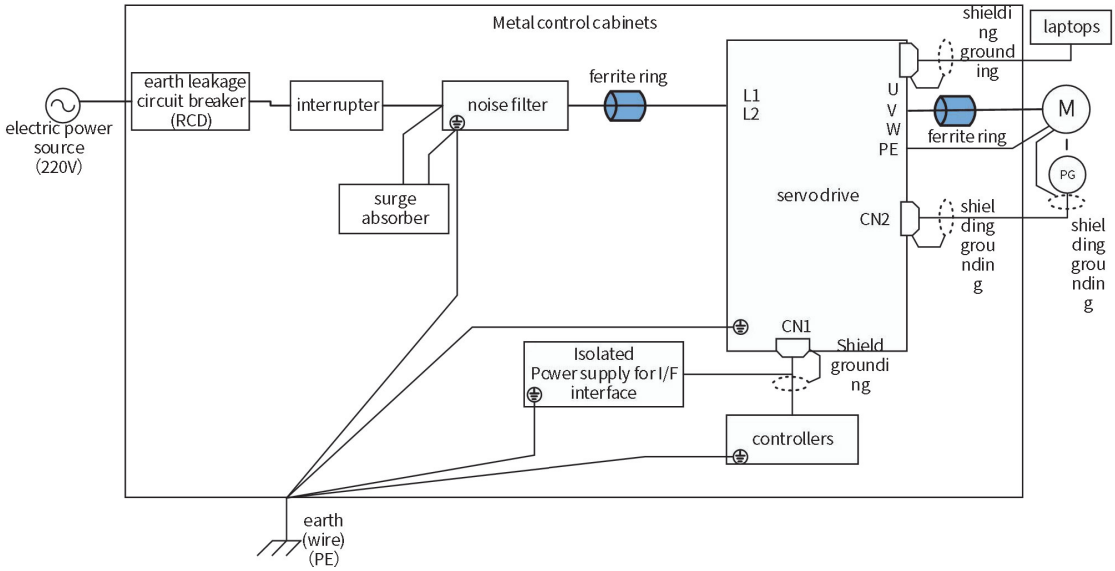


Figure: 3.11-1 Schematic diagram of anti-jamming measures for Ho-Suits drives

- command input cable length should be less than 3m; encoder cable length should be less than 20m and twisted shielded cable should be used.
- When wiring, please separate strong cables from weak cables and keep a distance of more than 30cm between them. Do not put them into the same pipe or bundle them together.
- Installation of ferrite magnets in each cable, input/output cable, and power cable for connection to the drive.
- Installation of surge suppressors on coils of relays, screw tubes, electromagnetic contactors
- Please install a noise filter on the input side of the power cord and do not share the power supply with welding machines, electrical discharge machining equipment, etc.; and
- Please connect the shield of all cables to ground (PE)
- Please ground both ends of the shield of the motor encoder cable.

3.11.3 Noise filters

1. Noise filter use

To prevent interference from power lines and to weaken the effect of servo drives on other sensitive equipment. When selecting, installing, and wiring noise filters, follow these guidelines.

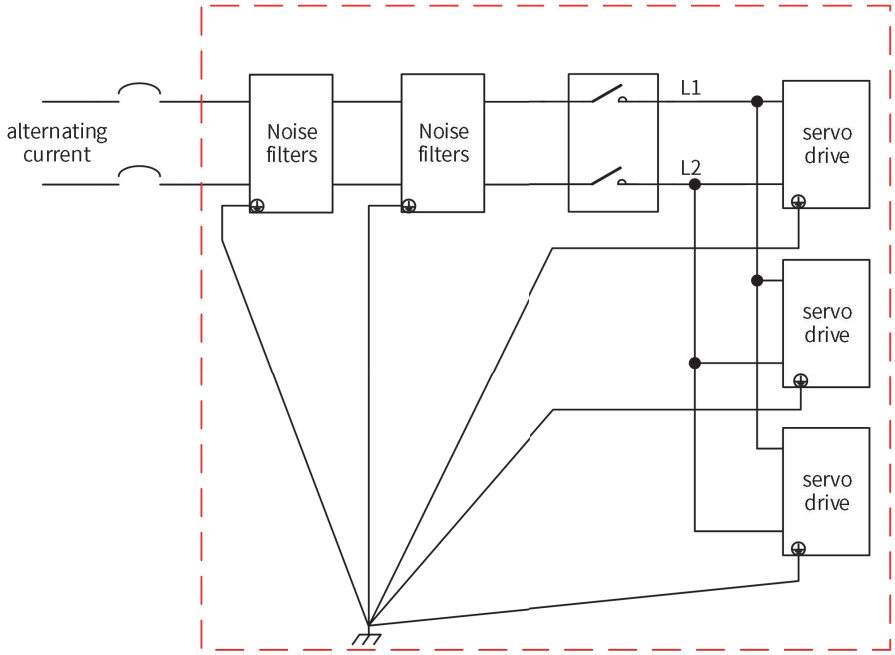


Figure: 3.11-2 Installation and Grounding Schematic for Noise Filters Used in Series

- Please select the appropriate noise filter according to the size of the input current.
- Please arrange the noise filter input and output wiring separately, do not arrange them in the same pipe or bundle them together.
- arranges the ground wire of the noise filter separately from its output power wire.
- noise filters need to use a single point of grounding, and the grounding wire should be as short and thick as possible.
- When the noise filter and the servo drive are installed in a control cabinet, it is recommended that the filter and the HO servo drive be fixed on the same metal plate, to ensure that the contact parts are conductive and well lapped, and that the metal plate is grounded.
- filters must be installed in such a way that the connection cable between the filter and the driver is as short as possible and should be less than 30 cm. At the same time, make sure that the filter and the driver are connected to the same ground reference plane, and ensure that the filter is reliably grounded, or else the filter's filtering effect will not be achieved.
- If you use more than one driver and share one noise filter in the power supply section, please consult the noise filter manufacturer. If the noise level reaches the limit, it is more effective to use two filters in series (as shown in the figure above).

3.11.4 Earth leakage protection circuit breakers

(1) The servo drive generates high-frequency leakage current during operation, and the leakage protection configuration on the line when installing the drive should pay attention to the following matters:

- equipment can generate DC leakage currents in protective conductors and must use a Type B (time-delay) earth leakage protection circuit breaker;
- If multiple drives are to be installed, each drive should be provided with an earth leakage protection circuit breaker;
- The capacity of the driver, the carrier frequency, the type and length of the motor cable, and the EMI filter all affect the size of the leakage current, and the protection threshold needs to be set reasonably;

- recommends the use of Chint, Schneider and other brands of leakage protection circuit breakers;

(2) When the leakage current generated by the driver causes the leakage protection circuit breaker to operate, the following measures can be taken:

- Increase the rated operating current of the earth leakage protection circuit breaker; replace the earth leakage protection circuit breaker with one that is type B, time-delayed, and has high-frequency suppression;
- reduces the carrier frequency;
- shortens the length of output drive cables;
- add leakage suppression equipment.

3.11.5 Input/Output Ring Selection

Add magnetic rings to the control power supply, power cable, and encoder cable.

Recommended Ring Material: Manganese-Zinc Magnetic Ring

Manufacturer：Xinkangda Magnetic Material

Model:NCD/HP1-H60/35/20

The control cable is wound 3 turns around the magnetic ring and connected to the drive;

The power cable U\V\W three-phase is wound 3 turns on the magnetic ring and connected to the driver, note that the PE ground wire cannot be wound into the ring;

The encoder cable is wound 3 turns around the magnetic ring and plugged into the drive;

3.11.6 Recommendations for solving common EMC problems

The same service drive products belong to the strong interference equipment, in the use of the process because of wiring, grounding, protection and other problems may occur when the interference phenomenon, when the phenomenon of mutual interference with other equipment can also be used in the following ways to rectify the phenomenon.

Table: 3.11-2 Common EMC Problems and Treatments

Interference Class	Methods Of Rectification
Leakage Protection Circuit Breaker Switch Trip	Reduce the carrier frequency without affecting performance; Reduced drive line length; Wrap a magnetic ring around the input drive line (without PE wire); For instantaneous tripping on power up, disconnect the larger capacitor to ground on the input; (Disconnect the ground terminal of the external or internal filter, and the ground terminal of the input port to ground Y capacitor) For operation or enable tripping, leakage current suppression is required at the input; (Leakage current filter, safety gauge capacitor + magnetic ring winding, magnetic ring winding)
Drive Operation Causes Interference	The motor housing is connected to the drive PE terminal ; The PE end of the drive is connected to the grid PE； Input power cord with wound magnetic ring; Add capacitance to the port of the interfered signal or wind a magnetic ring; Add additional common ground connections between devices;
Communication Jamming	The motor housing is connected to the drive PE terminal;

	The PE end of the drive is connected to the grid PE. Input power cord with wound magnetic ring; Add matching resistors to the source and load side of the communication line; Communication line differential pair plus communication common ground; Use shielded wire for the communication line, and connect the shield to the communication common ground; Multi-node communication wiring needs to be daisy-chained, with branch lengths less than 30cm.
I/Odisruptions	Increase capacitor filtering for low-speed DI, recommended 0.1 μF max. AI increase capacitance filtering, recommended maximum 0.22μuF;

3.12 Three control mode wiring for E1/E2 specifications

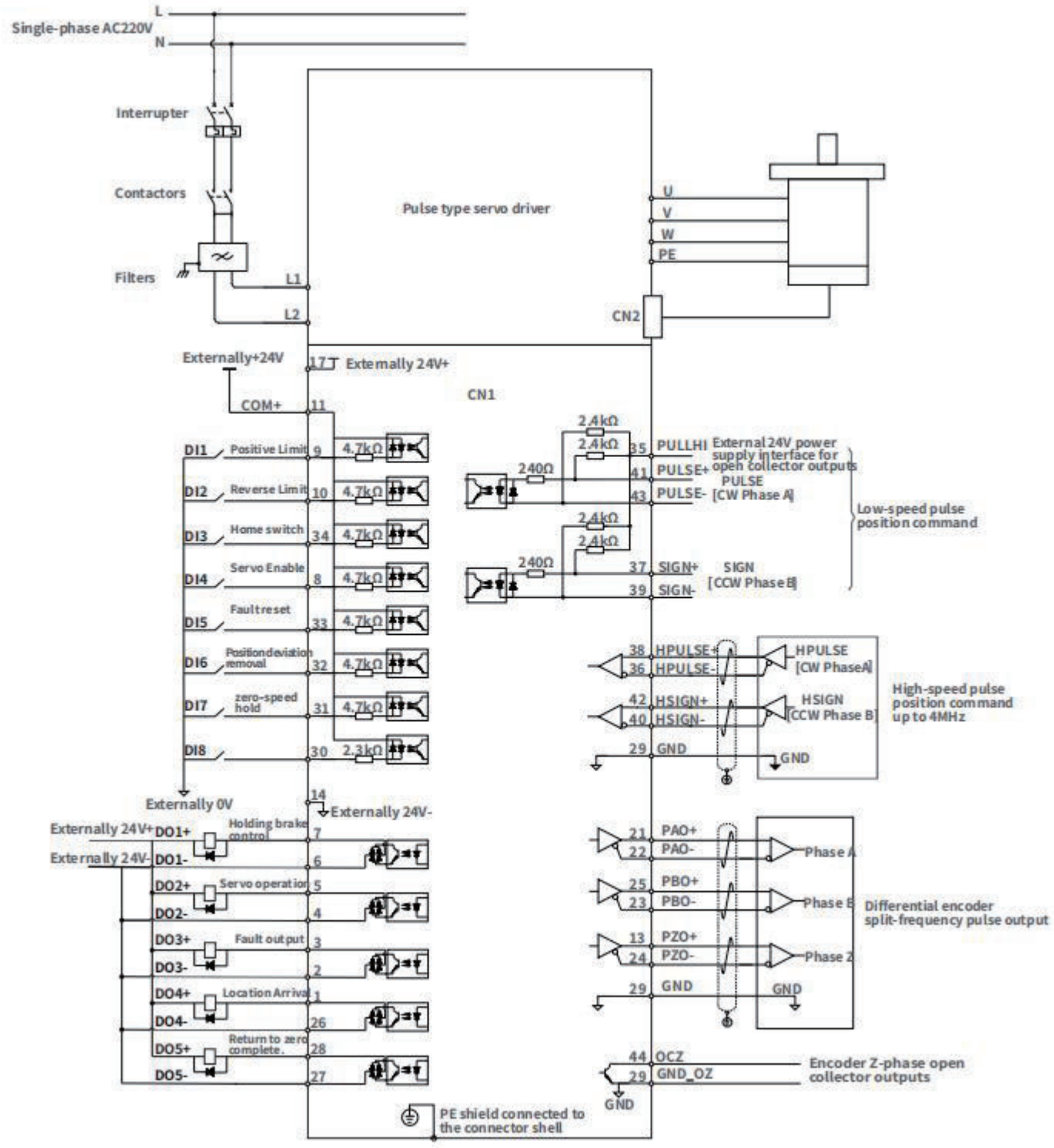


Figure : 3.12-1 Position Mode Wiring Diagrams

- Internal 24V power supply range 20-28V, maximum operating current 200mA.
- The DI input power supply needs to be connected externally, and the supply voltage range is 12-24VDC, up to 30VDC.
- Please use twisted shielded wire for high-speed/low-speed pulse port wiring, and the shielding layer must be

connected to PE at both ends, and GND is reliably connected to the signal ground of the upper computer.

- DO output power supply needs to be connected externally, power supply range 5-24V. Maximum allowable voltage of DO port is DC30V, maximum allowable current is 50mA.
- encoder crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.

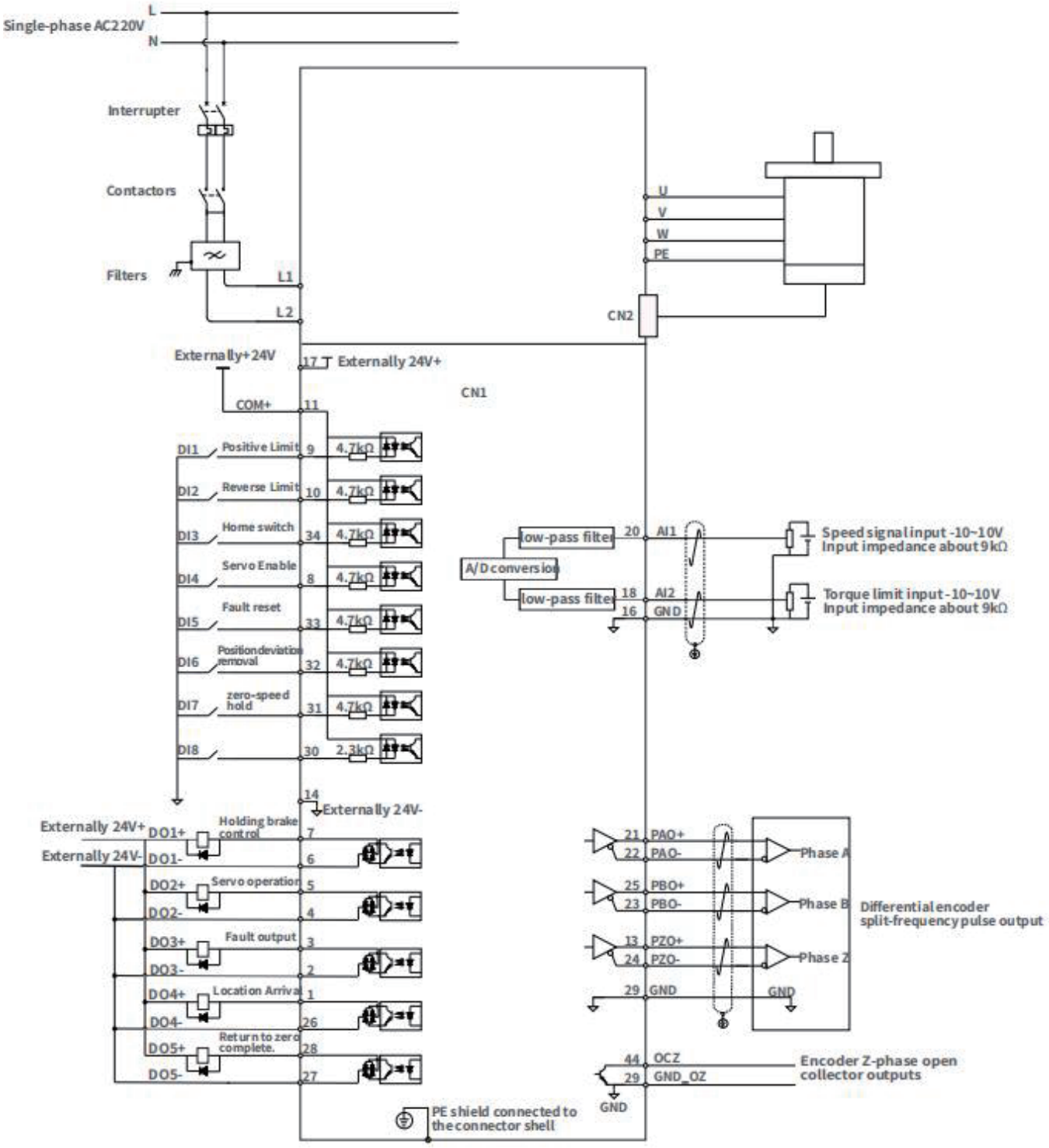


Figure: 3.12-2 Speed Mode Wiring Diagrams

- Please use twisted shielded wire for AI circuit wiring, and the shield must be connected to PE at both ends.

- Internal 24V power supply range 20-28V, maximum operating current 200mA.
- The DI input power supply can be externally connected with a supply voltage range of 12-24VDC up to 30VDC.
- DO output power supply can be connected externally, power supply range 5-24V. Maximum allowable voltage of DO port is DC30V, maximum allowable current is 50mA.
- encoder crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.

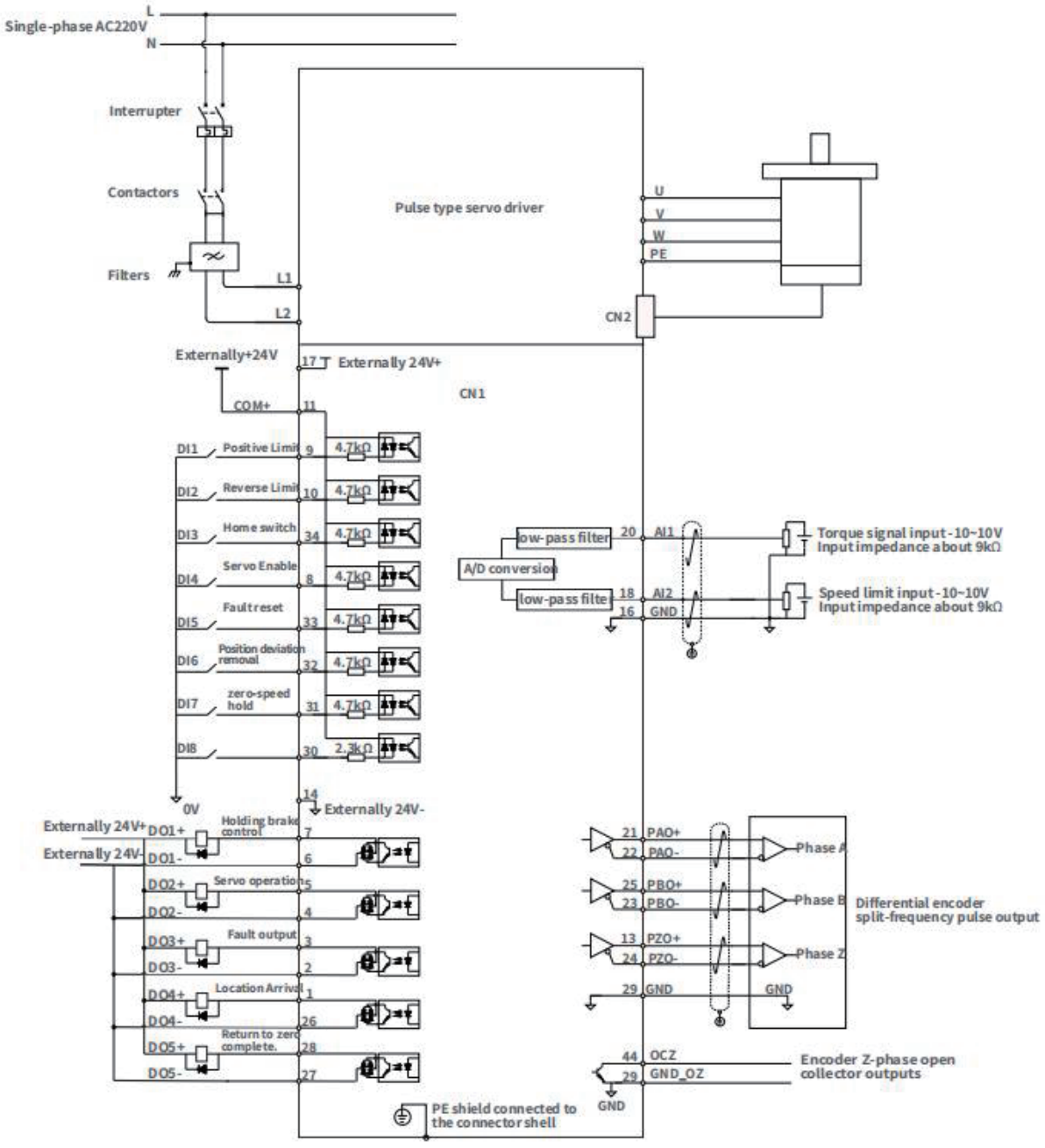


Figure: 3.12-3 Torque Mode Wiring Diagram

- Please use twisted shielded wire for AI circuit wiring, and the shield must be connected to PE at both ends.
- Internal 24V power supply range 20-28V, maximum operating current 200mA.
- The DI input power supply can be externally connected to a supply voltage range of 12-24VDC up to 30VDC.
- DO output power supply can be connected externally, power supply range 5-24V. Maximum allowable voltage of DO port is DC30V, maximum allowable current is 50mA.

- Encoder crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.

3.13 Three control mode wiring for E3/E4 specifications

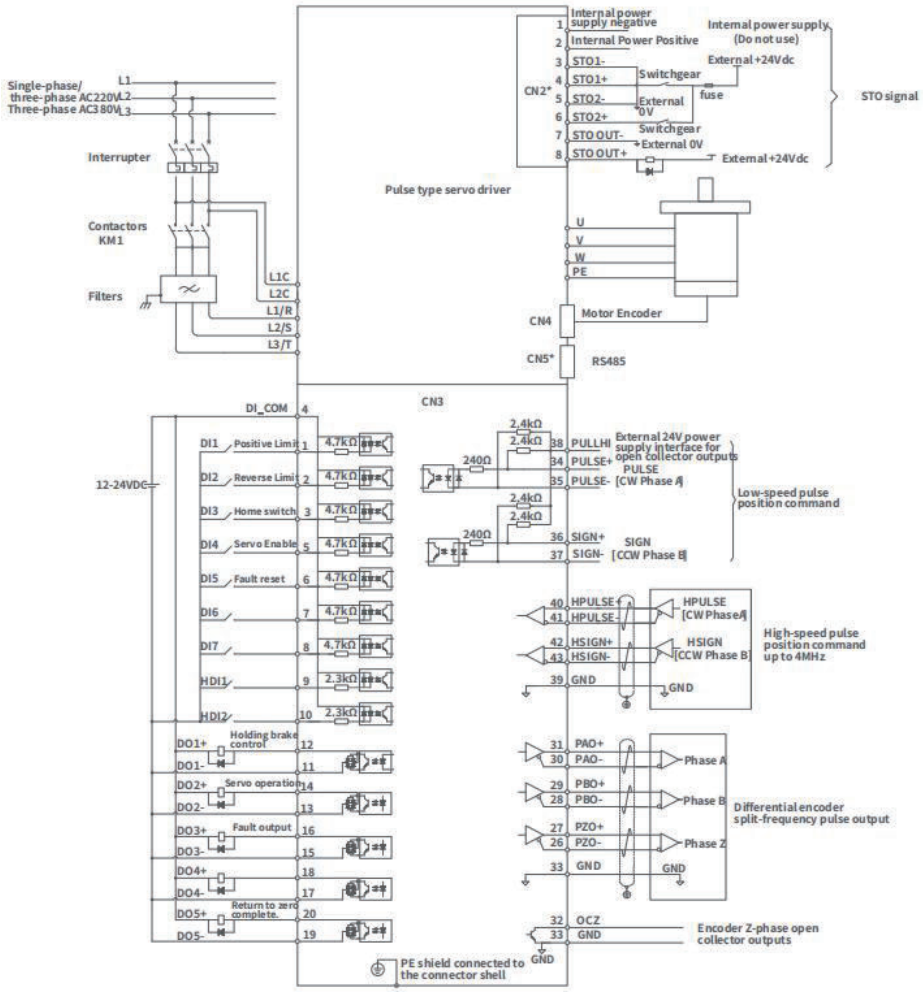


Figure : 3.13-1 Position Mode Wiring Diagrams

⚠ Note: * denotes "-SM" models only.

- AI/AO circuit wiring please use twisted shielded wire, the shield must be connected to PE at both ends.
- The DI input power supply needs to be connected externally, and the supply voltage range is 12-24VDC, up to 30VDC.
- HDI1 and HDI2 are high speed DI, please choose to use them according to the actual requirements.
- high-speed/low-speed pulse port wiring please use twisted shielded wire, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.
- DO output power supply needs to be connected externally, the power supply range is 5-24V. The maximum allowable voltage of DO port is DC30V and the maximum allowable current is 50mA.
- encoder crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.
- input power single/three-phase AC220V terminal is labeled as L1, L2, L3, three-phase AC380V terminal is labeled as R, S, T.

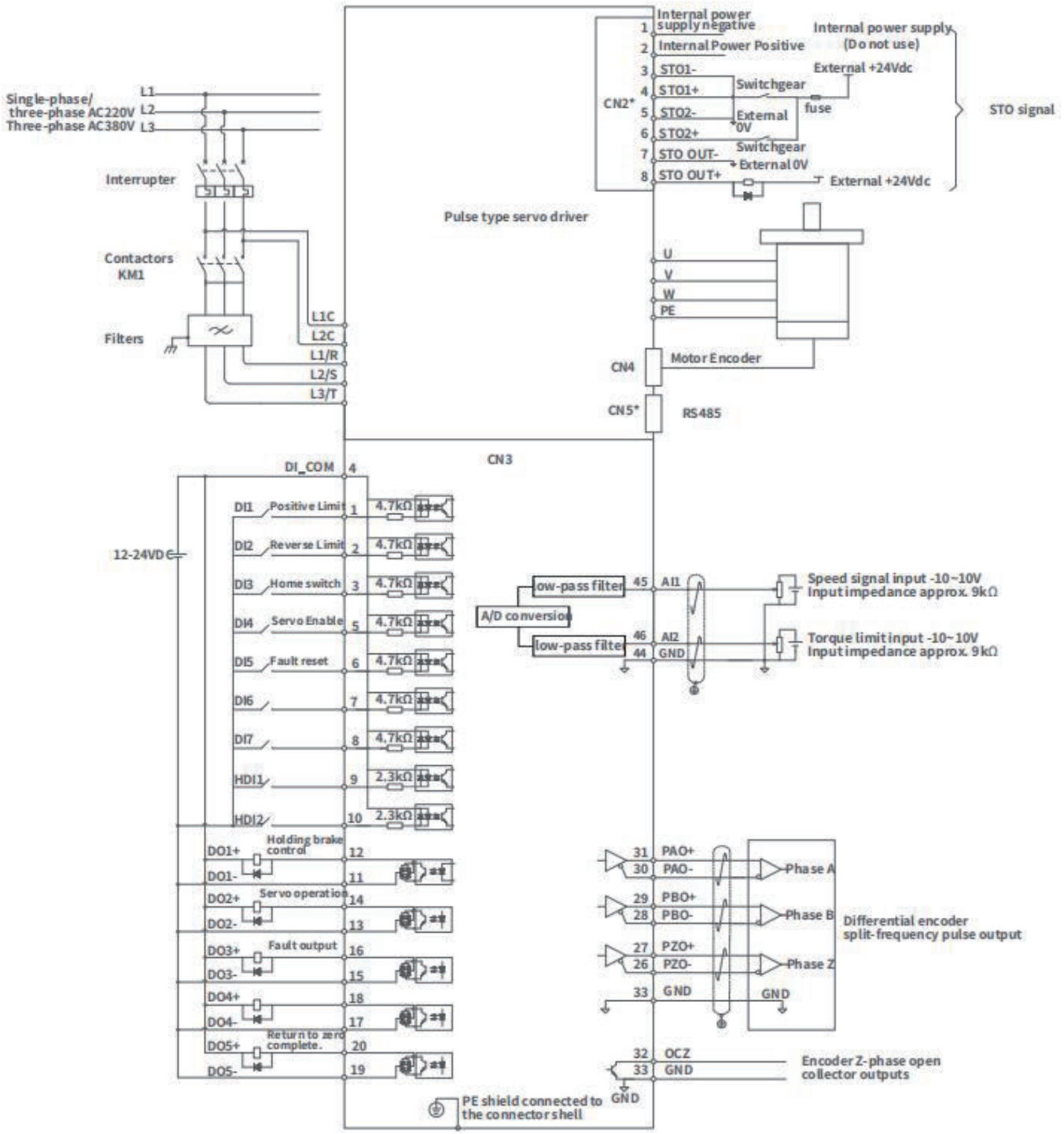


Figure: 3.13-2 Speed Mode Wiring Diagrams

⚠ Note: * denotes "-SM" models only.

- AI/AO circuit wiring please use twisted shielded wire, the shield must be connected to PE at both ends.
- The DI input power supply needs to be connected externally, and the supply voltage range is 12-24VDC, up to 30VDC.
- HDI1 and HDI2 are high speed DI, please choose to use them according to the actual requirements.
- DO output power supply needs to be connected externally, the power supply range is 5-24V. The maximum allowable voltage of DO port is DC30V and the maximum allowable current is 50mA.

Encoder crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.

- Input power single/three-phase AC220V terminal is labeled as L1, L2, L3, and three-phase AC380V terminal is labeled as R, S, T.

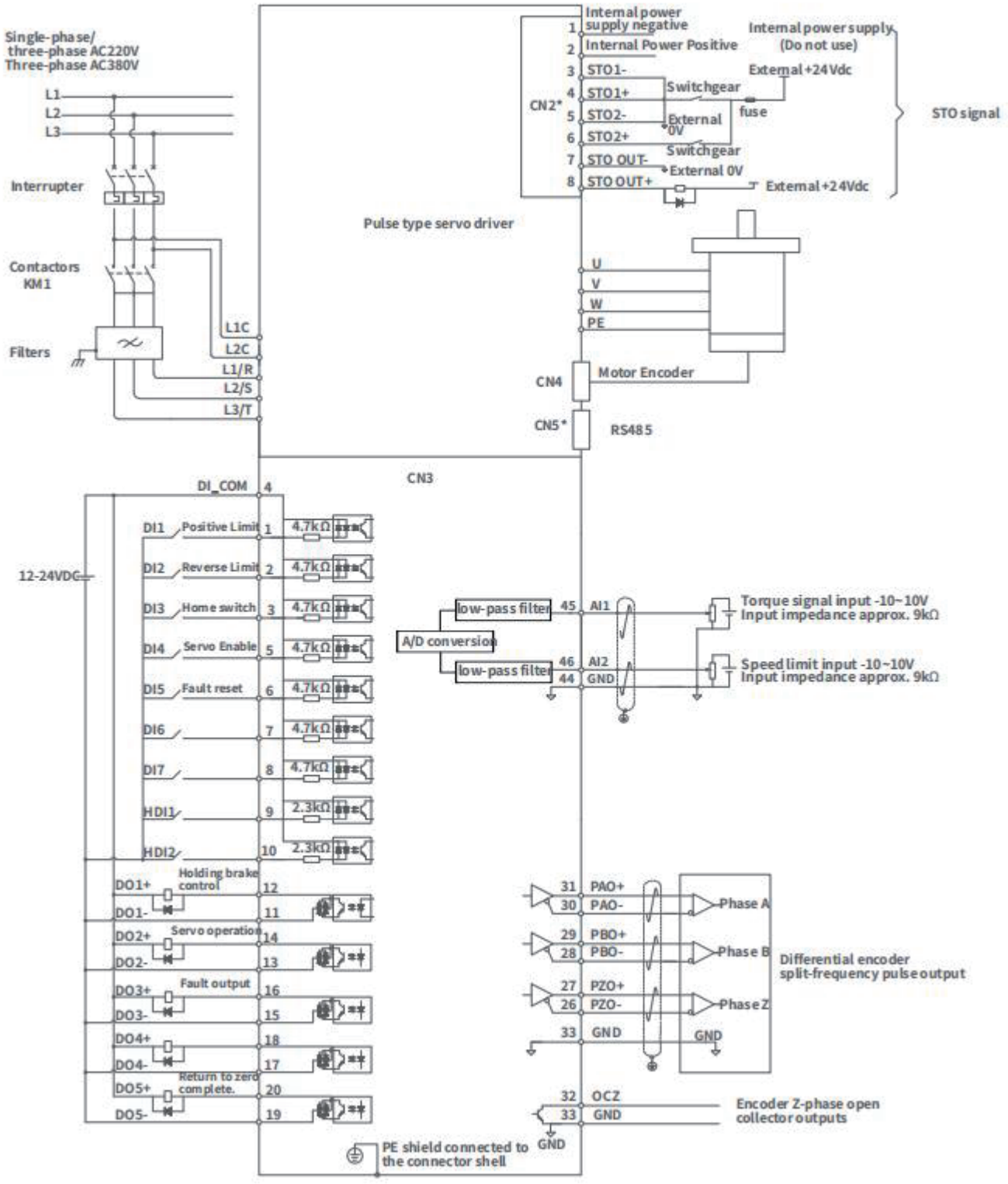


Figure: 3.13-3 Torque Mode Wiring Diagram

⚠ Note: * denotes "-SM" models only.

- AI/AO circuit wiring please use twisted shielded wire, the shield must be connected to PE at both ends.
- The DI input power supply needs to be connected externally, and the supply voltage range is 12-24VDC, up to 30VDC.
- HDI1 and HDI2 are high speed DI, please choose to use them according to the actual requirements.
- DO output power supply needs to be connected externally, the power supply range is 5-24V. The maximum allowable voltage of DO port is DC30V and the maximum allowable current is 50mA.

- Encoder crossover output cable please use twisted shielded cable, the shield must be connected to PE at both ends, GND and the upper computer signal ground reliable connection.
- Input power single/three-phase AC220V terminal is labeled as L1, L2, L3, three-phase AC380V terminal is labeled as R, S, T.

Chapter 4 Commissioning

4.1 Basic operational settings

4.1.1 Motor adjustment

Before running the servo system, it is necessary to enter the motor parameters and pole identification operation.

This section is a description of the panel operation process, and the background operation description is detailed in Section 4.3 Servo Debugging Software Usage.

1. Motor Parameter Entry

The motor parameters are set by stopping the machine, and the effective way is to power on the machine again.

The motor parameters are listed as follows.

Table: 4.1-1 List of motor parameters

Name	Function Code	Unit	Starting Value	Minimum Value	Maximum Values
rated voltage	P00.10	V	0-220V	0-220V	1-380V
rated current	P00.11	A	4.70	0	655.35
rating	P00.12	kW	0.75	0	655.35
Rated torque	P00.13	Nm	2.39	0	42949672.95
Maximum torque	P00.15	Nm	7.16	0	42949672.95
rated speed	P00.17	rpm	3000	0	65535
Maximum speed	P00.18	rpm	6000	0	65535
Motor Inertia Jm	P00.19	Kg ·cm^2	1.30	0	42949672.95
polar logarithm	P00.21	-	4	0	65535
phase resistance	P00.22	Ω	0.500	0	65.535
Inductors Lq	P00.23	mH	3.27	0	655.35
Inductors Ld	P00.24	mH	3.87	0	655.35
inverse electromotive force	P00.25	mV/rpm	33.30	0	655.35
D-axis counterpotential compensation	P00.31	%	60.0	0.0	6553.5
Q-axis counterpotential compensation	P00.32	%	100.0	0.0	6553.5
Current Sampling Extraction Rate	P00.33	-	0-extraction rate 32	0-extraction rate 32	3-extraction rate 256
D-axis proportional gain 1	P00.34	Hz	2000	0	65535
D-axis integral gain 1	P00.35	%	2.00	0.00	655.35
Q-axis proportional gain 1	P00.36	Hz	2000	0	65535
Q-axis integral gain 1	P00.37	%	1.00	0.00	655.35
D-axis proportional gain 2	P00.38	Hz	1000	0	65535
D-axis integral gain2	P00.39	%	2.00	0.00	655.35
Q-axis proportional gain 2	P00.40	Hz	1000	0	65535
Q-axis integral gain2	P00.41	%	1.00	0.00	655.35

Please check the model and parameters of the motor used, and refer to the following procedure to enter the motor parameters.

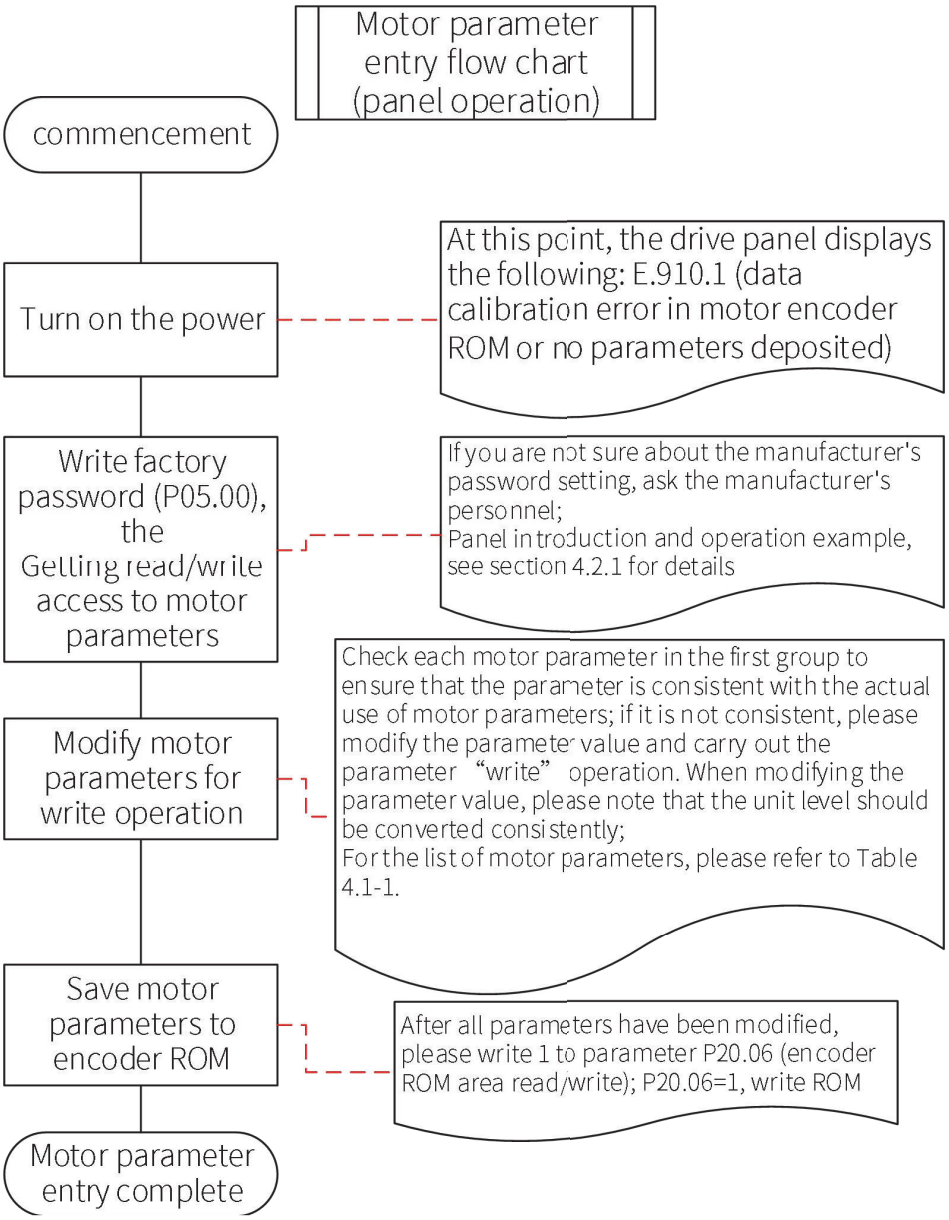


Fig. 4.1-1 Operation flow of motor parameter entry panel

1. Magnetic pole identification

Magnetic pole identification operation procedure, as follows.

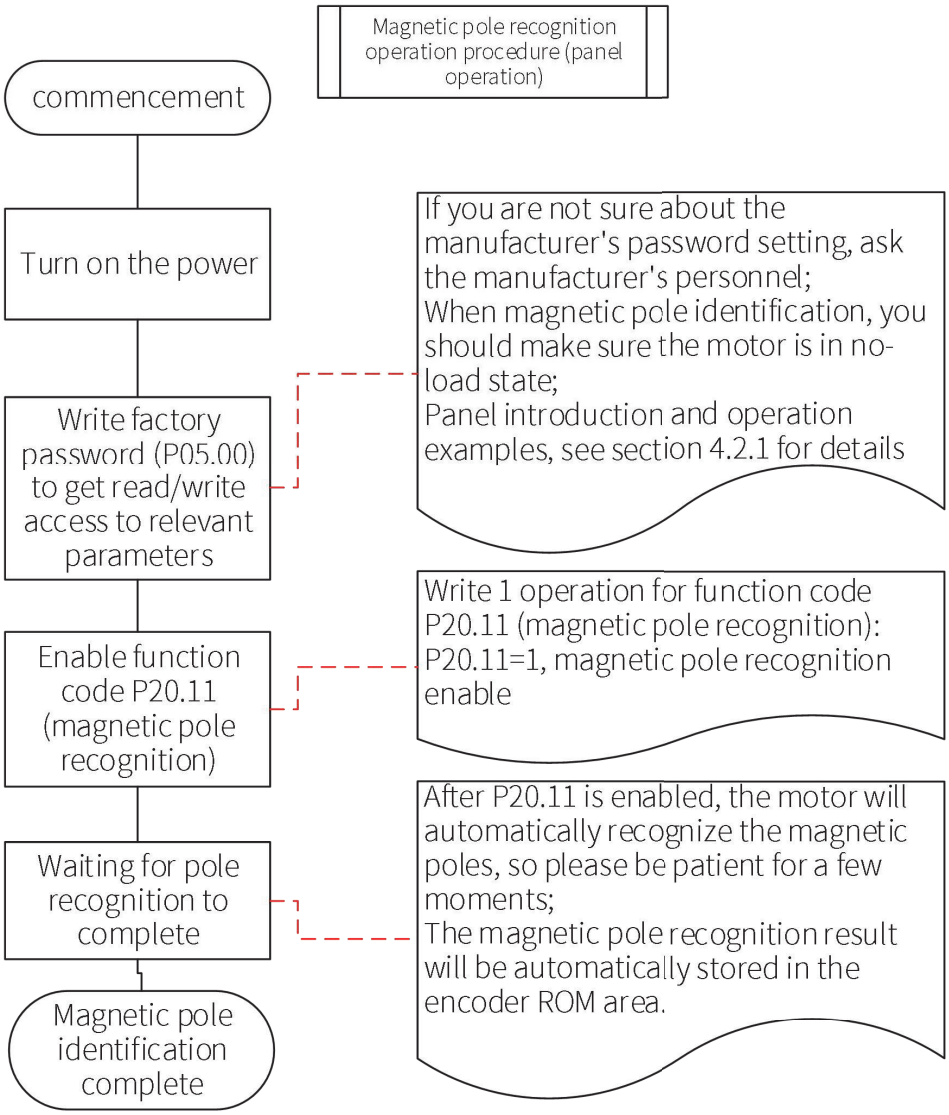


Figure: 4.1-2 Magnetic pole identification operation flow

4.1.2 Holding brake setting

The holding brake is used to stop the unintended movement of a moving load (e.g. dropping under gravity) when the servo system is not activated (e.g. servo system power failure), and to prevent the servomotor from moving unexpectedly after a power failure that may occur due to its own weight or by an external force.

⚠ Caution:

- The holding brake mechanism is a non-electrically actuated, fixed, specialized mechanism that cannot be used for braking purposes, and is used only to keep the servomotor in a stopped state;
- Holding coil no polarity;
- Servo enable should be turned off after the servo motor is stopped;
- When the motor with the built-in holding brake is running, the holding brake may make a clicking sound, and the function is not affected;
- Magnetic flux leakage may occur at the shaft end or other parts of the brake coil when it is energized (when the brake is open), so be aware of the possibility of such leakage when using magnetic sensors or other instruments near the motor.

1. Holding brake parameter setting

For applications with a holding brake, the holding brake enable switch (P05.12) must be set to enable and one of the servo drive DO terminals must be configured as function 17 (BK, holding brake control) and the valid logic for the corresponding DO terminal must be determined.

According to the current state of the servo drive, the working sequence of the holding mechanism can be divided into two kinds: servo drive normal state holding sequence, servo drive fault state holding sequence.

Table: 4.1-2 P05.12 Holding brake enable switch function codes

P05.12- Holding Brake Enable Switch	
accessibility	read/write
unit	-
default value	1
minimum value	0
maximum values	1
establishment, mode of entry into force	run setup/effective immediately

Table: 4.1-3 Brake Output Function No.

Encodings	Name	Functional Name	Functionality
17	BK	Holding brake control	Invalid, holding brake power on, holding brake action, motor in position lock state Effective, the holding brake power is disconnected, the holding brake is released and the motor can move.

2. Normal state of servo drive holding brake timing sequence

The normal state of the holding brake timing can be divided into two cases: motor static and motor movement

- stationary: actual motor speed is less than 30rpm;
- motion: actual motor speed of 30rpm and above;

3. Braking sequence when servo motor is stationary

- When the servo enable is turned from ON to OFF, the drive operates according to the static holding time sequence if the current motor speed is less than 30rpm;

- After holding brake output is set from OFF to ON, do not input position/speed/torque commands during the P05.13 time, or the commands will be lost or run incorrectly;
- When is used for the vertical axis, the self-weight of the mechanical moving part or external force may cause slight mechanical movement. When servo enable OFF occurs in the case of a stationary servomotor, the holding brake output immediately becomes OFF, but the motor remains energized for the P05.14 time to prevent the mechanical moving part from moving due to self-weight or external force.

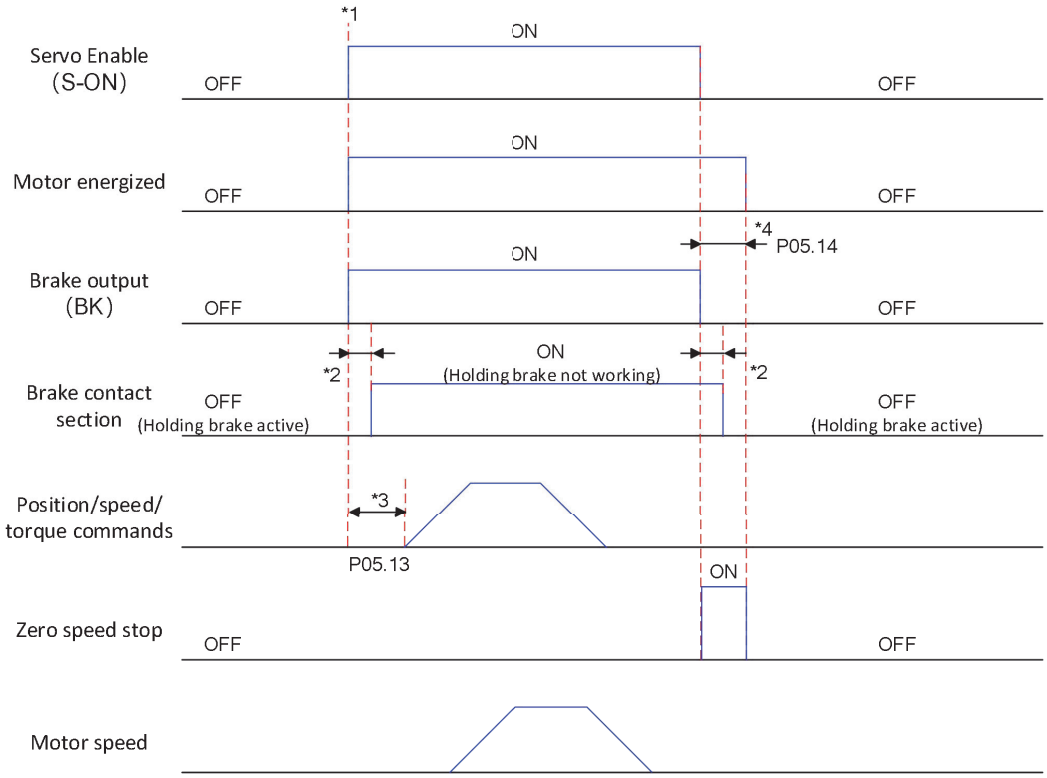


Fig. 4.1-3 Clamping timing diagram when the motor is stationary

*1: When the servo is enabled ON, the holding brake output is set to ON and the motor enters the energized state at the same time;

*2: Refer to the relevant specifications for the delay time of the holding brake contact part operation;

*3: Interval P05.13 or more from when the holding brake output is set to ON to when the command is input;

*4: When the servo motor is stationary (motor speed is lower than 30rpm), when the servo enable is OFF, the holding brake output is set to OFF at the same time. P05.14 allows you to set the delay time for the motor to enter the non-energized state after the holding brake output is OFF.

Table: 4.1-4 P05.13 Holding brake release time delay (stop state) function code for receiving command

P05.13-Holding brake release to ready to receive command delay	
accessibility	Read/Write
unit (of measure)	ms
default value	250
minimum value	0
maximum values	500
Establishment, mode of entry into force	Run Setup/Effective Immediately

Table: 4.1-5 P05.14 Zero speed holding time (stop state) function codes for holding brake engagement

P05.14 - Zero speed holding time for holding brake engagement	
accessibility	Read/Write
unit (of measure)	ms
default value	150

minimum value	1
maximum values	1000
Establishment, mode of entry into force	Run Setup/Effective Immediately

4. Brake timing during servo motor movement

If the current motor speed is greater than or equal to 30rpm when the servo enable is turned from ON to OFF, the driver will act in accordance with the motion holding timing sequence.

- When servo enable is set from OFF to ON, do not input position/speed/torque commands during the P05.13 time, or the commands will be lost or run incorrectly;
- When servo motor is moving, servo enable OFF occurs and the servo motor enters the zero-speed stopping state, but the holding brake output needs to satisfy one of the following conditions before it is set to OFF;

Ⅰ. P05.16 time has not expired, but the motor has decelerated to P05.15;

Ⅱ. Time P05.16 has expired, but the motor speed is still higher than P05.15.

- The motor remains energized for 50ms after the holding brake output of changes from ON to OFF, preventing the mechanical moving part from moving due to self-weight or external force.

Ⅰ. P05.16 time has not expired, but the motor has decelerated to P05.15;

Ⅱ. Time P05.16 has expired, but the motor speed is still higher than P05.15.

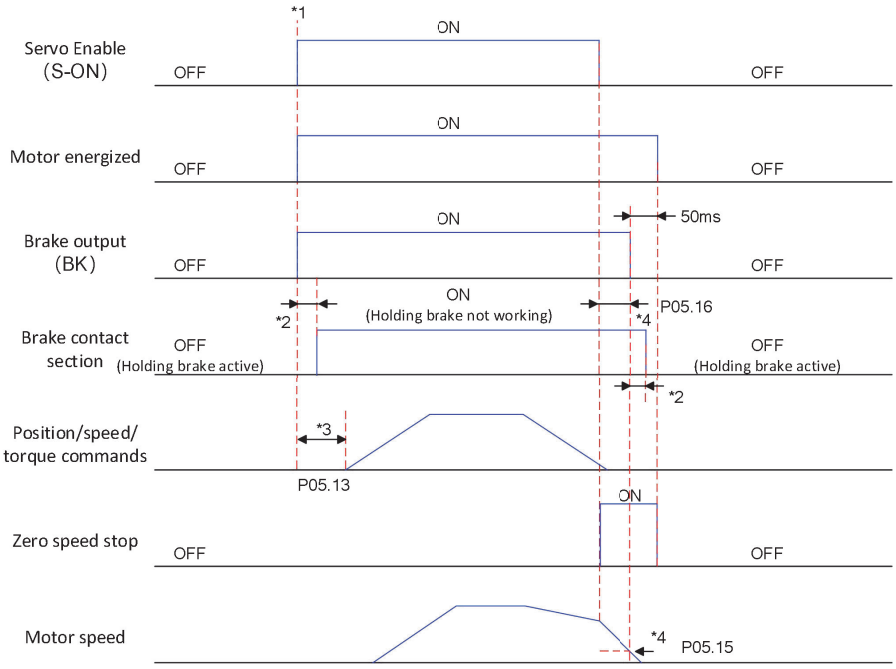


Figure: 4.1-4 Brake timing diagram during motor movement

*1: When the servo is enabled ON, the holding brake output is set to ON and the motor enters the energized state at the same time.

*2: Refer to the relevant specifications for the delay time of the holding brake contact part operation.

*3: Interval P05.13 or more from when the holding brake output is set to ON to when the command is input.

*4: In the case of servo motor motion, when the servo enable is OFF, P05.15 and P05.16 can be used to set the holding brake output OFF after the servo enable is OFF.

Table: 4.1-6 P05.15 Holding brake suction speed thresholds

P05.15-Threshold of the holding brake suction speed	
accessibility	Read/Write
unit	ms
default value	30
minimum value	0
maximum values	3000
Establishment, mode of entry into force	Run Setup/Effective Immediately

Table: 4.1-7 P05.16 Function code for holding brake suction time break-in value

P05.16-Threshold for holding brake suction time	
accessibility	Read/Write
unit	ms
default value	500(ms)
minimum value	1
maximum values	1000
Establishment, mode of entry into force	Run Setup/Effective Immediately

5. Servo Drive Fault Condition Holding Sequence

Servo faults are categorized into Type 1 faults (N0.1) and Type 2 faults (NO.2) according to the type of shutdown, please refer to "Chapter 6 Faults and Warnings". The Servo Drive fault status holding time sequence can be categorized into the following two cases:

- Type 1 faults occurring

The brake DO output conditions are the same as those in the "Brake Timing for Servomotor Motion under Normal Servo Driver Condition". That is, the brake output is set to OFF only when any of the following conditions are met.

Ⅰ. P05.16 time has not expired, but the motor has decelerated to P05.15;

Ⅱ. Time P05.16 has expired, but the motor speed is still higher than P05.15.

- Type 2 faults occurring

When a Type 2 fault occurs and the holding brake is enabled, the Type 2 fault stop method is forced to a "zero-speed stop, free-running state".

At this time, the servo motor firstly stops at zero speed, and when the actual speed of the motor is lower than 30rpm, the holding brake DO output condition is the same as that of the "holding brake timing when the servo motor is stationary under the normal state of the servo driver", i.e., the holding brake output immediately becomes OFF, but the motor is still in the energized state during the time of P05.14.

4.1.3 Direction of operation selection

By setting the running direction, you can change the running direction of the motor without changing the polarity of the input command. After making the change, the servo needs to be re-powered to take effect.

When the "Operation direction selection" is changed, the shape of the servo driver's output pulses and the positive and negative values of the monitoring parameters do not change.

The "Positive drive" and "Operation direction selection (P04.01)" settings in the overtravel prevention function are the same.

The running direction setting can be set by panel setting "P04.01" or background software setting "P04 group - motor running direction selection".

Table: 4.1-8 P04.01 Motor running direction selection

P04.01-Motor running direction selection	
accessibility	Read/Write
unit	1
default value	0
minimum value	0
maximum values	1
Establishment, mode of entry into force	Stop setting/powering up again
marginal notes	Sets the positive direction of motor operation when viewed from the motor shaft side.

4.1.4 Absolute value function

(1) Description of the use of the absolute value system

The absolute encoder not only detects the position of the motor within one revolution, but also counts the number of revolutions of the motor. When the drive is powered off, the multi-turn absolute encoder backs up the data through the battery, and when powered on, the drive uses the absolute position of the motor memorized by the multi-turn absolute encoder to calculate the absolute position of the machinery, so that it can directly carry out motion operations without the need to return the machinery to zero, and is widely used in the industries of manipulators and machine tools.

When using an absolute value motor for the first time, it is necessary to mechanically move to the home position and perform multi-turn absolute position zeroing through the driver to realize the home position calibration, and there is no need to return to zero in the future (except for absolute value alarms, etc.). It is recommended that the motor be stationary when reading the position to prevent dynamic jumps in the data.

If the motor supports multi-turn absolute encoder, the encoder cable needs to use a cable with a battery compartment. For details of the connection and terminals, refer to "Encoder Cable Connection of Servo Driver and Servomotor".

⚠ Caution:

- N3RP series servo drives support absolute position linear mode as well as absolute position rotary mode for position, speed, and torque modes;
- E.917 Encoder Battery Fault will occur when is first connected to the battery, it is necessary to set P20.05=1 to reset the encoder fault, and then carry out the home return operation;
- Modifies the P04.01 run direction selection and requires a new home reversion;
- Absolute position mode, the servo automatically detects whether the motor number is an absolute encoder motor, and if it is set, the error occurs a fault
- E.019 (encoder matching fault).

(2) Absolute value system related objects

Function Selection Objects.

Table: 4.1-9 P04.02 Position Feedback System Options

<table>
<tr><th colspan="3">P04.02-Position feedback system selection</th></tr>
<tr><td>accessibility</td><td colspan="2">Read/Write</td></tr>
<tr><td>unit</td><td colspan="2"></td></tr>
<tr><td>default value</td><td colspan="2">0</td></tr>
<tr><td>minimum value</td><td colspan="2">0</td></tr>
<tr><td>maximum values</td><td colspan="2">2</td></tr>
<tr><td>Establishment, mode of entry into force</td><td colspan="2">Stop setting/powering up again</td></tr>
<tr><td rowspan="6">marginal notes</td><td colspan="2">Setting absolute value system</td></tr>
<tr><td>setpoint</td><td>Absolute system selection</td></tr>
<tr><td>0</td><td>incremental model</td></tr>
<tr><td>1</td><td>Absolute linear mode</td></tr>
<tr><td>2</td><td>Absolute rotation mode</td></tr>
<tr><td colspan="2"></td></tr>
</table>

Table: 4.1-10 P20.05 Encoder Reset

P20.05-Encoder reset	
accessibility	Read/Write
unit	
default value	0
minimum value	0
maximum values	2
Establishment, mode of entry into force	Stop setting/powering up again
marginal notes	Encoder reset setpoint: 0 — no movement; 1 — reset fault; 2 — Reset Fault and Multiturn Data

Table: 4.1-11 Encoder Feedback Parameter Objects

Parameters	Name	Unit	Realm
P09.42	Encoder Multiturn	pen in	0-65535
P09.43	Encoder single-turn position	Encoder Unit	0- (2^{31}-1)
P09.45	Encoder absolute position low 32 bits	Encoder Unit	(-2^{31})- (2^{31}-1)
P09.47	Encoder absolute position high 32 bits	Encoder Unit	(-2^{31})- (2^{31}-1)

Caution:

- P09.43 is the encoder singleturn position, which ranges from 0 to the encoder resolution, or from 0 to (223-1) if it is a 23-bit encoder.
- P09.42 and P09.43 are encoder feedback data;
- Because P09.42 is an unsigned number, the absolute position of the absolute value encoder is calculated as follows:

$$Encoder\ absolute\ position = P09.42 \times Encoder\ Resolution + P09.43 \quad (P09.42 < 32768)$$

$$Or$$

$$Encoder\ absolute\ position = (P09.42 - 65536) \times Encoder\ Resolution + P09.43 \quad (P09.42 \geq 32768)$$

- P09.45、P09.47It is used to display the absolute encoder position and is calculated as follows: Absolute encoder absolute position=P09.47×2^{32}+ P09.45。

(3) Precautions for the use of absolute value systems

- When using absolute motor for the first time, due to the motor's new battery, it will generate absolute alarm E.917 (encoder battery fault), at this time, you need to set P20.05=1 to reset the encoder fault, and then execute the return to the origin to perform a multi-turn clearing operation;
- When the battery undervoltage is lower than 3.0V, the drive generates an absolute alarm E.921 (Encoder Battery Warning), which is automatically canceled by replacing the battery and powering up again.
- When the battery voltage is lower than 2.5V, or the battery has had a power failure, it generates an absolute value alarm, and the alarm cannot be eliminated even if the battery is replaced. At this time, it is necessary to reset the encoder fault using P20.05=1 after powering up the encoder, and then perform the return to the home position and execute the multi-turn zero clearing operation;

- When the servo drive is powered down, the maximum speed of the motor should not exceed 6000pm, otherwise, the encoder position information may be recorded incorrectly;
- Please ensure that the battery level and storage conditions do not damage the battery.

4.1.5 Electronic gear ratio setting

(1) Concept of gear ratio of electric wheel

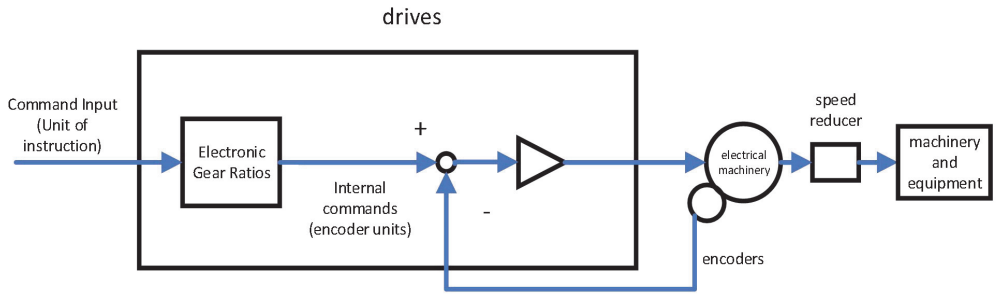


Figure: 4.1-5 Electronic Gear Ratios

The electronic gear ratio is the value of the set electronic gear ratio multiplied by the pulse command input from the upper controller as the position command in the position control mode. By using this function, the amount of motor rotation and movement per unit input command pulse can be arbitrarily set.

If the number of pulses required for each revolution of the motor is 10000 pulses, when the electronic gear ratio is equal to 1:1, the host computer sends 10000 pulses and the motor rotates once. When the electronic gear ratio is equal to 1:2, the host computer sends 20,000 pulses for every 2 pulses to the motor rotation pulse is 1 pulse, that is, the host computer sends 20,000 pulses, the motor rotates once.

Gear ratios are calculated as:

$$\text{Encoder Unit} = \text{unit of command} * \frac{\text{Electronic gear molecules}}{\text{Electronic Gear Score Master}}$$

The electronic gear ratio setting range is: $\frac{0.001\times\text{Encoder Resolution}}{10000} < B/A < \frac{4000\times\text{Encoder Resolution}}{10000}$。if not，malfunction E.421 (Electronic gear ratio setting error) will occur.Incorrect setting of the electronic gears will result in incorrect operation，this time，It is recommended to reset the setting with the servo driver stopped.

(2) Setting procedure for electronic gear ratio

Electronic gear ratios vary depending on the mechanism. Please follow the steps below for setting:

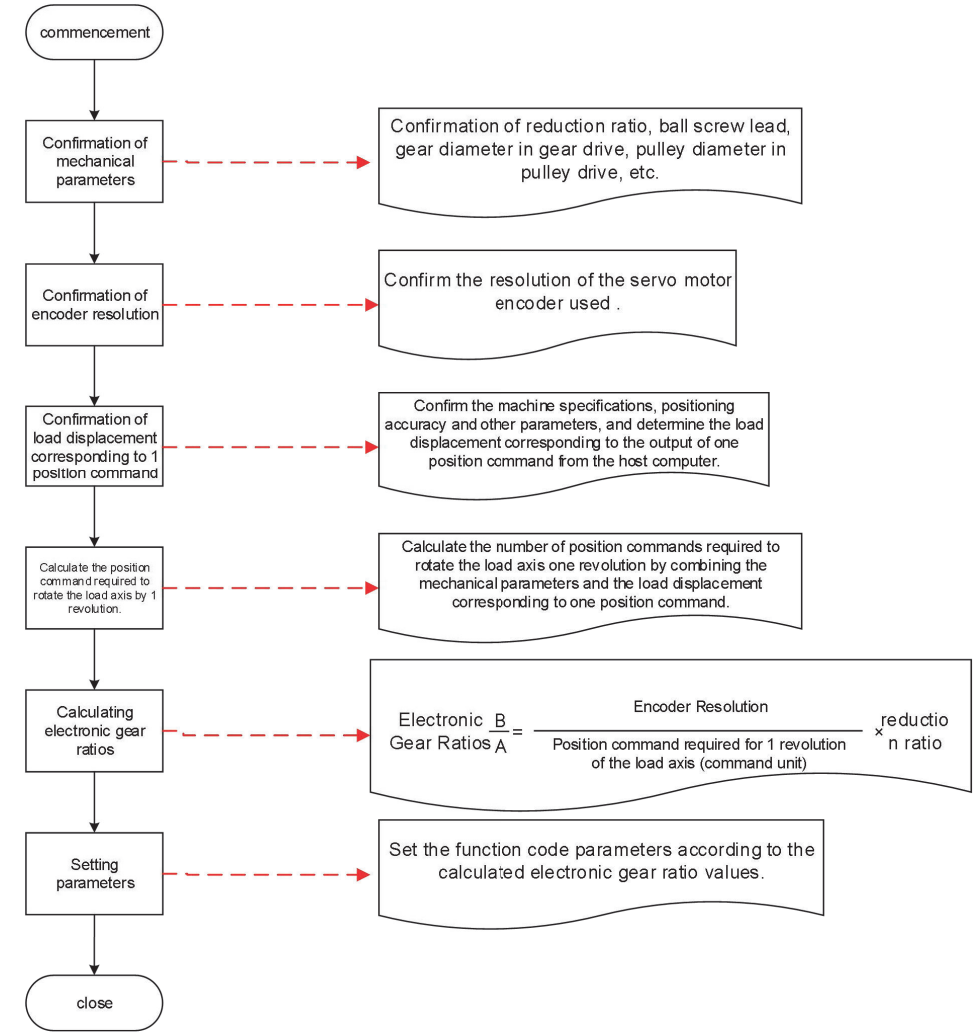


Fig. 4.1-6 Gear Ratio Setting Procedure

In this case, the procedure for setting parameters is as follows.

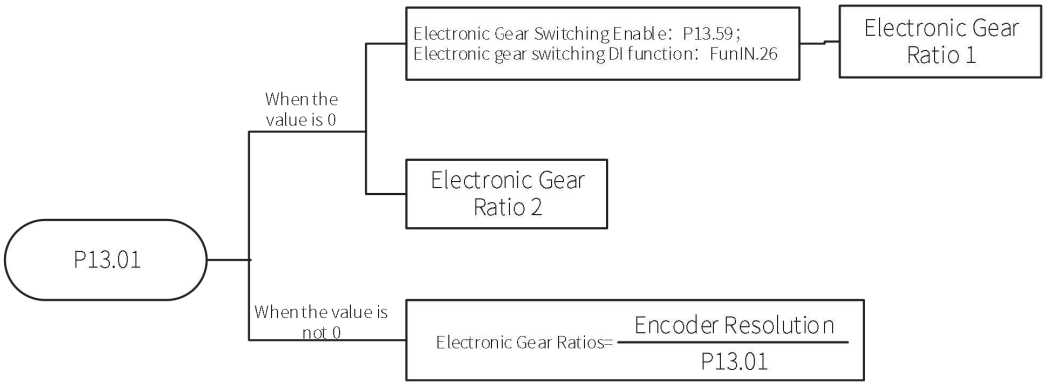


Fig. 4.1-7 Electronic Gear Ratio Setting Operation Procedure

When P13.01 is not 0， Electronic Gear Ratios$\frac{B}{A} = \frac{\text{Encoder Resolution}}{\text{P13.01}}$， At this time, the electronic gear ratio 1 and electronic gear ratio 2 have no effect.。

(3) Related Function Codes

- Electronic wheel ratio value setting

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P13	01	Number of command pulses per revolution of the motor	0~1048576	P/r	Setting the number of position commands for 1 rotation of the motor	Effective immediately	Energized again	0
P13	03	Electronic gear ratio molecules	1~1073741824		Molecules that set the electronic gear ratio for group 1	Operation Setting	Effective immediately	4
P13	05	Electronic gear ratio molecules	1~1073741824		Setting the denominator of group 1 electronic gear ratios	Operation Setting	Effective immediately	1
P22	05	Second set of electronic gears than molecules	1~1073741824		Setting up the molecules for group 2 electronic gear ratios	Operation Setting	Effective immediately	4
P22	07	The second set of electronic gears is divided into scores	1~1073741824		Setting the Denominator for Group 2 Electronic Gear Ratios	Operation Setting	Effective immediately	1

- Electronic Gear Ratio Switching Setting

When P13.01 is 0, the electronic gear ratio switching function can be used. The need to switch between gear ratio 1 and gear ratio 2 should be determined based on the mechanical operation and the electronic gear ratio switching conditions should be set. There is and only one group of electronic gear ratios functioning at any one time. If the parameters of this group of electronic gear ratios are changed in real time, their effective time is also limited by the switching conditions.

A large change in the real-time change value of the electronic gear ratio, or a large difference between the two sets of electronic gear ratios for switching, will lead to large fluctuations in the motor speed! At this time, the position command FIR filter (P07.00) can be used to make the position command switch smoothly.

Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
P13	59	Electronic Gear Switching Enable	0-The position command is equal to 0switch modes or data streams 1-Real-time switching	Setting the electronic gear ratio switching conditions	Shutdown Setting	Effective immediately	0

At the same time, please configure 1 DI terminal of the Servo Drive to function 26 (FunIN.26: Electronic Gear Switching) and make sure that the DI terminal is valid logic.

encodings	functional name	functionality
FunIN.26	Electronic Gear Switching	Invalid, Group 1 electronic gear ratio is selected in position control mode; Effectively, in position control mode, the 2nd set of electronic gear ratios is selected;

The final electronic gear ratio selected for the servo drive should be referred to the following table.

Table: 4.1-12 Electronic Gear Ratios

P13.01	P13.59	FunIN.26Corresponding DI terminal level	Electronic Gear Ratios
0	0	null	P13.03 P13.05
		validity	P22.05 P22.07
	1	null	P13.03 P13.05
		validity	P22.05 P22.07

4.1.6 Timing diagrams

1. Power on timing diagram

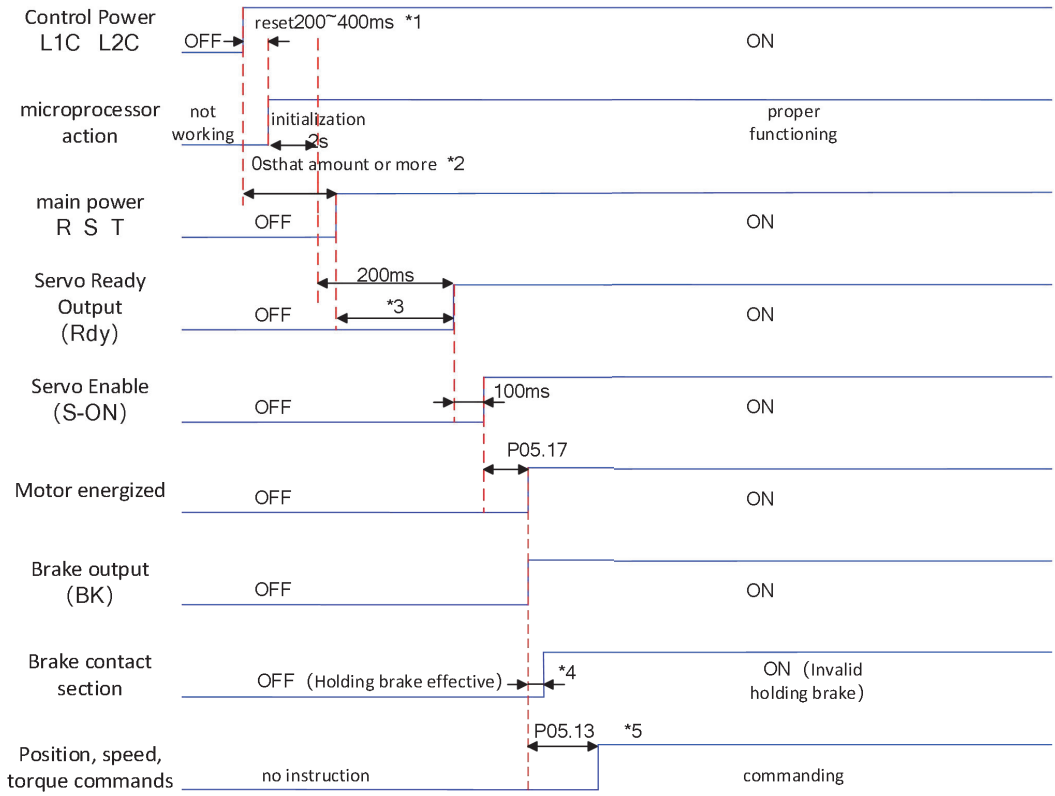


Figure: 4.1-8 Power On Timing Diagram

*1: Reset time, is the time determined by the microprocessor +5V power establishment time.

*2: Above 0s, the time is determined by the actual main power on action moment.

*3: When the control power supply and the main power supply are powered up at the same time, the time is the same as the time from the completion of microprocessor initialization to the validity of Rdv.

*4: Refer to the relevant specifications for the delay time of the holding brake contact part action. *5: When the holding brake enable switch (P05.12) is not turned on, P05.13 has no effect.

2. Shutdown timing diagram in case of warning or malfunction

- Failure 1: Free stop, remain in free running condition ;

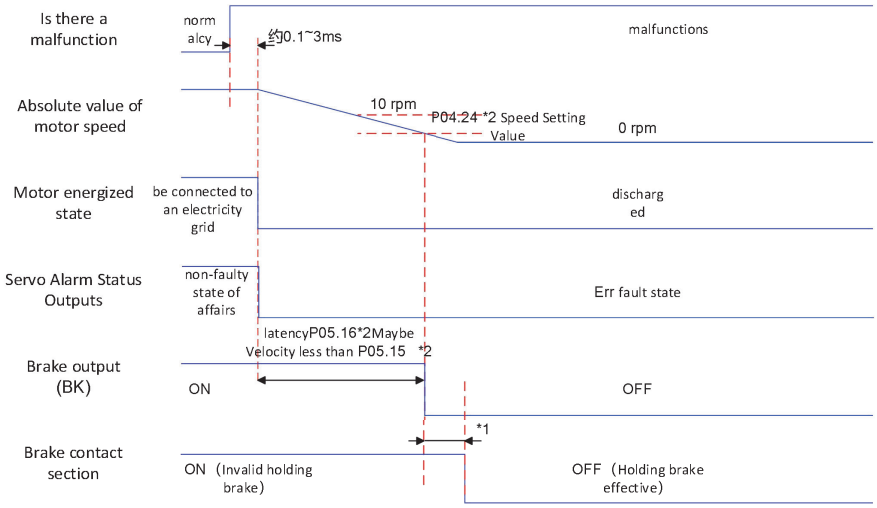


Fig. 4.1-9 Timing diagram for free stop and free run status at fault 1

*1: Refer to the relevant specifications for the delay time of the holding brake contact part operation.

*2: P05.15 and P05.16 have no effect when the holding brake enable switch (P05.12) is not turned on.

- Fault 2 Non-holding brake: free stop, remain in free running condition

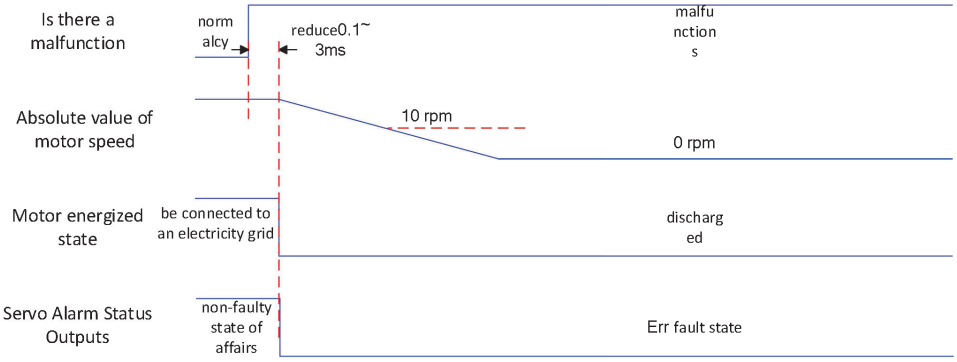


Fig. 4.1-10 Timing diagram for free stop and free run status at fault 2

- Fault 2 Non-Holding Brake: DB stops and holds DB status

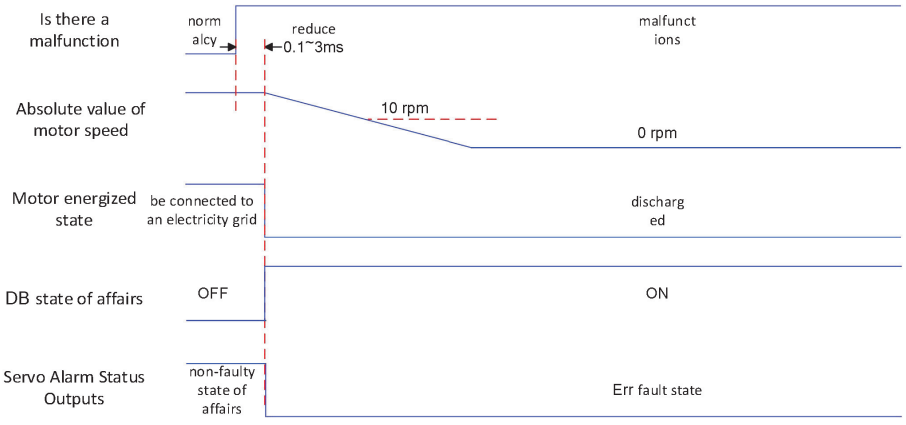


Figure: 4.1-11 DB shutdown at fault 2 to maintain DB status timing diagram

- Fault 2 Non-holding brake: zero-speed stop, free-running condition maintained

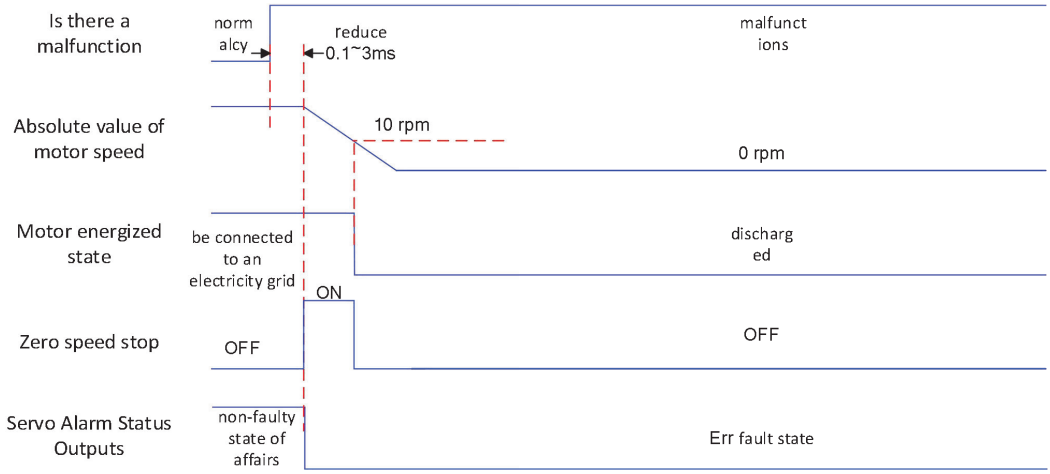


Fig. 4.1-12 Zero-speed shutdown and free-running status timing diagram for fault 2 (non-holding brake)

- Fault 2 With holding brake: Forced to stop at zero speed and remain in free running condition

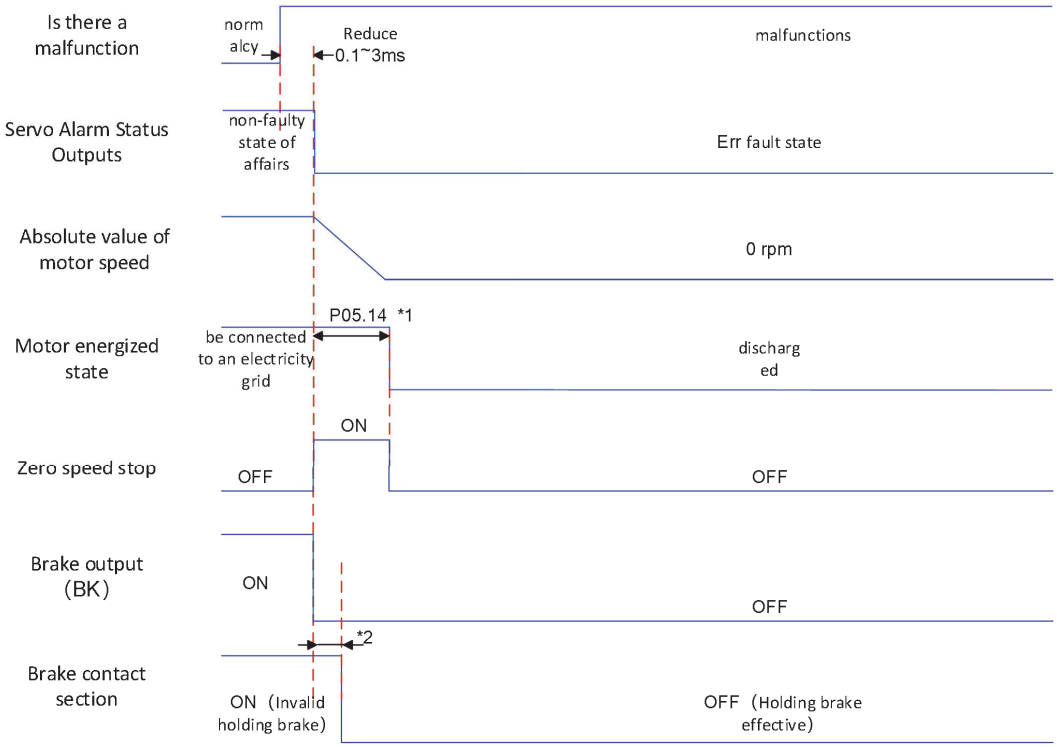


Fig. 4.1-13 Timing diagram of free stopping state of zero-speed stopping mode at fault 2 (with holding brake)

*1: P05.14 has no effect if the holding brake enable switch (P05.12) is not turned on;

*2: Refer to the relevant specifications for the delay time of the holding brake contact action.

The servo will interrupt the current running status of the service when a Type 3 warning occurs: A.220 (Forward overtravel warning), A.221 Reverse overtravel warning), and the shutdown timing is shown in 4.1-13).

- Over-travel stop warning: zero-speed stop, hold position locked

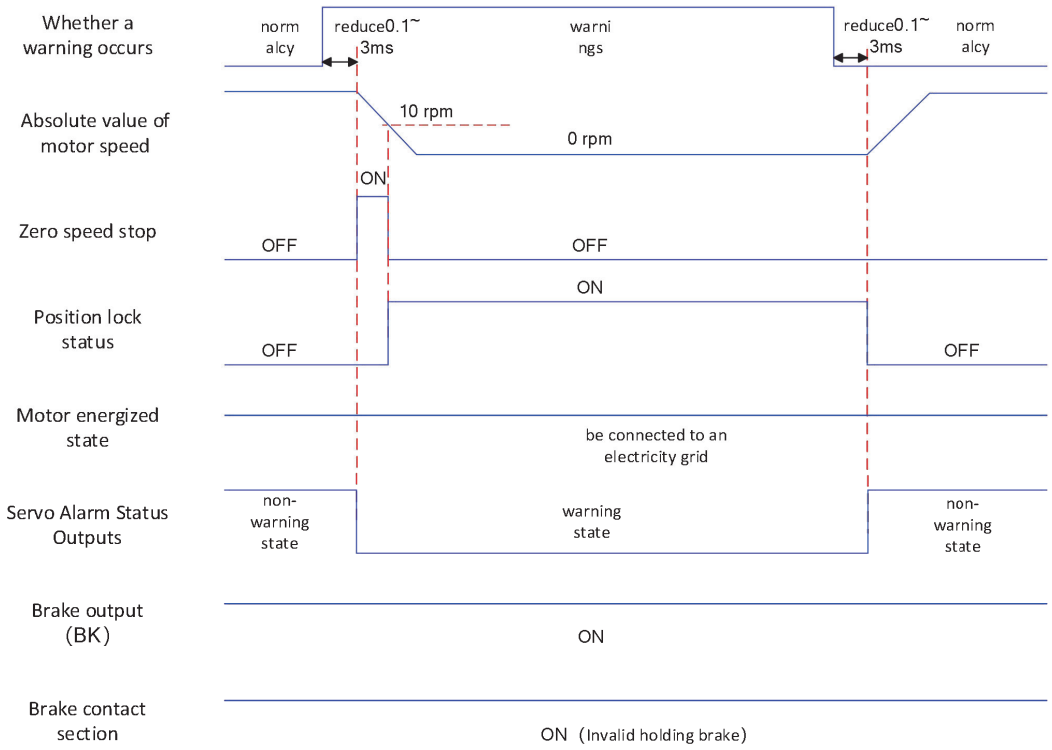


Figure: 4.1-14 Warning Timing Chart for Shutdown Category

Except for the above two Type 3 warnings, other warnings have no effect on the current state of the servo, as shown in 4.1-14).

- Non-Stop Warning.

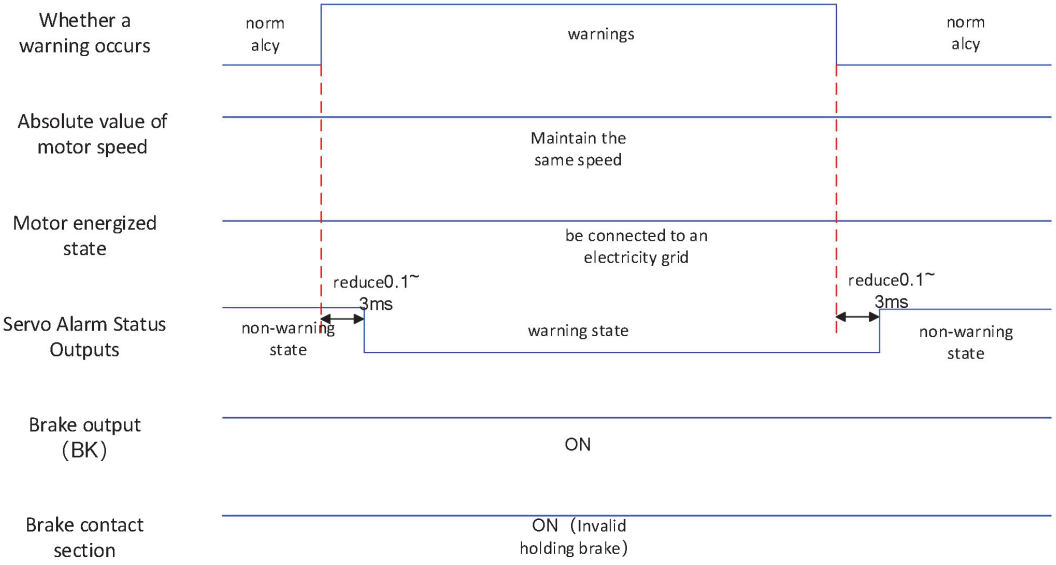


Figure: 4.1-15 Non-Stop Warning Timing Chart

- Fault Reset.

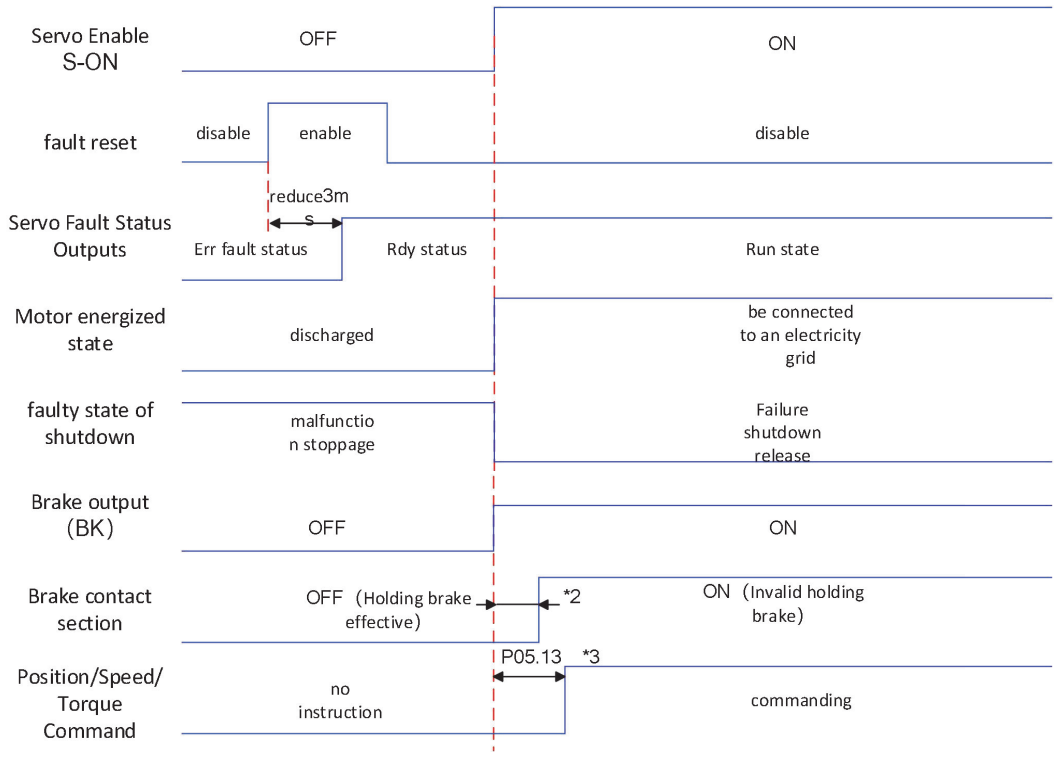


Figure: 4.1-16 Fault Reset Timing Chart

*1: DI fault reset signal (5: Fault reset) is valid along the change.

*2: Refer to the relevant specifications for the delay time of the holding brake contact part operation .

*3: P05.13 is not effective when the holding brake enable switch (P05.12) is not turned on.

4.1.7 Running

1. Pre-operation inspection

Table: 4.1-13 Pre-operation inspection procedure

Entry	Element
Wiring Inspection	1) Motor power line UVW line sequence (special attention) 2) Ground wire is not loose or shorted to UVW 3) Is the encoder wire loose
Mechanical connection check	Check whether the mechanical parts connected to the motor have strict requirements for the direction of motor movement, it is recommended that the motor be unloaded before performing the 'Safe Operation' procedure.
Environmental inspections	Do not run the motor in high temperature and high humidity

2. Safe operation

Table: 4.1-14 Safe Operation Procedures

Move	Description
Turn on the power, confirm the panel display	After the servo controller is connected to the power supply, under normal condition, the last three digits of the panel display rdy, if the panel flashes alarm code, please troubleshooting according to chapter seven.
spin	1) Tap to run the drive motor according to panel 4.2.2 2) Observe the motor running direction, if the direction is wrong, please stop the drive motor movement, according to 4.2.1 panel introduction to detect the drive parameters 3) Using a servo tuning software oscilloscope, observe the speed waveform, if the

	speed is wrong, check the electronic gear ratio setting according to 4.1.5 or correct the upper unit conversion.

3. Running

Table: 4.1-15 Operation Procedure

Entry	Description
mechanical connection	Please connect the motor to the load after the 'safe operation' has been carried out without error, multi-diaphragm couplings are recommended.
inertial discrimination	Use the inertia recognition function to set the correct inertia ratio
Gain adjustment	Adjust gain parameters, filter parameters, and advanced tuning parameters for high precision, high responsiveness control.
Run under the program	Use the driver for equipment and write control programs to perform specific functions

4.1.8 Downtime

In order to meet the servo drive to meet various working conditions, the servo drive supports different stopping methods and stopping states.

(1) Shutdown mode

- Free Stop: The servo motor is not energized, and the motor is free to reduce its speed to 0 by mechanical friction, etc;
- DB Stop: The servo motor stops in motion by relying on the reverse braking torque provided by the UVW three-phase short;
- Ramp Stop: Smooth stop according to pre-set position/speed/current ramp commands;
- Zero Speed Shutdown: Immediately sets the motor target speed to zero to execute a shutdown;
- Emergency Torque Stop: The servo drive outputs a reverse braking torque to quickly reduce the motor speed to 0.

(2) Shutdown state

- Hold Position Status: Holds the motor position and the motor shaft is not movable.
- maintains DB status: the drive internally shorts the UVW three-phase line, and the motor shaft is not free to move;
- Free motion state: the motor can move at will.

(3) Downtime status

The downtime conditions supported by the Servo Drive are as follows:

Table: 4.1-16 N3RP series servo drive stopping mode

Downtime	Related Parameter Settings		Shutdown Actions And Status	Descriptive
Category 1 failure shutdown	P04.10	0	Free downtime, free movement	Downtime conditions at the onset of Type I failures
		1	DB stop, free motion	
		2	DB shutdown, keep DB	
Type II malfunction shutdown	P04.11	0	Free downtime, free movement	Downtime conditions at the time of Type II failures
		1	Zero speed stop, free motion	
		2	Zero speed stop, hold DB	
		3	DB stop, free motion	
		4	DB shutdown, keep DB	
Disable Enable Stop mode	P04.12	0	Freedom to stop	Stopping condition when the servo driver stops being enabled
		1	DB downtime	
		2	Zero speed stop	

Disable Enable Stop state	P04.13	0	free movement	
		1	Maintain DB	
power failure and shutdown	P04.14	0	Shutdown by Disconnect Enable Mode	Shutdown condition when servo drive is powered down
		1	Zero speed stop	
overtravel stop	P04.15	0	Free downtime, free movement	Stop condition when the motor axis position exceeds the preset position, the stop position can be the servo internal software position limit value or external limit DI trigger moment position
		1	Zero speed stop, hold position	
		2	Zero speed stop, free motion	

4.2 Panel control operation

4.2.1 Introduction to panels

(1) Panel Composition

The N3RP series servo panel consists of keys and a digital tube display for information and parameter display, parameter setting, user password setting, and general function execution.

(2) Introduction to Keys

The function of each key is shown in the following figure.

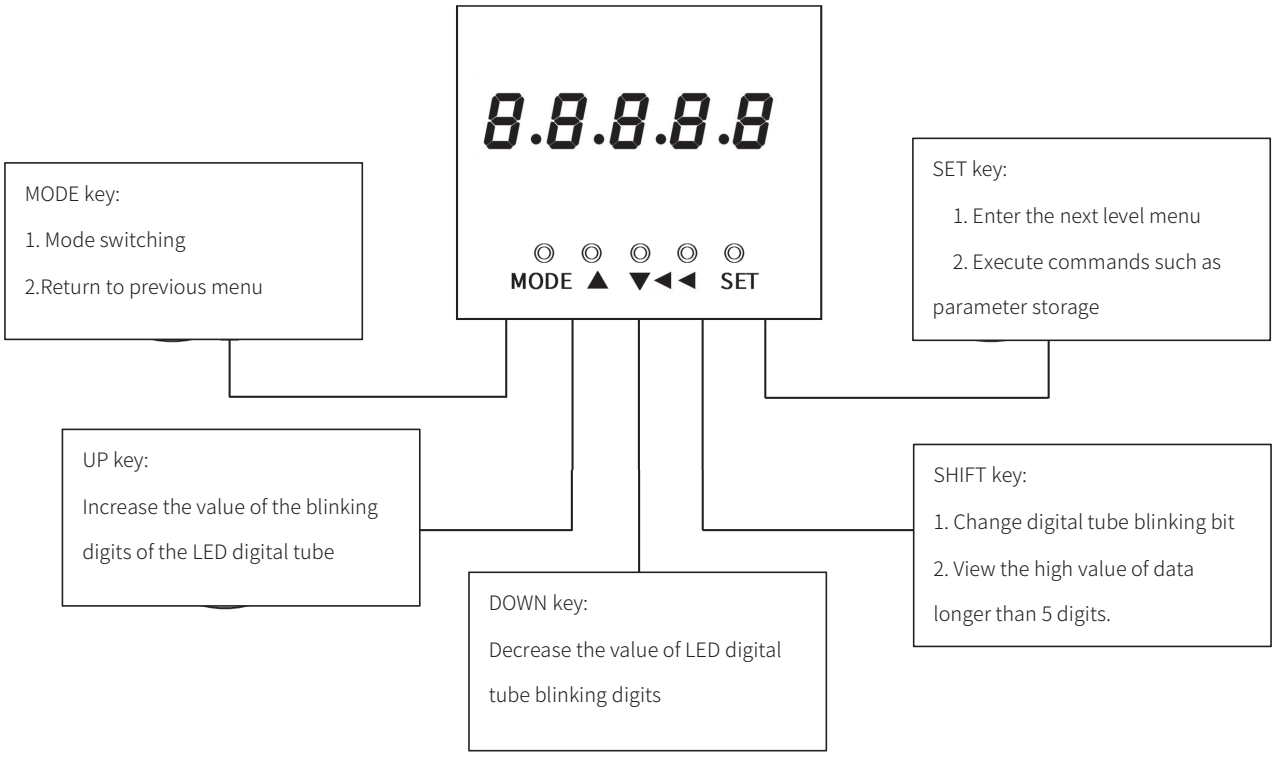


Figure: 4.2-1 Key Function Introduction Chart

Take the panel tap operation as an example, and make the following examples of key usage:

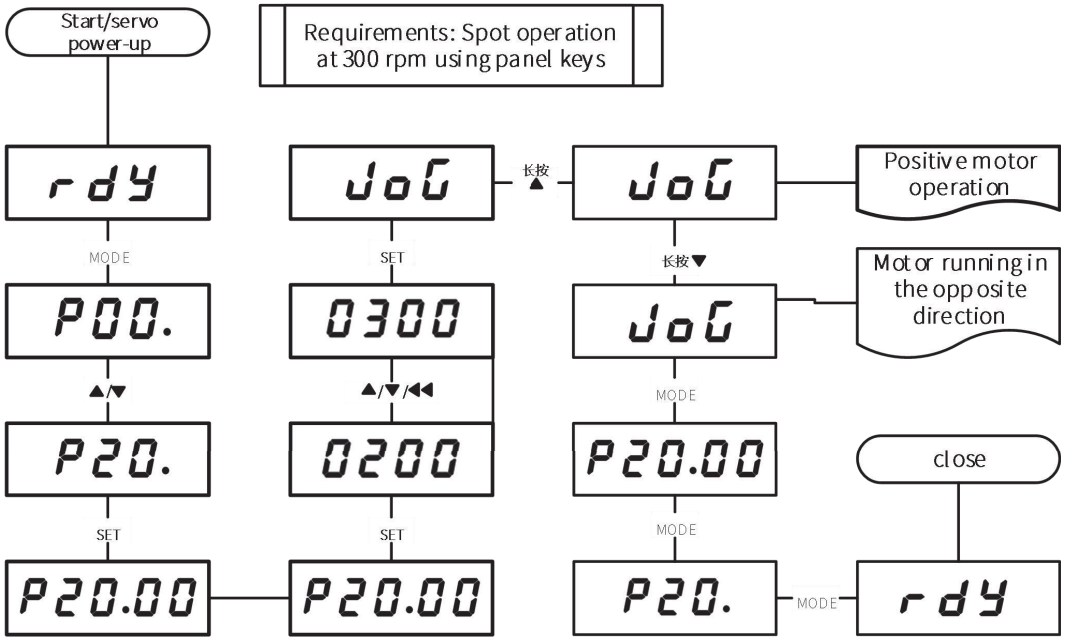


Figure: 4.2-2 Panel Tap Operation Example Operation and Display Diagrams

(3) Introduction to Panel Displays

The panel display consists of a 5-digit, 7-segment digital tube. When the servo drive is running, the display can be used for servo status display, parameter display, fault display and monitoring display.

- panel display category

Table: 4.2-1 Panel Display Categories

Display Category	Functional Description	Access	Give An Example
Status Display	Displays the current status of the servo, e.g. servo ready, servo running, etc.	1. Immediate access when power is turned on; 2.Under the parameter display, press the MODE key and enter; 3.Monitoring shows entry when the motor is stationary;	rdy
Parameter Display	Display function codes and their set values	1.With the status display, press the MODE key and enter; 2. Monitor the display and enter after pressing the MODE key; 3.Under the fault display, press the SET key first and then the MODE key to enter ;	P20.00
Fault Display	Displays faults and warning codes occurring at the servo	1.Under the parameter display, press the MODE key and enter; 2.Entry at the time of failure;	E.910.1
Monitor Display	Display servo Current operating parameters	1. Under Parameter Display, set the function code to 21 groups and enter; 2. Under the status display, set function code P05.03 and enter after motor movement ;	200

- panel display content introduction

Table: 4.2-2 Description of status display

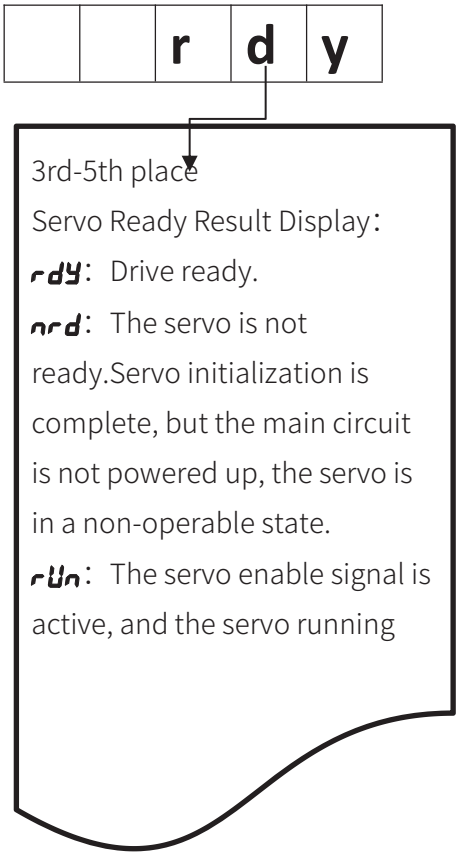
<table>
<tr><th>Display Category</th><th colspan="5">Display Content</th><th>Name</th><th>Display Occasions</th><th>Implied Meaning</th></tr>
<tr><td rowspan="3">Status Display</td><td>8</td><td>8</td><td>8</td><td>8</td><td>8</td><td>88888:
Servo initialization</td><td>Servo Power-on moment</td><td>The servo drive is in the initialization or reset state, waiting for the initialization or reset to be completed, and automatically entering other states</td></tr>
<tr><td></td><td></td><td>r</td><td>d</td><td>y</td><td>rdy:
Servo ready.</td><td>Servo ready.</td><td>Servo drive is operational</td></tr>
<tr><td colspan="8"> 
</td></tr>
</table>

Table: 4.2-3 Parameter display description

Display Category	Display Content					Name	Display Occasion	Implied Meaning
Parameter Display	P	2	0.	0	0	function code: P20.00		P: function code 20: function code group 00: Function Code Group Numbering
	1	2	3	4	5	Data (5 digits and below)demonstrate: 12345		
	-	1	2	3	4	Negative data (4 digits or less) display: -1234		
	-	7	8	9	0	Data (5 digits or more) display: 1234567890		▂:Lower four bits of multi-bit data ▃:Middle four of multi-bit data ▔:Higher four bits of multi-bit data
	-	3	4	5	6			
	-			1	2			
	-.	7	8	9	0	Negative data (5 or more digits) display:-1234567890		▃:negative value sign -(math.) ▂:Lower four bits of multi-bit negative data ▃:Middle four of multi-bit negative data ▔:Higher four bits of multibit negative data
	-.	3	4	5	6			
	-		-	1	2			
		1	0.	0	0	decimal point display: 100.0		.:Decimal point, no blinking
	d	n	⌐	e		done: Parameter setting completed	Successful parameterization	Parameterization is complete and stored near the servo drive
	=	=	.	.	.	= = . . . : Parameters restored to factory settings	Using the systemParameter initialization(P05.01)When set to 1	The servo drive is in the parameter initialDuring the initialization process, please wait until the system parameters are initialized and then re-power on the system for use.

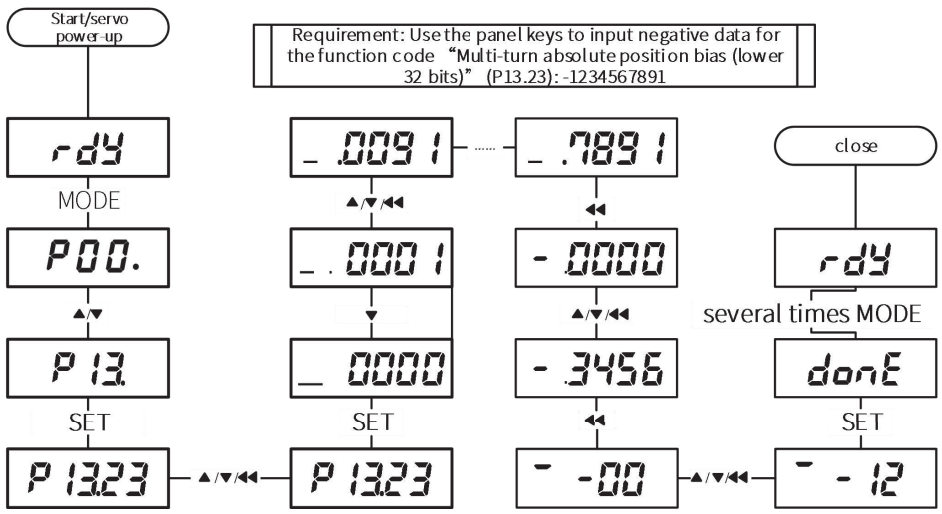
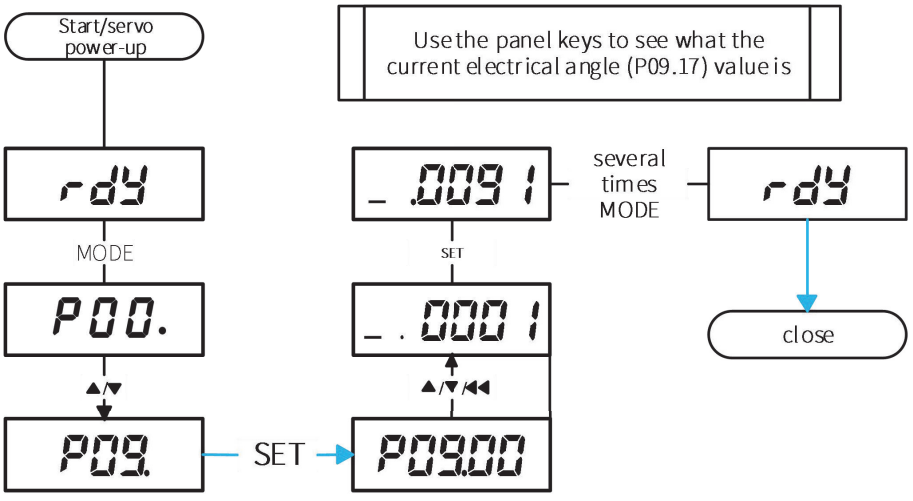
Parameter Display Example	

Table: 4.2-4 Fault display and monitoring display

Display Category	Display content					name	Display Occasion	implied meaning
fault indication	E.	0	1	0.	0	trouble code: E.010.0	Software parameter failure	E.: malfunctions Before the decimal point: fault master code After the decimal point: fault subcode
warning display	A.	2	2	4.	0	warning code: A.224.0	Braking resistor overload	A.: warnings Before the decimal point: warning master code After the decimal point: warning subcode
monitor	1	2	3	4	5	current parameter value: 12345		
Monitoring Display Examples								

4.2.2 Panel pointing operation

Before performing panel pointing operation, perform a pre-operation check of the servo system to make sure that the system operation is not interfered with. Turn on the power, power up the servo system, and perform panel pointing operation. The flow chart of panel tap operation is as follows.

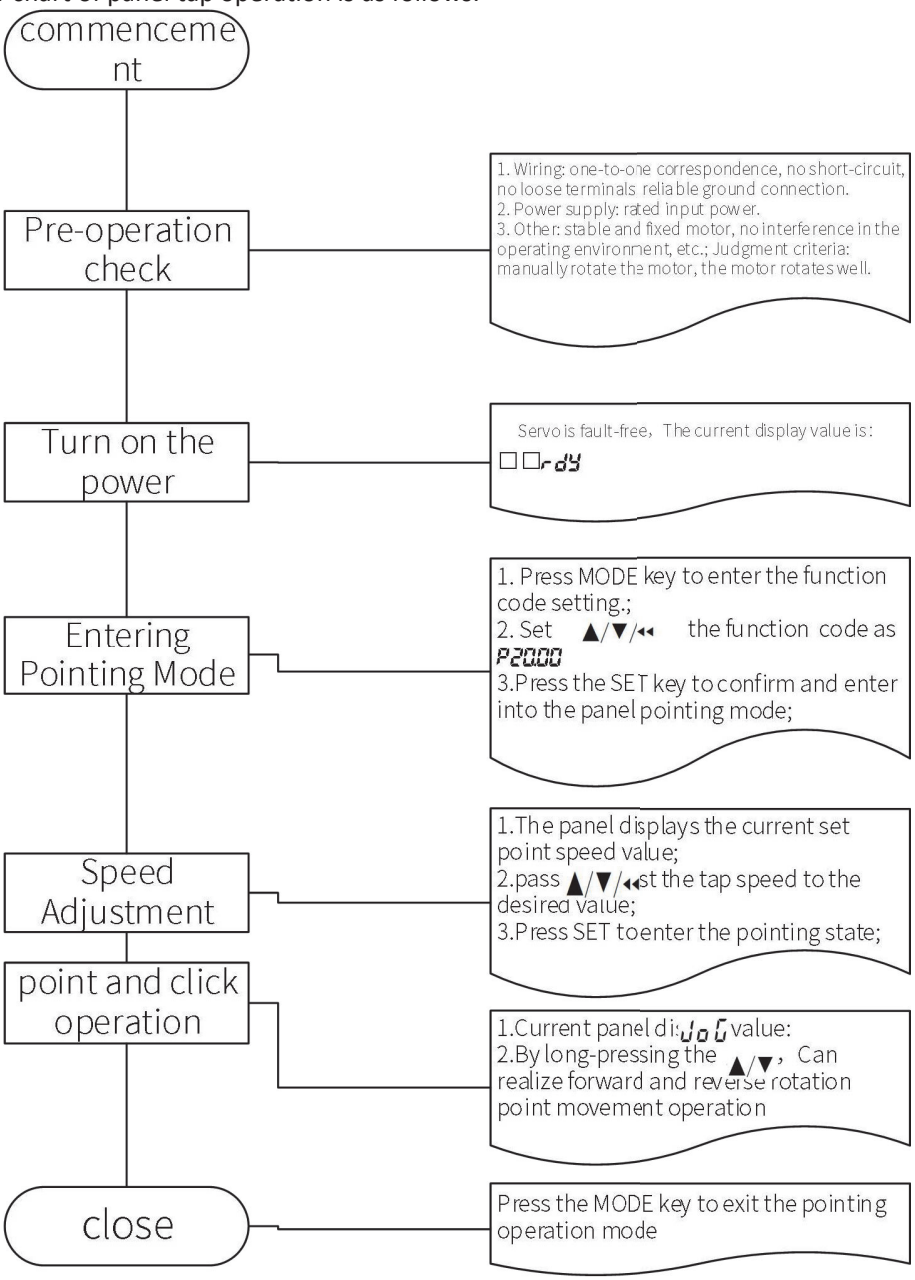


Figure: 4.2-3 Panel Tap Operation Flowchart

Using the panel pointing operation can confirm whether the servo system can operate normally, and whether there is any abnormal vibration and sound when the motor rotates.

4.3 Servo Commissioning Software Use

Servo Debugging Software is a debugging software for N3RP series servo drives.

4.3.1 Operational environment

This software is a green, no-installation version.

- Operating Requirements

hardware environment：PC

operating system： Windows7 x86&64、Windows10 x64、Windows11 x64

dependencies： Net Framework 4.5and above

4.3.2 Parameter management

Click on the toolbar function code parameter setting screen。

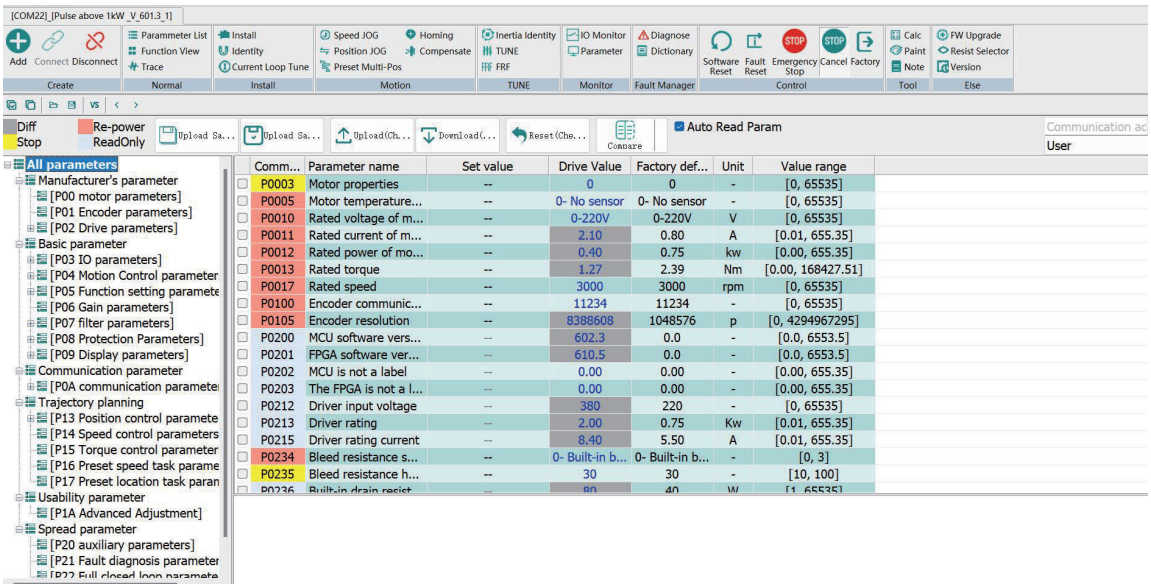


Figure: 4.3-1 Parameter List

- toolbar area

：The current page function code is all or nothing;

：Open and save the recipe file, saving the recipe only saves the current page with the function code checked;

：Parameter recipe comparison function, as follows.

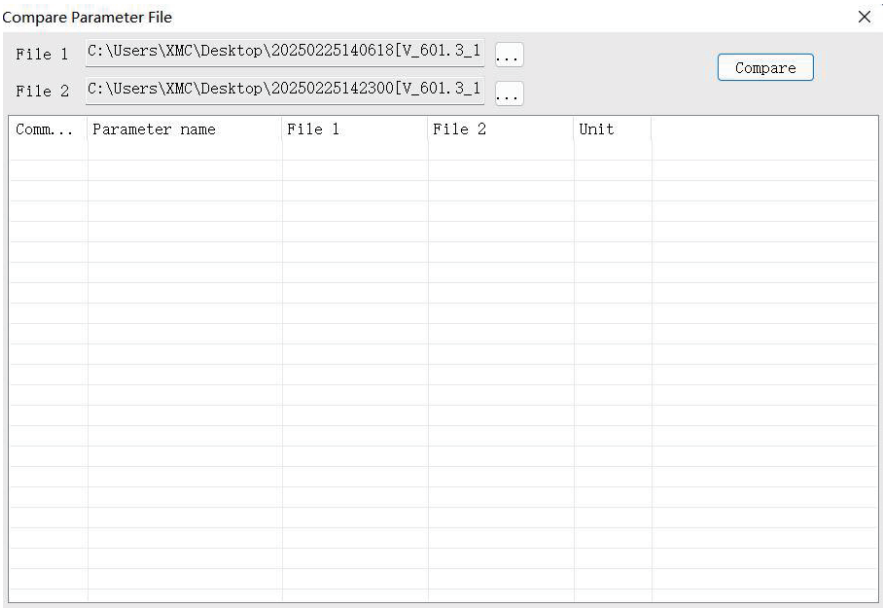


Figure: 4.3-2 Comparison of parameters

Previous Edit Group, Next Edit Group;

Restore Factory Settings;

- view area

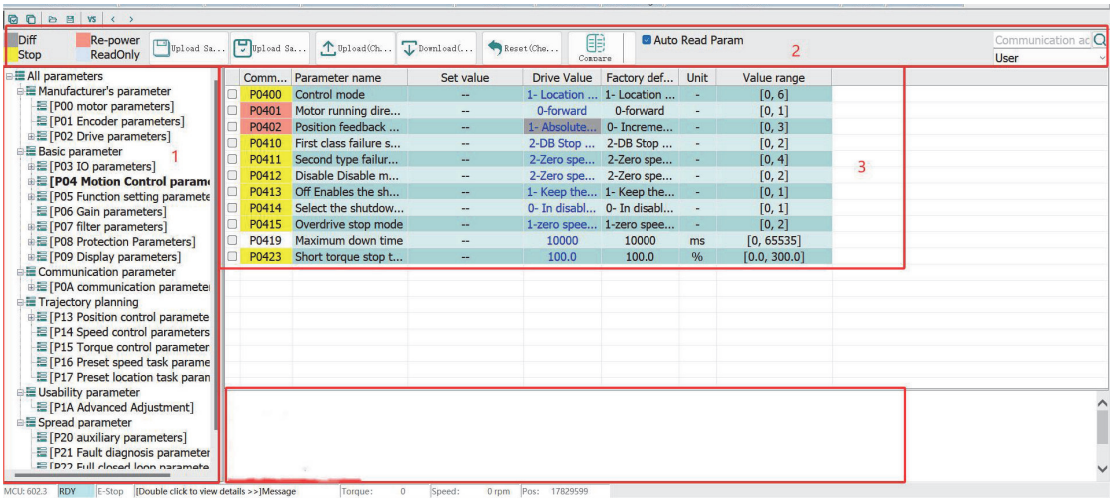


Figure: 4.3-3 Parameter List View

1、 Function code grouping area: from the user's point of view, divided into groups by function, more convenient for users to use;

2、 operating area:

Upload Hooks: Reads the current page of checked function code values from the drive and updates them to the set value column;

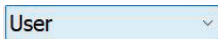
Download Tick: Download the current page of ticked function code settings to the drive;

Restore Checked: Restore the set value columns that have been checked on the current page to their factory values;

Refresh current value in real time: when checked, the current value column reads the function code value from the driver in real time;

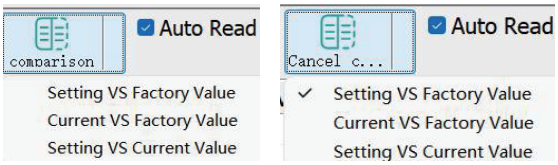
: Function code lookup,, support function code address, name, drop-down item fuzzy

query;

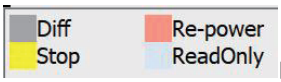


: Permission switching, support for ordinary, administrator, manufacturer three kinds of permissions, different permissions to display different function codes, manufacturer permissions for the use of manufacturers, not recommended for customers;

Parameter Comparison Function: It supports three kinds of comparison between set value and factory value, set value and current value, and current value and factory value. After clicking the comparison item, it will enter the comparison view, and users can click "Cancel Comparison" to exit the comparison view;



3、 Function code list area



List area that displays different background colors based on function code attributes;

Set value: User can edit the parameter through this column, the read-only parameter font is grayed out and cannot be modified;

Current Value: After the user checks Real-time Refresh, the Current Value column displays the drive value in real time;

Help: The user's mouse selects a function code line, and the help area displays help information for the selected function code;

- Right-click menu: Right-click on the parameter list area supports quick operations such as select all current pages, cancel select all current pages, read and write function codes, open and save recipes, and save modified parameters.

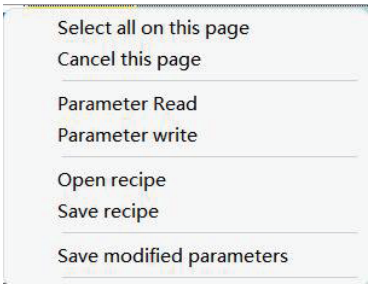


Figure: 4.3-4 Right-click Menu

4.3.3 Oscilloscope

- toolbar

: Open the waveform file in csv format;

: Save the current waveform only file in csv format;

: Take a screenshot of the current waveform display area, in bmp format;

: Measurement Function, click this button to perform measurement operations on the AB interval waveform by dragging the A and B cursors in the waveform area;

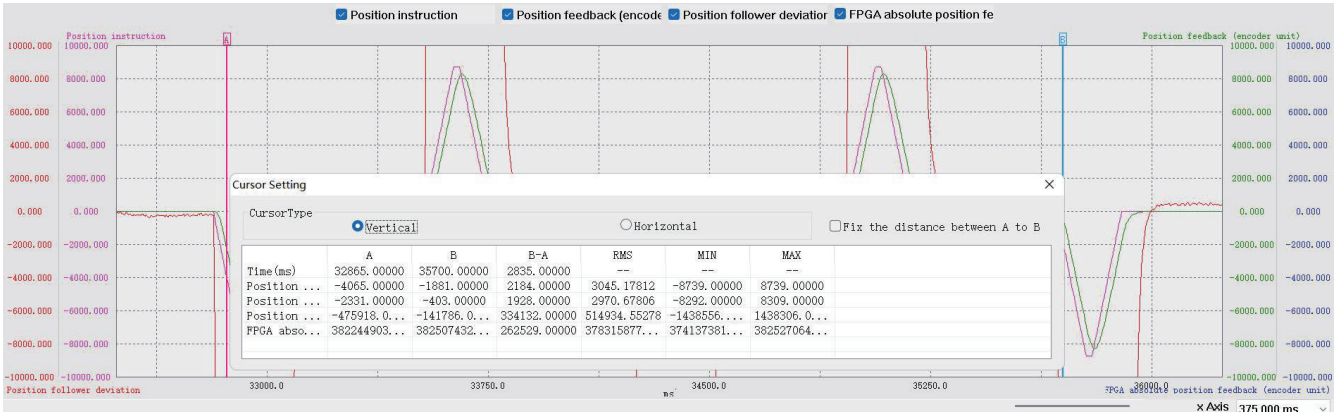


Figure: 4.3-5 Vernier Measurement

: Cursor function, after clicking this button, the mouse slides over the waveform area and displays the current mouse position showing the value of each channel in the waveform;

: Waveform amplification, click the button for the button is pressed down state amplification function is in effect, click the button again to lift the amplification failure; left mouse button to circle the waveform, zoom in on the circled area;

: Adaptive coordinate system, click this button, it will automatically calculate the waveform maximum and minimum values for vertical coordinate adaptation;

: FFT analysis, click the button, the left mouse button to circle the waveform area, the left mouse button lift the software for FFT analysis, pop-up analysis results, and identify the three resonance point frequency, the following figure:

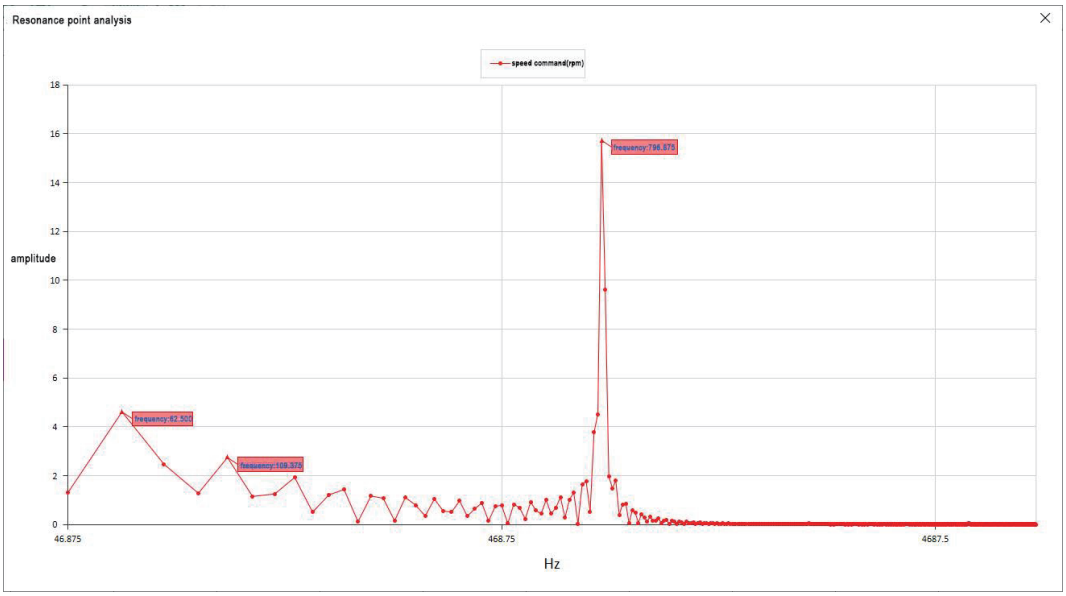


Figure: 4.3-6 FFT Resonance Point Analysis

：Waveform Comparison, click this button to select the waveforms to be compared, and the waveform files in the file will be superimposed onto the existing waveform area;

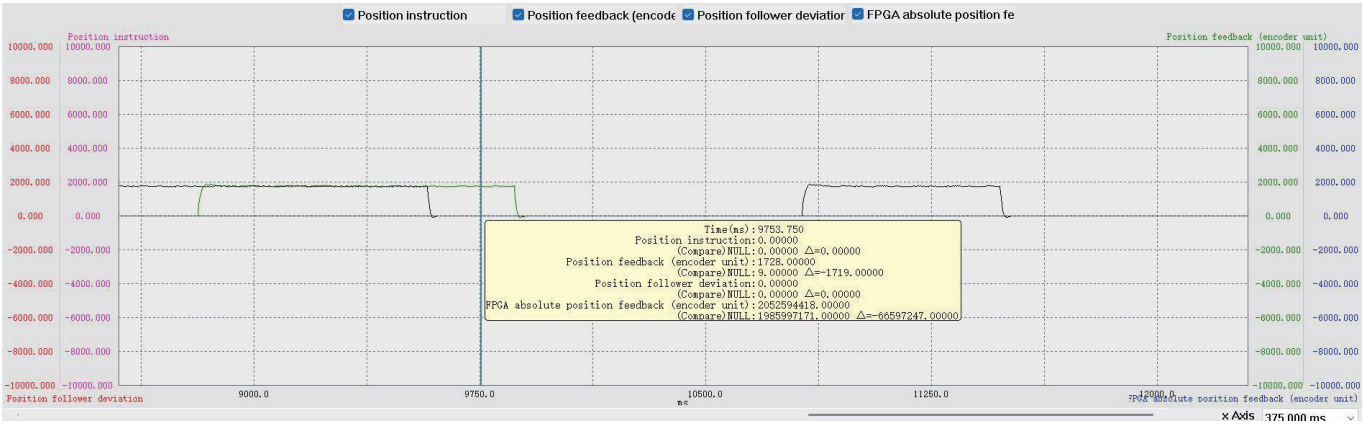


Figure: 4.3-7 Waveform Comparison

：Cancel Waveform Comparison, click this button and the compared waveform is deleted from the waveform area;

- placement

Channel Configuration: The oscilloscope supports up to four channels of acquisition. Users can use the three buttons of "Position Acquisition", "Velocity Acquisition" and "Torque Acquisition" to quickly generate the channel configurations under the corresponding modes;

Sampling mode: supports both triggered and continuous sampling.

Trigger Sampling: Accuracy can be up to 1x carrier frequency, but the number of sampling points is small (1024 points per channel). Users can click the "Trigger Condition" button to enter the Trigger Condition Setting interface to set the trigger condition;

Continuous sampling: continuous sampling accuracy at the millisecond level, supports long time continuous sampling, waveforms during sampling are automatically saved to the software directory "wavedata" directory.

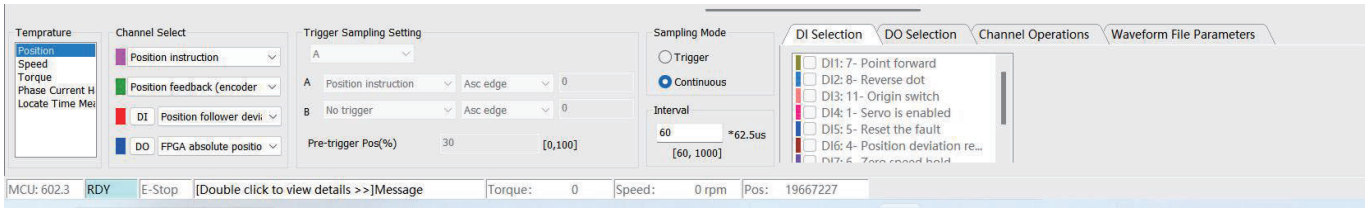
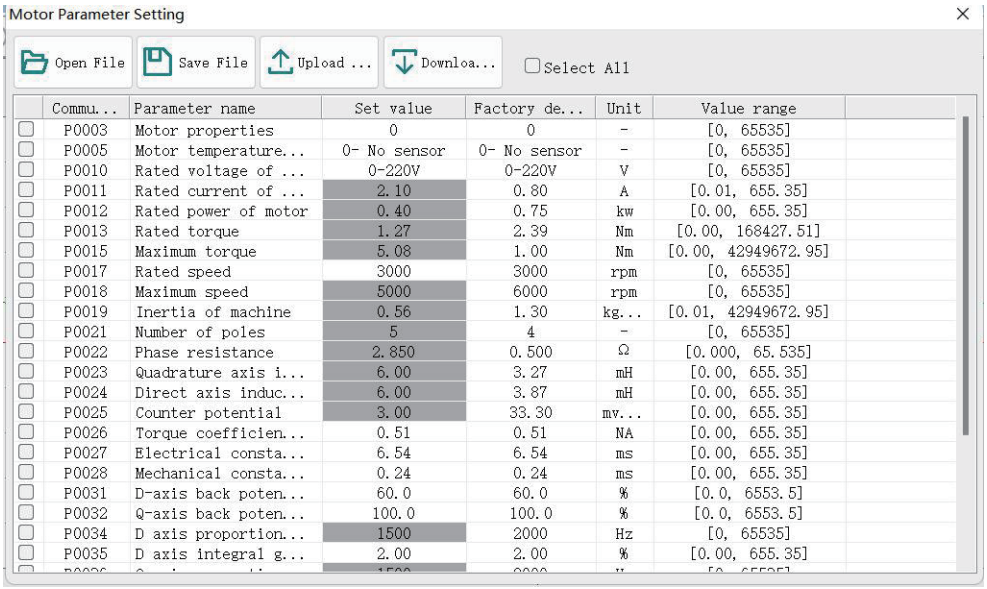


Figure: 4.3-8 Sampling Configuration Screen

4.3.4 Initialization

1. Motor parameterization

Click on the toolbar performs the motor encoder parameter setting screen:



	Commu...	Parameter name	Set value	Factory de...	Unit	Value range
☐	P0003	Motor properties	0	0	-	[0, 65535]
☐	P0005	Motor temperature...	0- No sensor	0- No sensor	-	[0, 65535]
☐	P0010	Rated voltage of ...	0-220V	0-220V	V	[0, 65535]
☐	P0011	Rated current of ...	2.10	0.80	A	[0.01, 655.35]
☐	P0012	Rated power of motor	0.40	0.75	kw	[0.00, 655.35]
☐	P0013	Rated torque	1.27	2.39	Nm	[0.00, 168427.51]
☐	P0015	Maximum torque	5.08	1.00	Nm	[0.00, 42949672.95]
☐	P0017	Rated speed	3000	3000	rpm	[0, 65535]
☐	P0018	Maximum speed	5000	6000	rpm	[0, 65535]
☐	P0019	Inertia of machine	0.56	1.30	kg...	[0.01, 42949672.95]
☐	P0021	Number of poles	5	4	-	[0, 65535]
☐	P0022	Phase resistance	2.850	0.500	Ω	[0.000, 65.535]
☐	P0023	Quadrature axis i...	6.00	3.27	mH	[0.00, 655.35]
☐	P0024	Direct axis induc...	6.00	3.87	mH	[0.00, 655.35]
☐	P0025	Counter potential	3.00	33.30	mv...	[0.00, 655.35]
☐	P0026	Torque coefficien...	0.51	0.51	NA	[0.00, 655.35]
☐	P0027	Electrical consta...	6.54	6.54	ms	[0.00, 655.35]
☐	P0028	Mechanical consta...	0.24	0.24	ms	[0.00, 655.35]
☐	P0031	D-axis back poten...	60.0	60.0	%	[0.0, 6553.5]
☐	P0032	Q-axis back poten...	100.0	100.0	%	[0.0, 6553.5]
☐	P0034	D axis proportion...	1500	2000	Hz	[0, 65535]
☐	P0035	D axis integral g...	2.00	2.00	%	[0.00, 655.35]

Figure: 4.3-9 Motor parameter management

- to open the file: debugging software has been integrated into the N3RP servo related motor parameters recipe, the user can directly select the motor model corresponding to the recipe. As shown in the figure below, select the recipe and click "Open" button.
- Save File: You can edit the parameter by editing the parameter value column, after editing, click "Save File" button to save the motor recipe;
- upload checkbox: read all motor parameters from the encoder;
- Download Tickbox: Tick the parameters to be downloaded, click the "Download" button to download the motor parameters to the encoder.

2. Magnetic pole identification

This function is used to initialize the motor angle when the motor is run for the first time.

Click on the toolbar

, Enter the Magnetic Pole Recognition screen:

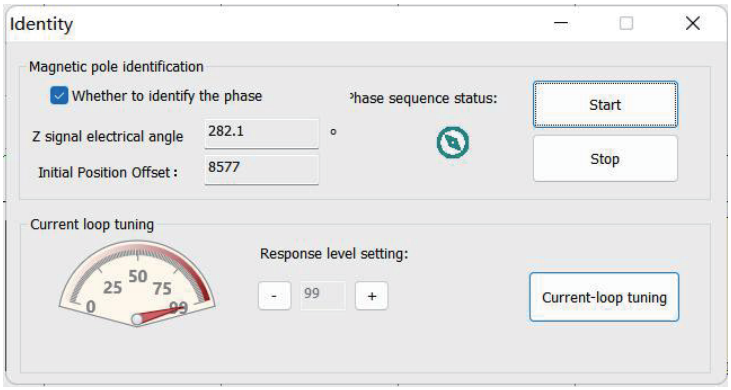


Figure: 4.3-10 Magnetic pole identification

3． DI/DO monitoring

This function is used to display DI and DO functions, status and pin wiring information, and also supports to force DI and DO outputs and perform DI and DO simulation.

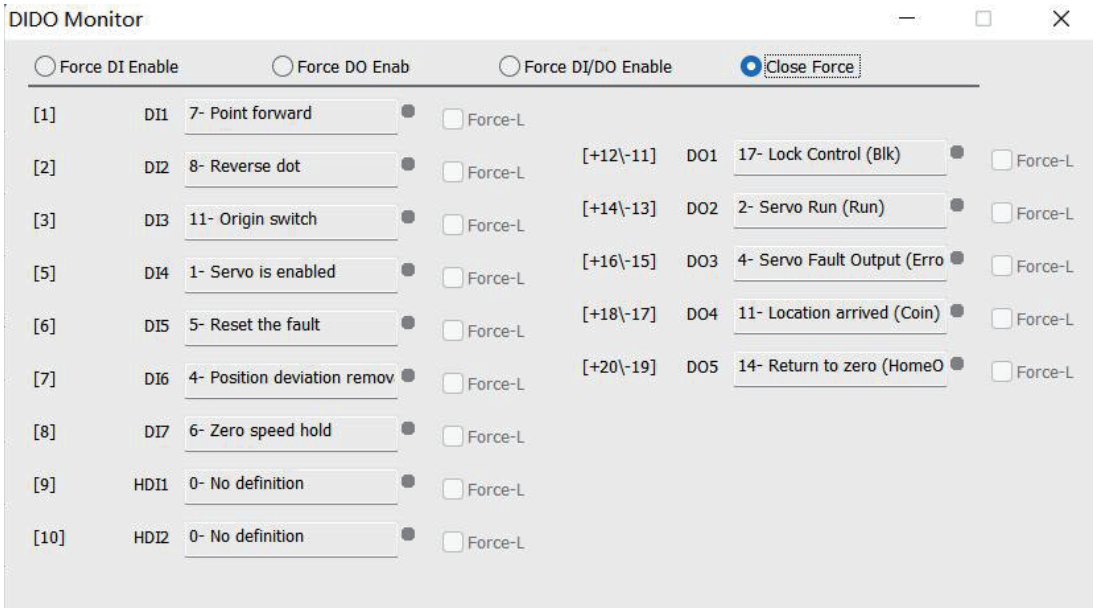


Figure: 4.3-11 DIDO Monitoring

4.3.5 Trial run

1． Speed JOG

This function can be used to control the rotation of the motor in the pointing mode, and to detect whether the motor can operate normally and whether there is any abnormality when it rotates.

Click on the toolbar Speed JOG， Enter the Speed JOG screen:

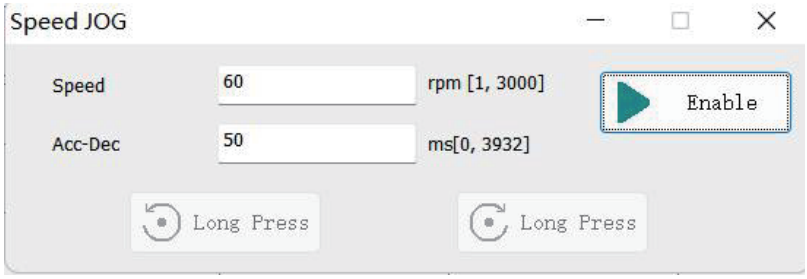


Figure: 4.3-12 Speed JOG

The steps for use are as follows:

a. Enter the motor running speed, acceleration and deceleration time parameters;

b. Click the Enable switch to enable the driver;

c. Left mouse button long press "long press forward" "long press reverse" button, control the motor for forward, reverse; mouse release, stop running.

2． Location JOG

This function is mainly used to control the motor to run in a reciprocating or fixed-distance manner according to the specified speed within the specified running limit position.

Click on the toolbar ⇋， Enter the location JOG screen:

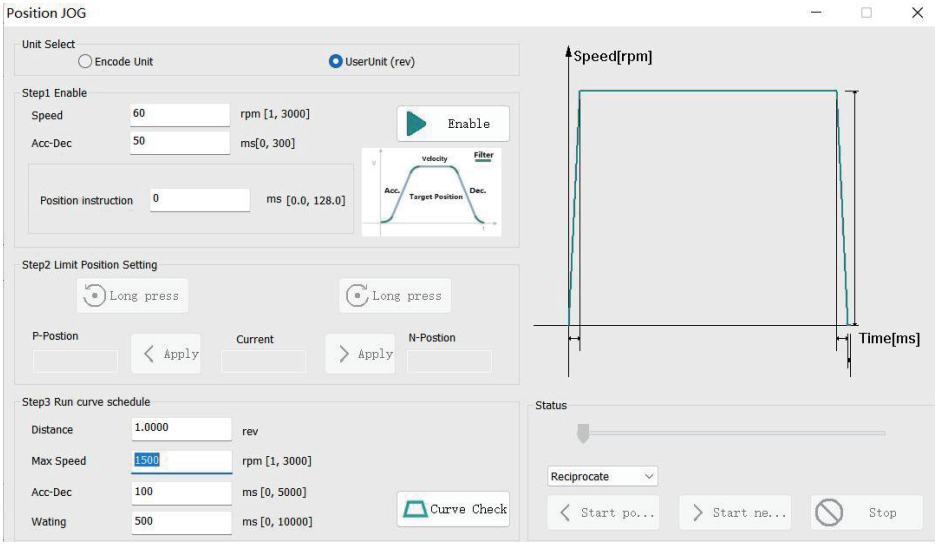


Figure : 4.3-13 Position JOG

The steps for use are as follows:

a. Enter the motor running speed, acceleration and deceleration time parameters and click the Enable ON button;

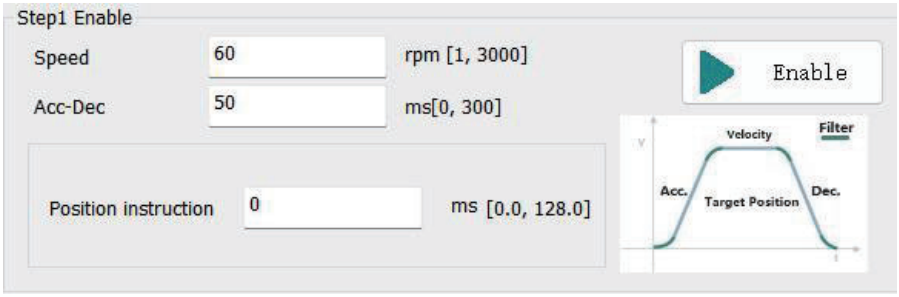


Figure: 4.3-14 Enabling ON

b. Operating limit position setting: Left mouse button long press button "long press forward", "long press reverse" for positive and negative limit position setting.

Fig. 4.3-15 Positive and Negative Limit Position Setting

c. Running curve planning: Setting running curve trajectory parameters;

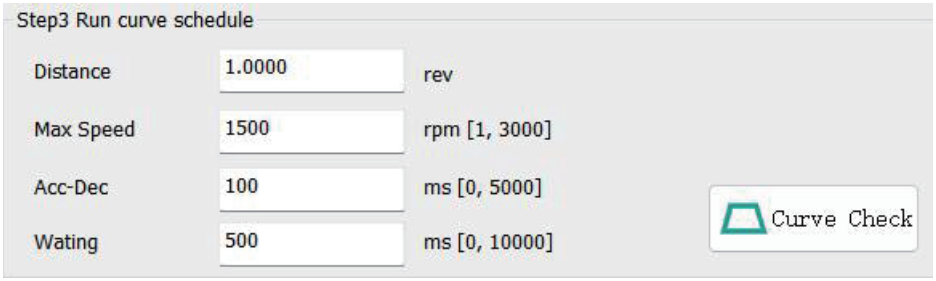


Figure: 4.3-16 Run Curve Configuration

Click on "Trajectory Verification" to generate a simulated running curve;

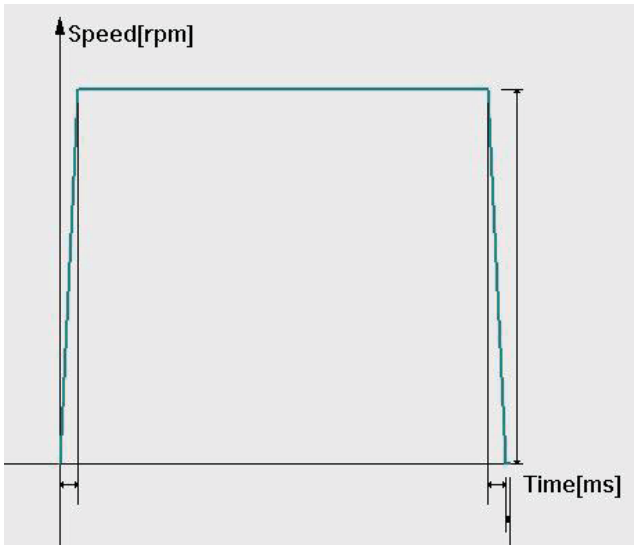


Figure: 4.3-17 Run Trace Generation

d. Running

Single: The motor moves the specified distance within the operating limits.

Reciprocating: The motor will reciprocate in the specified limit position range.

Clicking on the button "Start Forward" or "Start Reverse" starts the operation and clicking on the button "Stop" stops the motor;

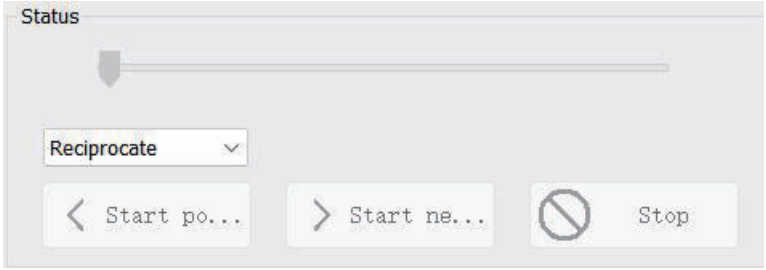


Figure: 4.3-18 Operation

3. Pre-positioned missions

This function supports the user to preset multiple running trajectories, the maximum support 16 segments.

Click on the toolbar , Enter the Preset Position Tasks screen:

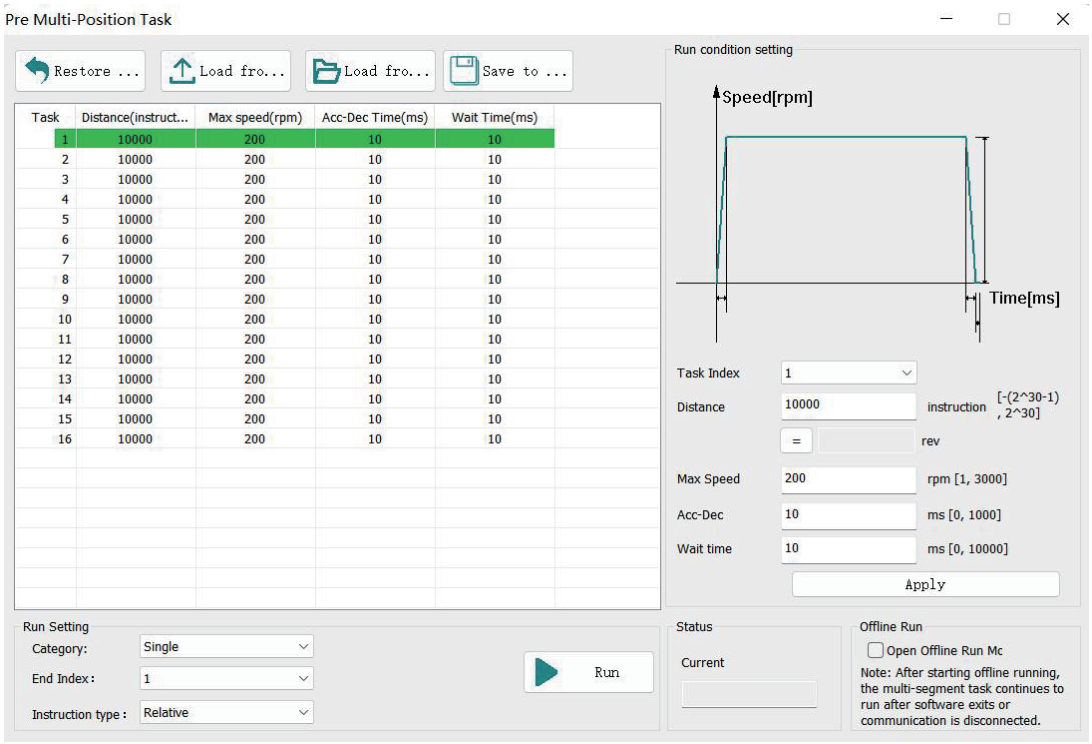


Figure : 4.3-19 Location JOG

The steps for use are as follows:

a. Edit the parameters of each segment: Select the specified task segment in the list, edit the running parameters, and then click "Apply" to update the parameters to the list;

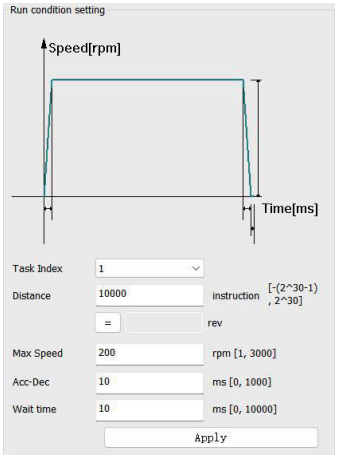


Figure : 4.3-20 Position Segment Configuration

b. Operational settings

Running mode: single and cycle are supported. The multi-segment position task runs only once in single-time mode; the multi-segment position runs cyclically in cyclic mode;

Termination Segment: The user can select the number of segments to be executed, the program will run from the first segment in order to terminate only the segment;

Instruction type: Relative displacement instruction and absolute displacement instruction are supported;

Click on "Run" to start the multi-stage trajectory task and the motor will run according to the preset trajectory;

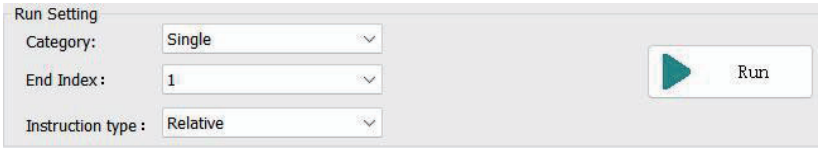


Figure: 4.3-21 Operation

4．Zero return

This function supports 35 kinds of return-to-zero modes, users can select the mode directly, or generate the corresponding return-to-zero mode according to the home return mode, start direction, encounter limit track, return-to-zero completion position, etc.

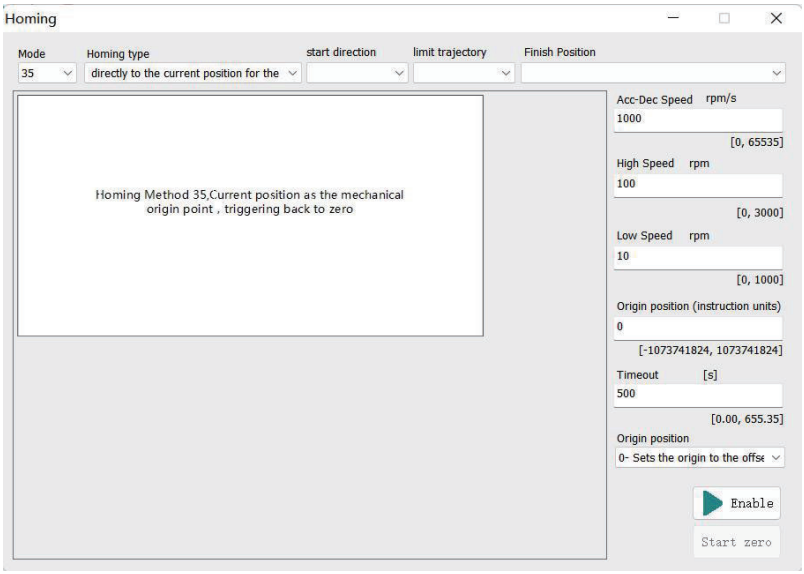


Figure: 4.3-22 Return to Zero

4.3.6 Tuning

1. Offline inertia identification

This function is based on the offline method for inertia recognition.

Click on the toolbar , Enter the Offline Inertia Recognition screen:

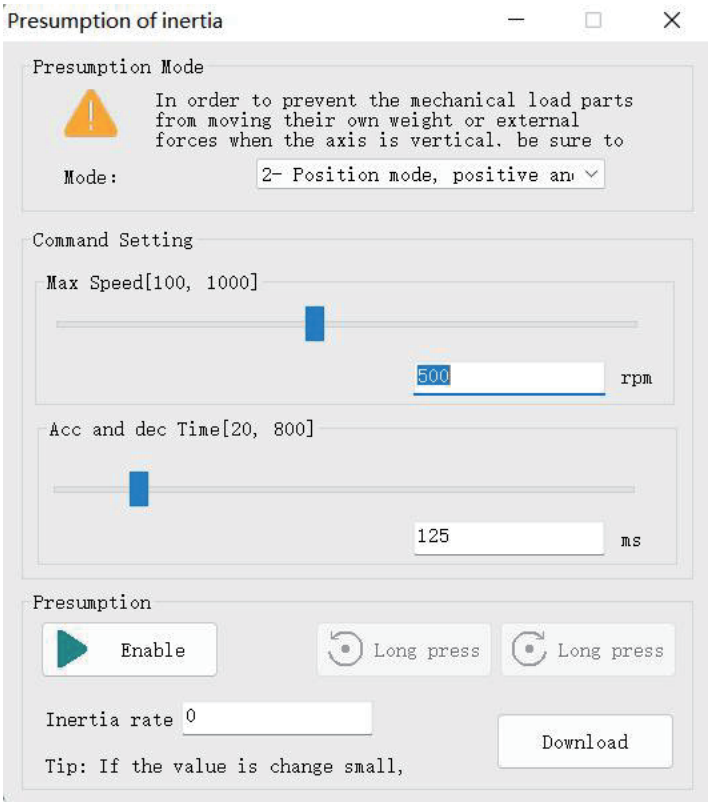


Figure: 4.3-23 Inertia Recognition

The steps for use are as follows:

a. Parameter Settings: Set the identification mode, maximum speed, and acceleration time. The software supports four modes: "0 - Speed mode, forward/reverse rotation", "1 - Speed mode, jog operation", "2 - Position mode, forward/reverse rotation operation", and "3 - Position mode, unidirectional operation". Click the enable switch to activate the driver.

b. Press and hold the "Long press forward" and "Long press reverse" buttons with the left mouse button for inertia recognition.,

Real-time display of the current identification results, identification of the value of the change is very small, can be judged as the end of the identification, click the "Download" button to write the identification results to the drive.

2． Gain adjustment

The software supports two gain adjustment methods: automatic gain adjustment and manual gain adjustment.

- Automatic Gain Adjustment

Users can decrease or increase the rigidity level by dragging the slider with the mouse or clicking the "-" and "+" buttons.

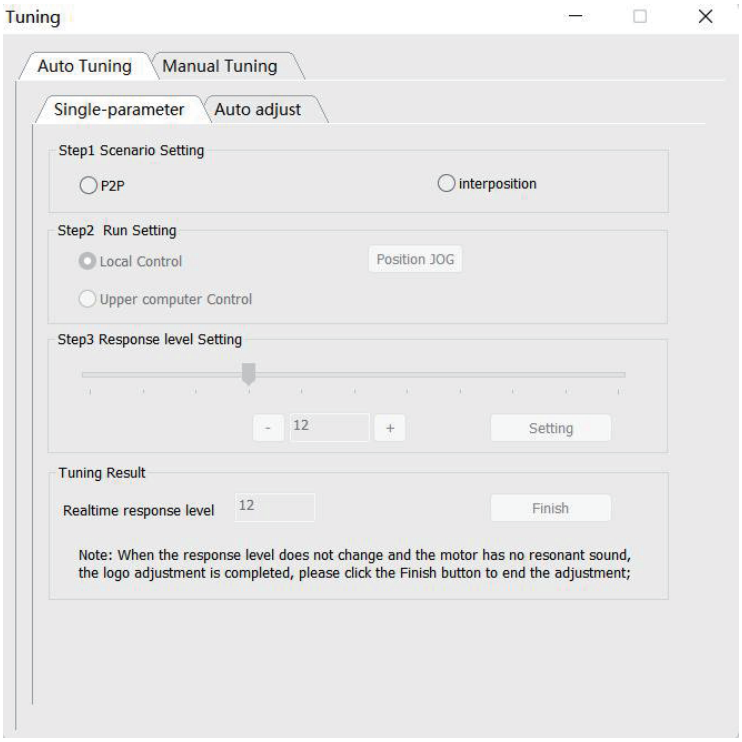


Figure: 4.3-24 Rigidity Table Setting

- manual gain adjustment

The command pattern supports both sinusoidal and step patterns. Supports adjustment of loop gain for position, speed, and torque control modes.

Figure: 4.3-25 Speed Loop Gain Adjustment

3． Frequency domain analysis-FRF

Frequency domain analysis supports three modes: velocity closed loop, velocity open loop, and mechanical characterization.

- Speed Closed Loop: automatically calculates and labels amplitude bandwidth and phase bandwidth.

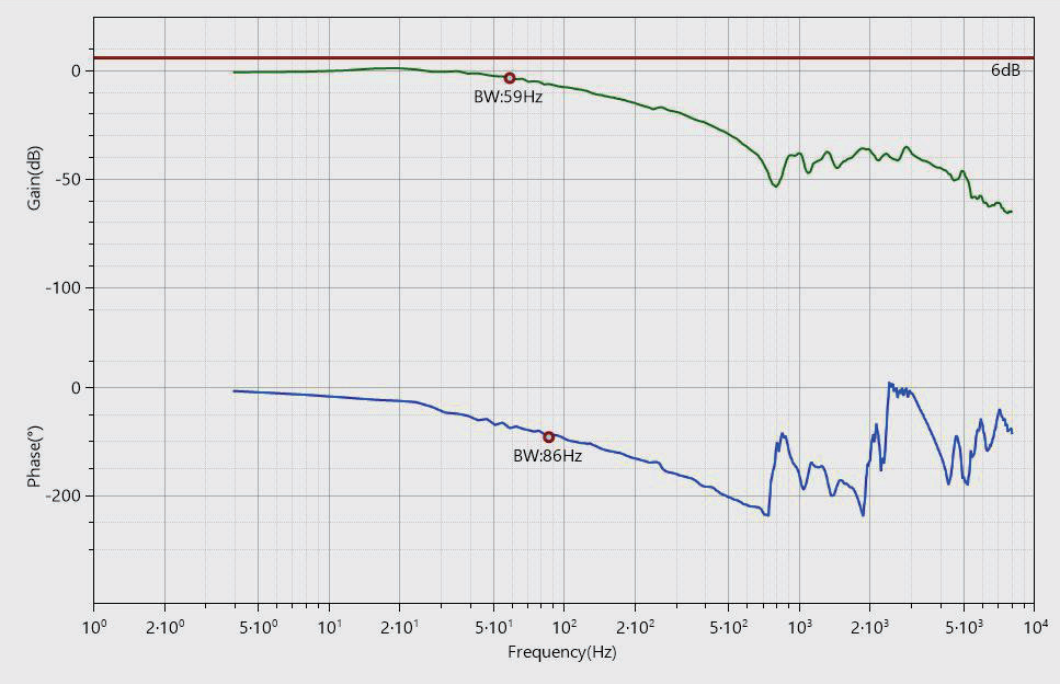


Figure: 4.3-26 Velocity Closure

- speed open loop: automatically calculates and labels amplitude margins and phase margins.

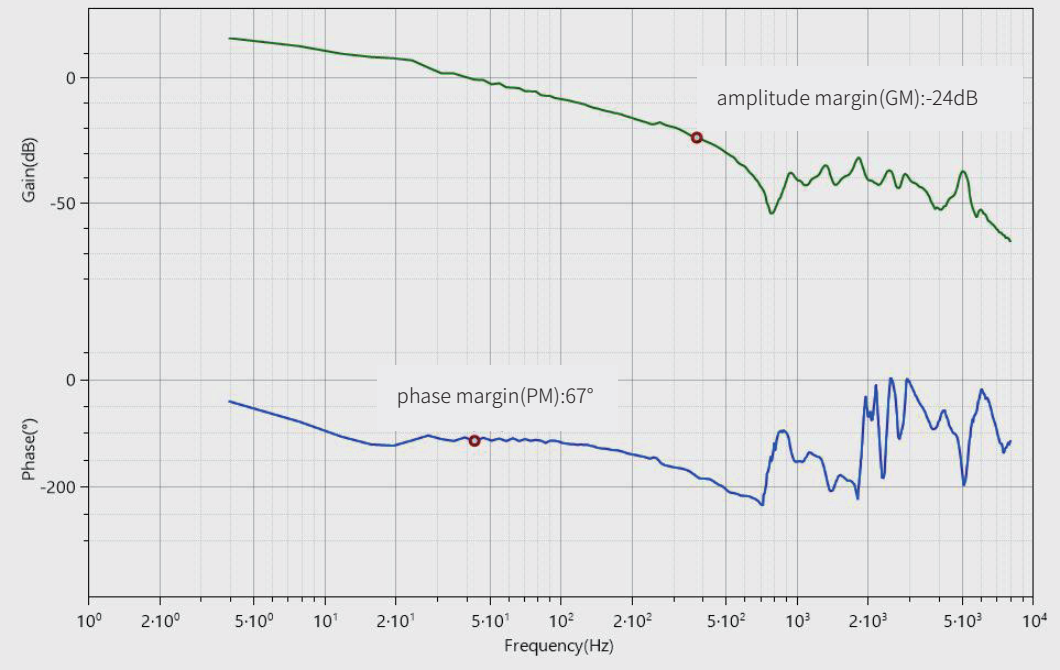


Figure: 4.3-27 Velocity Open Loop

- Mechanical properties: automatic identification of resonance and anti-resonance points. At present, the debugging software will automatically identify the two resonance points, and after identifying them, it will be automatically updated to the setup parameters of the traps, and users can directly click the download to write the identified resonance point frequencies into the driver.

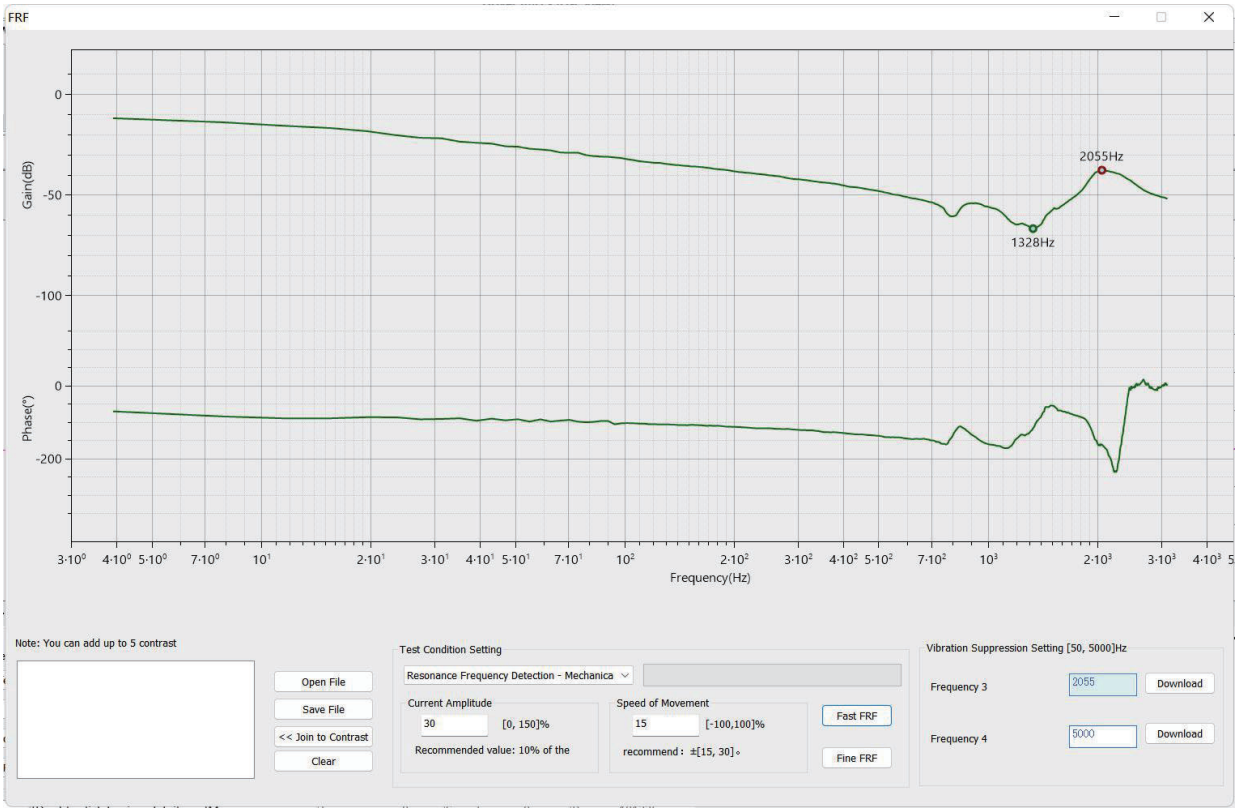


Figure: 4.3-28 Mechanical Properties

4.3.7 Troubleshooting

1. Real-time faults

When the equipment failure, the debugging software status bar real-time prompts the user (as shown below), the user can double-click the fault area to view the details of the fault, the red color identifies the fault, the yellow color identifies the warning.

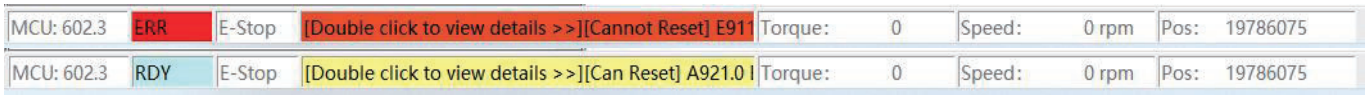


Figure: 4.3-29 Troubleshooting

Fault details include: fault name, level, whether it can be reset, fault cause, detection method and solution, etc., which is convenient for users to quickly troubleshoot the fault.

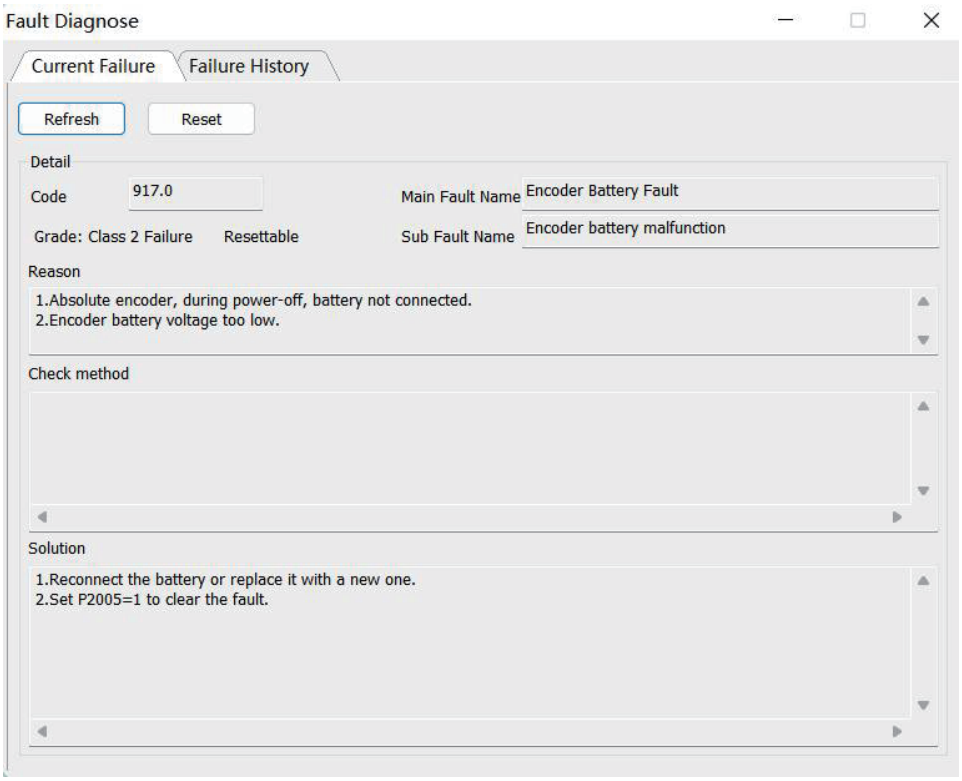


Figure: 4.3-30 Troubleshooting

2． Failure history

This function supports querying the last 10 historical fault information.

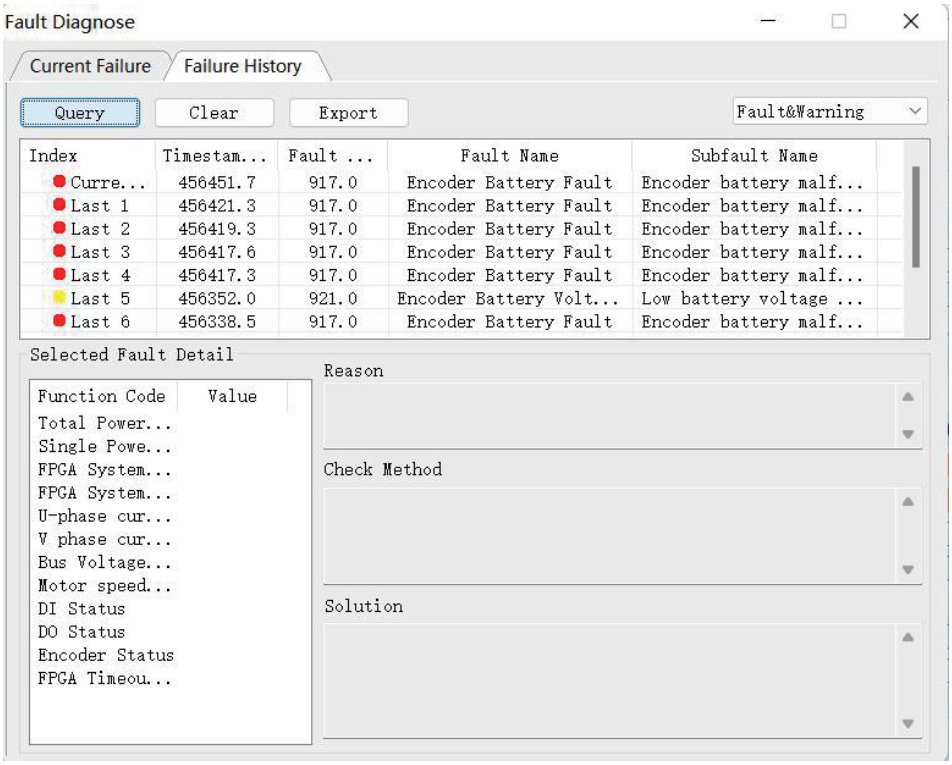


Figure: 4.3-31 Fault History

"Query" button: query the device's recent failure history, the information as shown above;

"Clear" button: Clears the history of faults in the drive;

When the mouse selects the history list line, the bottom of the list displays the relevant parameter information

and troubleshooting information at the time of the selected fault;

Chapter 5 Basic Functions

5.1 Functional overview

Functional Module	Function Points (Full Range)	Functional Specifications
Inputs and outputs Signal	5-digit LED, 5-channel keypad	Parameter setting, status display;
	8 DI	Sampling period: DI~1ms
	5 DO Outputs	Minimum Hold Time: 1ms. 50mA, Voltage Range 5V~30V.
	Low-speed pulse input	Differential input: up to 500 KHz
		Open collector: up to 200KHz
	High-speed pulse input	Supports differential inputs only: up to 4MHz
	crossover output	Up to 4MHz differential output
	Dynamic Braking Function (DB)	be in favor of
	Drain Control Function	Power-down discharge/over-voltage discharge/discharge blocking line detection
	USB debugging	DriveStart
Position Control Mode	Location command source	Pulse input/preset position/position JOG
	Instruction Filtering	Mean value/low pass/command trap/command integer
	Position feedback	Incremental mode/absolute linear/absolute rotary
	Electronic Gear Ratios	-
	软限位	-
	status output	Positioning complete/positioning close/motion complete
Speed Control Mode	Speed command source	Keyboard setting/communication setting/preset speed /speed JOG
	speed limit	-
	Speed Feed Forward	-
	Zero speed clamp	-
	status output	Motion Signal / Zero Speed Signal / Speed Arrival / Speed Consistency
Torque Control Mode	Torque command source	Keyboard Assignment/Communication Assignment
	Instruction Filtering	Two low-pass filters
	Torque Limit	
	speed limit	
	Torque Feed Forward	
	state processing	Torque Arrival/Torque Limit/Speed Limit

Functional Module	Function Points (Full Range)	Functional Specifications
control algorithm	Standard Rigidity Table	Up to 41 levels of rigidity
	Adaptive gain adjustment	-
	feedforward control	
	Gain switching	-
	Single-parameter self-tuning	-
	Offline inertia discrimination and online inertia discrimination	-
	Adaptive Trap	-
	vibration suppression	A-type vibration control, torque second-order low-pass filtering
	two-degree-of-freedom control	
	velocity observer	-
	Frequency domain characterization	Plotting open-loop and closed-loop Bird diagrams of control systems
	disturbance observer	-
	Model tracking control	-
	Deadband compensation	-
	Motor parameter identification	-
	magnetic pole identification	-
	Current loop self-tuning	-
protective function	troubleshooting	Fault display/storage/reset
	Drive hardware anomaly protection detection	Input phase loss, over-voltage, under-voltage, over-current, soft start abnormality, drain overload, driver overload, driver over-temperature and so on;
	Drive software anomaly protection detection	Parameter storage faults, product matching fault detection and more;
	Motor Abnormal Protection Detection	Short circuit detection to ground, motor overheating, motor overload, motor overspeed, phase sequence error, output phase loss, etc;
	Encoder Abnormal Protection Detection	Encoder disconnection, encoder communication abnormality, encoder battery abnormality, encoder count detection abnormality, and so on;
	Motion Control Abnormal Protection Detection	Positive and negative overtravel protection, flyer protection, command overspeed, excessive position deviation, zero return timeout, etc;
	Performance Algorithm Anomaly Protection Detection	Inertia recognition faults, pole recognition faults, motor parameter recognition faults, and so on;

Functional Module	Function Points (Full Range)	Functional Specifications
Servo debugging software debugging	Debugging Support	Background Speed Jog / Position Jog / Preset Position / Zero Return / Mechanical Characterization / Inertia Recognition / Single Parameter Gain Adjustment
		Time-domain tuning/frequency-domain characterization/current loop parameter tuning/parameter identification/pole identification, etc.
	electronic oscilloscope	Continuous Oscilloscope/Single Sampling
	fault diagnosis	Real-time faults/fault history/fault dictionary
	Operation status monitoring function	Parameter realization display
Other Functions	Multiple shutdown options	Zero speed/sharp turn according/slope/DB/free
	Real-time mode switching	-
	Servo operation status monitoring	Load factor, bus voltage, DIDO level, position feedback, position deviation, and more;
	CALL function	-
	software reset	-
	User Password Setting	-
	Parameter power-down save	-
	Parameter one-click factory restore	-

5.2 Control modes

5.2.1 Position control mode

"Command Unit": is the smallest value that can be distinguished from the input to the Servo Drive from the upper unit.

"Encoder unit": is the value of the input command, processed by the electronic gear ratio.

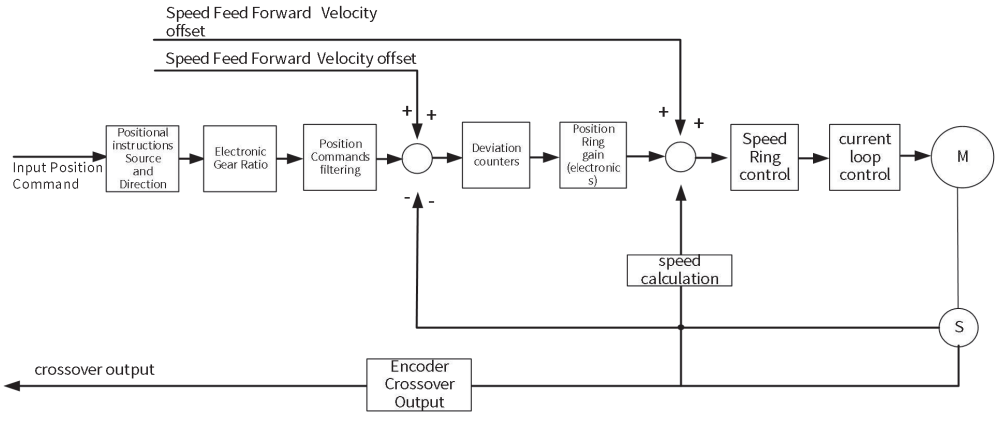


Figure: 5.2-1 Position Control Block Diagram

By setting the value of parameter P04.00 to 1 through the servo drive panel or servo debugging software debugging platform, the servo drive will work in position control mode.

Please set the servo drive parameters according to the mechanical structure and specifications. The following describes the basic parameter settings when the position control mode is used.

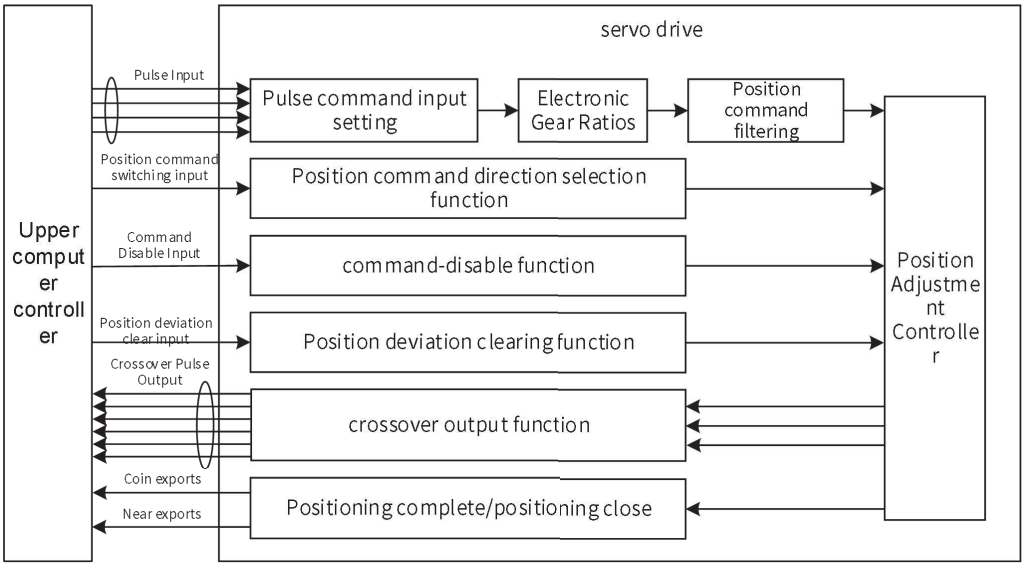


Figure: 5.2-2 Signal Interaction Diagram between Servo Drive and Upper Computer

5.2.1.1 Position command source selection

Position command input settings include: position command source, position command direction, and position command prohibition.

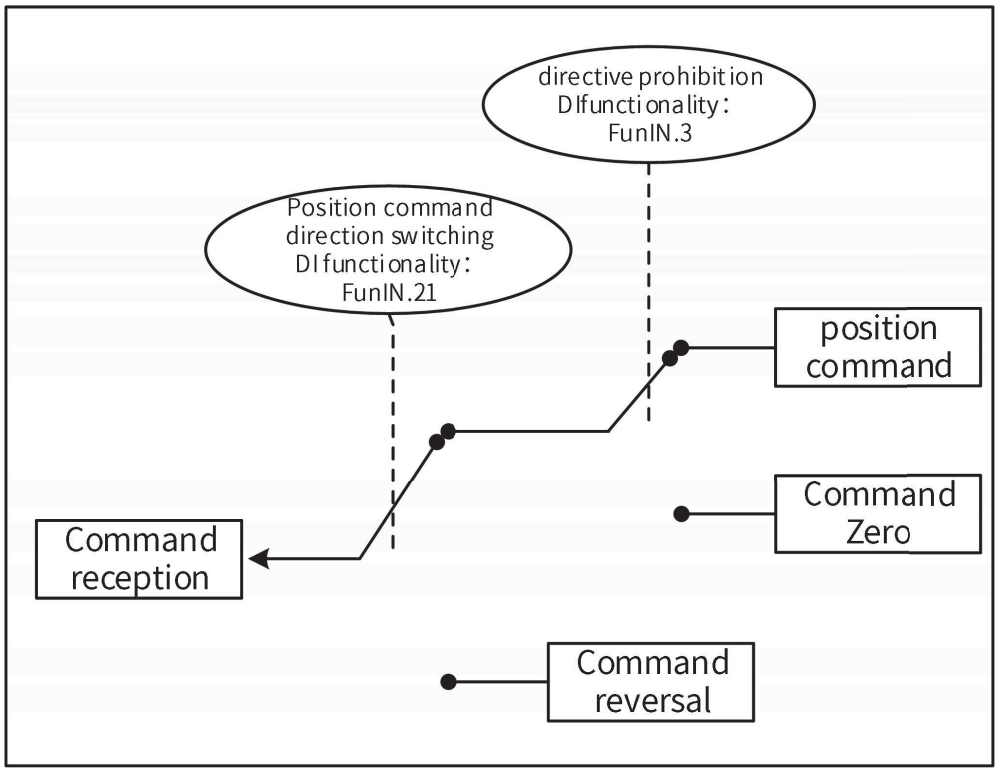


Figure : 5.2-3 Position Command Input Setting Block Diagram

1. Sources of positional instructions

For position control mode, the position command source should first be set via function code P13.00.

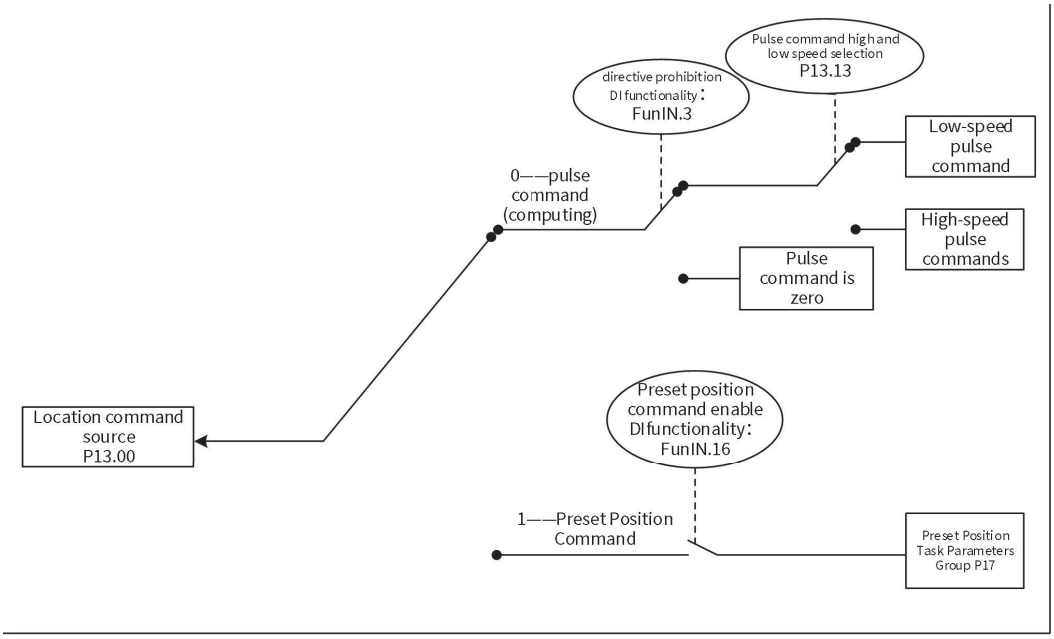


Figure : 5.2-4 Position Command Source Setting

Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
P13	00	Location command source	0-Pulse command 1-Preset position command	Sets the source of the location command. Where the pulse command is an external position command and the preset position command is an internal position command.	Shutdown Setting	Effective immediately	0

1) Position command source is a pulse command(P13.00=0)

When you select a pulse command, do the following to get the correct pulse command form.

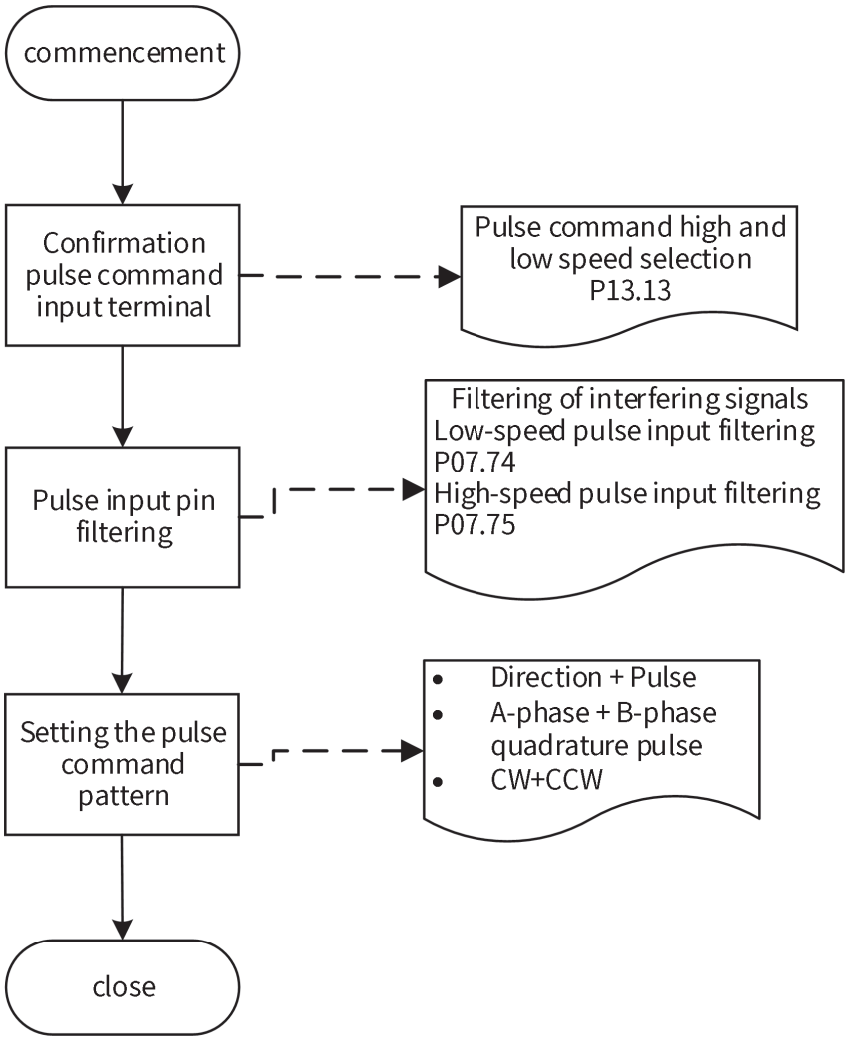
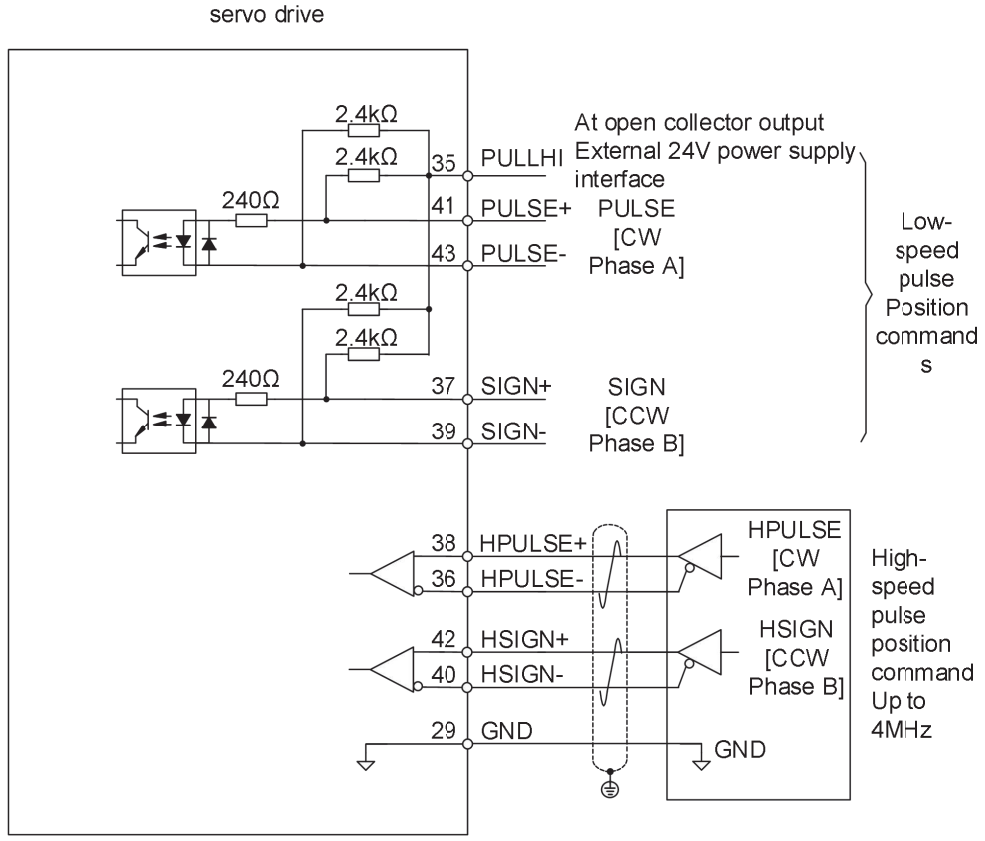


Fig. 5.2-5 Pulse command source setting process

- Pulse command input terminal

  The servo driver has 2 sets of pulse input terminals:



The low-speed pulse input terminals (corresponding to PULSE+, PULSE-, SIGN+, and SIGN-) accept differential inputs (input pulse max. frequency of 500 kpps) and open collector inputs (input pulse max. frequency of 200 kpps).

High-speed pulse input terminals (corresponding to HPULSE+, HPULSE-, HSIGN+, HSIGN-), accepting only differential inputs (maximum frequency of input pulses is 4 Mpps).

Function Code		Name	Setting Range	Functionality	Setting Method	Commencement Date	Factory Setting
P13	13	Pulse command high and low speed selection	0 - low speed 1-High Speed	Set the hardware input terminals for pulse commands.	Shutdown Setting	Effective immediately	0

Refer to Chapter 3 for a detailed description of the interface circuit.

Table 5.2-1 Pulse Input Specifications

Pulse Specifications		Maximum Input Frequency	Voltage Specification	Direct Current (Elec.)
High Speed Pulse	differential signal	4M	5V	<25mA
low-speed pulse	differential signal	500k	5V	<15mA
	Open collector signal	200k	24V	<15mA

- Pulse input pin filtering

The hardware input terminals for low-speed pulses or high-speed pulses need to be set up with a certain pin filtering time to filter the input pulse commands to prevent interfering signals from entering the servo driver and causing the motor to malfunction.

Function Code		Name	Setting Range	Unit (Of Measure)	Functionality	Setting Method	Commencement Date	Factory Setting
P07	74	Low-speed pulse Command filtering	0~255	25ns	Sets the filtering time constant for low-speed pulses.	Shutdown Settings	Energized again.	30
P07	75	High Speed Pulse Command Filter	0~255	25ns	Setting the filtering time constant for high-speed pulses.	Shutdown Settings	Energized again.	3

If the filtering time constant of the pulse input pin is tF and the minimum width of the input signal is tmin, the input signal and the filtered signal are shown below. Where the filtered signal will be delayed by tF compared to the input signal.

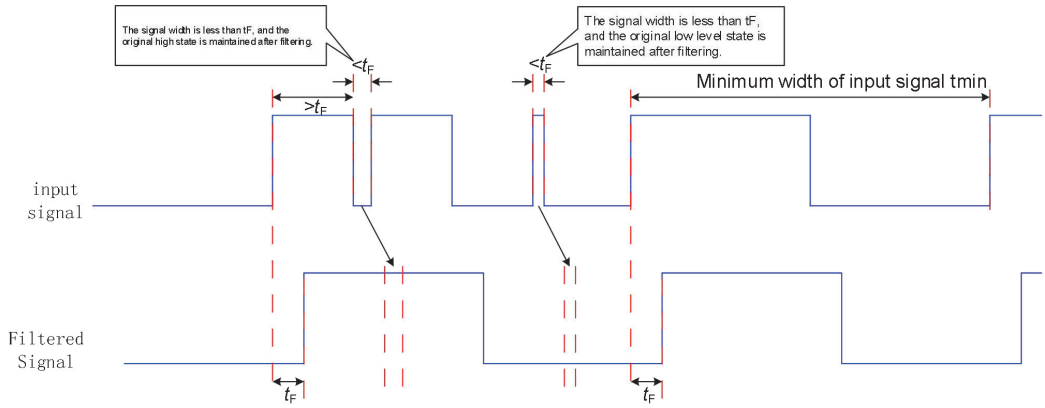


Fig. 5.2-6 Example of Filtered Signal Waveforms

Pulse input pin filtering time tF needs to satisfy: tF≤(20%~25%)tmin.

The maximum frequency (or minimum pulse width) of the input pulse is known and the recommended values of the filtering parameters are shown in the table below.

Table 5.2-2 Recommended Filtering Parameters Table

Input Pulse Terminal	Corresponding Function Code	Maximum Frequency Of Input Pulse	Recommended Filtering Parameters (Unit: 25ns)
Low-speed pulse input terminal	P07.74	<167k	30
Low-speed pulse input terminal	P07.74	167k~250k	20
Low-speed pulse input terminal	P07.74	250k~500k	10
High-speed pulse input terminal	P07.75	500k~1M	5
High-speed pulse input terminal	P07.75	>1M	3

Example: The setting value is 30, then the actual pulse input pin filtering time is 30*25=750ns.

- **Pulse Instruction Morphology**

There are three forms of pulse commands that can be input to the Servo Driver as follows:

Direction + pulse (positive or negative logic)

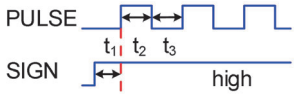
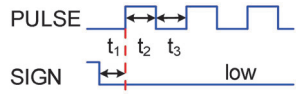
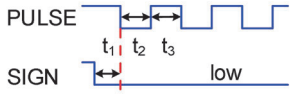
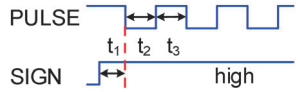
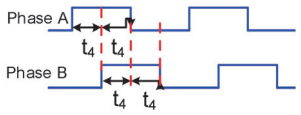
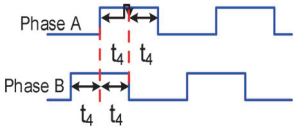
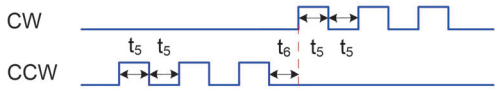
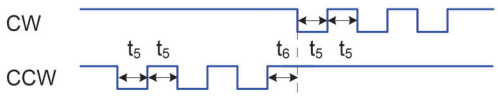
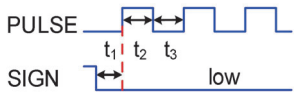
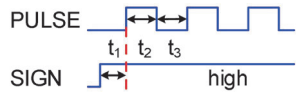
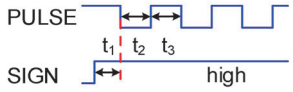
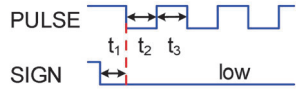
A-phase + B-phase quadrature pulse, 4x frequency

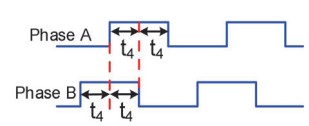
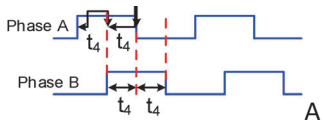
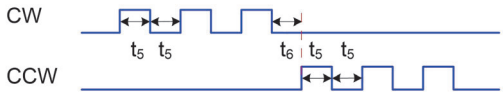
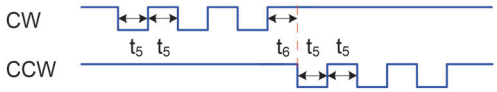
B-positive pulse / negative pulse (CW+CCW)

Please set the pulse pattern according to the host computer or other pulse output device.

Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
P13	14	Pulse Command Form	0-direction + pulse (positive logic) 1-Direction + Pulse (negative logic) 2-A-phase + B-phase quadrature pulse 4x frequency 3-CW+CCW	Selection Pulse Command Format	Shutdown Setting	Energized again.	0

Table 5.2-3 Pulse Pattern Description

P04.01 Run Direction Selection	P13.14 Command Format Setting	Pulse Pattern	Signal	Schematic Diagram Of Forward Pulse	Reverse Pulse Schematic
0	0	Pulse + Direction Positive Logic	PULSE SIGN		
	1	Pulse + Direction Negative Logic	PULSE SIGN		
	2	Phase A+Phase B Quadrature Pulse 4x Frequency	PULSE (Phase A) SIGN (Phase B)	 Phase A is 90° ahead of phase B	 B-phase overruns A-phase by 90°
	3	CW+CCW	PULSE (CW) SIGN (CCW)		
					
1	0	Pulse + Direction Positive Logic	PULSE SIGN		
	1	Pulse + Direction Negative Logic	PULSE SIGN		

	2	A-phase + B-phase quadrature pulse 4 times frequency	PULSE (Phase A) SIGN (Phase B)	 B-phase overruns A-phase by 90°	 Phase A is 90° ahead of phase B
	3	CW+CCW	PULSE (CW) SIGN (CCW)		
					

The maximum frequency and minimum time width specifications for position pulse commands corresponding to different input terminals are shown in the table below:

- **pulse command specification**

Input Terminal		Maximum Frequency	Minimum Time Width/Ms					
			t1	t2	t3	t4	t5	t6
High-speed pulse input terminal		4Mpps	0.125	0.125	0.125	0.25	0.125	0.125
Low-speed pulse Input terminal	differential input	500kpps	1	1	1	2	1	1
	Collector Input	200kpps	2.5	2.5	2.5	5	2.5	2.5

The rise and fall time of the position pulse command should be less than 0.1μs.

- **Pulse command frequency**

The position maximum pulse input frequency can be set with function code P08.05. If the actual input pulse frequency is greater than P08.05, warning E.424.0 (position command overspeed fault) will occur.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P08	05	Position Maximum Pulse Input Frequency	100~4000	kHz	Sets the maximum frequency of the external pulse command.	Shutdown Setting	Energized again.	4000

- **Position command source for preset position commands (P13.00=1)**

The servo drive has a preset position operation function. It means that the servo drive stores 16 segments of position commands internally, and the displacement, maximum running speed, acceleration and deceleration time of each segment can be set separately. The waiting time and articulation between each segment can also be selected according to actual needs. The setting process is as follows:

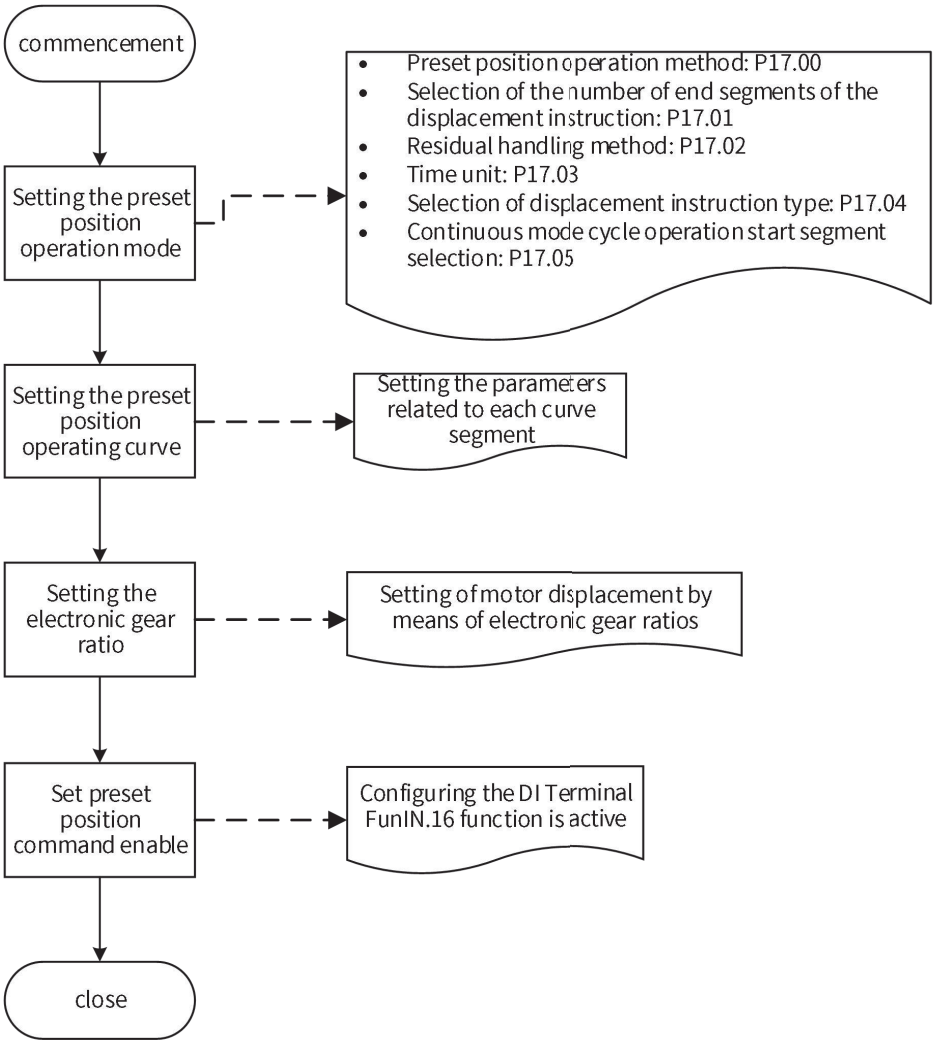


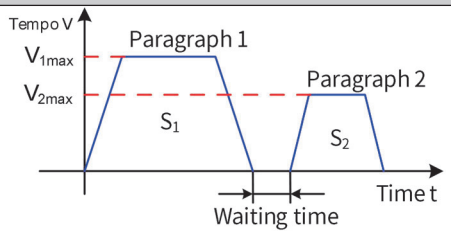
Figure : 5.2-7 Preset Position Command Source Setting Flow

2) Setting the preset position operation mode

Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
P17	00	Preset Position Task Run Mode	0-single run 1-run in a loop 2-DIToggle Run 3-sequential operation	Setting up paragraph-to-paragraph articulation	Shutdown Setting	Effective immediately	1
P17	01	Displacement Execution Segment Selection	1~16	Setting the total number of segments for preset position commands	Shutdown Setting	Effective immediately	1
P17	02	Residual treatment method	0-Continue to run unfinished segments 1-Restart operation from paragraph 1	Setting servo enable ON presets the starting segment number when position operation is resumed from interruption. attention (heed)： P17.02 is only valid when P17.00 ≠ 2.	Shutdown Setting	Effective immediately	0
P17	03	Waiting time Unit	0-ms 1-s	Set the acceleration and deceleration time and the waiting time unit. Caution: The wait time is only valid when P17.00 = 0 or 1.	Shutdown Setting	Effective immediately	0
P17	04	Position Command Type Selection	0-Relative Displacement Command 1-absolute displacement command	Set Position Command Type	Shutdown Setting	Effective immediately	0
P17	05	Cycle mode Starting segment selection	0~16	When P17.00=3, set the starting segment number for multi-segment position runs after round 1. Caution: P17.05=0 or P17.05＞P17.01 denotes non-cyclic； P17.05＞1 Indicates that the starting segment number is the P17.05 set value.	Shutdown Setting	Effective immediately	0

- **Single run end stop (P17.00=0)**

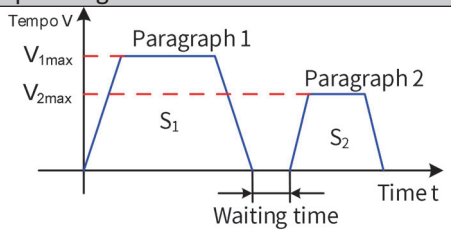
Table 5.2-4 Single Run Description

Model Description	Operating Curve
Running 1 round; Automatic incremental switching of segment number; Waiting time can be set between each segment; Preset position command enable signal is level active.	 V1max、V2max：Maximum operating speed for segments 1 and 2； S1、S2：Paragraph 1, paragraph 2 displacement; The positioning completion signal is active at the completion of each segment run; When the preset position command is enabled OFF during operation, the servo gives up the unfinished displacement of this section and stops, and the positioning completion signal is valid after the stop is completed; Re-enable the preset position command ON, and the servo selects the corresponding segment operation according to the P17.02 setting; servo enable OFF occurs when a segment operation occurs, and the motor stops according to the servo OFF stopping mode, and after the stopping is completed, the positioning completion is invalid; Position command direction switching DI during a section of operation(FunIN.21)Logic switching has no effect on the direction of operation of this segment.

The total number of preset position instruction segments set in P17.00 that the driver runs completely once is called the completion of 1 round of operation.

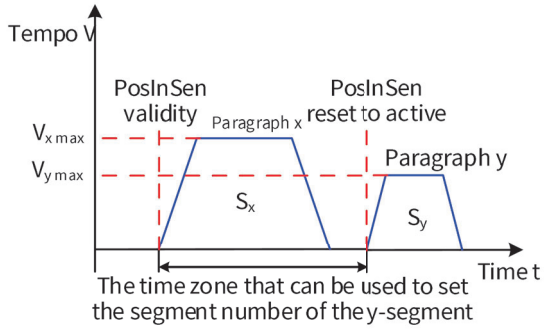
- **loop running (P17.00=1)**

Table 5.2-5 Description of Cyclic Operation

Model Description	operating curve
The cycle runs with a starting segment number of 1 for each round; Automatic incremental switching of segment numbers; Waiting time can be set between each segment; FunIN.16 (Preset Position Enable) is active and maintains the cyclic operation state. The preset position command enable signal is level active.	 V1max、V2max：Maximum operating speed for segments 1 and 2; S1、S2：1st and 2nd Dan transfer； Positioning completion signals are active at the end of each segment； When the preset position command is enabled OFF during operation, the servo discards the unfinished displacement of this section and stops, and the positioning completion signal is valid after the stop is completed； Re-enable the multi-segment position command ON, the servo according to P17.02 settings to select the corresponding segment operation; a segment operation occurs when the servo enable OFF, the motor according to the servo OFF stopping mode stopping, stopping is completed, the positioning is completed invalid； Position command direction switching DI during a section of operation (FunIN.21)Logic switching has no effect on the direction of operation of this segment。

- **DI switching operation (P17.00=2)**

Table 5.2-6 DI switching operation description

Model Description	operating curve
When running the current segment number, you can set the next running segment number, and the motor stops after completing the position command set for the current segment number. After the preset position command enable is reset to ON, the current segment number command is run.; The segment number is determined by the DI terminal logic; there is no waiting time between each segment, and the interval time is determined by the command delay of the host computer.; Preset position command enable signal is valid along the change.	 Vxmax、Vymax：Maximum operating speed of section x, section y; Sx, Sy: displacement of section x, section y; Positioning completion signals are active at the end of each segment. When the preset position command is enabled OFF during operation, the servo will continue to execute the unfinished displacement in this section and output the positioning completion signal. The switching segment numbers must be in the following order： Segment number switching is not valid until the xth segment displacement has been localized; During the xth displacement operation or after positioning is completed, enable OFF the preset position command, and then switch the segment number from x to y (if x=y, the servo will execute the xth displacement again); After the xth displacement positioning is completed, the preset position command enable is set to ON, and the servo drive executes the yth displacement. Servo enable OFF occurs during operation of a segment, the motor stops according to the servo OFF stopping method, and after the stopping is completed, the positioning completion is invalidated; Position instruction direction switching DI (FunIN.21) logic switching has no effect on the direction of operation of this segment during segment operation.

When the preset position operation mode is set to DI switching operation, configure the 4 DI terminals of the servo driver to function 27~30 (FunIN.27: preset command selection 1~ FunIN.30: preset command selection 4) and make sure that the DI terminals have valid logic.

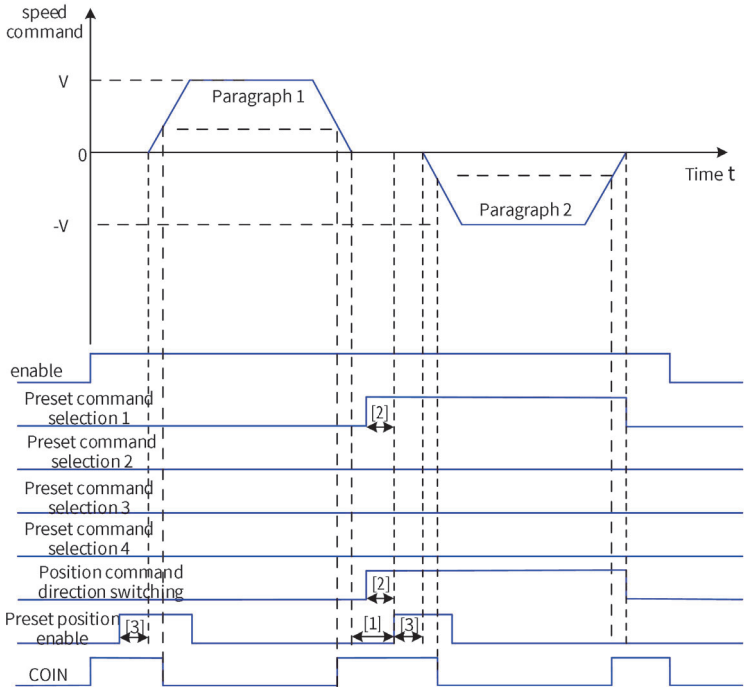


Figure: 5.2-8 Preset Position Timing Chart

attention：

*1: Area available for switching the segment number: the interval in which the position command for the previous segment has been sent and the preset position enable for the next segment becomes active again.

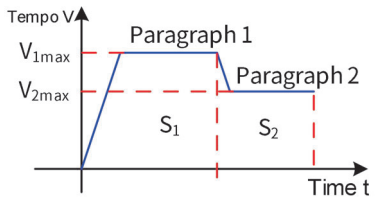
*2: Remains active for at least 3ms when using the DI terminal.

<table>
<tr><th>Encodings</th><th>Functional Name</th><th>Functionality</th></tr>
<tr><td>FunIN.27</td><td>Preset command selection 1</td><td rowspan="4">The preset segment number is a 4-digit binary number, and the correspondence between preset command selection 1 to preset command selection 4 and the segment number is shown in the table below:

<table><tr><th>Preset Command Selection 4</th><th>Preset Command Selection 3</th><th>Preset Command Selection 2</th><th>Preset Command Selection 1</th><th>Section Number</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>2</td></tr><tr><td colspan="5">…</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>16</td></tr></table>The DI terminal logic is level valid, and the preset command selection value is 1 when the input level is valid, and 0 otherwise..</td></tr>
<tr><td>FunIN.28</td><td>Preset command selection 2</td></tr>
<tr><td>FunIN.29</td><td>Preset command selection 3</td></tr>
<tr><td>FunIN.30</td><td>Preset command selection 4</td></tr>
</table>

- **sequential run (P17.00=3)**

Table 5.2-7 Sequential Operation Description

Model Description	Operating Curve
Can run 1 round and stop (P17.05=0 or P17.05＞P17.01)； Can be run in a loop with a starting segment number of P17.05 after round 1； Automatic incremental switching of segment numbers； No wait time between segments; preset position enable signal is level active；	 V1max、V2max：Maximum operating speed for segments 1 and 2； S1、S2：1st and 2nd Dan transfer； Positioning completion signals are active at the end of each segment.； If the preset position command is enabled OFF during the operation of a segment, the servo discards the unfinished displacement of the segment and stops, and the positioning completion signal is valid after the stop is completed.； Re-enable the preset position ON, the servo according to P17.02 settings to select the corresponding section operation; a section of the operation of the servo OFF, the motor in accordance with the servo OFF stopping mode stop, stopping the completion of the positioning completed invalid； Position instruction direction switching DI (FunIN.21) logic switching has no effect on the direction of operation of this segment during segment operation.

3) Preset position operating curve setting

The preset position operation function can set 16 different position commands, and the displacement, maximum operation speed, acceleration and deceleration time, and waiting time between each segment can be set separately.

Take the first segment as an example：

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P17	12	Para. 1 Mobile displacement	-1073741824 ~1073741824	Instruction Unit	Setting the 1st position instruction sum	Operation Setting	Effective immediately	10000
P17	14	Paragraph 1 Displacement operating speed	1~6000	rpm	Setting the maximum operating speed for segment 1	Operation Setting	Effective immediately	200
P17	15	1st displacement acceleration and deceleration time	0~65535	ms(s)	Sets the time for the motor to shift uniformly from 0 rpm to 1000 rpm in the first segment of the multi-stage position.	Operation Setting	Effective immediately	10
P17	16	Waiting time	0~10000	ms(s)	Setting the wait time after	Opera	Effecti	10

		after completion of the first displacement			completion of the 1st segment positioning	tion Setting	ve immediately	

Based on the above settings, the actual motor operating curve is shown below:

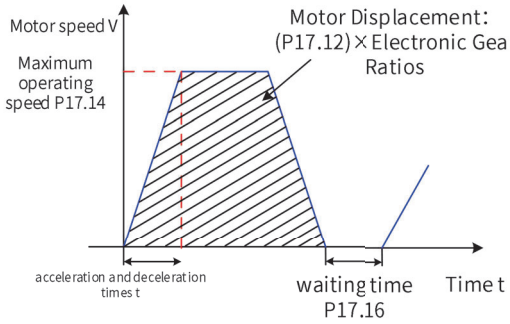


Fig. 5.2-9 Motor operation curve of section 1

Therefore, the actual acceleration to P17.14 (the 1st displacement running speed) takes time t:

$$t = \frac{(P17.14)}{1000} \times (P17.15)$$

Please refer to Chapter 8 for the setting of the parameters of the remaining 15 segments.

4) Preset position command enable

If the preset position finger 3 is selected as the position command source, configure one DI terminal of the servo driver as function 16.。

(FunIN.16: Preset position enable) and determines that the DI terminal is valid logic

Encodings	Functional Name	Functionality
FunIN.16	Preset position enable	Effective, servo motors run multiple position commands; Invalid, servomotor is locked; attention： When P17.00=0, 1, 3, the logic of DI terminal corresponding to the preset position enable signal is level valid; when P17.00=2, the logic of DI terminal corresponding to the preset position enable signal is level valid, and the along sideization is effective.

2. Position command direction setting

The direction of the position command can be switched via the DI terminal to change the direction of motor operation. Configure one DI terminal of the Servo Drive to function 21 (FunIN.21: Position command direction switching) and make sure that the DI terminal is valid logic.

Encodings	Functional Name	Functionality
FunIN.21	Position command direction switching	Invalid, the actual position command direction is the same as the set position command direction; Effective, the actual position command direction is opposite to the set position command direction;

The actual motor operation direction is related to the motor operation direction selection (P04.01), position command positive and negative, and position command direction switching (FunIN.21).

Table 5.2-8 Motor operation direction table

P4.01	Position Command Positive and Negative	FunIN.21	Actual motor running direction
0	+	null	counterclockwise
0	+	validity	clockwise
0	-	null	clockwise
0	-	validity	counterclockwise
1	+	null	clockwise
1	+	validity	counterclockwise
1	-	null	counterclockwise
1	-	validity	clockwise

3. Instruction disable function

Command Prohibit Function: i.e., all position commands are mandatorily set to zero, the servo drive does not respond to any internal or external position commands, and the motor is in servo-locked state under the position control mode. At this time, the drive can be switched to other control modes to continue operation.

To use the command inhibit function, configure 1 DI terminal of the Servo Drive to function 3 and make sure that the DI terminal is valid logic.

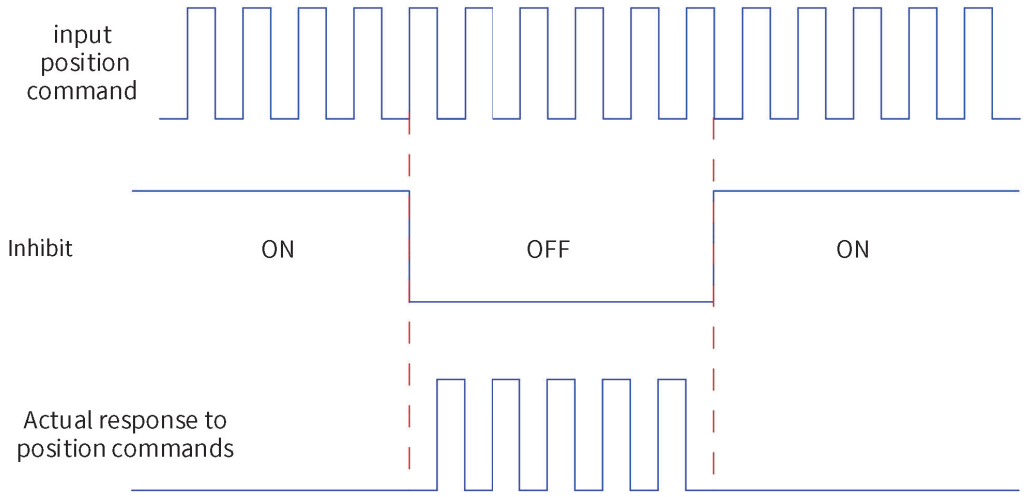


Fig. 5.2-10 Example of Instruction Disable Function Waveforms

Encodings	Functional Name	Functionality
FunIN.3	directive prohibition	Invalid, servo drive can respond to commands; Effective, the servo drive does not respond to any internal or external position commands;

5.2.1.2 Position Command Filtering

Position command filtering is the filtering of position commands (encoder units) that have been divided or multiplied by the electronic gear. This includes FIR filtering and mean value filtering.。

The inclusion of position command filtering should be considered in the following cases:

- Position commands output from the host computer are not accelerated or decelerated;
- Low pulse command frequency;
- When the electronic gear ratio is 10 times or more.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P07	00	Position command FIR filtering	0~6553.5	ms	Setting the time constant of the FIR filter for position commands (encoder units)	Shutdown Settings	immediate effect	0.0
P07	01	Position command mean value filtering	0~128.0	ms	Setting the time constant of the averaging filter for position commands (encoder units)	Shutdown Settings	immediate effect	0.0

This function has no effect on the amount of displacement (total number of position commands)。

If the setting value is too large, it will lead to an increase in the latency of the response, and the filtering time constant should be set according to the actual situation.

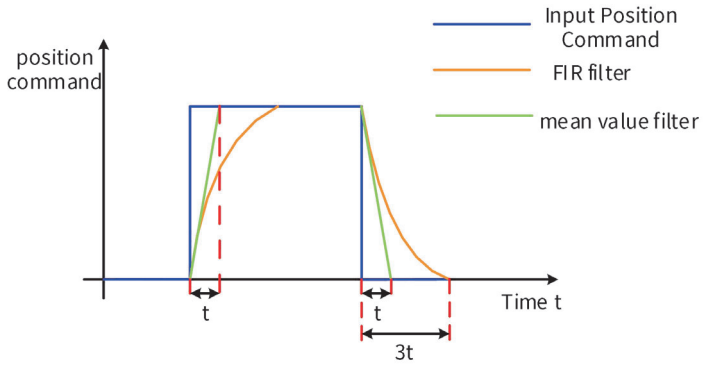


Fig: 5.2-11 Schematic diagram of first order filtering and average filtering for rectangular position command

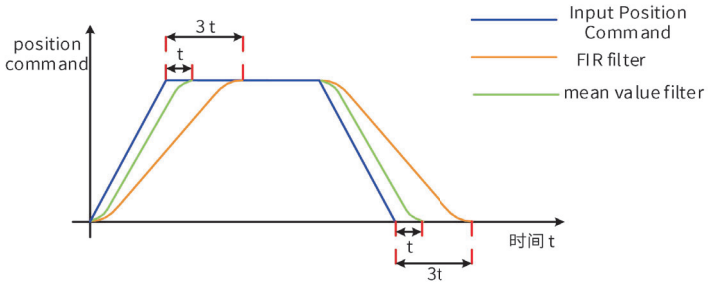


Figure: 5.2-12 Ladder Position Command First Order Filtering and Average Filtering Schematics

5.2.1.3 Positional deviation removal

Position deviation = (position command - position feedback)(encoder units)

The position deviation clear function means that the drive can clear the position deviation to zero when certain

conditions (P08.06) are met.

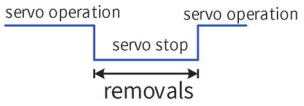
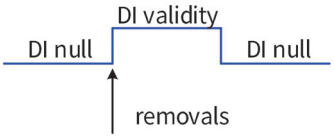
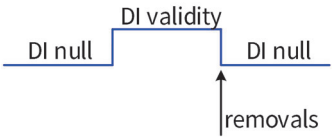
Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
P08	08	Position deviation Clearing method	0-Clear when servo is not RUN 1-Cleared when servo OFF or DI signal is active	Setting conditions for clearing position deviation	Shutdown Setting	Effective immediately	0

When P08.08 = 1, 1 DI terminal of the servo drive should be configured as function 4 (FunIN.4: ClrPosErr, position deviation clear) and make sure that the DI terminal is valid Logic.

Encodings	Functional Name	Functionality
FunIN.4	positional error clearing	Valid, zero position deviation; Invalid, no clearing operation is performed.

The setting method is as follows：

Table 5.2-9 Position deviation clear setting

Setpoint	Removal Conditions	Clearing Time
P08.08=0	When the servo state is not "run", the position deviation is cleared.	
P08.08=1	Servo OFF or clear position deviation Clear position deviation when DI terminal logic is active.	 (Rising edge valid)
		 (Effective along the descending edge)

5.2.1.4 Positioning completion signal/positioning approach signal

Positioning completion function means that the position follower deviation meets the conditions set by the user (P13.08), which can be considered as the end of positioning in the position control mode. At this time, the servo drive can output the position arrival (Coin) signal, which is received by the host computer to confirm the positioning completion of the servo drive.

The functional principle is shown in the following diagram：

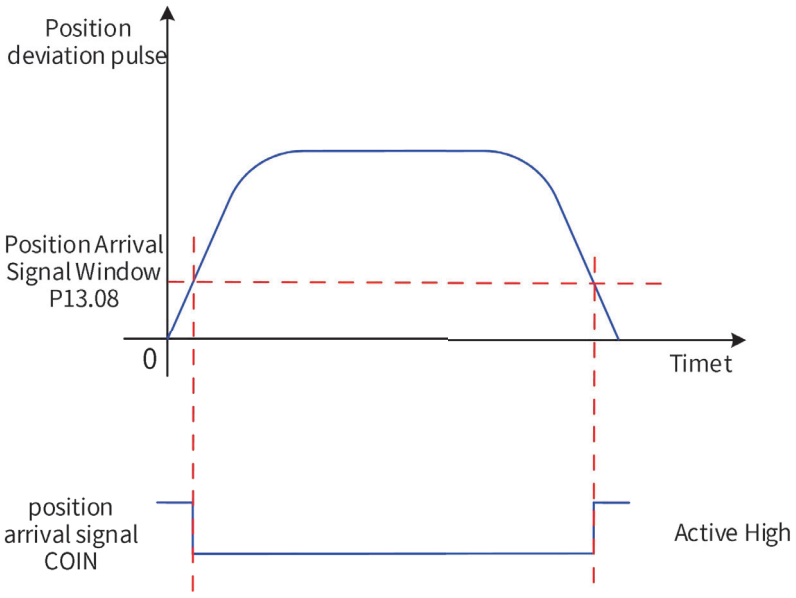


Figure: 5.2-13 Positioning Completion Function Description

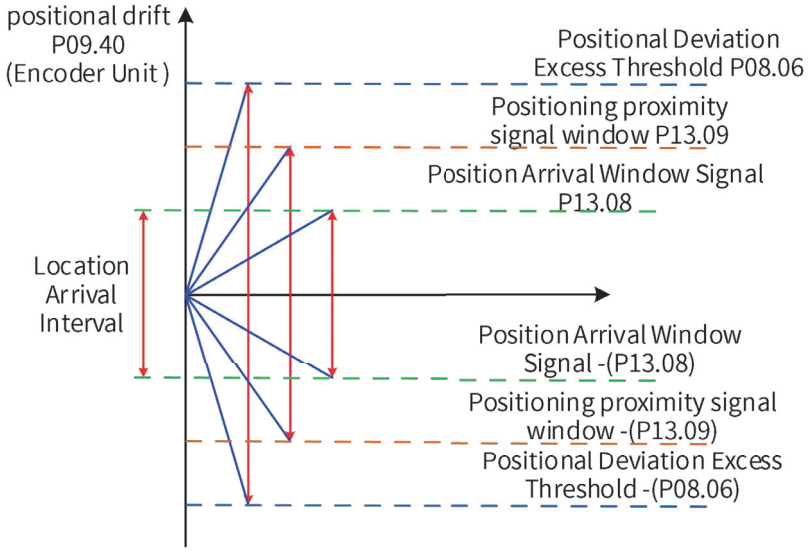
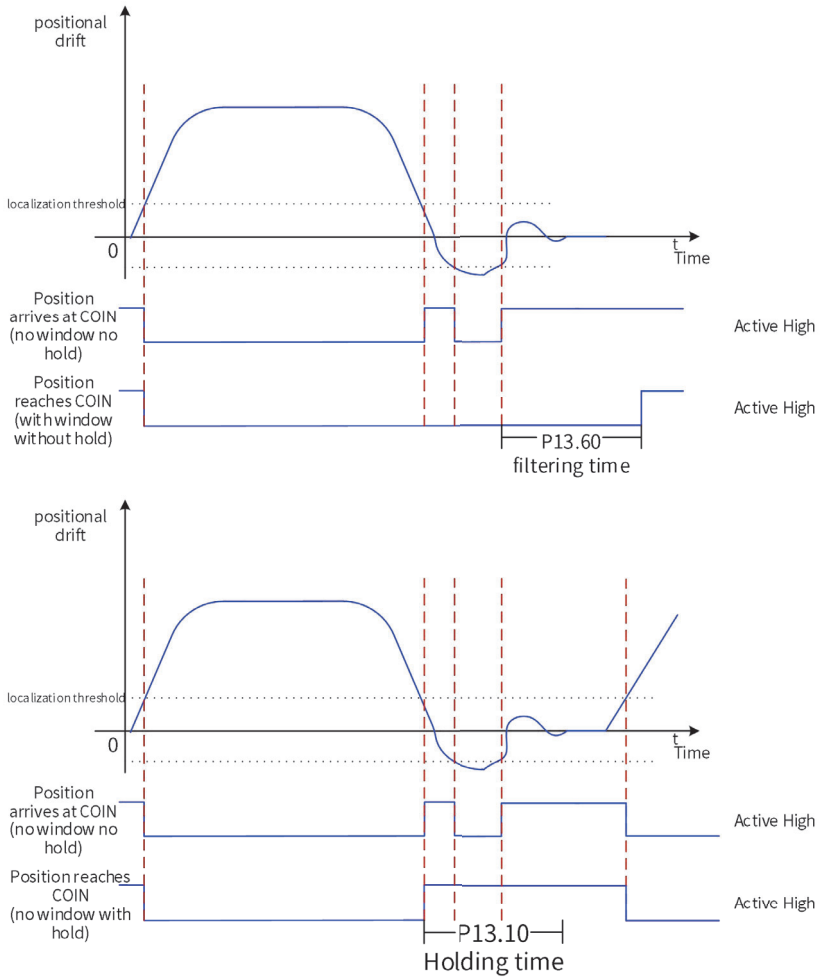


Figure: 5.2-14 Position deviation related signals

When the position deviation meets the condition (P13.09), the servo driver can also output the positioning proximity (FunOut.10) signal. Usually, the host computer can receive the positioning proximity signal before confirming the arrival of the position to prepare for the positioning completion operation.

Before using the position completion/approach function, the output conditions, thresholds and windows, and hold times for position arrival/position approach should be set. The principle of position arrival window time and hold time is as follows：



When the positioning completion output is selected with a hold function, a value of 0 indicates that the positioning completion signal remains active until the next position command is received.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P13	07	Position arrival signal output condition	Output when the absolute value of the position deviation is less than P13.08 Output when the absolute value of the position deviation is less than P13.08 and the position command after filtering is 0 Output when the absolute value of the position deviation is less than P13.08 and the position command before filtering is 0 Output when the absolute value of the	-	Setting the conditions for position arrival (COIN)/positioning approach (NEAR) to be valid	Operation Setting	Effective immediately	0

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
			position deviation is less than P13.08 and the position command before filtering is 0 Output, at least keep the P13.10 setup time effective					
P13	08	Position Arrival Signal Window	1~65535	Encoder Unit	Sets the threshold for the absolute value of the position deviation when the position arrival (COIN) is valid.	Operation Setting	Effective immediately	7
P13	09	Positioning proximity Signal window	1~65535	Encoder Unit	Sets the threshold for the absolute value of the position deviation when positioning proximity (NEAR) is active	Operation Setting	Effective immediately	65535
P13	10	Position arrival signal hold time	0-30000	ms	Positioning signal is valid for at least the time it is maintained	Operation Setting	Effective immediately	0
P13	60	Positioning complete Filter time	0-30000	ms	Positioning signal filtering time, output valid level after filtering	Operation Setting	Effective immediately	0

attention：

- The position approach signal window (P13.09) generally needs to be larger than the position arrival signal window (P13.08).
- The position arrival signal window (P13.08) reflects only the threshold value of the absolute value of the position deviation when the positioning is complete and valid, independent of the positioning accuracy.
- If the setting value of speed feedforward gain (P06.08) is too large or when operating at low speed, it will cause the absolute value of position deviation to be small, and if the setting value of P13.08 is too large, it will cause the positioning completion to be effective all the time, therefore, to improve the effectiveness of positioning completion, please reduce the setting value of P13.08.
- If the Position Arrival Signal Window (P13.08) is small and the position deviation is also small, the output

condition of the positioning completion signal can be changed by setting P13.07.

- When the servo enable is invalid, the positioning completion signal (COIN) and positioning approach signal (NEAR) outputs are invalid.

When using the positioning completion and positioning proximity functions, the two DO terminals of the servo driver should be configured as DO function 10 (FunOUT.10: NEAR, positioning proximity) and DO function 11 (FunOUT.11: COIN, position arrival) respectively and determine the valid logic of the corresponding DO terminals.

Encodings	Name	Functional Name	Functionality
FunOut.10	NEAR	Positioning Approaching.	Effectively, in position control mode, the absolute value of position deviation satisfies the set condition P13.09, indicating that the servo positioning is close to the. Invalid, position control mode, servo is in positioning approach process.
FunOut.11	COIN	Location Arrival	Effective, the absolute value of position deviation in position control mode satisfies the set condition P13.08, indicating that the servo position reaches the. Invalid, in position control mode, the servo is in the process of positioning completion.

5.2.1.5 times zero

1. Introduction to functions

- Return-to-zero function refers to the function of servo drive positioning the mechanical home position according to external signals, given the speed of movement.。
- Actual motor position feedback after return to zero = P13.51 (home mechanical offset)；
- The mechanical home position can correspond to the home switch signal, positive and negative limit switches, and motor Z signal；
- There are various ways to return to zero mechanically, if you can't disconnect the mechanical connection between the motor and the equipment in actual use, please refer to the chapter home return mode introduction to choose the appropriate way to return to zero to avoid damaging the equipment.
- When the servo is in zero return mode and running, it cannot be cut into other modes; when zero return is completed or interrupted (fault or invalid enable), it can be cut into other modes；
- Please pay attention to the distance between the limit switches and the forward and reverse limit switches, not too close, and must be set to the appropriate acceleration, otherwise it may lead to crash the machine！

2. Parameterization

1) Home return mode setting

Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
P13	44	Home return enable	0-Disable the home return function 1-Enable home return function via DI 2-Immediate origin reversion	Setting the Home Reset Mode and	Operation Setting	Effective immed	0

Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
				Trigger Signal Source		iately	
P13	45	(math) origin reversion model	(-1)- Reverse to zero, the deceleration point is the mechanical limit position, the origin is the motor Z signal, the mechanical limit position must be encountered before the Z signal is encountered (-2)-Positive return to zero, the deceleration point is the mechanical limit position, the origin is the Z signal of the motor, the mechanical limit position must be encountered before the Z signal is encountered 1- Reverse return to zero, the deceleration point is the reverse limit switch, the origin is the motor Z signal, the Z signal must be encountered before encountering the reverse limit falling edge 2- Positive return to zero, the deceleration point is the positive limit switch, the origin is the motor Z signal, the Z signal must be encountered before encountering the falling edge of the positive limit 3- Positive return to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the falling edge 4- Reverse back to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the rising edge 5- Reverse back to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the falling edge 6- Positive return to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the rising edge 7- Positive return to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the falling edge 8- Positive return to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the rising edge 9- Positive return to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the rising edge of the other side of the origin switch 10- Positive return to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the falling edge on the other side of the origin switch 11- Reverse back to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the falling edge 12- Reverse back to zero, the deceleration point is the origin switch, the origin is the motor Z signal, before encountering the Z signal must first encounter the origin switch on the same side of the rising edge	Setting the zero direction, deceleration point, and home position during home return	Shutdown Setting	Effective immediately	1

Function Code		Name	Setting Range	Functionality	Setting Method	Effective Date	Factory Setting
			13- Reverse back to zero, the deceleration point is the home switch, the origin is the Z signal of the motor on the other side of the home switch, the rising edge on the other side of the home switch must be encountered before the Z signal is encountered 14- Positive return to zero, the deceleration point is the home switch, the origin is the Z signal of the motor on the other side of the home switch, the Z signal must be encountered before encountering the falling edge on the other side of the home switch 15~16- reservations 17~32- Similar to 1 ~14, but the deceleration point coincides with the origin 33- Reverse to zero, home to motor Z signal 34-Positive return to zero, origin is motor Z signal 35-Take the current position as the origin				

2) Home return running curve setting

If the home signal is valid without sufficient deceleration after the deceleration point signal is valid, the final positioning may be unstable. Consider the displacement required for deceleration before setting the deceleration point and home position signal input positions. The speed of acceleration and deceleration when searching for the home position (P13.48) also affects positioning stability, so it should be taken into account when setting.

Function Code		Name	Setting Range	Unit (Of Measure)	Functionality	Setting Method	Effective Date	Factory Setting
P13	46	Origin High Speed Search Speed	0~3000	rpm	Setting the high-speed speed value for searching the deceleration point signal when the home return is zeroed.	Shutdown Setting	Effective immediately	100
P13	47	Home low Search speed	0~1000	rpm	Sets the low speed value when searching for the home position when the home position is returned to zero. The speed setting value should be low enough to prevent mechanical shocks during shutdown.	Shutdown Setting	Effective immediately	10
P13	48	Return of origin, acceleration and deceleration.	0~1000	rpm/s	Setting the acceleration of the motor from 0 to 1000rpm during home return.。	Shutdown Setting	Effective immediately	1000
P13	49	Origin search Time	0~655.35	s	Limit the total home return time, if exceeded the warning A.425.0 (Home return to zero failed) occurs.	Shutdown Setting	Effective immediately	500.00

Function Code		Name	Setting Range	Unit (Of Measure)	Functionality	Setting Method	Effective Date	Factory Setting
P13	51	Home Mechanical Offset	-1073741824 ~1073741824	Instruction Unit	Setting the absolute motor position after home return (P09.49) value.	Shutdown Setting	Effective immediately	0

Encodings	Functional Name	Functionality
FunIN.11	Home Switch	Valid, current position is the origin; HomeSwitch Set DI terminal logic / Actual Effective Level 0(low level) / low level 1(high level) / high level The logic of the DI terminal corresponding to the home switch should be set to active high/low level according to the output of the upper computer。
FunIN.12	Zero Enable	Valid, enable the home return function, the home return operation process, repeated enable invalid; Invalid, disable origin reversion function.
FunOut.14	Back to zero. Done.	Valid, home return to zero complete for position control. Invalid. Home return to zero incomplete.

3) Zero reset enable setting

- P13.44=0

Disable the home return function

- P13.44=1

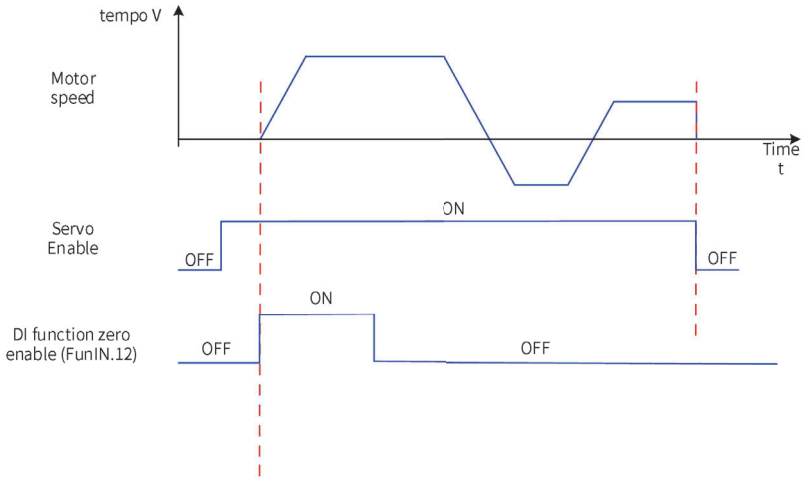


Figure: 5.2-15 Timing Diagram Example

The servo enable signal must be turned on before turning on the HomingStart signal;

The servo enable signal remains active and the HomingStart signal change is blocked while the home return is in

progress.;

If the servo enable signal is disabled and the servo motor stops rotating while the home return is in progress, turn on the servo enable signal and then the HomingStart signal to restart the home return;

Failure of home return to zero (A.425.0) occurs, the servo motor stops rotating, keeps the servo enable signal active, and re-triggers the HomingStart signal to be active, which can reset A.425.0 and re-execute the home return;

Repeatedly triggers home return;

- P13.44=2

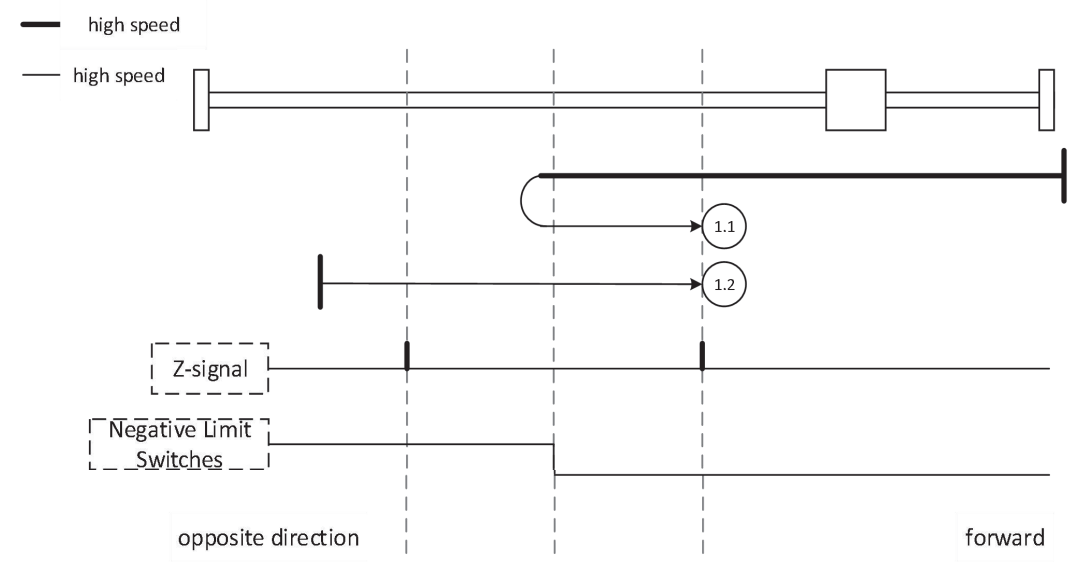
Setting the servo enable signal to active after power-on immediately performs home return.;

If the servo enable signal is disabled while the home return is in progress, the servo motor stops rotating, and the home return can be retriggered by resetting the servo enable signal to valid.;

Failure of home return to zero (A.425.0) occurs, P13.44 is set to 0, the servo motor stops rotating, and the servo enable signal is set to invalid to reset A.425.0; after the completion of the home return, P13.44 = 0; if you want to re-perform the home return, you have to re-set P13.44;

4) Introduction to the Origin Recurrence Model

- Mode 1: origin reversion mode 1

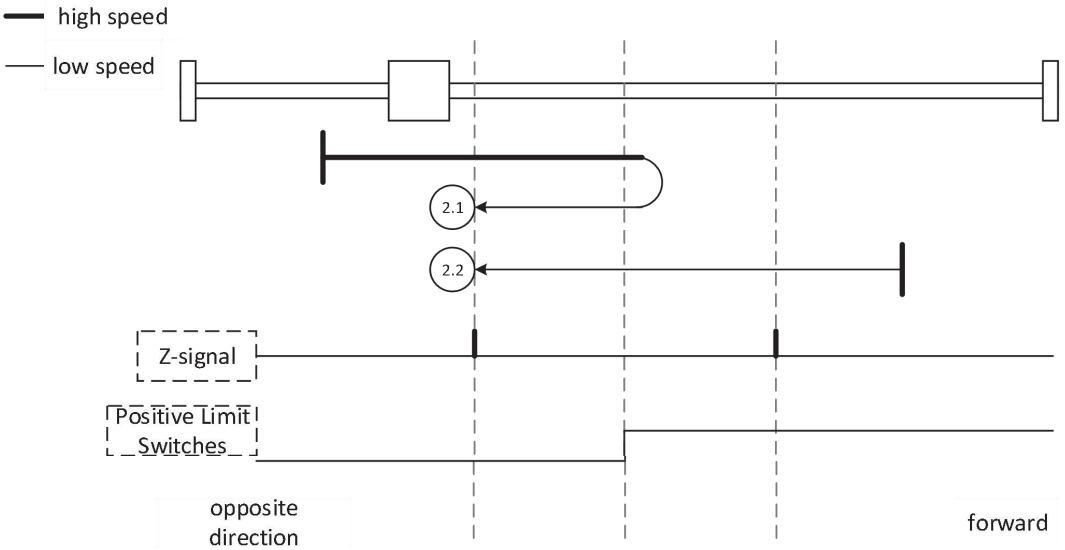
<table>
<tr><td>Movement Block Diagram</td><td> 
</td></tr>
<tr><td>Positioning Signal</td><td><table>
<tr><td>starting point</td><td>velocity point</td></tr>
<tr><td>Z phase signal</td><td>Negative Limit Switches</td></tr>
</table></td></tr>
<tr><td>Mode 1</td><td>Action Description</td></tr>
</table>

Note: Different initial conditions, different actions

initial conditions	zero return action
1.1-Deceleration point invalid when returning to zero	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the reverse limit signal, forward low-speed operation, after encountering the falling edge of the reverse limit signal, the first Z signal stops.
1.2-Deceleration point valid when returning to zero	When starting zero return, start forward low speed zero return directly and stop at the first Z signal after the falling edge of the reverse limit signal.

- Mode 2: Origin Resumption Mode 2

Movement Block Diagram



Positioning Signal

starting point	velocity point
Z phase signal	Positive Limit Switches

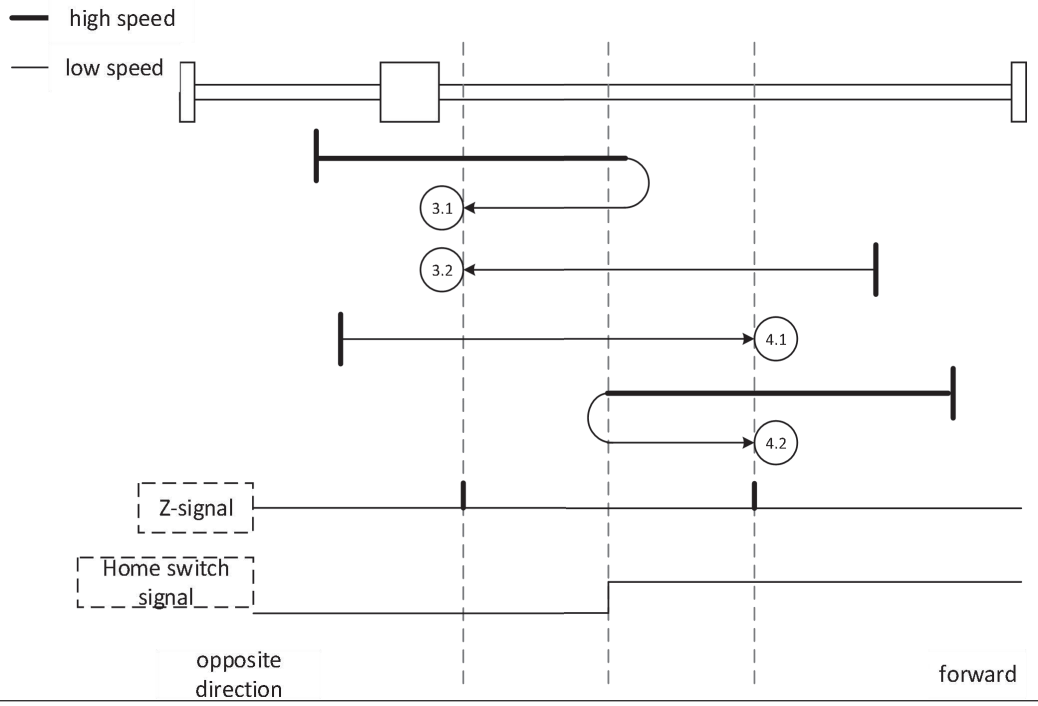
Method 2	Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
2.1-Deceleration point invalid when returning to zero	When starting to return to zero, run at high speed in the forward direction, then run at low speed in the reverse direction after encountering the rising edge of the forward limit signal, and stop at the first Z signal after encountering the falling edge of the forward limit signal.
2.2-Deceleration point valid when returning to zero	When starting zero return, start the reverse low-speed zero return directly, and stop at the first Z-phase signal after encountering the falling edge of the positive limit signal.

- Modalities 3-4：Origin reversion model 3-4

Movement Block Diagram



localization signal

starting point	velocity point
Z phase signal	Home switch signal

Mode 3

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
3.1-Deceleration point invalid when returning to zero	At the beginning of zero return, forward high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, and stop at the first Z signal after encountering the falling edge of the home switch signal.
3.2-Deceleration point valid when returning to zero	When starting zero return, start reverse low speed zero return directly and stop at the first Z signal after the falling edge of the home switch signal.

Mode 4

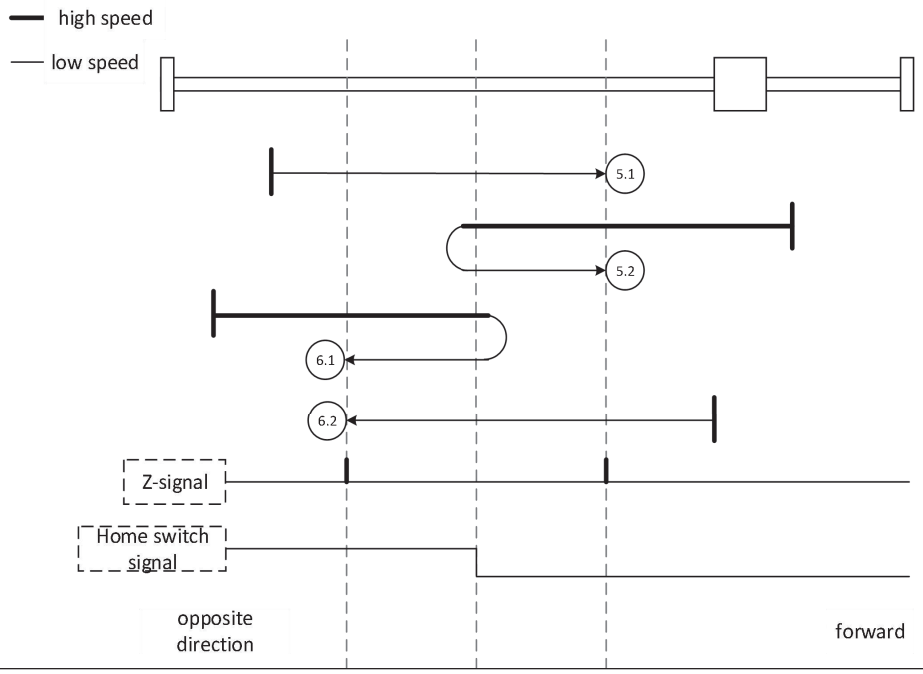
Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
4.1-Deceleration point invalid when returning to zero	Zero return starts directly with forward low speed zero return and stops at the first Z signal after the rising edge of the home switch signal.
4.2-Deceleration point valid when returning to zero	When starting to return to zero, reverse high-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, and stop at the first Z signal after encountering the rising edge of the home switch signal.

- Modalities 5-6：Origin reversion model 5-6

Movement Block Diagram



localization signal

starting point	velocity point
Z phase signal	Home switch signal

Mode 5

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
5.1-Deceleration point valid when returning to zero	When starting zero return, start forward low speed zero return directly and stop at the first Z signal after the falling edge of the home switch signal.
5.2-Deceleration point invalid when returning to zero	At the beginning of zero return, reverse high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, and stop at the first Z signal after encountering the falling edge of the home switch signal.

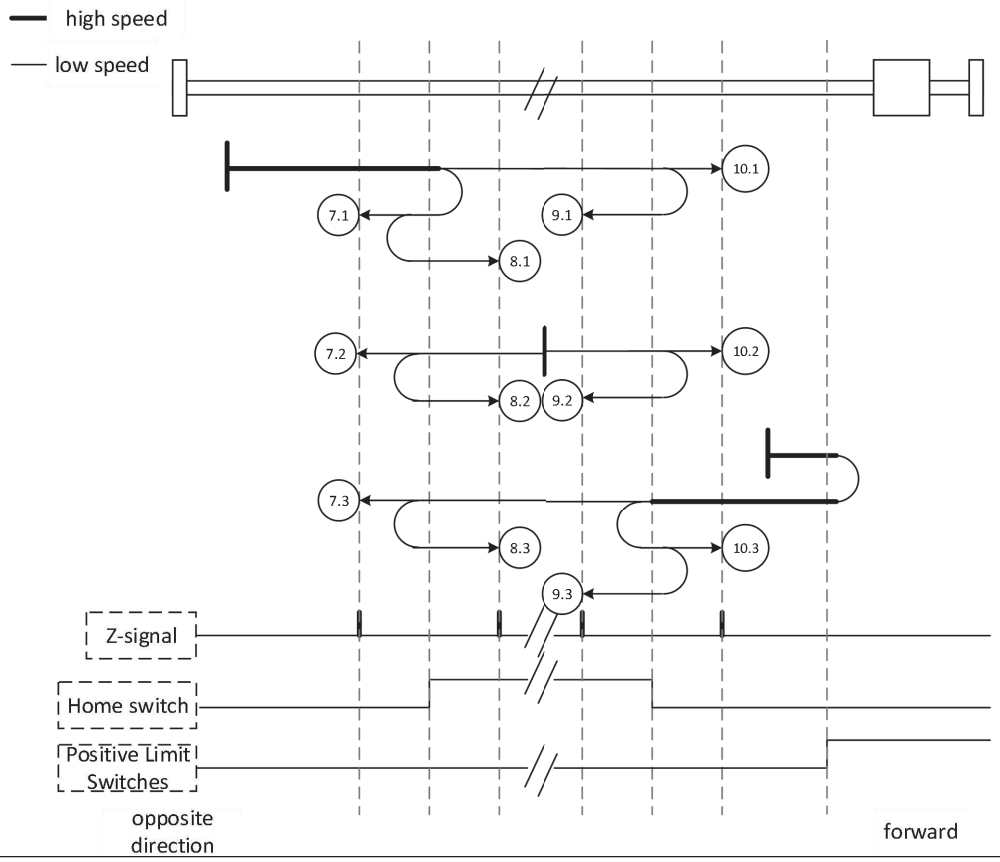
Mode 6 Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
6.1-Deceleration point valid when returning to zero	At the beginning of zero return, forward high-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, and stop at the first Z signal after encountering the rising edge of the home switch signal.
6.2-Deceleration point invalid when returning to zero	When starting zero return, start reverse low speed zero return directly and stop at the first Z signal after the rising edge of the home switch signal.

- modes 7-10: origin reversion modes 7-10

Movement Block Diagram



localization signal

starting point	velocity point
Z phase signal	Home switch signal

Mode 7

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
7.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	At the beginning of zero return, forward high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, and stop at the first Z signal after encountering the falling edge of the home switch signal.
7.2-Deceleration point valid when returning to zero	When starting zero return, start reverse low speed zero return directly and stop at the first Z signal after the falling edge of the home switch signal.
7.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch	At the beginning of zero return, forward high-speed operation, before encountering the home switch encountered the positive limit signal, reverse high-speed operation, encountered the rising edge of the home switch signal, continue to reverse low-speed operation, encountered the falling edge of the home switch signal after the first Z signal stops.

Mode 8

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
8.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, after encountering the rising edge of the home switch signal, the first Z signal stops.
8.2-Deceleration point valid when returning to zero	When starting to return to zero, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, and stop at the first Z signal after encountering the rising edge of the home switch signal.
8.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch	When starting to return to zero, forward high-speed operation, before encountering the home switch, encountering the positive limit signal, reverse high-speed operation, encountering the rising edge of the home switch signal, reverse low-speed operation, encountering the falling edge of the home switch signal, forward low-speed operation, encountering the rising edge of the home switch signal, the first Z signal stops.

Mode 9

Action Description

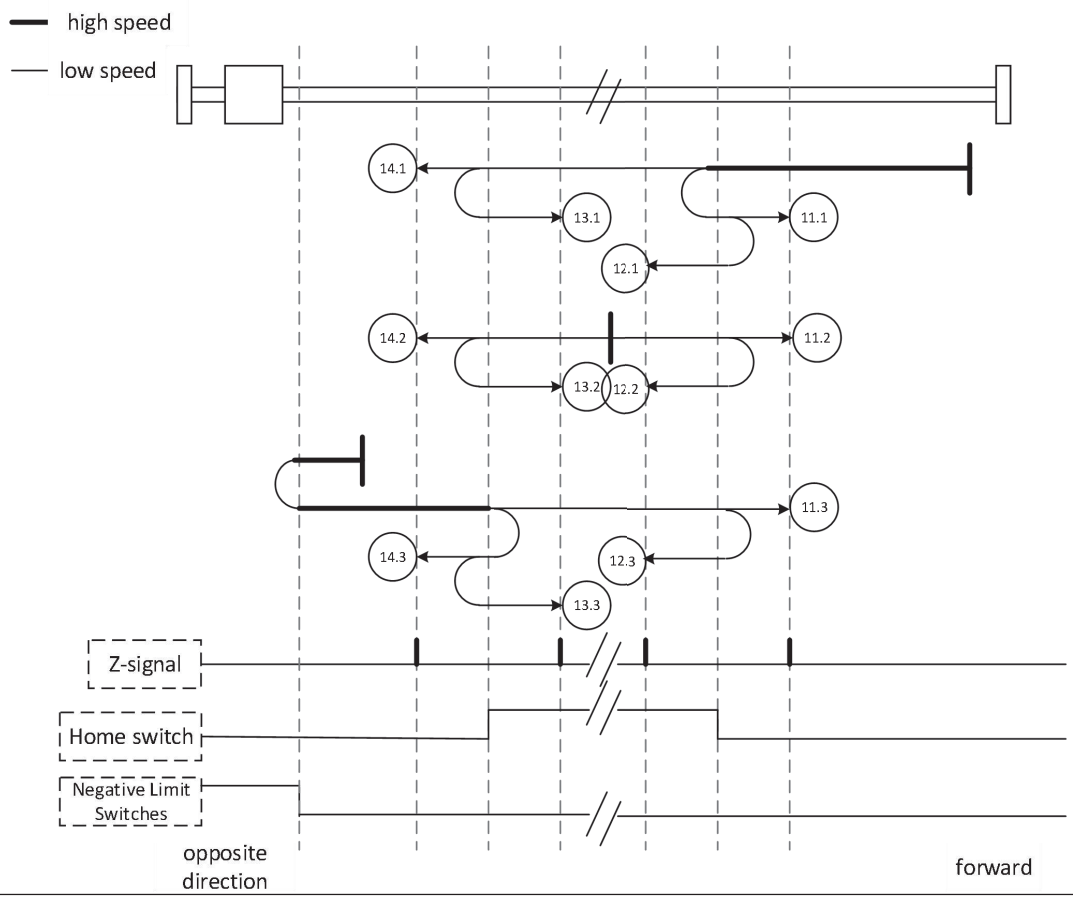
Note: Different initial conditions, different actions

initial conditions	zero return action
9.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, after encountering the rising edge of the home switch signal, the first Z signal stops.
9.2-Deceleration point valid when returning to zero	When starting to return to zero, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, and stop at the first Z phase signal after encountering the rising edge of the home switch signal.
9.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch	When starting to return to zero, forward high-speed operation, before encountering the home switch encountered a positive limit signal, reverse high-speed operation, encountered the rising edge of the home switch signal, forward low-speed operation, encountered the falling edge of the home switch signal, reverse low-speed operation, encountered the rising edge of the home switch signal, the first Z signal stops.

<table>
<tr><td rowspan="2">Mode 10</td><td>Action Description</td></tr>
<tr><td>Note: Different initial conditions, different actions
<table>
<tr><th>initial conditions</th><th>zero return action</th></tr>
<tr><td>10.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process</td><td>When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, after encountering the falling edge of the home switch signal, continue forward low-speed operation, and stop at the first Z signal after encountering the falling edge of the home switch signal.</td></tr>
<tr><td>10.2-Deceleration point valid when returning to zero</td><td>When starting to return to zero, run in the forward direction at low speed, and after encountering the falling edge of the home switch signal, continue to run in the forward direction at low speed, and stop at the first Z signal after encountering the falling edge of the home switch signal.</td></tr>
<tr><td>10.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch</td><td>At the beginning of zero return, forward high-speed operation, encounter the positive limit signal before the home switch, reverse high-speed operation, encounter the rising edge of the home switch signal, forward low-speed operation, encounter the falling edge of the home switch signal, continue forward low-speed operation, encounter the falling edge of the home switch signal, the first Z signal stops.
*** Translated with www.DeepL.com/Translator (free version) ***</td></tr>
</table></td></tr>
</table>

- Modalities 11-14：Origin reversion mode 11-14

Movement Block Diagram



localization signal

starting point	velocityocityocity point
Z phase signal	Home switch signal

Mode 11

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
11.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	At the beginning of zero return, reverse high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, and stop at the first Z signal after encountering the falling edge of the home switch signal.
11.2-Deceleration point valid when returning to zero	When starting zero return, start forward low speed zero return directly and stop at the first Z signal after the falling edge of the home switch signal.
11.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch	When starting to return to zero, reverse high-speed operation, before encountering the home switch, encountering the reverse limit signal, forward high-speed operation, encountering the rising edge of the home switch signal, forward low-speed operation, encountering the falling edge of the home switch signal, the first Z signal stops.

Mode 12

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
12.1-The deceleration point is not valid when returning to zero and the reverse limit switch is not encountered during the process	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, after encountering the rising edge of the home switch signal, the first Z signal stops.
12.2-Deceleration point valid when returning to zero	When starting to return to zero, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, and stop at the first Z signal after encountering the rising edge of the home switch signal.
12.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch	When starting to return to zero, reverse high-speed operation, encounter reverse limit signal before encountering the home switch, forward high-speed operation, encounter the rising edge of the home switch signal, forward low-speed operation, encounter the falling edge of the home switch signal, reverse low-speed operation, and encounter the first Z signal stop after the rising edge of the home switch signal.

Mode 13

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
13.1-The deceleration point is not valid when returning to zero and the reverse limit switch is not encountered during the process	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, after encountering the rising edge of the home switch signal, the first Z signal stops.
13.2-Deceleration point valid when returning to zero	When starting to return to zero, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, and stop at the first Z signal after encountering the rising edge of the home switch signal.
13.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch	When starting to return to zero, reverse high-speed operation, encounter the reverse limit signal before encountering the home switch, forward high-speed operation, encounter the rising edge of the home switch signal, reverse low-speed operation, encounter the falling edge of the home switch signal, forward low-speed operation, encounter the rising edge of the home switch signal, the first Z signal stops.

<table>
<tr><td rowspan="2">Mode 14</td><td>Action Description</td></tr>
<tr><td>Note: Different initial conditions, different actions

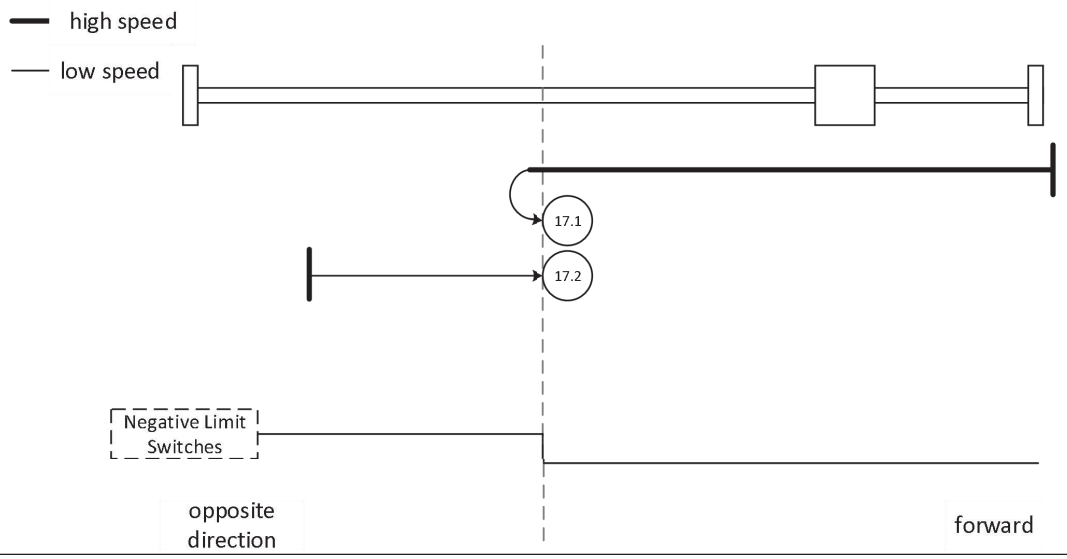
<table>
<tr><th>initial conditions</th><th>zero return action</th></tr>
<tr><td>14.1-The deceleration point is not valid when returning to zero and the reverse limit switch is not encountered during the process</td><td>When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, after encountering the falling edge of the home switch signal, continue to reverse low-speed operation, and stop at the first Z signal after encountering the falling edge of the home switch signal.</td></tr>
<tr><td>14.2-Deceleration point valid when returning to zero</td><td>When starting to return to zero, reverse low-speed operation, after encountering the falling edge of the home switch signal, continue to reverse low-speed operation, and stop at the first Z signal after encountering the falling edge of the home switch signal.</td></tr>
<tr><td>14.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch</td><td>When starting to return to zero, reverse high-speed operation, encounter the reverse limit signal before encountering the home switch, forward high-speed operation, encounter the rising edge of the home switch signal, reverse low-speed operation, encounter the falling edge of the home switch signal, continue to reverse low-speed operation, encounter the falling edge of the home switch signal, the first Z signal stops after the first Z signal.</td></tr>
</table></td></tr>
</table>

- Modalities 15-16: reservations；

Note that modes 17-30 are similar to modes 1-14, with the difference that they do not rely on the Z-belief sign as the origin, as follows.

- Mode 17: Origin Resumption Mode 17

Movement Block Diagram



localization signal

starting point	velocity point
Negative Limit Switches	Negative Limit Switches

Mode 17

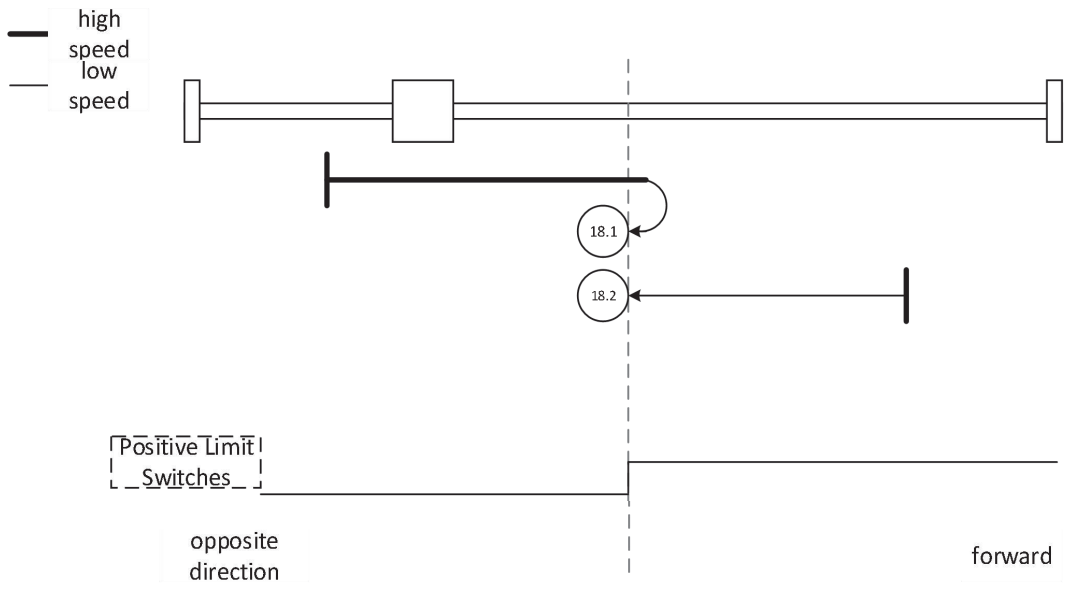
Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
17.1-Deceleration point invalid when returning to zero	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the reverse limit signal, forward low-speed operation, and stop after encountering the falling edge of the reverse limit signal.
17.2-Deceleration point valid when returning to zero	When starting zero return, start forward low speed zero return directly and stop after encountering the falling edge of reverse limit signal.

- Mode 18: Origin Resumption Mode 18

Movement Block Diagram



localization signal

starting point	velocity point
Positive Limit Switches	Positive Limit Switches

Mode 18

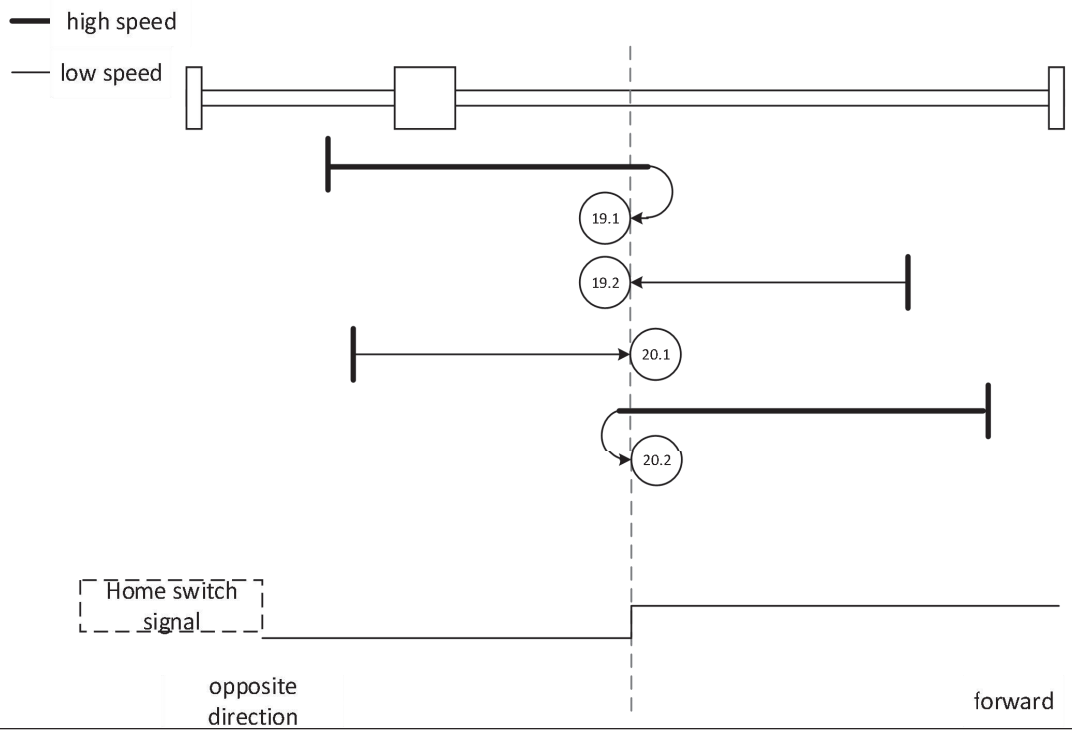
Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
18.1-Deceleration point invalid when returning to zero	When starting to return to zero, run at high speed in the forward direction, then run at low speed in the reverse direction after encountering the rising edge of the forward limit signal, and stop after encountering the falling edge of the forward limit signal.
18.2-Deceleration point valid when returning to zero	When starting zero return, start reverse low speed zero return directly and stop after encountering the falling edge of positive limit signal.

- modes 19-20: origin resumption modes 19-20

Movement Block Diagram



localization signal

starting point	velocity point
Home switch signal	Home switch signal

Mode 19

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
19.1-Deceleration point invalid when returning to zero	When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, and stop after encountering the falling edge of the home switch signal.
19.2-Deceleration point valid when returning to zero	When starting zero return, start reverse low speed zero return directly and stop after encountering the falling edge of the home switch signal.

Met

Action Description

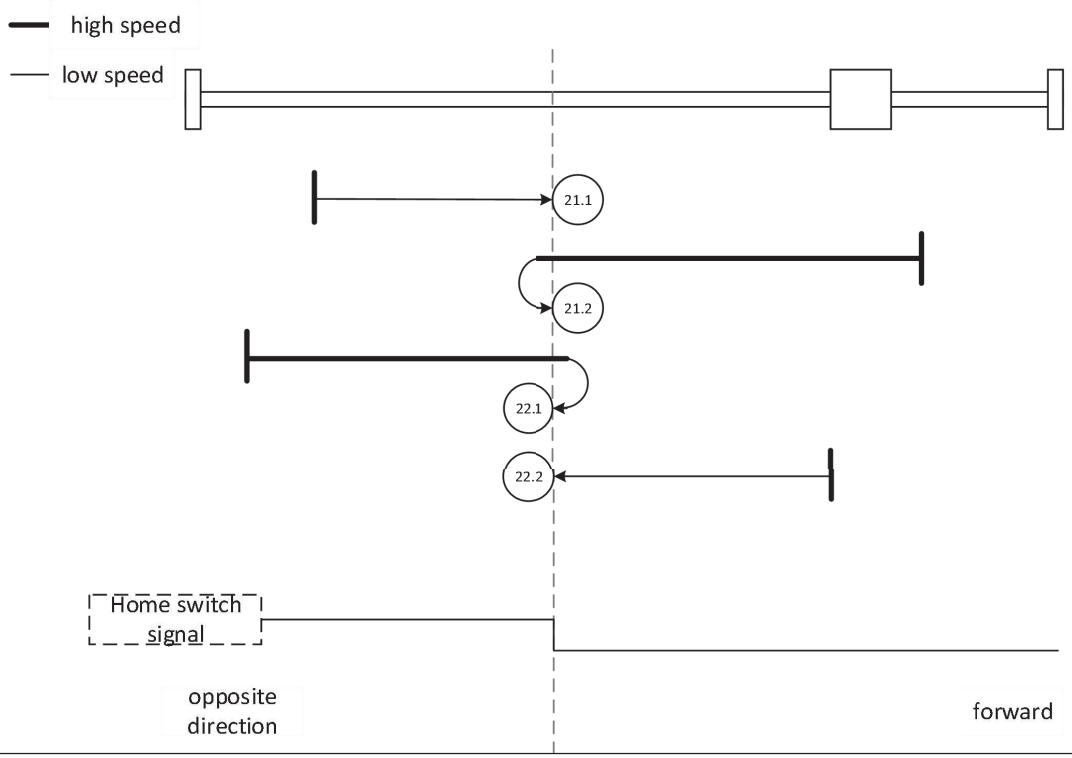
hod 20

Note: Different initial conditions, different actions

initial conditions	zero return action
20.1-Deceleration point invalid when returning to zero	When starting zero return, directly start forward low speed zero return, and stop after encountering the rising edge of the home switch signal.
20.2-Deceleration point valid when returning to zero	When starting to return to zero, reverse high-speed operation, meet the falling edge of the home switch signal, then forward low-speed operation, meet the rising edge of the home switch signal and stop.

- modes 21-22: origin reversion modes 21-22

Movement Block Diagram



localization signal

starting point	velocity point
Home switch signal	Home switch signal

Method 21

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
21.1-Deceleration point valid when returning to zero	When starting zero return, directly start forward low-speed zero return and stop after encountering the falling edge of the home switch signal.
21.2-Deceleration point invalid when returning to zero	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, and stop after encountering the falling edge of the home switch signal.

Meth

Action Description

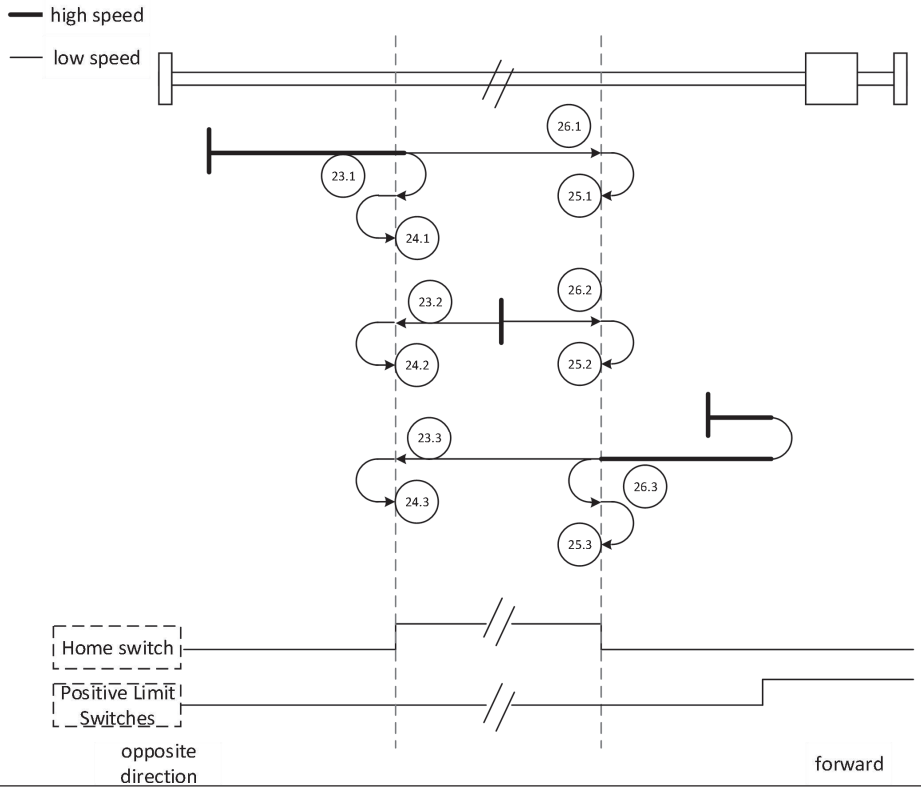
od 22

Note: Different initial conditions, different actions

initial conditions	zero return action
22.1-Deceleration point valid when returning to zero	When starting to return to zero, run at high speed in the forward direction, then run at low speed in the reverse direction after encountering the falling edge of the home switch signal, and stop after encountering the rising edge of the home switch signal.
22.2-Deceleration point invalid when returning to zero	When starting zero return, start reverse low speed zero return directly and stop when encountering the rising edge of the home switch signal.

- modes 23-26: origin resumption modes 23-26

Movement Block Diagram



local ization signal

starting point	velocity point
Home switch signal	Home switch signal

Method 23

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
23.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, and stop after encountering the falling edge of the home switch signal.
23.2-Deceleration point valid when returning to zero	When starting zero return, start reverse low speed zero return directly and stop after encountering the falling edge of the home switch signal.
23.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch	At the beginning of zero return, forward high-speed operation, before encountering the home switch encountered the forward limit signal, reverse high-speed operation, encountered the rising edge of the home switch signal, reverse low-speed operation, encountered the falling edge of the home switch signal and then stop.

Method 24

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
24.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, and stopping after encountering the rising edge of the home switch signal.
24.2-Deceleration point valid when returning to zero	When starting to return to zero, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, and stop after encountering the rising edge of the home switch signal.
24.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch	At the beginning of zero return, forward high-speed operation, before encountering the home switch meets the positive limit signal, reverse high-speed operation, meets the rising edge of the home switch signal, reverse low-speed operation, meets the falling edge of the home switch signal, forward low-speed operation, meets the rising edge of the home switch signal and then stops.

Method 25

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
25.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, and stopping after encountering the rising edge of the home switch signal.
25.2-Deceleration point valid when returning to zero	When starting to return to zero, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, and stop after encountering the rising edge of the home switch signal.
25.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch	When starting to return to zero, forward high-speed operation, before encountering the home switch encountered a positive limit signal, reverse high-speed operation, encountered the rising edge of the home switch signal, forward low-speed operation, encountered the falling edge of the home switch signal, reverse low-speed operation, encountered the rising edge of the home switch signal and then shut down.

Method 26.

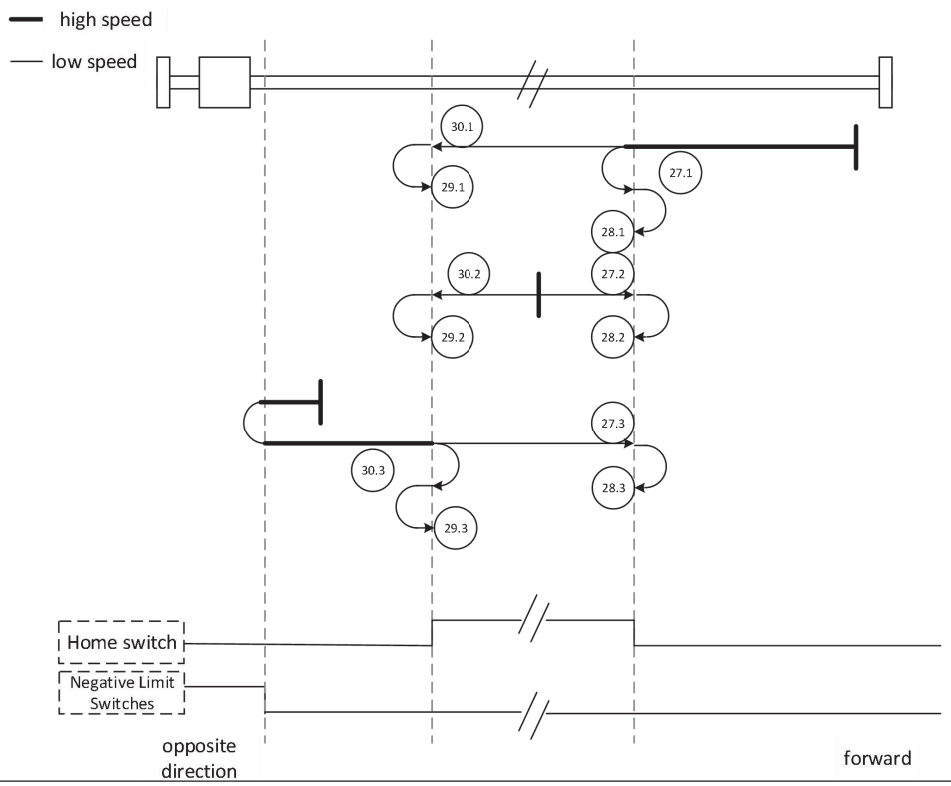
Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
26.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	When starting to return to zero, forward high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, after encountering the falling edge of the home switch signal, continue forward low-speed operation, and stop after encountering the falling edge of the home switch signal.
26.2-Deceleration point valid when returning to zero	When starting to return to zero, positive low-speed operation, after encountering the falling edge of the home switch signal, continue positive low-speed operation, and stop after encountering the falling edge of the home switch signal.
26.3-The deceleration point is not valid when returning to zero and the process encounters a positive limit switch	At the beginning of zero return, forward high-speed operation, before encountering the home switch, encountering the positive limit signal, reverse high-speed operation, encountering the rising edge of the home switch signal, forward low-speed operation, encountering the falling edge of the home switch signal, continue forward low-speed operation, encountering the falling edge of the home switch signal, stopping.

- modalities 27-30: origin resumption modalities 27-30

Movement Block Diagram



localization signal

starting point	velocity point
Home switch signal	Home switch signal

Method 27.

Action Description

Note: Different initial conditions, different actions

initial conditions	zero return action
27.1-The deceleration point is not valid when returning to zero and the positive limit switch is not encountered during the process	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, and stop after encountering the falling edge of the home switch signal.
27.2-Deceleration point valid when returning to zero	When starting zero return, directly start forward low-speed zero return and stop after encountering the falling edge of the home switch signal.
27.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch	When starting to return to zero, reverse high-speed operation, before encountering the home switch, encountering the reverse limit signal, forward high-speed operation, encountering the rising edge of the home switch signal, forward low-speed operation, encountering the falling edge of the home switch signal and stopping.

Method 28

Action Description

Note: Different initial conditions, different actions

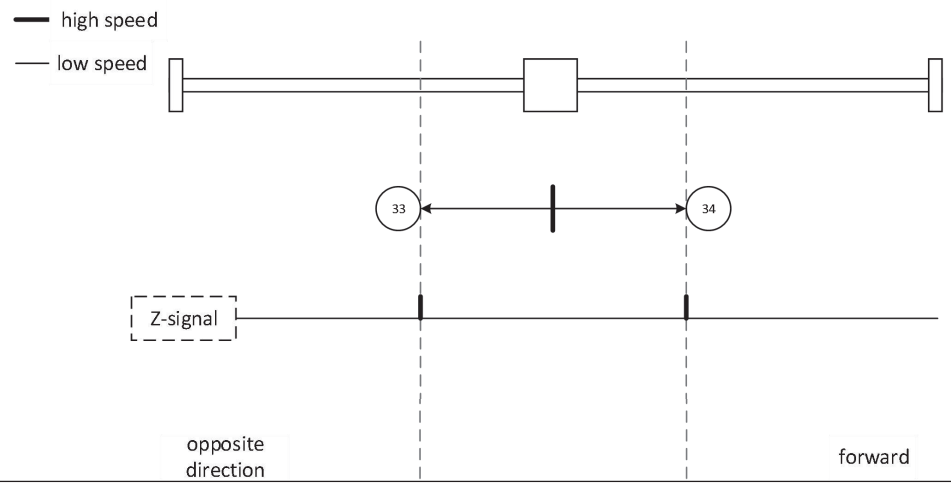
initial conditions	zero return action
28.1-The deceleration point is not valid when returning to zero and the reverse limit switch is not encountered during the process	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, and stopping after encountering the rising edge of the home switch signal.
28.2-Deceleration point valid when returning to zero	When starting to return to zero, forward low-speed operation, after encountering the falling edge of the home switch signal, reverse low-speed operation, and stop after encountering the rising edge of the home switch signal.
28.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch	When starting to return to zero, reverse high-speed operation, encounter reverse limit signal before encountering the home switch, forward high-speed operation, encounter the rising edge of the home switch signal, forward low-speed operation, encounter the falling edge of the home switch signal, reverse low-speed operation, encounter the rising edge of the home switch signal and then stop.

<table>
<tr><td rowspan="2">Method 29.</td><td>Action Description</td></tr>
<tr><td>Note: Different initial conditions, different actions
<table>
<tr><th>initial conditions</th><th>zero return action</th></tr>
<tr><td>29.1-The deceleration point is not valid when returning to zero and the reverse limit switch is not encountered during the process</td><td>When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, and stopping after encountering the rising edge of the home switch signal.</td></tr>
<tr><td>29.2-Deceleration point valid when returning to zero</td><td>When starting to return to zero, reverse low-speed operation, after encountering the falling edge of the home switch signal, forward low-speed operation, and stop after encountering the rising edge of the home switch signal.</td></tr>
<tr><td>29.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch</td><td>When starting to return to zero, reverse high-speed operation, before encountering the home switch, encountering the reverse limit signal, forward high-speed operation, encountering the rising edge of the home switch signal, reverse low-speed operation, encountering the falling edge of the home switch signal, forward low-speed operation, encountering the rising edge of the home switch signal, and then stop.</td></tr>
</table></td></tr>
<tr><td>Mode 30</td><td>Action Description</td></tr>
</table>

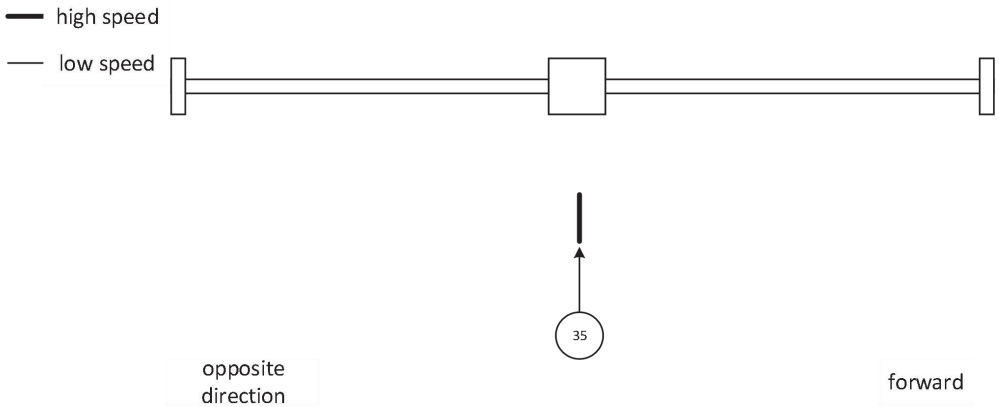
Note: Different initial conditions, different actions

initial conditions	zero return action
30.1-The deceleration point is not valid when returning to zero and the reverse limit switch is not encountered during the process	When starting to return to zero, reverse high-speed operation, after encountering the rising edge of the home switch signal, reverse low-speed operation, after encountering the falling edge of the home switch signal, continue to reverse low-speed operation, and stop after encountering the falling edge of the home switch signal.
30.2-Deceleration point valid when returning to zero	When starting to return to zero, reverse low-speed operation, after encountering the falling edge of the home switch signal, continue to reverse low-speed operation, and stop after encountering the falling edge of the home switch signal.
30.3-The deceleration point is not valid when returning to zero and the process encounters a reverse limit switch	At the beginning of zero return, reverse high-speed operation, before encountering the home switch, encountering the reverse limit signal, forward high-speed operation, encountering the rising edge of the home switch signal, reverse low-speed operation, encountering the falling edge of the home switch signal, continue to reverse low-speed operation, encountering the falling edge of the home switch signal, and then stop.

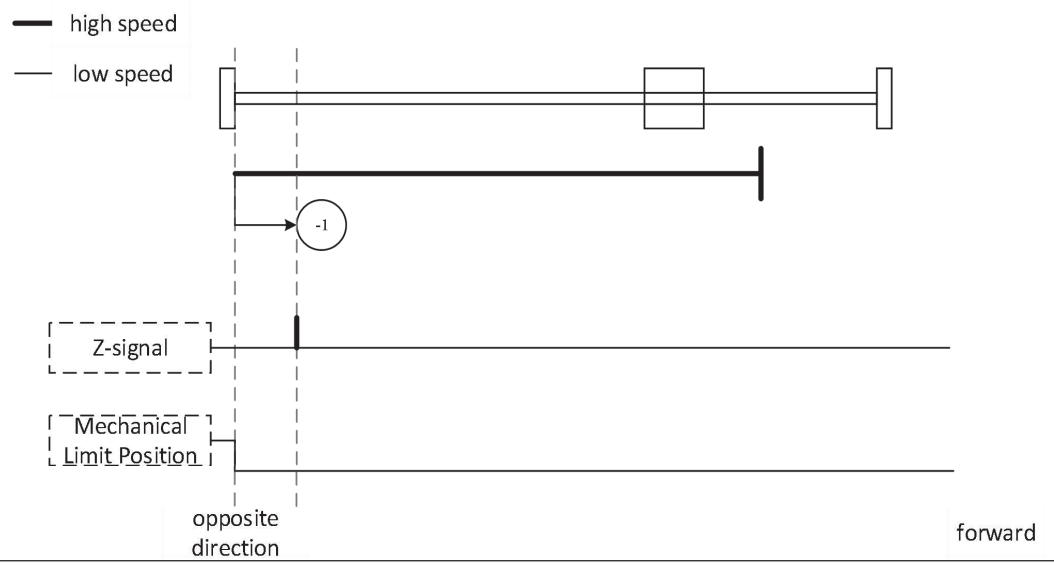
- Modalities 31-32： reservations
- Modalities 33-34： The origin reversion model 33-34

Movement Block Diagram	
localization signal	starting point: velocity point Phase Z Signal: none
Mode 33	Action Description 33 - Reverse low speed operation, stop at first Z-signal
Mode 34	Action Description 34 - Forward low speed run, stop at first Z-signal

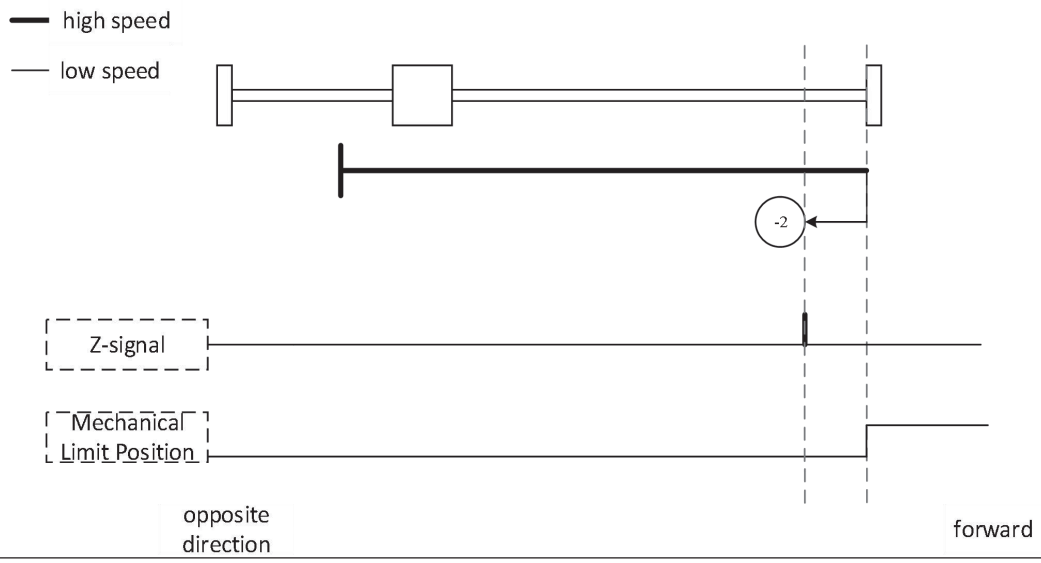
- Mode 35: Origin Resumption Mode 35

Movement Block Diagram	
Positioning Signal	starting point: velocityocityocity point current position: none
Mode 35	Action Description 35 - Take the current position as the origin

- mode-1: origin resumption mode -1

<table>
<tr><td>Movement Block Diagram</td><td> 
</td></tr>
<tr><td>localization signal</td><td><table>
<tr><th>starting point</th><th>velocity point</th></tr>
<tr><td>Phase Z Signal</td><td>Mechanical Limit Position</td></tr>
</table></td></tr>
<tr><td>Mode-1</td><td>Action Description
-1 - The motor first runs at high speed in the reverse direction, and after hitting the mechanical limit position, if the torque reaches the torque limit value and the speed is near zero speed, and if this state is maintained for a certain period of time, it is judged that the shaft has reached the mechanical limit position, and the motor is running in the forward direction at a low speed, and then stops when it encounters the first Z-signal.</td></tr>
</table>

Mode-2: Home reversion mode -2

<table>
<tr><td>Movement Block Diagram</td><td> 
</td></tr>
<tr><td>localization signal</td><td><table>
<tr><td>starting point</td><td>velocityocityocity point</td></tr>
<tr><td>Phase Z Signal</td><td>Mechanical Limit Position</td></tr>
</table></td></tr>
<tr><td>Mode -2</td><td>Action Description
-2 - The motor first runs at high speed in the forward direction, and after hitting the mechanical limit position, if the torque reaches the torque limit value, the speed is near zero speed, and if this state is maintained for a certain period of time, it is judged to have reached the mechanical limit position, and the motor runs in the reverse direction at a low speed, and after that, it stops when it encounters the first Z phase signal.</td></tr>
</table>

5.2.2 Speed control mode

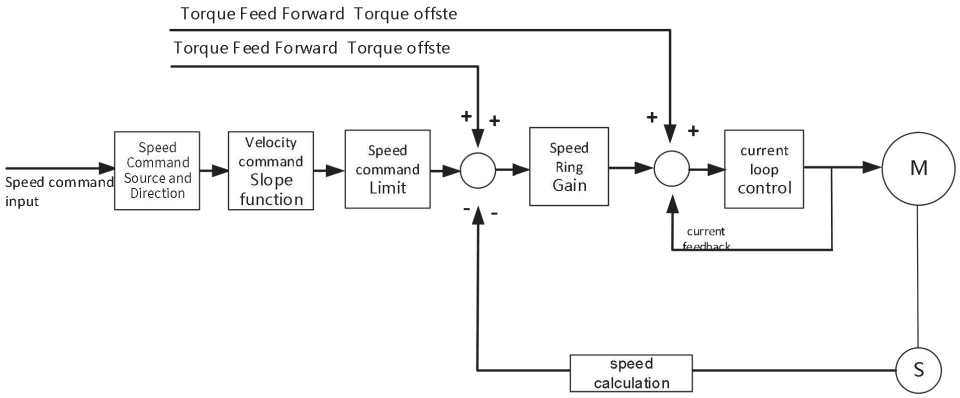


Figure: 5.2-16 Speed Control Block Diagram

By setting the value of parameter P04.00 to 0 through the servo drive panel or servo debugging software debugging platform, the servo drive will work in speed control mode.

Please set the servo drive parameters according to the mechanical structure and specifications. The following describes the basic parameter settings when the speed control mode is used.

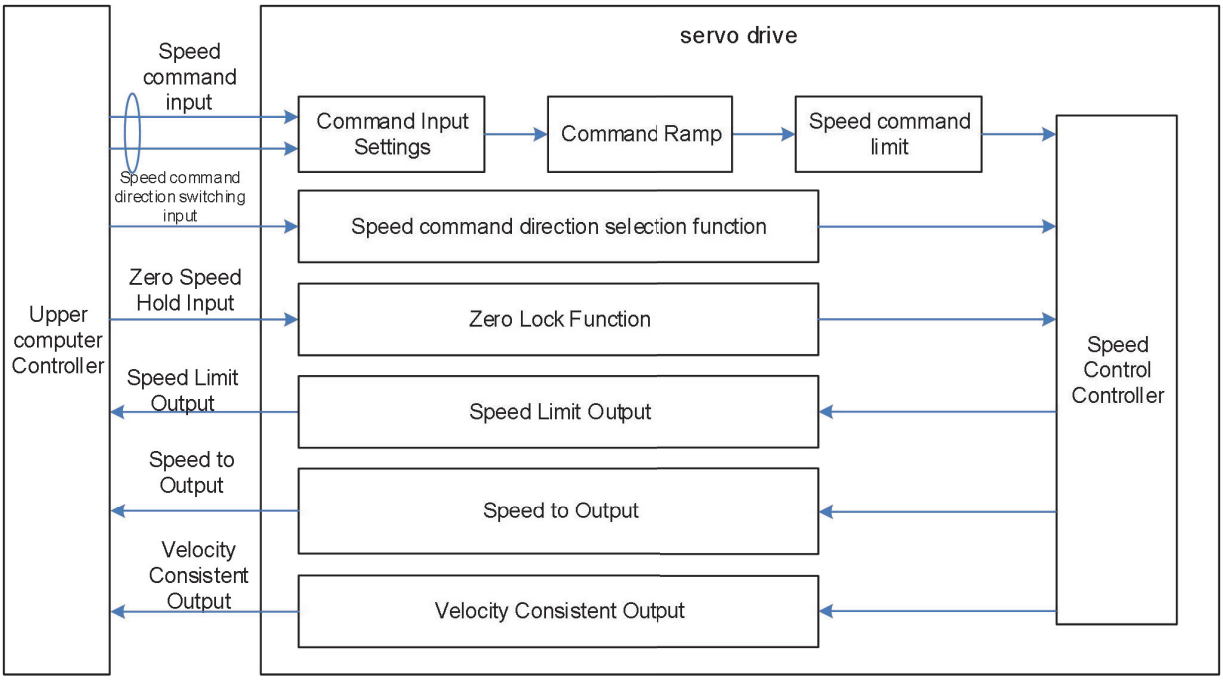


Figure: 5.2-17 Signal Interaction Diagram between Servo Drive and Upper Computer

5.2.3 Speed command input settings

1. Sources of speed instructions

The speed control mode has the following five speed command acquisition methods, which are set by function code P14.00.

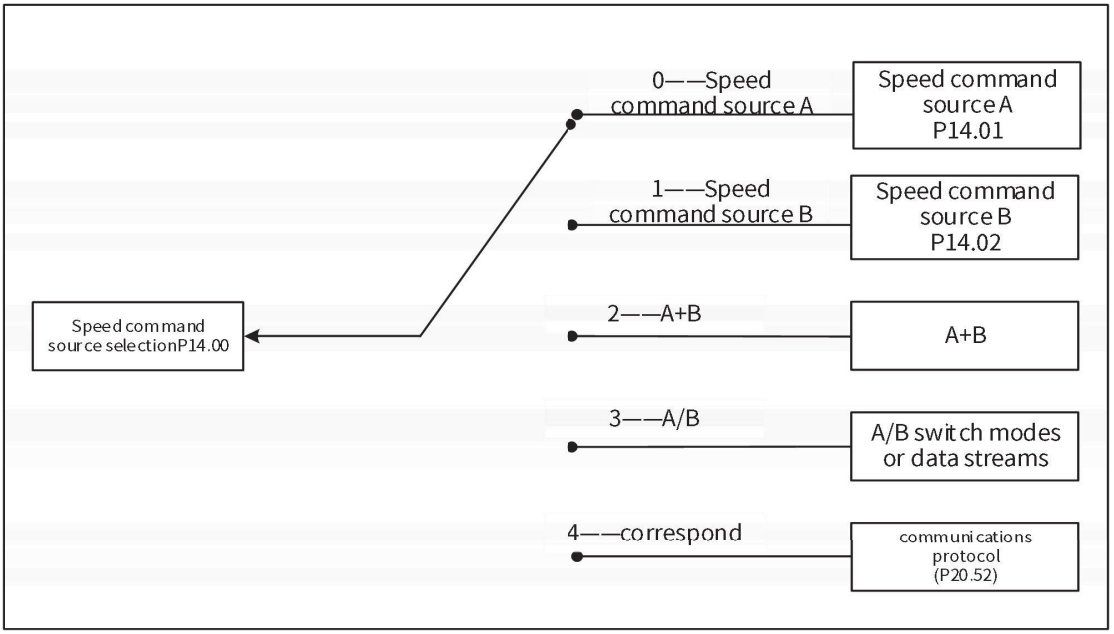


Figure : 5.2-18 Speed Command Source Selection Chart

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P14	00	Speed Command Source Selection	Source A Source B Source A+B Source A\B DI switching Communication given	-	Set speed command source selection	Shutdown Setting	Effective immediately	0

1) Speed command source A

Speed Command Source A includes three forms of commands: keypad-given, analog voltage-given, and preset speed task commands. Keyboard give and preset speed task commands are internal speed commands, and analog voltage give is an external speed command.

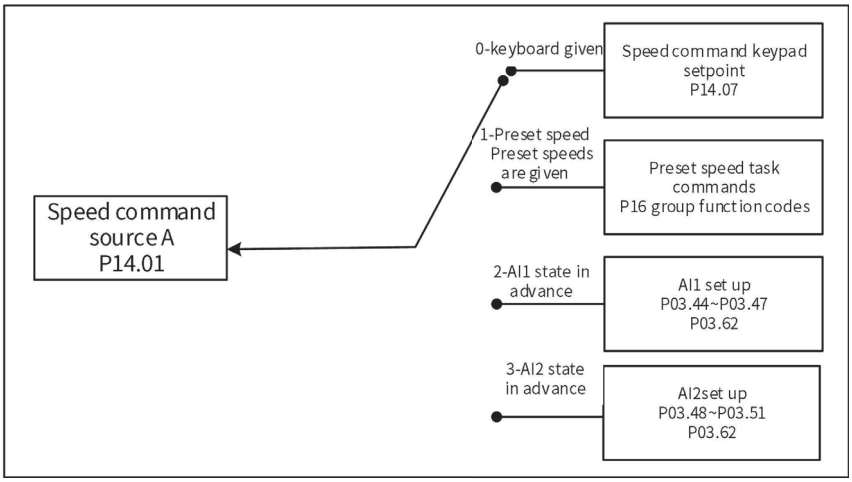


Figure: 5.2-19 Speed Command Sources A Diagram

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P14	01	Speed command Source A	Keypad given Preset speed given AI1 given AI2 given	-	Set speed command source A	Shutdown Setting	Effective immediately	0

- keyboard given

means that the speed value is set by function code P14.07 and is used as the speed command.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P14	07	Speed command keypad setpoint	-9999~30000	rpm	Set Speed Command Keypad Setting Value	Operation Setting	Effective immediately	200

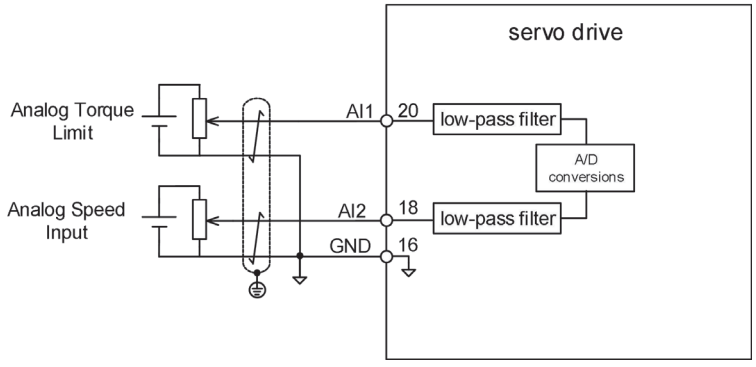
- Analog Voltage Feedback

Refers to the analog voltage signal output from the host computer or other devices, which is processed as a speed command.

Analog voltage input terminal：

Servo driver with 2 analog input channels: AI1 and AI2, maximum input voltage ±10Vdc, input impedance: about 9kΩ.

Analog Input Circuit：



Operating Methods：

AI2 is used as an example to illustrate the analog voltage setting speed command method.

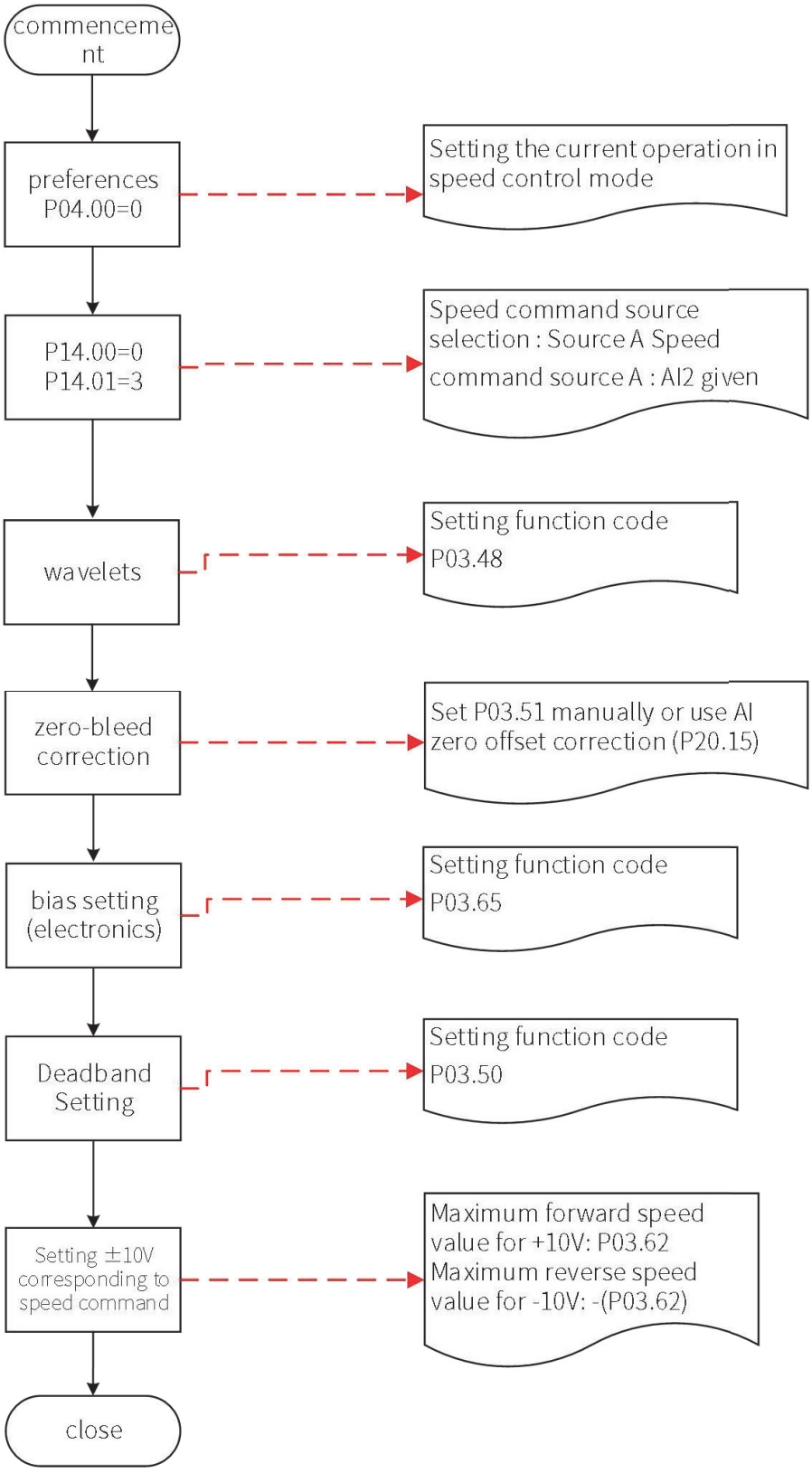


Figure: 5.2-20 Analog Voltage Speed Command Operation Flowchart

Zero drift: the value of the servo driver's sampling voltage relative to GND when the analog channel input voltage is zero.

Bias: The value of the corresponding analog channel input voltage when the sampling voltage is zero after zero drift correction.

Deadband: refers to the input voltage interval of the corresponding analog channel when the sampling voltage is zero.

The unprocessed analog channel output voltage is shown in the following figure y1, which is processed internally by the servo driver to finally get the speed command y6.

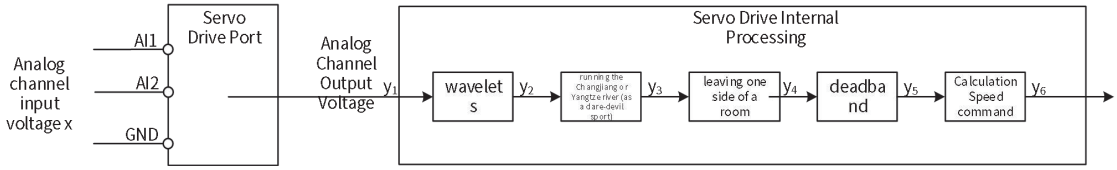


Figure : 5.2-21 Servo Drive AI Processing Flow

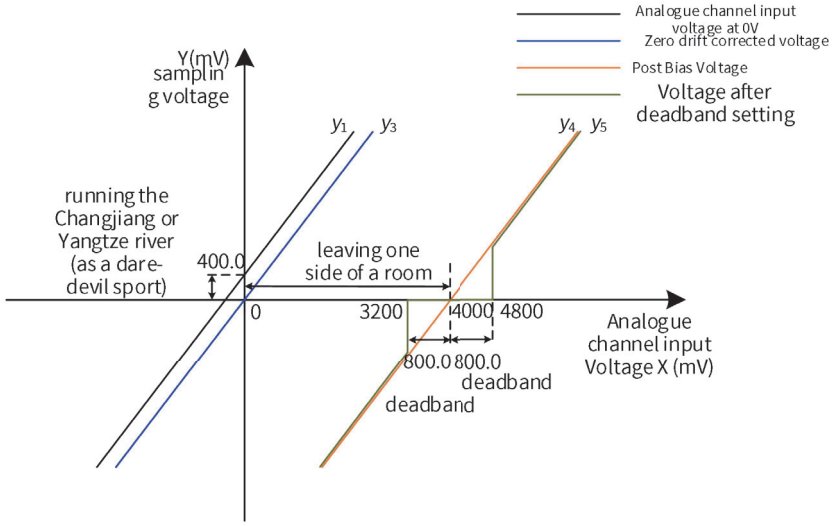


Fig. 5.2-22 Example of Servo Driver AI Processing Corresponding to Sampling Voltage

- wavelets:

The servo driver provides an analog channel filtering function. By setting the filtering time constant P03.48, it prevents fluctuations in motor commands caused by instability in the analog input voltage, and also attenuates erroneous motor movements caused by interference signals. The filtering function has no effect on eliminating or suppressing zero drift and deadband.

- zero-bleed correction:

Calibration of the analog channel output voltage deviation from 0V when the actual input voltage is 0V.

In the figure, the output voltage of the analog channel without internal processing of the driver is shown as y1. Taking the filtering time constant P03.48 = 0.00ms as an example, the filtered sampled voltage y2 is the same as y1.

It can be seen that the actual input voltage x = 0, the output voltage y1 = 400.0mV, this 400.0mV is known as zero drift.

Manually set P03.48 = 400.0 (mV), after zero drift correction, the sampled voltage is shown as y3. y3 = y1 - 400.0

Zero drift can also be corrected automatically with the analog channel auto-tuning function (P20.15).

- bias setting (electronics):

Setting the actual input voltage value when the sampling voltage is 0.。

As shown in the figure, when the preset sampling voltage y4=0, the corresponding actual input voltage x=4000mV, and this 4000mV is called the bias.。

Manually set P02.49 = 4000 (mV), after biasing, the sampled voltagey4=x-4000 = y3-4000

- deadband correction：

Limits the input voltage range that is valid when the driver sampling voltage is not 0。

After the bias setting is completed, when the input voltage x is within 3200mV and 4800mV, the value of the sampling voltage is 0, and this 800.0mV is called the deadband.。

Setting P03.50=800.0, after deadband correction, the sampled voltage is shown in y5。

$$y_5 = \begin{cases} 0 & 3200 \leqslant x \leqslant 4800 \\ y_4 & 4800 < x \leqslant 10000 \text{或} -10000 \leqslant x < 3200 \end{cases}$$

- Calculation speed command：

After the zero drift, bias and deadband settings are completed, the speed command value corresponding to 10V (10000mV) in the sampling voltage at this time needs to be set through P03.62, and the actual speed command y6：

$$y_6 = \frac{y_5}{10000} \times (P03.62)$$

This value will be used as the speed control mode analog speed command given value。

In this case, it is shown in Fig. 5.2-23 (left) without bias and 5.2-24 (right) with bias. When the correct setting is completed, the AI2 sampling voltage value can be viewed in real time through P09.23, and the corresponding speed command value of the input analog can also be viewed through P09.01.

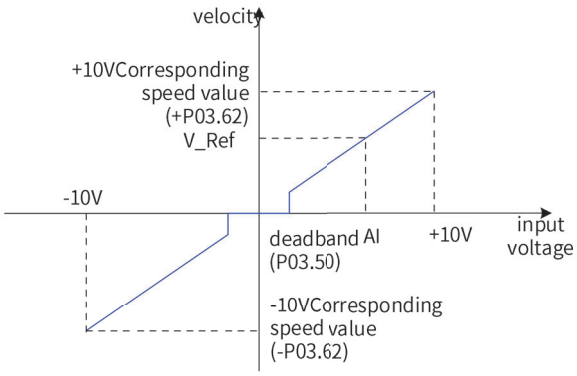


Figure: 5.2-23 Schematic diagram of unbiased AI2 (left)

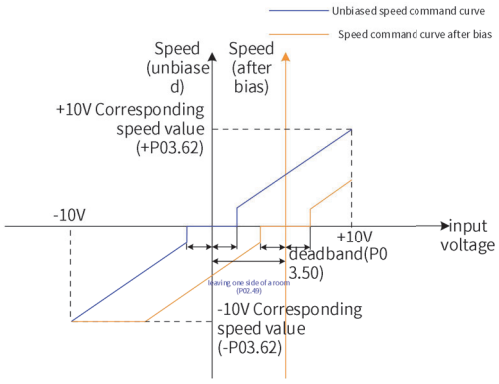


Figure: 5.2-24 Schematic of AI2 after bias (right)

Final speed command value y6 versus input voltage x：

$$y_6 = \begin{cases} 0 & B-C \leqslant x \leqslant B+C \\ x-B & B+C < x \leqslant 10000 \text{或} -10000 \leqslant x < B-C \end{cases}$$

Where: B: Bias; C: Deadband.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P02	49	AI2 offset voltage	-10000~10000	mV	Setting the AI2 channel analog bias value	Operation Setting	Effective immediately	0
P03	48	AI2 input filter time	0~655.35	ms	Setting the analog average filtering time constant for AI2 channel	Operation Setting	Effective immediately	2.00
P03	50	AI2 dead zone	0~1000.0	mV	Setting the AI2 channel analog deadband value	Operation Setting	Effective immediately	10.0
P03	51	AI2 zero drift	-500.0~500.0	mV	Setting the analog zero-drift value of AI2 channel	Operation Setting	Effective immediately	0.0
P03	62	Analog 10V corresponds to the speed value	0~6000	rpm	Setting analog 10V corresponding to speed value	Shutdown Setting	Effective immediately	3000
P20	15	AI Zero drift Calibration	0-no operation 1-AI1align 2-AI2align	-	Zero drift auto-correction enable for analog AI1 and AI2 channels	Shutdown Setting	Effective immediately	0

Note: When you choose to use the analog AI1 input channel, the setting method is similar to the analog AI2 setting method described above, and the related function codes can be found in Chapter VIII.

2) Speed command source B

Speed command source B includes three forms of commands: keypad given, analog voltage given, and preset speed task. The keyboard give and preset speed task commands are internal speed commands, and the analog voltage give is an external speed command.

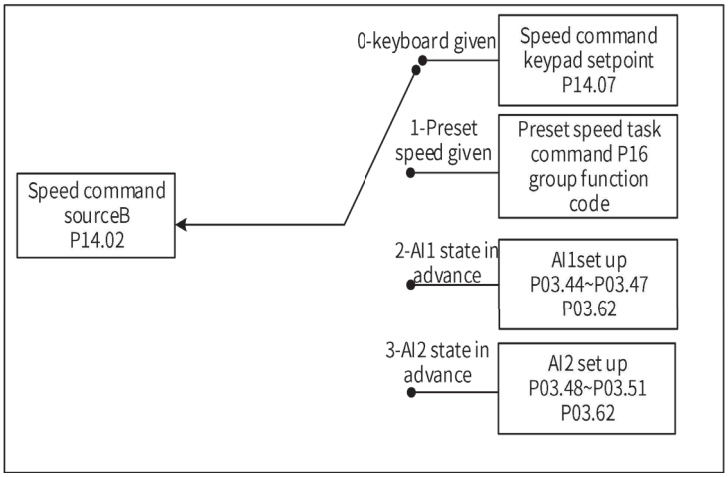


Figure: 5.2-25 Speed Command Source B Chart

Function Code	Name	Setting Range	Unit	Functionality	Setting Method	Entry Into Force Time	Factory Setting

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Entry Into Force Time	Factory Setting
P14	02	Speed command sourceB	Keypad given Preset speed given AI1 given AI2 given	-	Set speed command source B	Shutdown Setting	Effective immediately	1

In this case, the digital feed and analog voltage setting method is the same as the speed command source A.

The following describes the preset speed task commands. The servo drive has a preset speed task operation function. It means that the servo drive has stored 16 segments of speed commands internally, and the maximum running speed and running time of each segment can be set separately. It is also equipped with 4 groups of acceleration and deceleration times for selection. The setting process is as follows:

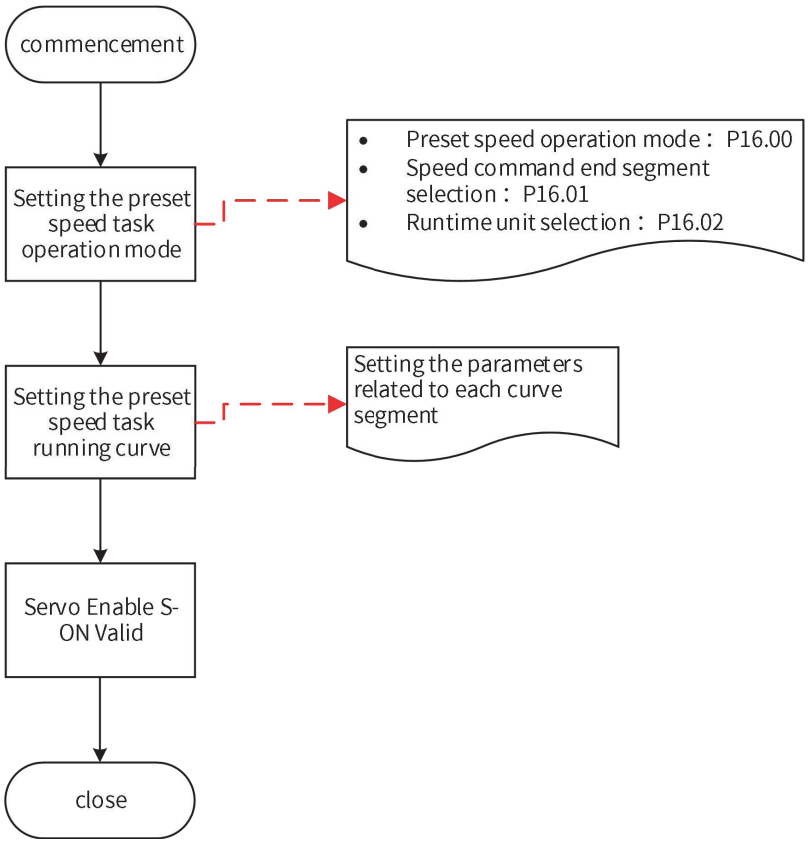


Figure: 5.2-26 Preset Speed Task Setting Flowchart

- Setting the preset speed task operation mode

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Entry Into Force Time	Factory Setting
P16	00	Preset speed command operation mode	Single run Cyclic run DI switching run	-	Setting the preset speed Command operation mode	Shutdown Setting	Effective immediately	1

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Entry Into Force Time	Factory Setting
P16	01	Speed command end segment selection	1~16	-	Set speed command End point segment selection	Shutdown Setting	Effective immediately	16
P16	02	Runtime unit selection	S min	-	Setting runtime unit selection	Shutdown Setting	Effective immediately	0

Configurable external DI terminal and set to function FunIN.20: Speed command direction switching for preset position command direction selection.

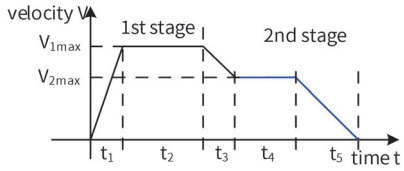
Function Number	Function Name	Descriptive
FunIN.20	Speed command direction selection	Invalid - positive directioncc； Effective - reverse direction。

P16.01=2 is used as an example to illustrate the modes.

- Single run end stop(P16.00=0)

Function code P16.00 is set to 0 to select the single run stop mode. After setting function codes P16.01 and P16.02 according to the total number of segments to be executed and the unit of execution time respectively, and setting the command value of the corresponding segment, running time, acceleration and deceleration time and other parameters according to the demand, the drive will run in accordance with the segment code from the first segment to the Nth segment until it stops after running the last segment.

Table 5.2-9 End-of-run Shutdown Description

Model Description	Operating Curve
Run 1 round; automatic incremental switching of segment numbers；	 V1max、V2max：Command speeds for paragraphs 1 and 2； t1：Actual acceleration and deceleration times for paragraph 1； t3、t5：Acceleration and deceleration times for period 2； Running time of a section: the variable speed time of the previous speed instruction switching to the speed instruction of the section + the constant speed running time of the section (e.g., the first running time of the first section in the figure is t1+t2, the second running time of the second section is t3+t4, and so on) Do not set the running time of a section to 0, the drive will skip the speed instruction of the section and execute the next section; the actual speed of the motor reaches the maximum running speed of the section, and the speed arrives at the maximum running speed of the section. The actual speed of the motor reaches the maximum speed set for the segment, and the speed arrival signal is valid; if a servo enable OFF occurs during the operation of a segment, the motor stops according to the servo OFF stopping mode (H02-05).

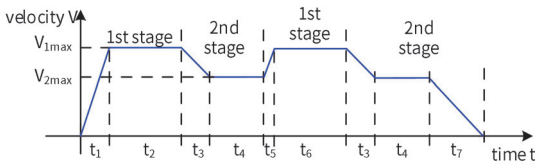
Note: The total number of segments of the preset speed task command set in P16.01 that the drive runs completely once is referred to as the completion of one round of operation.

- run in a loop(P16.00=1)

Function code P16.00 is set to 1 to select the cyclic operation mode. After setting function codes P16.01 and P16.02 according to the total number of segments to be executed and the unit of execution time respectively, and setting the command value, running time, acceleration and deceleration time and other parameters of the corresponding segments according to the demand, the module will run according to the running time and acceleration

and deceleration time of the commands of the segments and the drive will run in accordance with the segment code from the first to the Nth segment, and it automatically jumps to the first segment to run in a cycle after the last segment is finished.

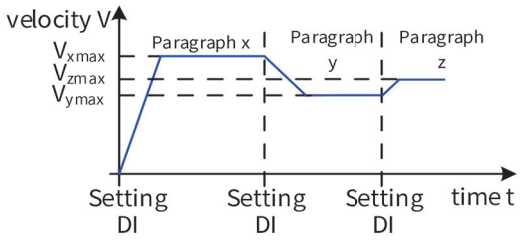
Table 5.2-10 Description of Cyclic Operation

Model Description	Operating Curve
Cyclic operation, the starting segment number of each round is 1; the segment number is automatically incremented and switched; if the servo enable is active, the cyclic operation state is maintained all the time.	 V1max、V2max：Maximum operating speed for segments 1 and 2； Running time of a section: the speed change time of the previous speed command to switch to the speed command of the section + the constant speed running time of the section (e.g., the first running time of the first section in the figure is t1+t2, the second running time of the second section is t3+t4, and so on) Do not set the running time of a section to 0, the drive will skip the speed command of the section, and execute the next section； The actual speed of the motor reaches the maximum running speed set for the section, and the speed arrival signal is valid; if the servo enable OFF occurs during the operation of a section, the motor stops according to the servo OFF stopping mode(P04.12)

- DI switching operation(P16.00=2)

Function code P16.00 is set to 2 to select the external DI switching method. After setting function codes P16.01 and P16.02 according to the total number of segments to be executed and the unit of execution time, and setting the command value of the corresponding segment, run time, acceleration/deceleration time and other parameters according to the demand, the driver will choose to run the speed command of the corresponding segment according to the combination of ON/OFF of the external DI.

Table 5.2-11 DI switching operation description

Model Description	Operating Curve
Continuous operation with servo enable; segment numbering is determined by DI terminal logic; runtime for each speed command is determined only by the segment number switching interval	 x，y：Segment number, segment number and DI terminal logical relationship as described below； A segment's running time is not affected by the function code setting, and if the segment number changes during a segment's speed command, it immediately switches to the new segment number.； The actual motor speed reaches the maximum operating speed set for the segment, and the speed arrival signal is valid.； Servo enable OFF occurs during operation of a segment, and the motor stops in the servo-OFF stopping mode (P04.12);

When the multi-segment position operation mode is set to DI switching operation, the four DI terminals of the servo driver must be configured to function 27 ~ 30 (FunIN.27 ~ FunIN.30 multi-segment operation command switching), and the effective logic of the DI terminals must be determined. At the same time, one DI terminal of the

Servo Drive can be configured as function 20 (FunIN.20: speed command direction selection) to switch the speed command direction.

<table>
<tr><th>Function Number</th><th>Function Name</th><th>Descriptive</th><th>Note</th></tr>
<tr><td>FunIN.20</td><td>Speed Command Direction Selection</td><td>Ineffective - positive direction;
Effective - negative direction</td><td>For setting the speed command direction only in preset speed command DI switching mode：</td></tr>
<tr><td>FunIN.27</td><td>Preset Command Selection 1</td><td rowspan="3">The multi-segment number is a 4-digit binary number, and the correspondence between FunIN.27~FunIN.30 and the segment number is shown in the following table
<table><tr><th>FunIN.30</th><th>FunIN.29</th><th>FunIN.28</th><th>FunIN.27</th><th>段号</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>2</td></tr><tr><td colspan="5">…</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>16</td></tr></table>The CMD value is 1 when the input level of DI terminal is valid, otherwise it is 0.</td><td></td></tr>
<tr><td>FunIN.28</td><td>Preset Command Selection 2</td><td></td></tr>
<tr><td>FunIN.29</td><td>Preset Command Selection 3</td><td></td></tr>
<tr><td>FunIN.30</td><td>Preset Command Selection 4</td><td></td><td></td></tr>
</table>

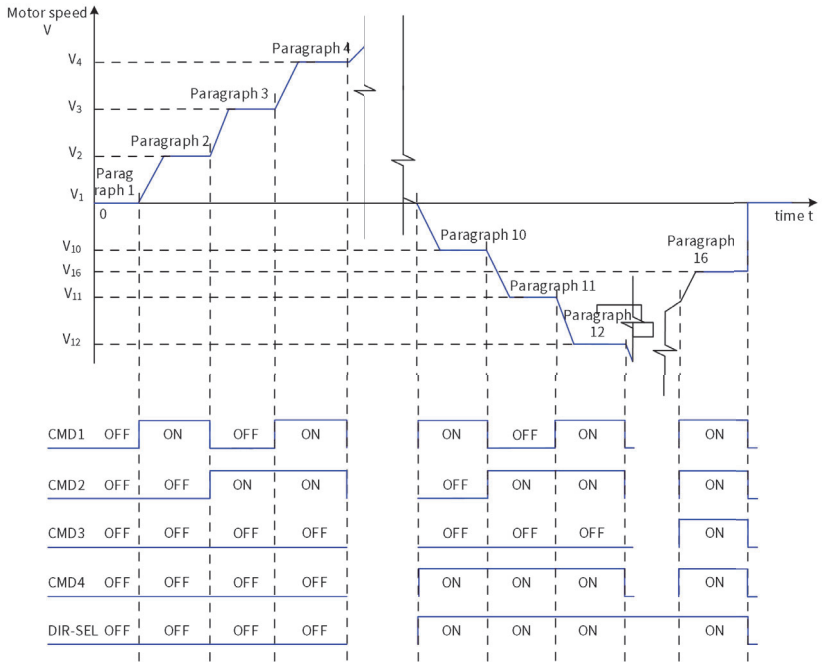


Figure: 5.2-27 Example of Preset Speed Task Curve

- Preset speed task run curve setting

Taking the 1st speed instruction as an example, the relevant function codes are as follows:

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P16	03	Acceleration time 1	0~65535	ms	Setting the 1st set of acceleration and deceleration time	Shutdown Setting	Effective immediately	10
P16	04	Deceleration time 1	0~65535	ms		Shutdown Setting	Effective immediately	10
P16	09	Acceleration time 4	0~65535	ms	Setting the acceleration and deceleration time for group 4	Shutdown Setting	Effective immediately	150
P16	10	Deceleration time4	0~65535	ms		Shutdown Setting	Effective immediately	150
P16	20	1st speed command	-6000~6000	rpm	Setting the 1st speed command value	Shutdown Setting	Effective immediately	0
P16	21	Running time of the 1st instruction	0~6553.5	s (min)	Setting the 1st command run time	Shutdown Setting	Effective immediately	5.0
P16	22	Acceleration and deceleration time for paragraph 1	0-zero acceleration/deceleration time 1-	-	Selection of 1st acceleration/deceleration mode	Shutdown Setting	Effective imme	0

			acceleration/deceleration time 1 2-acceleration/deceleration time 2 3-acceleration/deceleration time 3 4-acceleration/deceleration time 4				diately	

There are 4 groups of acceleration and deceleration times available in the preset speed task command parameters, in addition to the 1~16 segment command values and command run time, and the default mode is no acceleration and deceleration times. Taking the end of P16.01=1 single run in the preset speed task as an example, the actual acceleration and deceleration time as well as the running time are explained as follows：

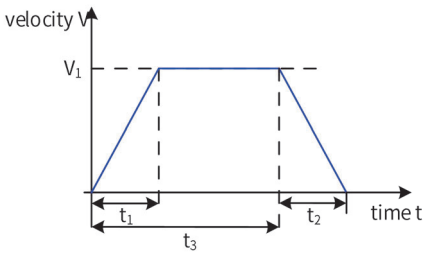


Figure: 5.2-28 Example of Preset Speed Task Curve

As shown above, the velocity command for this segment is V1 and the actual acceleration time t1 is：

$$t_1 = \frac{V_1}{1000} \times \text{Acceleration time for this speed setting}$$

Actual deceleration time t2：

$$t_2 = \frac{V_1}{1000} \times \text{Deceleration time for this speed setting}$$

running time： The variable speed time of the previous speed command switching to this speed command + the constant speed running time of this section, as shown in the figure t3.

3) A/B DI switching source

When "A/B switching" is selected for the speed command, i.e., when function code P14.00=3, it is necessary to assign the DI function FunIN.23 to the corresponding DI terminal, and to decide whether the A command source input is valid or the B command source input is valid according to the input signal on this DI terminal.

Function Number	Function Name	Descriptive	Note
FunIN.23	Run command switching	Invalid-Currently running command is A Valid-Currently running command is B	

4) communication protocol

means that when function code P14.00 is set to 4, the speed command value comes from the set value of function

code P20.52, and function code P20.52 must be modified by communication, and is not visible to the control panel.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P20	52	Bus given speed command	-9000.000~9000.000	rpm	Setting of the speed command value in the form of a communication given; accuracy of 0.001 rpm.	Operation Setting	Effective immediately	0

2． Speed command direction setting

Speed command direction switching is realized through DI, i.e., the DI function FunIN.20 is assigned to the corresponding DI terminal, and the current speed command direction is determined according to the input signal on this DI terminal, thus satisfying the need for speed command direction switching.

Function Number	Function Name	Descriptive	Note
FunIN.20	Speed command direction selection	Ineffective - positive direction; Effective - negative direction。	

The actual motor operation direction is related to the operation direction selection (P04.01), speed command direction, and speed command direction DI switching (FunIN.20).。

Actual motor running direction setting in speed control mode

P04.01	Speed Command Plus Or Minus	Funin.20	Actual Motor Running Direction
0	+	null	counterclockwise
0	+	validity	clockwise
0	-	null	clockwise
0	-	validity	counterclockwise
1	+	null	clockwise
1	+	validity	counterclockwise
1	-	null	counterclockwise
1	-	validity	clockwise

5.2.3.1 Ramp function settings

Ramp function setting refers to the conversion of speed commands with large acceleration to speed commands with more gentle acceleration, i.e., by setting the acceleration and deceleration times for the purpose of acceleration control.

In speed control mode, excessive acceleration of the speed command will cause the motor to jump or vibrate violently, at this time, increase the acceleration or deceleration time to realize the smooth speed change of the motor, to avoid the above situation leading to mechanical damage.

⚠ attention：

When the speed command is derived from the keyboard, analog voltage, or spot speed, the acceleration and deceleration times are set by function codes P14.08 and P14.09; when the speed command is derived from a preset

speed task, the acceleration and deceleration times are set by the P16 group parameter, see Chapter 8 for details.

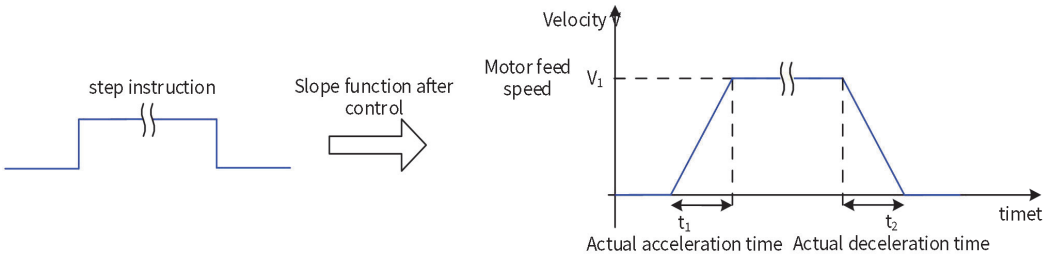


Figure: 5.2-29 Schematic Definition of the Slope Function

P14.08：Acceleration time from 0 to 1000rpm for speed commands。

P14.09：Speed command deceleration time from 1000rpm to 0。

Therefore, the actual acceleration and deceleration times are calculated as follows：

$$\text{Actual acceleration time } t_1 = \frac{\text{speed command}}{1000} \times \text{Speed command acceleration ramp time}$$

$$\text{Actual deceleration time } t_2 = \frac{\text{speed command}}{1000} \times \text{Speed command deceleration ramp time}$$

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P14	08	Speed command acceleration ramp time	0~65535	ms	Used to set acceleration and deceleration time values for speed commands other than multispeed commands in speed mode.	Operation Setting	Immediate effect	0
P14	09	Speed command deceleration ramp time	0~65535	ms		Operation Settings	immediate effect	0

5.2.3.2 Zero lock function

attention：

Zero lock function is used in the speed control mode for systems where the upper unit has not built a position loop.

If the servo motor oscillates in the zero position lock state, the position loop gain can be adjusted.

The zero position lock function is that in the speed control mode, when the amplitude of the speed command is less than or equal to the setting value of P14.10 when the zero position lock DI signal FunIN.6 (zero speed hold) is valid, the servo motor enters into the zero position lock state, and at this time the servo driver builds the position loop internally, and the speed command is invalid; the servo motor is fixed in the zero position lock effective position within ±1 pulse even if the zero position lock is not valid because of the The servo motor is fixed within ±1 pulse of the

effective position of zero position locking, and even if the movement occurs due to external force, it will return to the fixed zero position.

If the speed command amplitude is greater than P14.10, the servomotor exits the zero-lock state, at which time the servomotor continues to run according to the currently input speed command. If the zero lock DI signal FunIN.6 (zero speed hold) is invalid, the zero lock function is invalid.

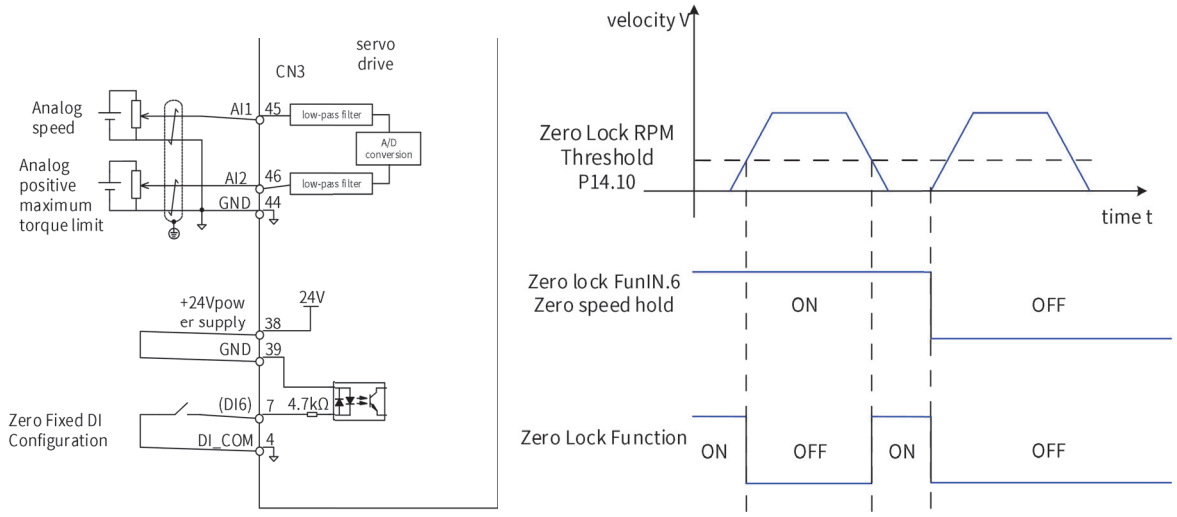


Figure: 5.2-30 Zero Lock Related Wiring and Waveforms

Function Code		Name	Setting Range	Unit (Of Measure)	Functionality	Setting Method	Effective Date	Factory Setting
P14	10	Zero Lock RPM Threshold	0~6000	rpm	Setting the speed threshold for the zero-speed lock function	Operation Setting	Effective immediately	10

Function Number	Function Name	Descriptive	Note
FunIN.6	zero-speed hold	Valid-enable zero lock function； Invalid - disable zero lock function。	

5.2.3.3 Speed command limits

⚠ attention：

When the actual motor speed exceeds the overspeed fault threshold P08.03, the drive generates E.416 (motor overspeed), see Chapter 7 Parameter Detail Table for the setting of P08.03. The speed command limit value must be less than P08.03.

In speed control mode, the servo drive can limit the size of the speed command, and the speed command limit sources include：

P14.03：Set the amplitude limit for positive and negative direction speed commands, and the positive and negative direction speed commands will be limited to this value if they exceed the set value.

P14.04：Sets the forward speed threshold value above which all forward speed commands are limited.

P14.05：Sets the reverse speed threshold above which negative direction speed commands are limited.

Maximum motor speed (default limit point): determined by the actual motor model used.

The actual motor speed limit interval is satisfied：

|Amplitude of positive speed command|≤min{Maximum motor speed、P14.03、P14.04}

|Magnitude of negative speed command|≤min{Maximum motor speed、P14.03、P14.05}

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P14	03	Maximum speed limit value	0~60000	rpm	Setting the maximum speed limit value	Operation Settings	Effective immediately	10000
P14	04	Positive Speed Limit	0~60000	rpm	Setting the forward speed limit value	Operation Settings	Effective immediately	10000
P14	05	Speed Reverse Limit	0~60000	rpm	Setting the reverse speed limit value	Operation Settings	Effective immediately	10000

5.2.3.4 Velocity dependent DO outputs

The speed feedback value is filtered and compared with different thresholds to output a DO signal for use by the host computer. The corresponding filter time parameter is set by P07.76.

1. Motor motion signal DO output

When the absolute value of the actual motor rotation speed after filtering reaches P14.12 (Motor Motion Status Threshold), the motor can be considered to be in motion. At this point, the Servo Driver can output a motor motion (FunOUT.5: Motor Motion) signal, which is used to confirm that motor motion has occurred. Conversely, when the absolute value of the actual motor speed after filtering is less than P14.12, the motor is considered to be not in motion.

Judgment of motor motion (FunOUT.5: Motor Motion) signals is not affected by the Drive's operating status and control mode.

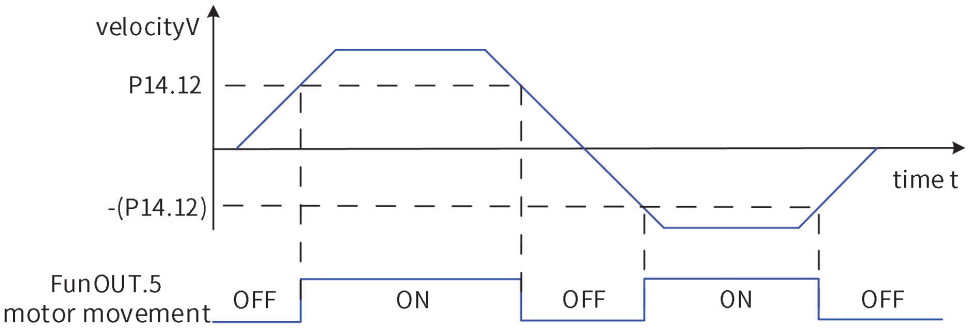


Fig. 5.2-31 Motor Motion Signal Waveforms

Attention：

In the above figure, ON represents that the motor movement DO signal is valid, and OFF represents that the motor movement DO signal is invalid.

function code		name	Setting range	unit	functionality	Setting method	Effective date	Factory Setting
P14	12	Motor Motion State Threshold	0~1000	rpm	Setting the motor motion signal judgment threshold	Operation Setting	Effective immediately	20

When using the motor motion signal output function, assign one of the Servo Driver's DO terminals to be the DO function (FunOUT.5: Motor Motion) and determine the valid logic for the DO terminal.

Function Number	Function Name	Descriptive	Note
FunOUT.5	motor movement	Invalid, the absolute value of motor speed after filtering is less than the setting value of function code P14.12 Valid, the absolute value of motor speed after filtering reaches the setting value of function code P14.12	

2. Speed consistent signal DO output

In the speed control mode, when the absolute value of the deviation between the actual speed of the servo motor and the speed command after filtering meets a certain threshold (P14.13), the actual speed of the motor is considered to have reached the set value of the speed command, and the driver can output a speed consistent (FunOUT.7: speed consistent) signal at this time. On the contrary, if the absolute value of the deviation between the actual rotational speed of the servo motor and the speed command after filtering exceeds the threshold value, the speed consistent signal is invalid.

The speed coherence (FunOUT.7: Speed coherence) signal is always invalid when the drive is not running or in non-speed control mode.

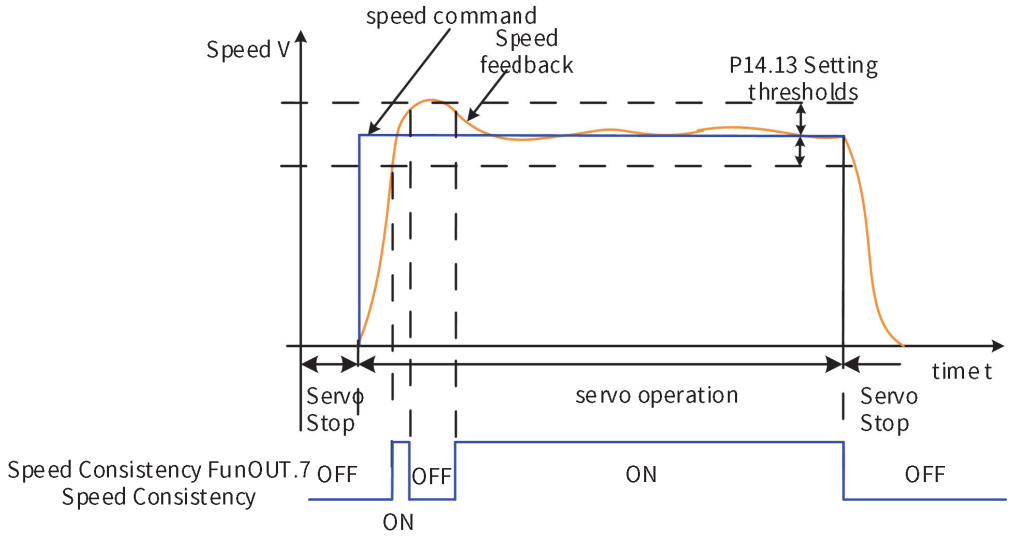


Figure: 5.2-32 Velocity Consistent Signal Waveforms

Attention：

In the above figure, ON means speed consistent DO signal is valid, OFF means speed consistent DO signal is invalid.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P14	13	Speed consistent Signal width	0~100	rpm	Consistent set speed Signal width	Operation Settings	Immediate effect	10

When using the speed consistent signal output function, assign one of the DO terminals of the Servo Driver to be the DO function (FunOUT.7: Speed Consistent) and make sure that the DO terminal is valid logic.

Function Number	Function Name	Descriptive	Note
FunOUT.7	speed	Invalid, the absolute value of the deviation between the actual motor speed and the speed command after filtering is greater than the function code P14.13. Valid, the absolute value of the deviation between the actual speed of the motor and the speed command after filtering is not greater than the function code P14.13.	

3. Speed arrival signal DO output

When the absolute value of the actual rotational speed of the servo motor after filtering exceeds a certain threshold (P14.14), the actual rotational speed of the servo motor is considered to have reached the desired value, and at this time, the servo driver can output the speed arrival (FunOUT.8: speed arrival) signal. On the contrary, if the absolute value of the actual rotational speed of the servo motor after filtering is not greater than this value, the speed arrival signal is invalid.

The judgment of the speed arrival (FunOUT.8: speed arrival) signal is independent of the drive operating state and control mode.

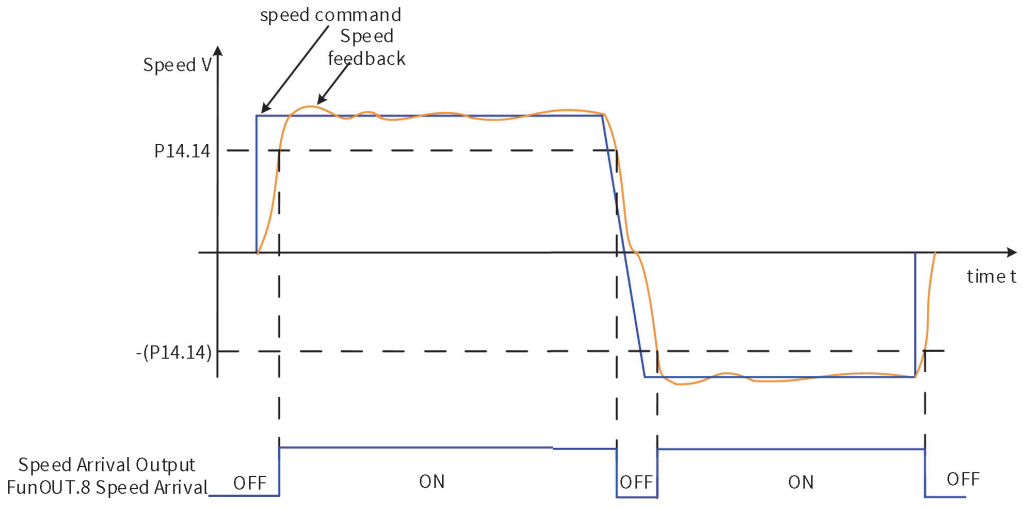


Figure: 5.2-33 Speed Arrival Signal Waveforms

Attention：

In the above figure, ON means that the speed arrives at DO signal is valid, and OFF means that the speed arrives at DO signal is invalid.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P14	14	Velocity reaches signal threshold	10~6000	rpm	Setting the speed arrival signal judgment threshold	Operation Setting	Effective immediately	1000

When using the motor motion signal output function, one of the DO terminals of the Servo Driver should be assigned as the DO function (FunOUT.8: VArr, speed arrival), and make sure that the DO terminal is valid Logic.

Function Number	Function Name	Descriptive	Note
FunOUT.8	speed	Invalid, the absolute value of the motor speed feedback after filtering is greater than function code P14.14 Valid, the absolute value of the motor speed feedback after filtering is not greater than the function code P14.14	

4. Zero speed signal DO output

When the absolute value of the actual speed of the servo motor is less than a certain threshold (P14.15), the actual speed of the servo motor is considered to be close to static, and at this time, the servo driver can output a zero-speed (FunOUT.6: Zero-speed signal) signal. On the contrary, if the absolute value of the actual rotational speed of the servo motor is not greater than this value, it is considered that the motor is not in a stationary state, and the zero speed signal is invalid.

The judgment of the zero speed (FunOUT.6: Zero speed signal) signal is independent of the drive operating status and control mode.

When there is interference in the speed feedback, it can be filtered out by the speed feedback DO filter, and the corresponding filter time parameter is set by P07.76.

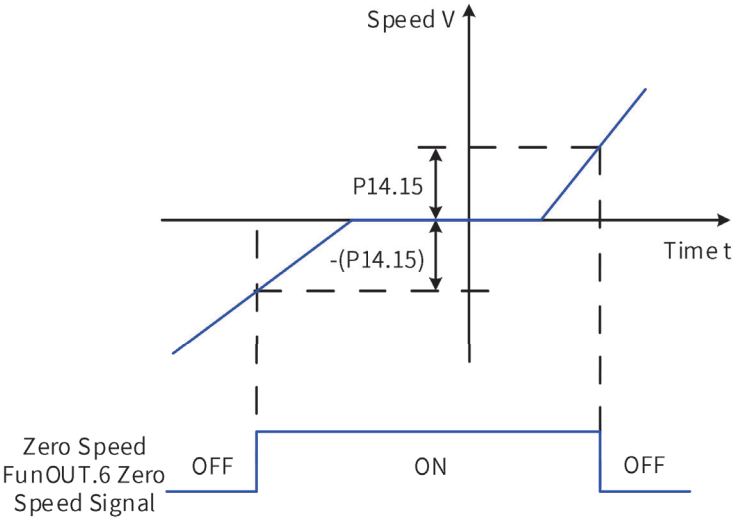


Figure: 5.2-34 Zero Speed Signal Waveforms

Attention：

In the above figure, ON means zero-speed DO signal is valid, OFF means zero-speed DO signal is invalid.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Effective Date	Factory Setting
P14	15	Zero Speed Output Signal Threshold	1~6000	rpm	Setting the judgment threshold for zero-speed output signals	Operation Setting	Effective immediately	10

When using the motor zero-speed signal output function, assign one of the Servo Driver's DO terminals as DO function 3 (FunOUT.6: Zero-speed signal) and make sure that the DO terminal is valid Logic.

Function Number	Function Name	Descriptive	Note
FunOUT.6	Zero Speed Signal	Invalid, when the difference of the speed feedback of the motor is greater than the value set by function code P14.15 Valid, when the difference of the speed feedback of the motor is not greater than the value set by function code P14.15	Output signal when servomotor stops rotating

5.2.4 Torque control mode

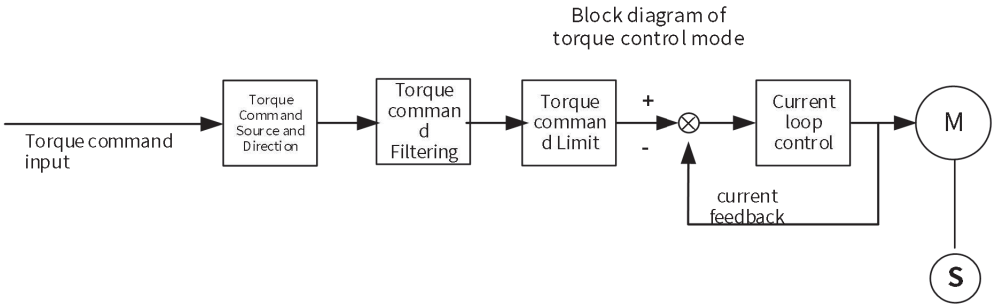


Figure: 5.2-35 Torque Control Block Diagram

Set the value of parameter P04.00 to 2 through the servo drive panel or Daqo Drive debugging platform, and the servo drive will work in torque control mode. Please set the servo drive parameters according to the mechanical structure and indicators. The following describes the basic parameter settings when the torque control mode is used.

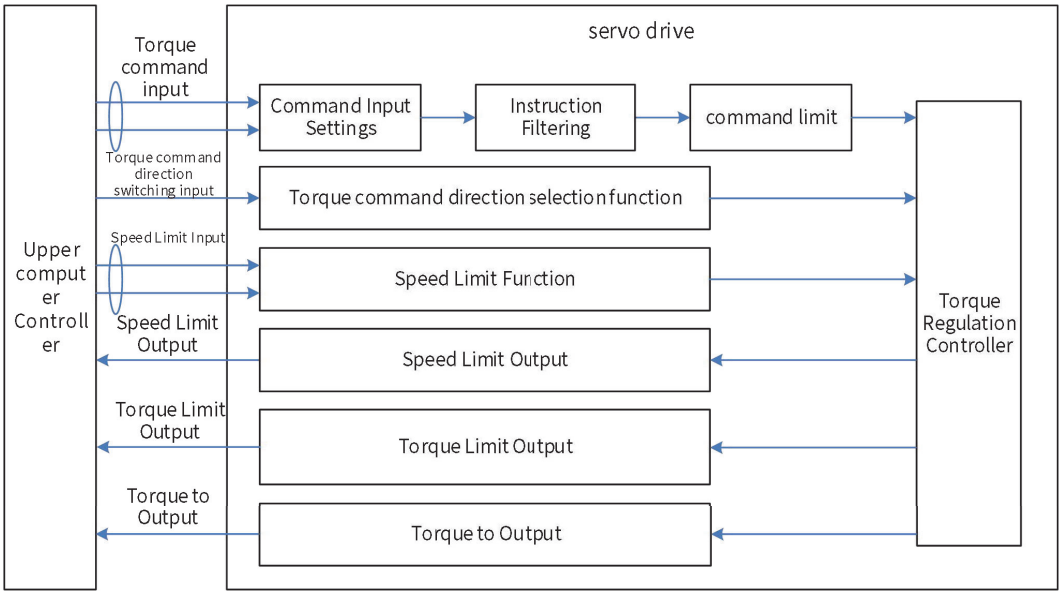


Figure: 5.2-36 Signal Interaction Diagram between Servo Drive and Upper Computer

5.2.4.1 Torque command input setting

1. Torque command source

The torque control mode has the following five torque command acquisition methods, which are set by function code P15.00.

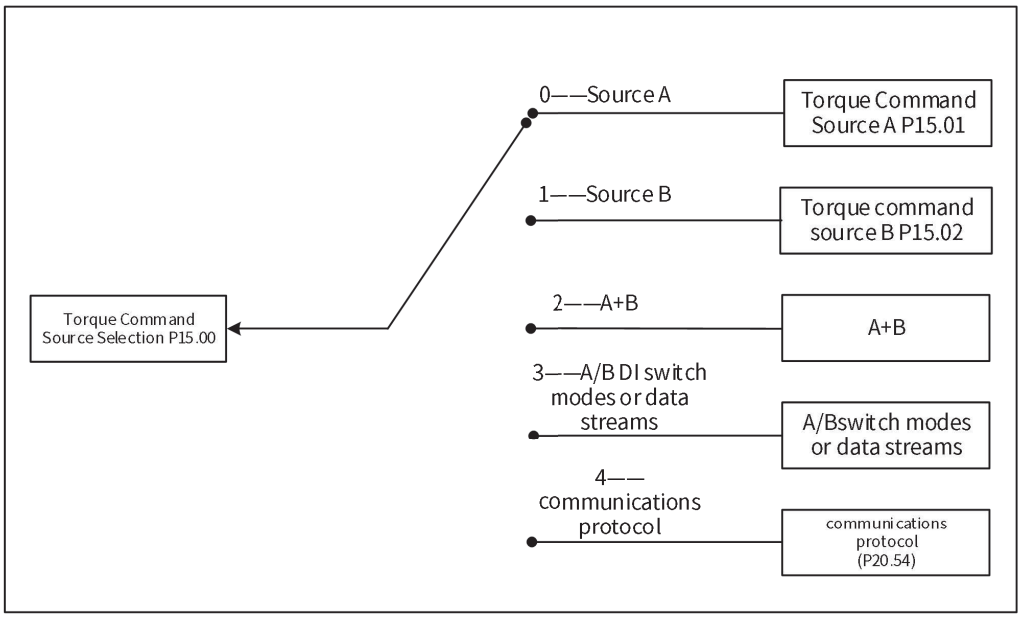


Figure: 5.2-37 Torque Command Source Map

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P15	00	Torque command source selection	Source A Source B Source A+B Source A\B DI Switching communication protocol	-	Select Torque Command Source	Shutdown Setting	Effective immediately	0

1) Torque command source A

Torque command source A includes two forms of commands: keypad given and analog voltage given. The keyboard is used as internal torque command and the analog voltage is used as external torque command.

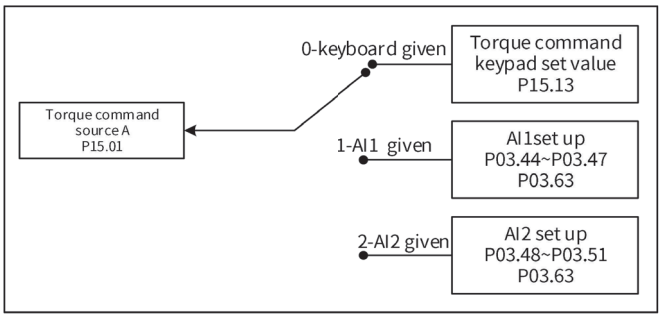


Figure : 5.2-38 Torque Command Source A Description

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Entry Into Force Time	Factory Setting
P15	01	Torque command source A	0 - Keypad given (P15.13) 1 - AI1 given 2 - AI2 given	-	Selection of torque command source A	Shutdown Setting	Effective immediately	0

- keyboard given

means the percentage of the commanded torque relative to the rated torque of the motor, as set by function code P15.13.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Entry Into Force Time	Factory Setting
P15	13	Torque command keypad setting	-300.0~300.0	%	Numerical setting of the internal torque command with an accuracy of 0.1%.	Operation Setting	Effective immediately	0

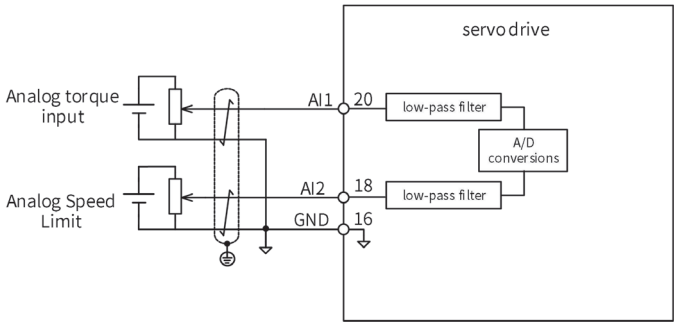
- analog voltage feed

Refers to the analog voltage signal output from the host computer or other devices, which is processed as a torque command.

Analog voltage input terminal

Servo driver with 2 analog input channels: AI1 and AI2, maximum input voltage ±10Vdc, input impedance: about 9kΩ.。

Analog Input Circuit：



Operating Methods：

AI1 is used as an example to illustrate the analog voltage setting torque command method.

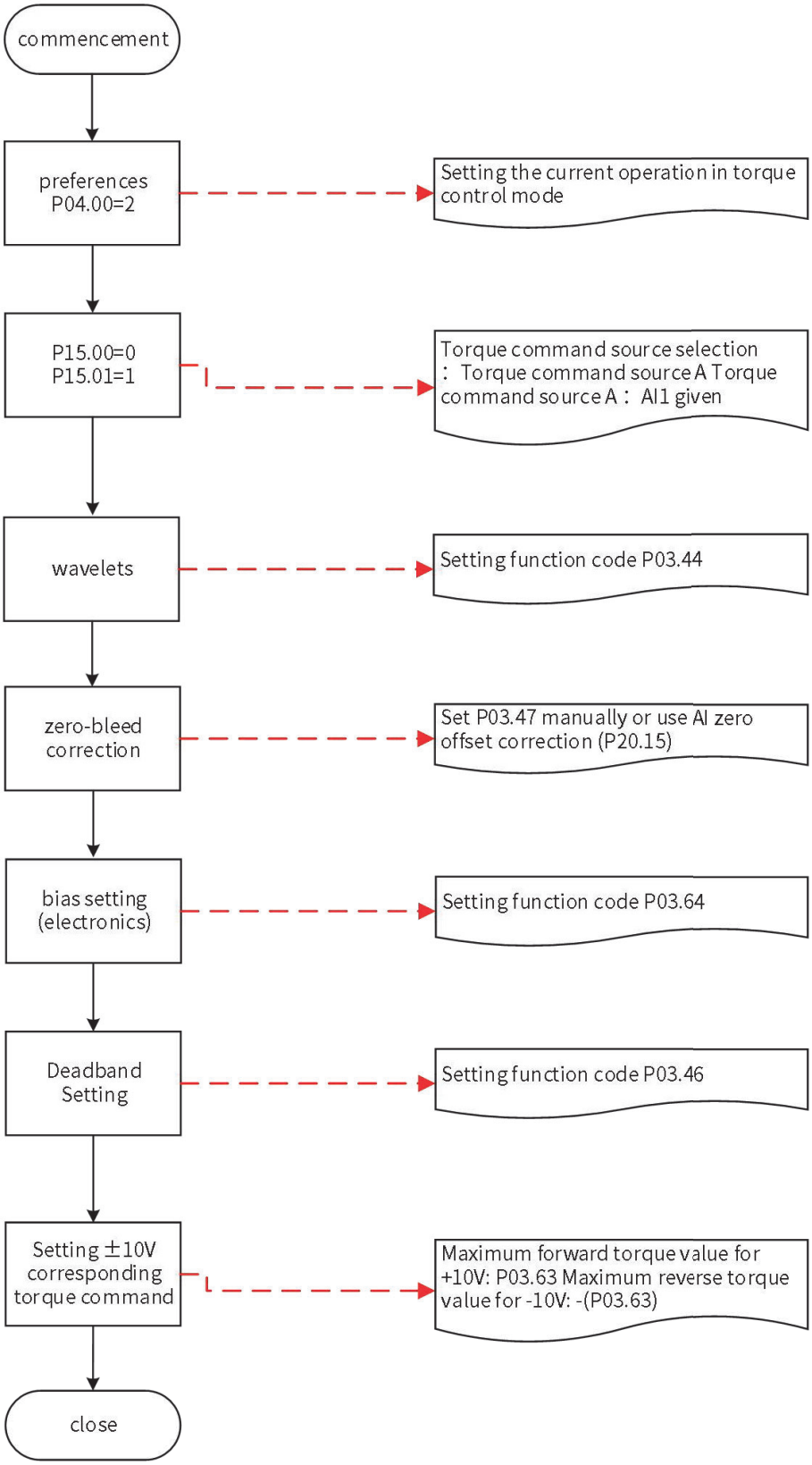


Figure: 5.2-39 Analog Voltage Torque Command Operation Flowchart

Zero drift: the value of the servo driver's sampling voltage relative to GND when the analog channel input voltage

is zero.

Bias: refers to the analog channel input voltage value when the sampling voltage is zero after zero-drift correction.

Deadband: refers to the input voltage interval of the corresponding analog channel when the sampling voltage is zero.

The output voltage of the unprocessed analog channel is shown in Figure: 5.2-40 y1, which is processed internally by the servo driver to finally get the torque command y6.

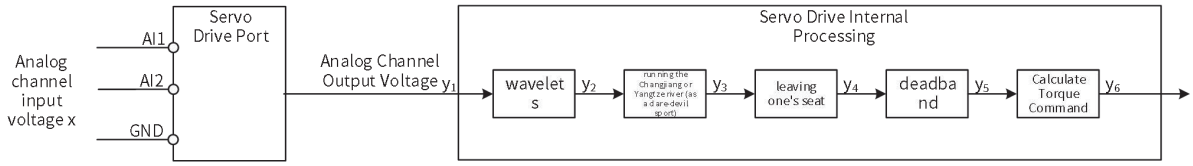


Figure: 5.2-40 Servo Drive AI Processing Flow

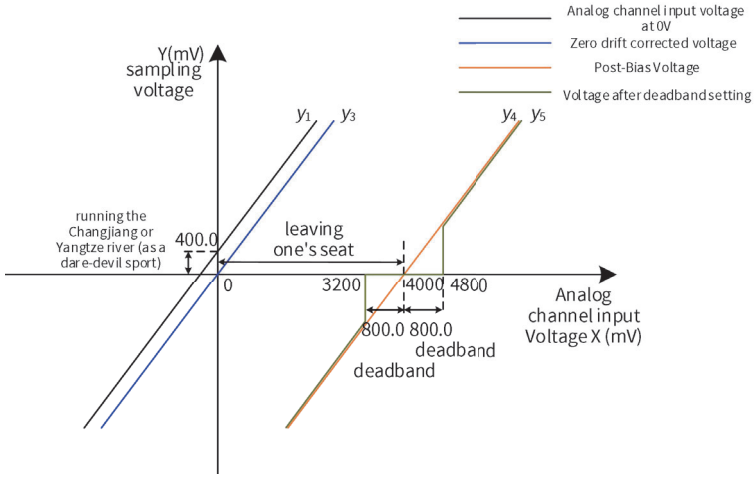


Fig. 5.2-41 Example of Sampling Voltage Corresponding to Servo Driver AI Processing

- wavelets：

The servo driver provides an analog channel filtering function. By setting the filtering time constant P03.44, it prevents fluctuations in motor commands caused by instability in the analog input voltage, and also attenuates erroneous motor movements caused by interference signals. The filtering function has no effect on eliminating or suppressing zero drift and deadband.

- zero-bleed correction：

Calibration of the analog channel output voltage deviation from 0V when the actual input voltage is 0V.

In the figure, the output voltage of the analog channel without internal processing of the driver is shown as y1. Taking the filtering time constant P03.44 = 0.00ms as an example, the filtered sampled voltage y2 is the same as y1.

It can be seen that the actual input voltage x = 0, the output voltage y1 = 400.0mV, this 400.0mV is known as zero drift.

Manually set P03.47 = 400.0 (mV), after zero drift correction, the sampled voltage is shown as y3. y3 = y1 - 400.0

Zero drift can also be corrected automatically with the analog channel auto-tuning function (P20.15).

- bias setting：

Setting the actual input voltage value corresponding to when the sampling voltage is 0。

As shown in the figure, when the preset sampling voltage y3=0, the corresponding actual input voltage x=4000mV, and this 4000mV is called the bias.。

Manually set P02.48 = 4000 (mV), after biasing, the sampled voltage is shown as y4. y4 = y3 - 4000

deadband correction：

Limits the input voltage range that is valid when the driver sampling voltage is not 0.

After the bias setting is completed, when the input voltage x is within 3200mv and 4800mv, the value of the sampling voltage is 0, and this 800.0mV is called the deadband.

Setting P03.46=800, after deadband correction, the sampled voltage is shown in y5.

$$y_5 = \begin{cases} 0 & 3200 \leqslant x \leqslant 4800 \\ y_4 & 4800 < x \leqslant 10000 \text{或} -10000 \leqslant x < 3200 \end{cases}$$

Calculate Torque Command：

After the zero drift, bias, and deadband settings are completed, it is necessary to set the torque command value corresponding to 10V (10000mV) in the sampling voltage at this time through P03.63, and the actual torque command y6：

$$y_6 = \frac{y_5}{10000} \times (P03.63)$$

This value will be used as the torque control mode analog torque command given value.

Among them, without bias is shown in Fig: 5.2-42 (left) and with bias is shown in Fig: 5.2-43 (right). When the correct setting is completed, the AI1 sampling voltage value can be viewed in real time through P09.22, and the input analog torque command value can also be viewed through P09.22.

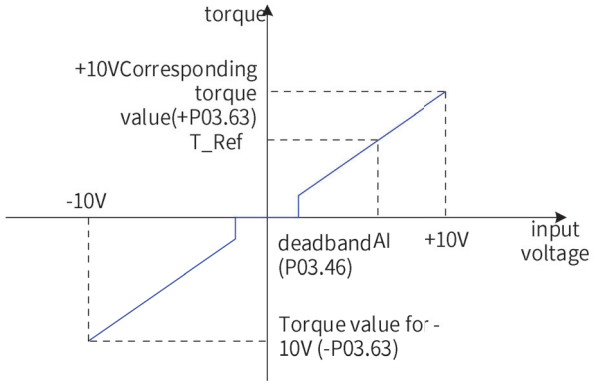


Figure: 5.2-42 Schematic diagram of unbiased AI2 (left)

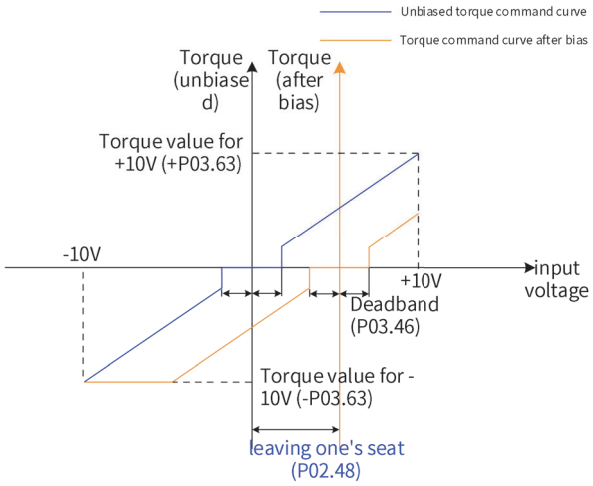


Figure: 5.2-43 Schematic of AI2 after bias (right)

Final torque command value y6 versus input voltage x：

$$y_6 = \begin{cases} 0 & B-C \leqslant x \leqslant B+C \\ (x-B) \times \frac{P03.63}{10} & B+C < x \leqslant 10000 \text{或} -10000 \leqslant x < B-C \end{cases}$$

Where: B: Bias; C: Deadband

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P02	48	AI1 offset voltage	-10000 ~ 10000	mV	Setting the AI1 channel analog bias value	Operation Setting	Effective immediately	0
P03	44	AI1 input filter time	0~655.35	ms	Setting the analog average filtering time constant for AI1 channel	Operation Setting	Effective immediately	2.00
P03	46	AI1 dead zone	0~1000.0	mV	Setting the analog deadband value of AI1 channel	Operation Setting	Effective immediately	10.0
P03	47	AI1 zero drift	-500.0~500.0	mV	Setting the analog zero-drift value of AI1 channel	Operation Setting	Effective immediately	0.0
P03	63	Analog 10V corresponds to torque	1.00 times ~ 8.00 times rated torque	倍	Setting analog 10V corresponding torque value	Shutdown Setting	Effective immediately	1.00
P20	15	AI zero offset correction	0-No operation 1-AI1 adjustment 2-AI2 adjustment	-	Zero drift auto-correction enable for analog AI1 and AI2 channels	Shutdown Setting	Effective immediately	0

Note: When you choose to use the analog AI2 input channel, the setting method is similar to the analog AI1 setting method described above, and the related function codes can be found in Chapter 8.

1) Torque command sourceB

Torque command source B is used in the same way as the main torque command source A. Parameter details can be found in Chapter 8.

2) A/B switching source

When "A/B switching" is selected for the torque command, i.e., when function code P15.00 = 3, it is necessary to assign the DI function FunIN.23 to the corresponding DI terminal, and to determine whether the A command source input is valid or the B command source input is valid according to the input signal on this DI terminal.

Function Number	Function Name	Descriptive	Note
FunIN.23	Run command switching	OFF-Current running instruction is A ON-Current running instruction is B	

3) Communication given

means that when function code P15.00 is set to 4, the torque command is derived from the set value of function code P20.54, and function code P20.54 must be modified by means of communication and is not visible to the control panel.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P20	54	Bus given torque command	-100.000~100.000	%	Setting of the torque command value in the form of a communication given; the accuracy is 0.001%.	Operation Setting	Effective immediately	-

Torque command direction switching is realized through the DI terminal, i.e., the DI function FunIN.19 is assigned to the corresponding DI terminal, and the current torque command direction is determined according to the input signal on this DI terminal, thus satisfying the demand for torque command direction switching.

Function Number	Function Name	Descriptive	Note
FunIN.19	Torque command direction switching	Invalid - the actual torque command direction is the same as the setting direction Valid - the actual torque command direction is opposite to the setting direction	

The actual motor motion direction is related to motion direction selection (P04.01), torque command direction, and torque command direction DI switching (FunIN.19).

Table 5.2-12 Actual motor motion direction setting in torque control mode

P04.01	Torque Command Positive Or Negative	FunIN.19	Actual Motor Movement Direction
0	+	null	counterclockwise
0	+	efficiently	clockwise
0	-	null	clockwise
0	-	efficiently	counterclockwise
1	+	null	clockwise
1	+	efficiently	counterclockwise
1	-	null	counterclockwise
1	-	efficiently	clockwise

5.2.4.2 Torque command filtering

Attention：

If the filtering time constant setting is too large, the responsiveness will be reduced, so check the responsiveness before making the setting!

In position, speed, torque, and mixed control modes, the servo drive enables low-pass filtering of torque commands for smoother commands and reduced vibration.

The servo drive provides 2 low pass filters for torque command, filter 1 is used by default;

Use the gain switching function (P06.15=1 and P06.16≠0) to switch to Filter 2 when the conditions set in P06.16 are met.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P07	02	Torque Filter 1	0~30.00	ms	Setting the low-pass filtering time constant for group 1 torque commands	Operation Setting	Effective immediately	0.79
P07	03	Torque Filter 2	0~30.00	ms	Setting the low-pass filtering time constant for group 2 torque commands	Operation Setting	Effective immediately	0.79

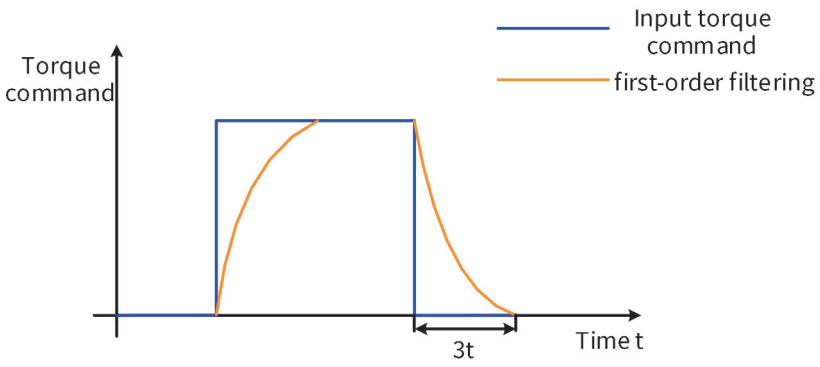


Fig: 5.2-44 Rectangular torque command first order filtering schematic

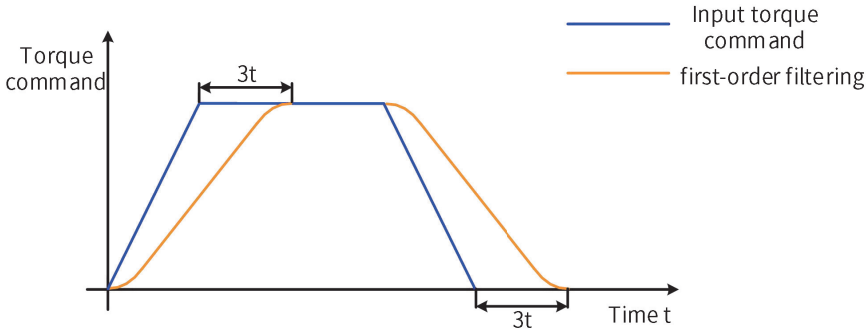


Fig: 5.2-45 Ladder Torque Command First Order Filtering Schematic

5.2.4.3 Torque command limits

The torque command limit is valid in position control, speed control, torque control, and mixed control modes and must be set! To protect the drive and motor, the torque command should be limited.

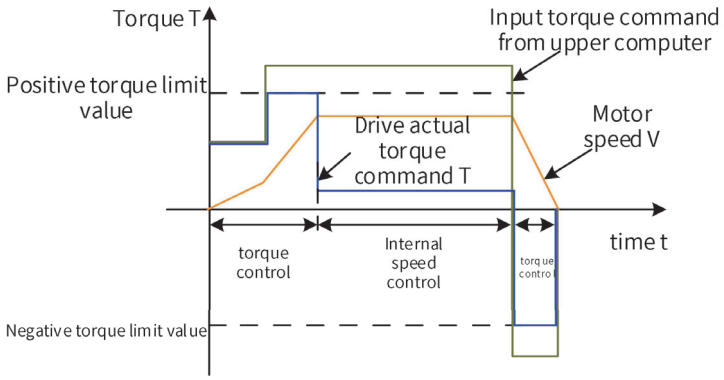


Figure: 5.2-46 Torque Setting and Torque Limiting

When the absolute value of the torque command input by the upper computer or output by the speed regulator is greater than the absolute value of the torque command limit, then the torque command of the actual drive is limited to be equal to the value of the torque command limit; and vice versa, it is equal to the value of the torque command input by the upper computer or output by the speed regulator. At any moment, there is and only one torque limit value valid. Both positive and negative torque limit values do not exceed the maximum torque of the drive and motor and ±300.0% of the rated torque.

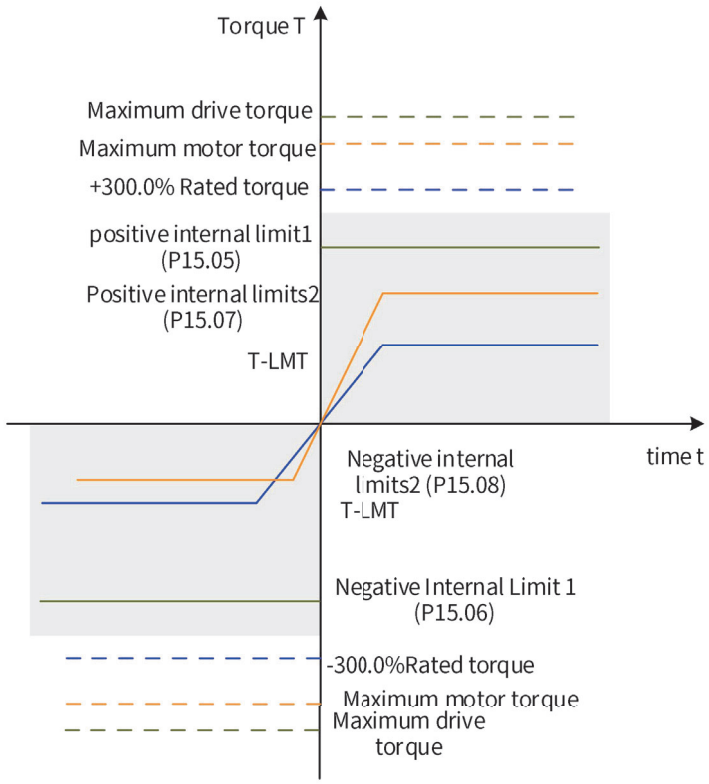


Fig. 5.2-47 Torque Limit Example

1. Setting the source of torque limitation

The torque limit source can be set by function code P15.03. After setting the torque limit, the drive torque command will be limited to the torque limit value, and when the torque limit value is reached, then the motor will run with the torque limit value as the torque command. The torque limit value should be set according to the load operation requirements. If the setting is too small, the acceleration and deceleration ability of the motor may be weakened, and the actual speed value of the motor will not reach the demand value during constant torque operation.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P15	03	Torque Limit Source Selection	0-Internal torque limit value 1 1-External AI limit 2-DI switching between internal torque limit value 1 and limit value 2 3-DI switching between internal torque limit value 1 and external AI limit 4-Internal torque limit value 1 and external AI limit minimum value	-	Select torque limiting source	Shutdown Setting	Effective immediately	0

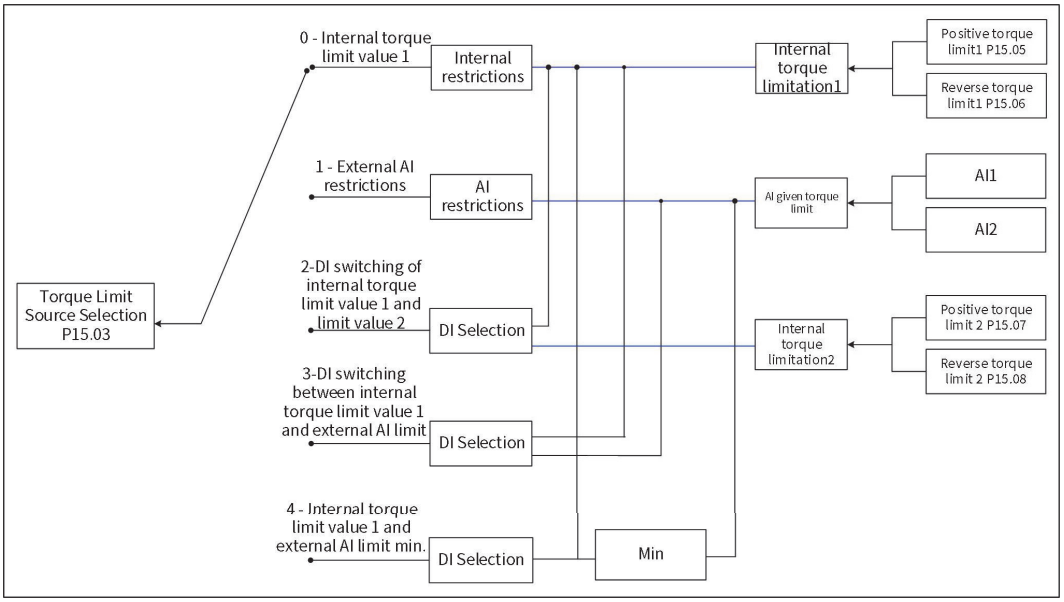


Figure: 5.2-48 Torque Limit Sources

The following diagrams show the case in which the absolute value of the torque command entered by the host computer is greater than the absolute value of the torque limit value in the torque mode.。

1) P15.03 = 0: Internal torque limit value

The torque command limit value is determined only by internal function codes P15.05 and P15.06.

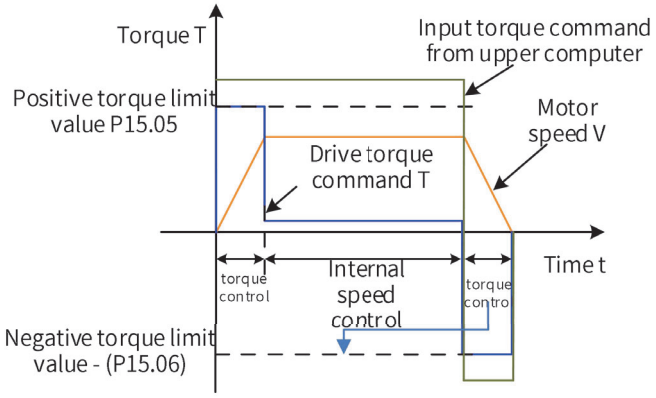


Fig. 5.2-49 P15.03 = 0 Torque Limit Curve

2) P15.03 = 1: External AI limitation

After the external analog channel is selected according to P15.04, the torque command limit value is determined by the torque value corresponding to the input voltage of the AI terminal.

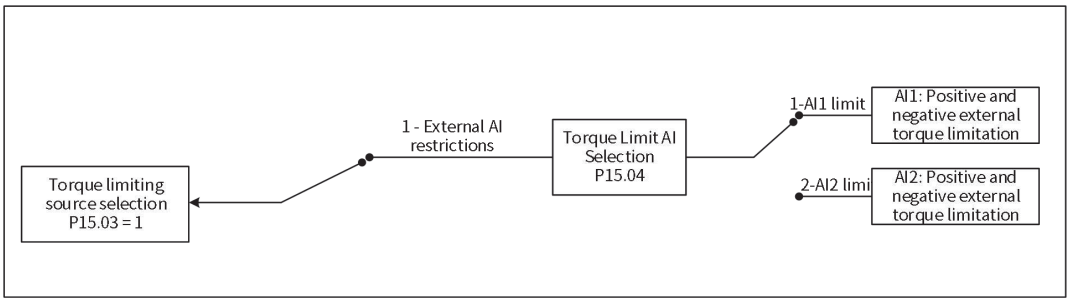


Figure: 5.2-50 P15.03 = 1 torque limiting source

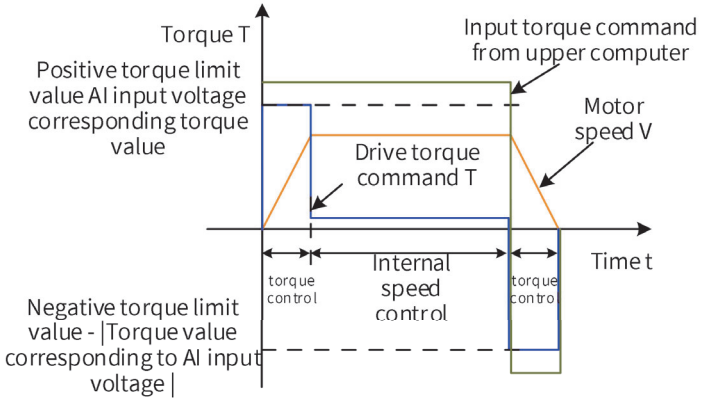


Figure: 5.2-51 P 15.03=1 Torque Limit Curve Diagram

For the setting of analog input terminals AI1 and AI2, please refer to Chapter 8 to set the correspondence between torque and analog voltage.

3) P15.03 = 2： DI switches internal torque limit value 1 and limit value 2

The torque command limit value is selected according to the logic state of the external DI signal. Positive torque limit values are selected between function codes P15.05 and P15.07; negative torque limit values are selected between

function codes P15.06 and P15.08.

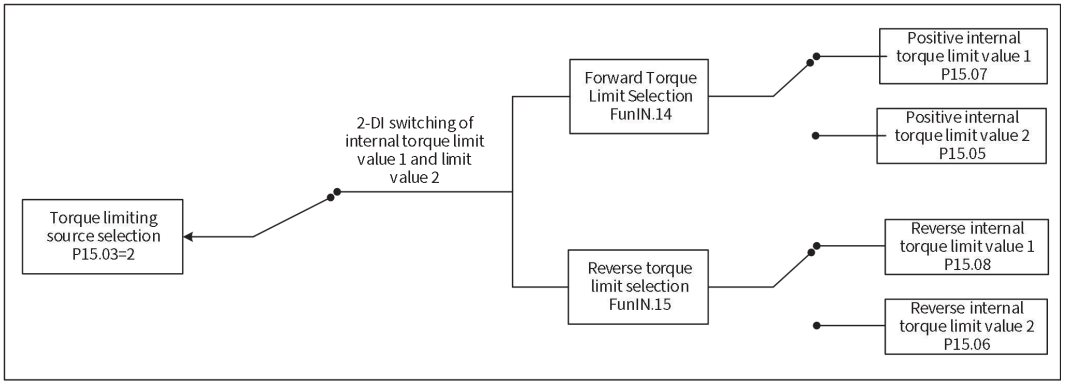


Figure: 5.2-52 P15.03=2 Torque Limit Sources

Table 5.2-13 P15.03=2 Description

DIfunctional status		FunIN.14Forward Torque Limit Selection	
		OFF	ON
FunIN.15 Reverse Torque Limit Selection	OFF	Positive torque limit value set by P15.05 Negative torque limit value set by P15.06	Positive torque limit value set by P15.07 Negative torque limit value set by P15.06
	ON	Positive torque limit value set by P15.05 Negative torque limit value set by P15.08	Positive torque limit value set by P15.07 Negative torque limit value set by P15.08

At this point, assign the 2 DI terminals of the drive as DI function FunIN.14 (Forward torque limit selection) and FunIN.15 (Reverse torque limit selection), and determine the DI terminal logic.

Function Number	Function Name	Descriptive	Note
FunOUT.14	Forward Torque Limit Selection	Switching of the torque limiting source is performed according to the selection of P15.03. When P15.03=2： Valid - positive external torque limitation is valid; Invalid - positive internal torque limitation is valid. When P15.03=3 and the AI limit value is greater than the positive rotation external limit value： Valid - Positive external torque limit is valid; Invalid - AI torque limit is valid. When P15.03=4： Valid - AI torque limit is valid; Invalid - Positive internal torque limit is valid	
FunIN.15	Reverse Torque Limit Selection	Switching of the torque limiting source is performed according to the selection of P15.03. When P15.03=2： Valid - Reverse external torque limit is valid; Invalid - Reverse internal torque limit is valid. When P15.03=3 and the AI limit value is less than the reverse external limit value： Valid-Reverse external torque limit is valid. Invalid-AI torque limit is valid. When P15.03=4： Valid - AI torque limit is valid; Invalid - Reverse internal torque limit is valid	

4) P15.03 = 3: DI switching internal torque limit value 1 and external AI limit

Positive torque limit: After selecting the external analog channel according to P15.04，

When the logic of the external DI signal (FunIN.14) is invalid, the positive torque limit value is determined by function code P15.05；

When the external DI signal (FunIN.14) logic is valid, the positive torque limit value is determined by the torque value corresponding to the input voltage to the AI terminal.。

Negative torque limit: after selecting the external analog channel according to P15.04，

When the logic of the external DI signal FunIN.15) is invalid, the negative torque limit value is determined by function code P15.06；

When the external DI signal (FunIN.15) logic is valid, the negative torque limit value is determined by the torque value corresponding to the input voltage to the AI terminal.

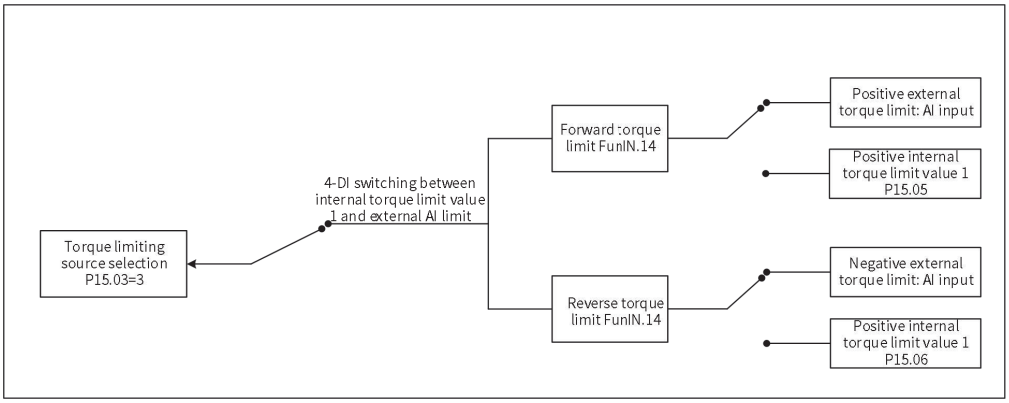


Figure: 5.2-53 P15.03 = 3 Torque Limit Sources

Table 5.2-14 Description of P15.03=3

DIfunctional status		FunIN.14Forward Torque Limit Selection	
		OFF	ON
FunIN.15 Reverse Torque Limit Selection	OFF	Positive torque limit value set by P15.05 Negative torque limit value set by P15.06	Positive torque limit value is set by AI input corresponding torque value Negative torque limit value is set by P15.06.
	ON	Positive torque limit value is set by P15.05 Negative torque limit value is set by AI input corresponding torque value.	Positive torque limit value is set by the torque value corresponding to the AI input Negative torque limit value is set by the torque value corresponding to the AI input.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P15	04	Torque Limit AI Selection	1-AI1 limit 2-AI2 limit	-	Selection of analog input channel for torque limiting signal	Shutdown Setting	Effective immediately	1
P15	05	Positive internal torque Limit	0~300.0	%	Setting of internal positive and negative torque limit values (100% corresponds to	Operation Setting	Effective immediately	300.0

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
		value 1			1x rated torque)			
P15	06	Reverse internal torque Limit value 1	0~300.0	%		Operation Setting	Effective immediately	300.0
P15	07	Positive internal torque Limit value 2	0~300.0	%	Setting external positive and negative torque limit values (100% corresponds to 1x rated torque)	Operation Setting	Effective immediately	300.0
P15	08	Reverse internal torque Limit value 2	0~300.0	%		Operation Setting	Effective immediately	300.0

5) P15.03 = 4： Internal torque limit value 1 and external AI limit min.

Positive torque limit: After selecting the external analog channel according to P15.04，

When the logic of the external DI signal (FunIN.14) is invalid, the positive torque limit value is determined by the torque value corresponding to the input voltage to the external AI terminal.；

When the external DI signal (FunIN.14) logic is valid, the positive torque limit value is determined by the smaller of the torque value corresponding to function code P15.07 and the input voltage to the AI terminal.。

Negative torque limit: after selecting the external analog channel according to P15.08，

If the external DI signal (FunIN.15) logic is invalid, the negative torque limit value is determined by the torque value corresponding to the external AI terminal input voltage.；

When the external DI signal (FunIN.15) logic is valid, the negative torque limit value is determined by the smaller of the torque value corresponding to function code P15.08 and the input voltage to the AI terminal.

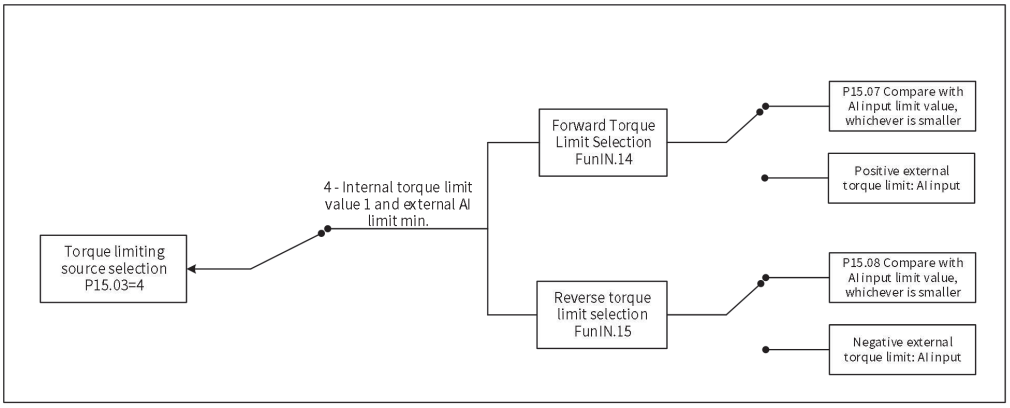


Figure: 5.2-54 P15.03 = 4 Torque Limit Sources

Table 5.2-15 P15.03=4 Description

Di Functional Status		Funin.14Forward Torque Limit Selection	
		Off	On
FunIN.15 Reverse Torque Limit Selection	OFF	Positive torque limit value is set by the torque value corresponding to the AI input Negative torque limit value is set by the torque value corresponding to the AI input.	Positive torque limit value is set by comparing the torque value corresponding to AI input with P15.07 and taking the minimum value Negative torque limit value is set by the torque value corresponding to AI input.
	ON	Positive torque limit value is set by the torque value corresponding to the AI input Negative torque limit value is set by comparing the torque value corresponding to the AI input with P15.08 and taking the minimum value.	Positive torque limit value is set by comparing the torque value corresponding to the AI input with P15.07 and taking the minimum value Negative torque limit value is set by comparing the torque value corresponding to the AI input with P15.08 and taking the minimum value.

2. Setting torque limiting DO output signal

When the torque command reaches the torque limit value, the driver outputs a torque limit signal (FunOUT.12: Torque Limit) for use by the upper computer, at which time 1 DO terminal of the driver should be assigned as the DO function FunOUT.12, and the DO terminal logic should be determined.

Function Number	Function Name	Descriptive	Note
FunOUT.12	Torque Limit	Valid-Drive torque command reaches the torque limit value and is limited to the limit value Invalid-Drive torque command does not reach the limit value	

5.2.4.4 Speed limitation in torque mode

In the torque control mode, if the given torque command is too large and larger than the mechanical side load torque, it will cause the motor to accelerate continuously, and overspeed may occur, damaging the mechanical equipment. Therefore, it is necessary to limit the speed of the motor to protect the machinery。

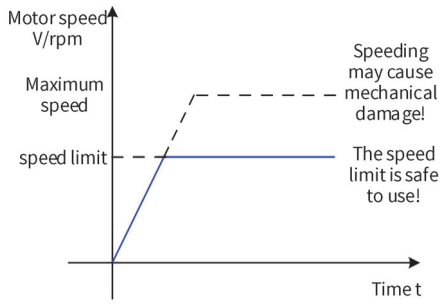


Figure: 5.2-55 Torque Mode Speed Limit Schematic

1. Setting speed limit sources

In torque mode, the selection of the speed limit source can be set by the function code. After setting the speed limit, the actual motor speed will be limited to the speed limit value. After reaching the speed limit value, the motor runs at a constant speed with the speed limit value. The speed limit value should be set according to the operating requirements of the load.

function code		name	Setting range	unit	functionality	Setting method	commencement date	Factory Setting
P15	09	Speed limit source selection in torque mode	0-Internal speed limit 1-DI selectable speed limit 2-External AI speed limit	-	Selecting the source of speed limit in torque mode	immediate effect	Operation Settings	0

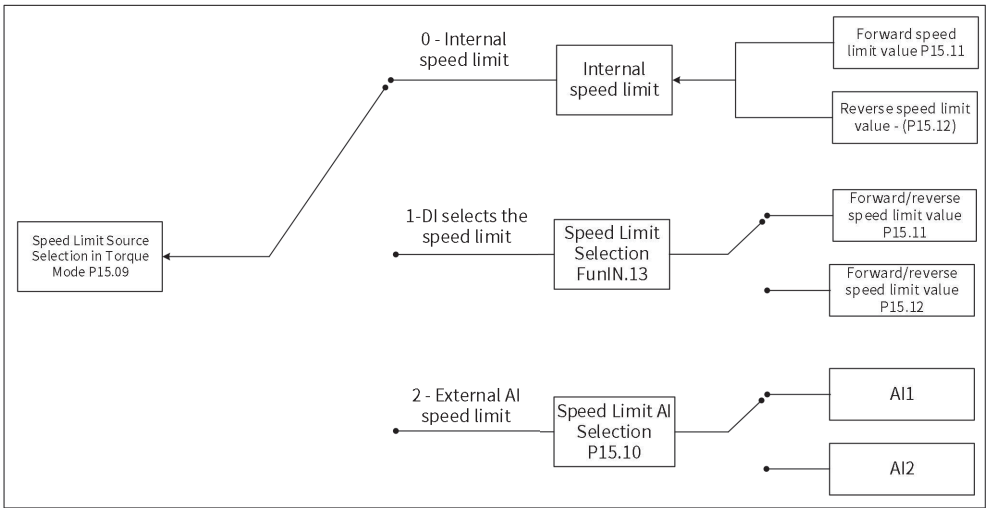


Figure: 5.2-56 Speed Limit Sources

1) P15.09=0： Internal Speed Limit

The speed of the motor is only determined by the internal function codes P15.11 and P15.12 when the motor is moving in different directions.

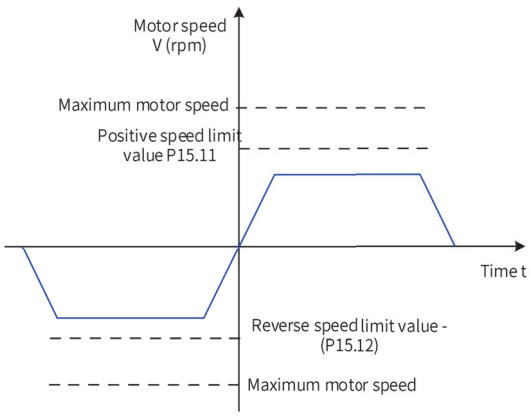


Figure: 5.2-57 P15.09=0 Speed Limit Curve Diagram

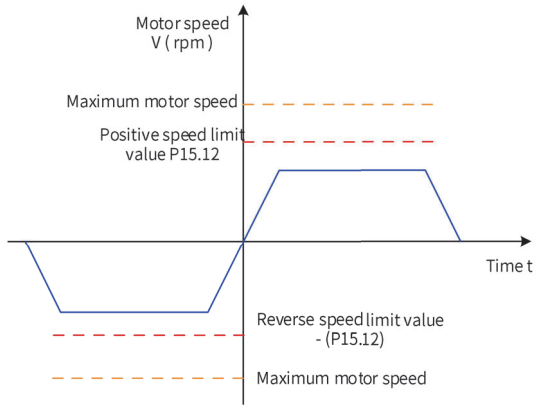
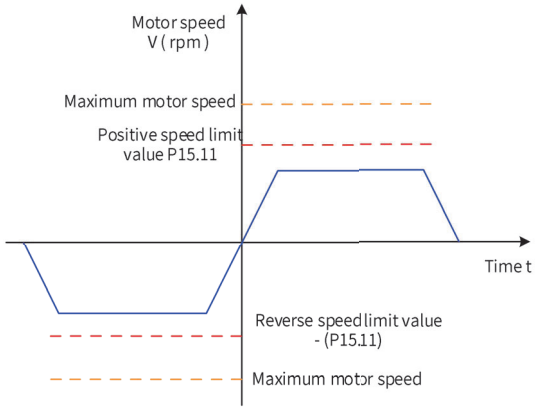
2) P15.09=1： DI selects the speed limit

The servo drive selects P15.11 or P15.12 as the forward/reverse speed limit value according to the actual DI

terminal logic. In this case, the Servo Drive should be assigned a DI logic as DI function FunIN.13 (Speed Limit Selection) and assign DI terminal logic.

Function Number	Function Name	Descriptive	Note
FunIN.13	Speed Limit Selection	Invalid - P15.11 as internal forward/reverse speed limit value Valid - P15.12 as internal forward/reverse speed limit value	

Table 5.2-16 Speed Limit Description

FunIN.13 Speed Limit Selection	
OFF	**ON**
	
The speed limit value is set by P15.12 when FunIN.13 is invalid.	FunIN.13The speed limit value when valid is set by P15.11.

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P15	10	Speed Limit AI Selection	1-AI1 2-AI2	-	Selecting the analog channel when using AI as the speed limit source	Effective immediately	Operation Setting	1
P15	11	Internal speed positive limit value for torque control	0~6000	rpm	Setting the forward speed limit value in torque mode / Setting the speed limit value in torque mode1	Effective immediately	Operation Setting	3000
P15	12	Negative internal speed limit value for torque control	0~6000	rpm	Reverse speed limit value in set torque mode / Speed limit value in set torque mode2	Effective immediately	Operation Setting	3000

3) P15.09=2： External AI speed limit

When the motor moves in different directions, the voltage corresponding to the speed limit is input through the external analog channel specified in P15.10. When the AI input is less than the internal speed limit (P15.11/P15.12), the AI limit is effective; conversely, when the AI input is greater than the internal speed limit (P15.11/P15.12), the internal speed limit is effective.

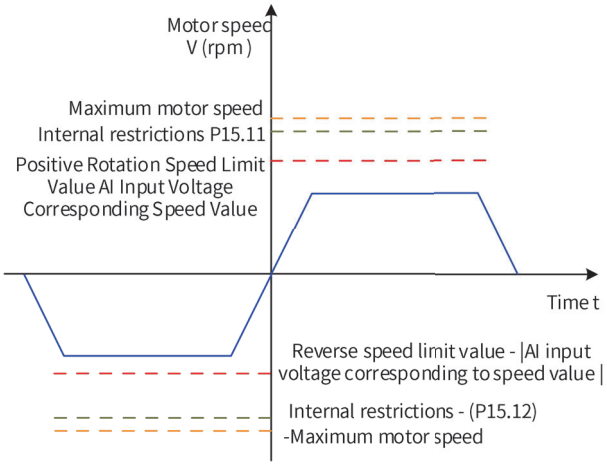


Figure: 5.2-58 P15.09=2 Speed Limit Curve Diagram

1. Setting speed limit DO output signal

In the torque mode, when the absolute value of the actual speed of the servo motor exceeds the speed limit value and the time reaches P15.24, it is considered that the actual speed of the servo motor is restricted, and at this time, the servo driver can output the speed limit (FunOUT.13: Speed Limit) signal for the use of the upper computer. On the contrary, if any condition is not satisfied, the speed limit signal is invalid.

The judgment of the speed limit (FunOUT.13: Speed limit) signal is performed only in the torque mode, servo operation state. One DO terminal of the Servo Drive should be assigned as DO function FunOUT.13, and the DO terminal logic should be set.

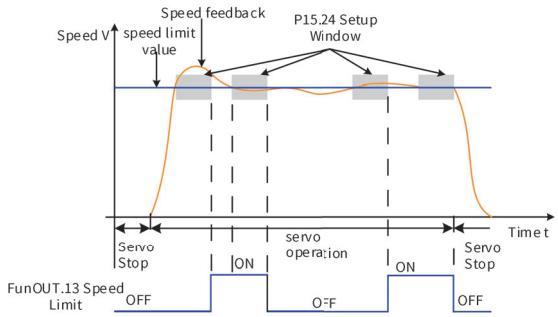


Figure: 5.2-59 Speed Limit DO Output Waveform Example

Function Number	Function Name	Descriptive	Note
FunOUT.13	Speed Limit Selection	Valid - motor speed is limited; Invalid - motor speed is not limited	

5.2.4.5 Torque to output

The torque arrival function is used to determine whether the actual torque command reaches the set interval.

When the actual torque command reaches the torque command threshold, the driver can output the corresponding DO signal (FunOUT.9: Torque Arrival) for use by the host computer.

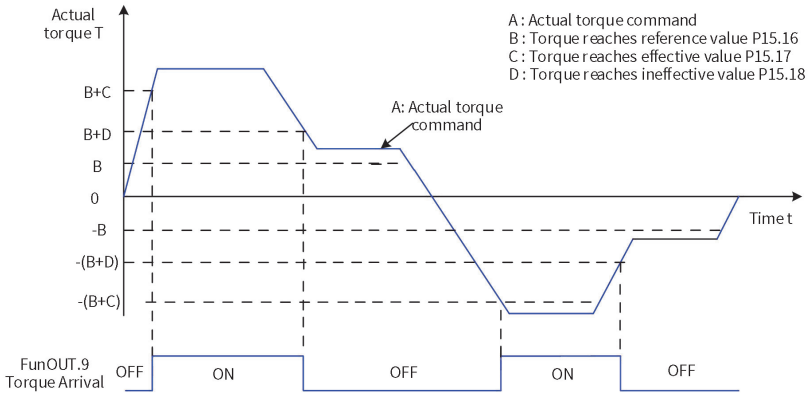


Fig. 5.2-60 Example of torque arrival output waveforms

Actual torque command (can be viewed by P09.02): A;

Torque arrives at reference value P15.16: B;

Torque reaches hysteresis loop valid value P15.17: C;

Torque arrives at hysteresis loop invalid value P15.18: D;

where C and D are biased based on B.

Therefore, when the torque reaching DO signal changes from invalid to valid, the actual torque command must satisfy:

|A|≥B+C Otherwise, the torque reaching DO signal remains invalid.

Conversely, when the torque to DO signal changes from valid to invalid, the actual torque command must satisfy:

|A|<B+D Otherwise, the torque to DO signal remains valid.

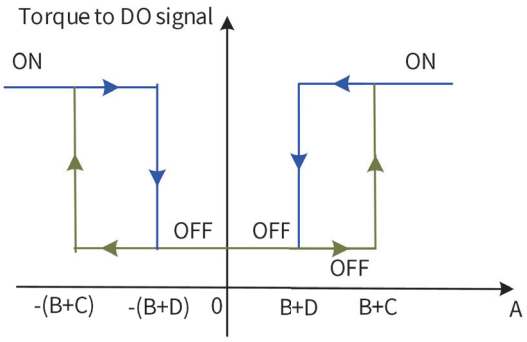


Figure: 5.2-61 Torque Reach Output Valid Explanation

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P15	16	Torque reaches reference value	0~300.0	%	Set torque reaches the command reference value (100% corresponds to double the rated torque).	Operation Setting	Effective immediately	0
P15	17	Torque to RMS	0~300.0	%	Setting torque reaches the effective offset threshold (100% corresponds to double the rated torque)	Operation Setting	Effective immediately	20.0

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P15	18	Torque reaches invalid value	0~300.0	%	Set torque reaches invalid offset threshold (100% corresponds to double the rated torque)	Operation Setting	Effective immediately	10.0

When using the torque arrival DO signal, 1 DO terminal of the Servo Driver should be assigned to DO function 9 (FunOUT.9: Torque Arrival), and determine the DO terminal logic

Function Number	Function Name	Descriptive	Note
FunOUT.9	Speed Limit Select	Valid - the absolute value of the torque command reaches the set value Invalid - the absolute value of the torque command is less than the set value	

5.3 Application Functions

5.3.1 Soft limits

Conventional hardware limit function: In the conventional way, the limit can only be given by an external signal, which is connected to the CN5 interface of the servo drive by an external sensor signal.

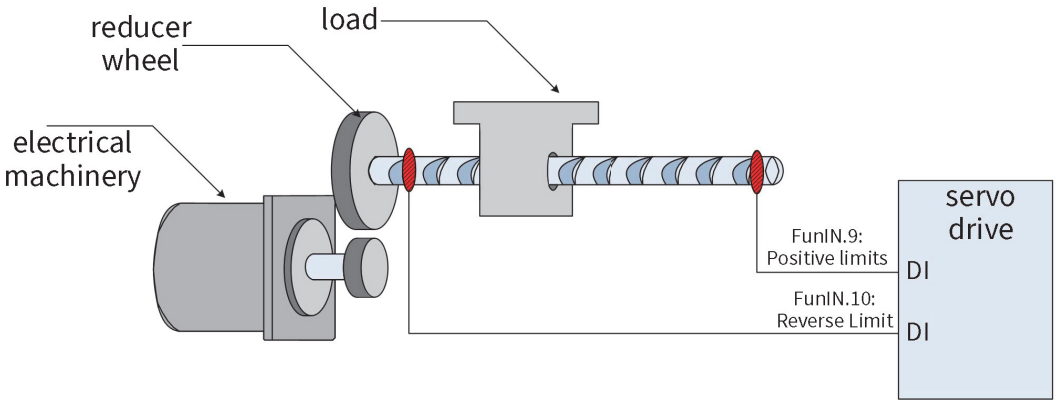


Figure: 5.3-1 Installation Schematic of Limit Switches

Soft Limit Function: It means that the internal position feedback of the drive is compared with the set limit value, and when the limit value is exceeded, the alarm and shutdown operation will be executed immediately. This function can be used in both absolute position mode and incremental position mode, incremental position mode needs to set P05.43=2, after the drive is powered on, first carry out the home return to find the origin of the machine, and then enable the soft limit function.

1. Comparison of advantages and disadvantages of traditional hardware limit and soft limit functions

Conventional Hardware Limit Functions		Soft Limit Function	
1	Can only be limited to linear motion, single-turn rotary motion	1	Can be used not only in linear motion, but also in rotary mode
2	Requires externally mounted mechanical limit switches	2	No hardware wiring required, preventing poor wiring contact leading to false operation
3	Unable to determine mechanical slipping abnormality	3	Comparison of internal positions prevents abnormal movements due to mechanical slippage
4	When the power is cut off, the machinery moves out of the limit and cannot be judged or alarmed		

2. Soft Limit Related Function Codes

Function Code	Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P05.43	Soft Limit Setting	0-No limit 1-Limit 2-Limit after return to zero	1	Soft limit function selection.	Shutdown Setting	Effective immediately	0
P13.63	Positive Position Software Limit	-2147483648~2147483647	unit of command (computing)	Setting the software limit positive position limit	Shutdown Setting	Effective immediately	2147483647
P13.65	Reverse Position Software Limit	-2147483648~2147483647	unit of command (computing)	Setting the software limit reverse position limit	Shutdown Setting	Effective immediately	-2147483648

- P05.43=0 does not enable the soft limit function;
- P05.43 = 1 enables the soft limit function immediately after the drive is powered up. When the position feedback counter (P09.34) is greater than P13.63, A.220 warning occurs and positive overtravel stop is executed; when the position feedback counter (P09.34) is less than P13.65, A.221 warning occurs and negative overtravel stop is executed;
- When P05.43=2, the soft limit is not enabled before the home return after the drive is powered on, when the position feedback counter (P09.34) is greater than P13.63 after the home return, A.220 warning occurs, and a positive overtravel shutdown is executed; when the position feedback counter (P09.34) is less than P13.65 after the home return, A.221 warning occurs, and a negative overtravel shutdown is executed.
- When P13.63< P13.65, the two values are interchanged

5.3.2 Crossover output

attention：

- For applications requiring high accuracy of the Z signal crossover output, it is recommended to use the effective change edge of the Z signal output：

①P05.22=0Effective change edge is falling edge;

②P05.22=1The effective change edge is the rising edge

The crossover output function of the servo drive means that the position command pulse or the position pulse

from the encoder feedback is output in the form of A / B phase quadrature pulses.

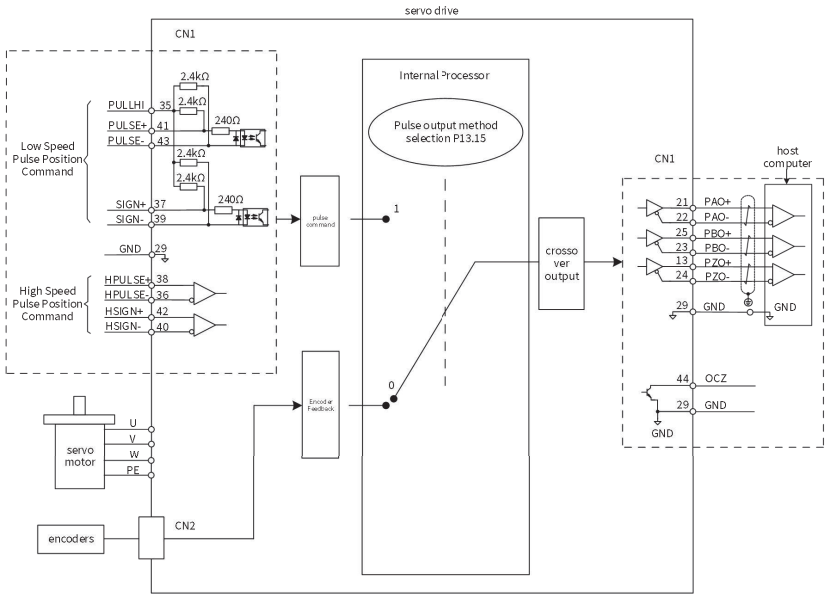


Fig. 5.3-2 Schematic diagram of crossover output principle

Among them, when the multi-axis servo pulse synchronous tracking, it is recommended to use the pulse command synchronous output mode, i.e. P13.15=1; when the upper computer is used as the closed-loop feedback, it is recommended to use the encoder frequency division output mode, i.e. P13.15=0；

Servo driver with 1 set of frequency output terminals：

A-phase pulse: PAO+, PAO-, differential output, maximum output pulse frequency of 4Mpps

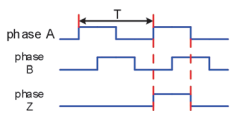
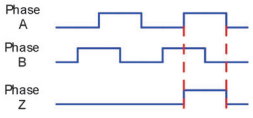
B-phase pulse: PBO+, PBO-, differential output, maximum output pulse frequency is 4Mpps

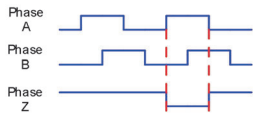
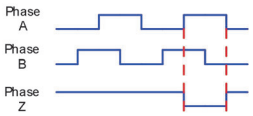
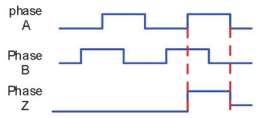
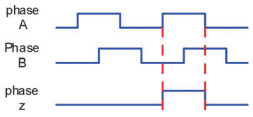
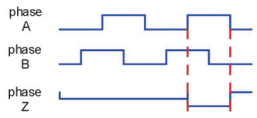
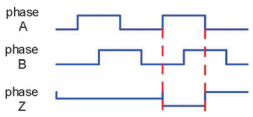
Z-phase pulse: PZO+, PZO-, differential output, maximum output pulse frequency is 4Mpps

When using the crossover output function, set the pulse output method (P13.15), crossover output phase (P05.23), number of encoder crossover pulses (P13.16), and Z-signal output polarity (P05.22) as required.

Output source for the encoder crossover output (P13.15 = 0), the motor rotates 1 turn, the number of output pulses in phase A/B is determined by P13.16; the pulse width T in phase A/B is determined by the speed of the motor, and the width of phase Z is the same as the same step of phase A, and the width of the pulse width is T. The Z phase outputs the Z signal for 1 time for every 1-turn of the motor rotation.

Table 5.3-1 Schematic diagram of encoder divided output (P13.15=0) pulses

P05.23 (Crossover Output Phase)	P05.22 (ZPulse output polarity)	Positive rotation, pulse output schematic	Reverse, Pulse Output Schematic
0	0	 Phase A is 90° ahead of phase B	 B-phase overruns A-phase by 90°

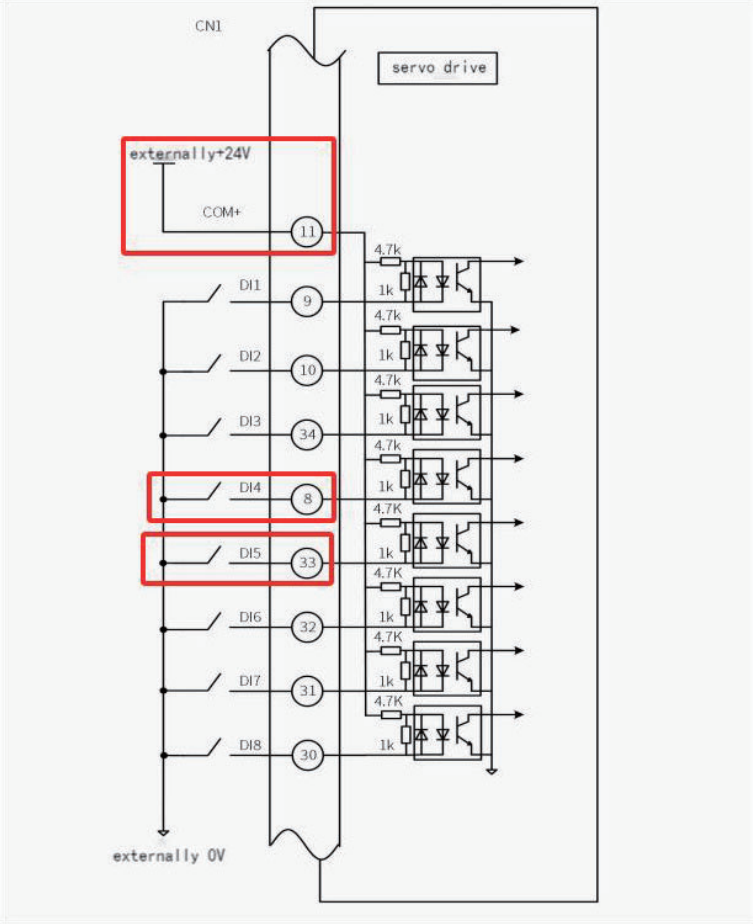
	1	 Phase A is 90° ahead of phase B	 B-phase overruns A-phase by 90°
1	0	 B-phase overruns A-phase by 90°	 Phase A is 90° ahead of phase B
	1	 B-phase overruns A-phase by 90°	 Phase A is 90° ahead of phase B

Function Code		Name	Setting Range	Unit	Functionality	Setting Method	Commencement Date	Factory Setting
P05	23	Crossover Output Phase	0-A ahead of the curve B 1-A lagging B	-	Sets the phase relationship between the A-phase pulse and the B-phase pulse of the pulse output.	Shutdown Setting	Energized again	0
P13	15	Servo pulse output method selection	0-Encoder crossover output 1-Pulse command synchronized output 2-Crossover or synchronized output disabled	-	Select servo pulse output method	Shutdown Setting	Energized again	0
P13	16	Number of encoder divided pulses	35~1073741824	p/r	Set the resolution of the output pulses equal to the number of output pulses per 1 revolution of the motor PAO/PBO (before 4x frequency).	Shutdown Setting	Energized again	2500
P05	22	Z signal Output polarity	0 - Output high level when valid 1 - Output low level when valid	-	Setting the output level when the Z-phase pulse is valid	Shutdown Setting	Energized again	1

5.3.3 Probe functions

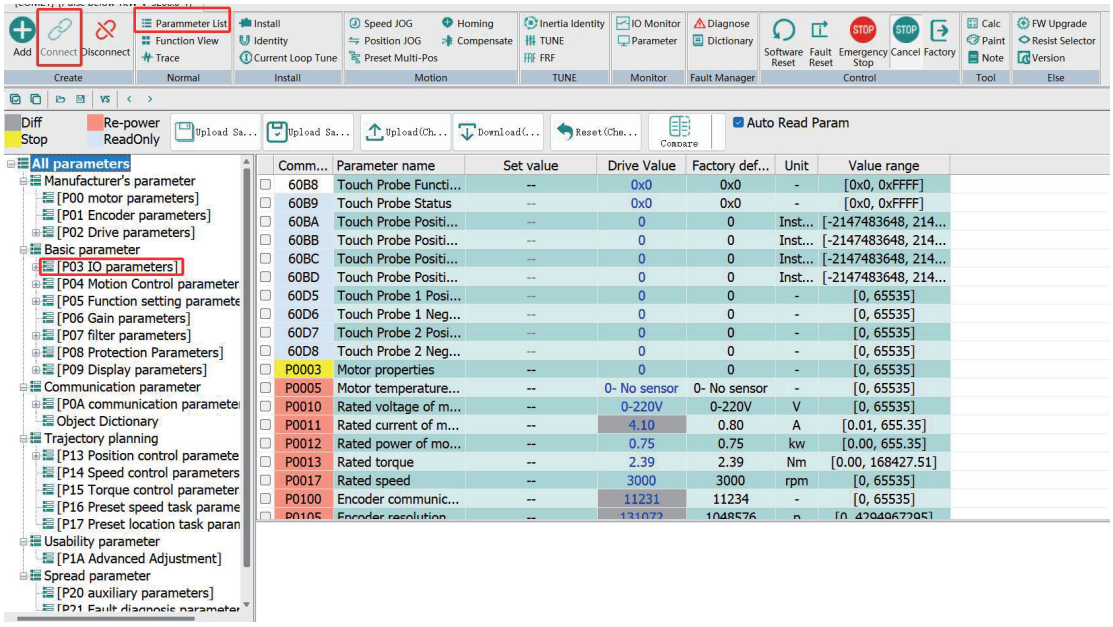
1. Connection

Please wire according to the diagram below. Since only DI4 (Probe 1) and DI5 (Probe 2) have probe functions, connecting to DI4 and DI5 is sufficient to use the probe function.

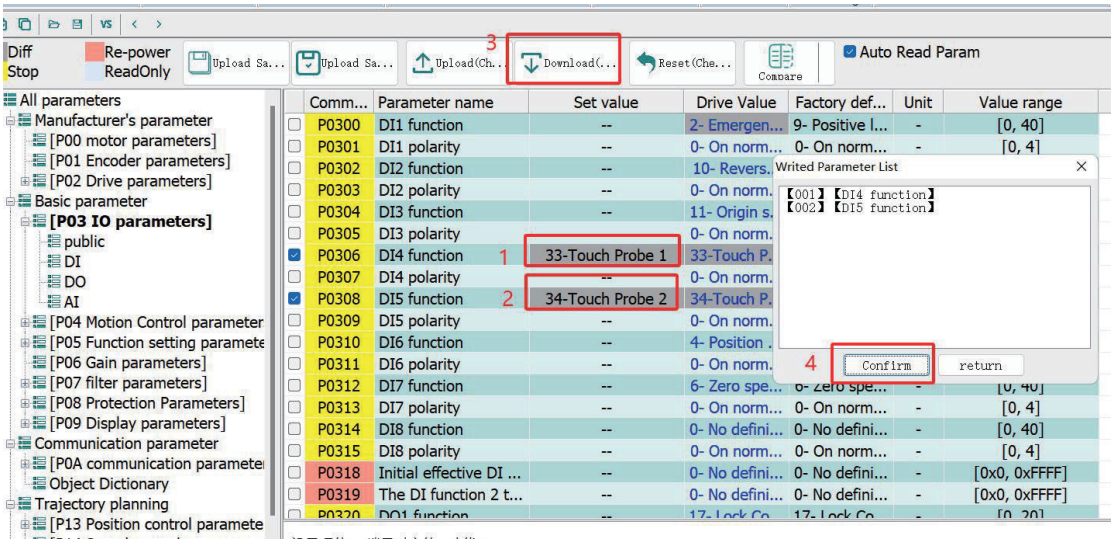


2. Parameter Settings

- Open the PULSE-SERVO pulse servo software. After connecting the device, select the parameter view and locate P03 IO parameters.



- Modify the function parameters of DI4 and DI5. Change the P0306 DI4 function to Probe 1 (33) and the P0308 DI5 function to Probe 2 (34). Then click the 'Download Check Option', click 'OK', and the download will be completed.



- Locate the object dictionary parameter group in the 6000 group, and write the value 3333 to the probe control word (60B8) to enable Probe 1 and Probe 2. For the specific bit definitions of the probe function (0x60B8), refer to the parameter comments in the software or see Table 1-1 below.

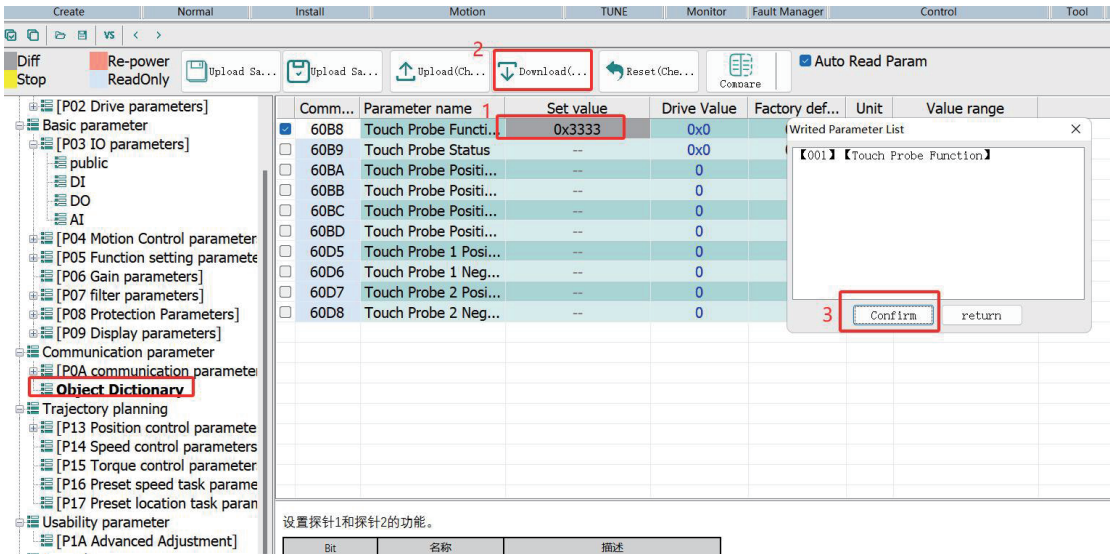


Table 1-1: Specific Bit Definitions for the Probe Function (0x60B8).

Bit	Name	Descriptive
0	Probe 1 Function	0 - Disabled; 1 - Enabled
1	Probe 1 Mode	0 - Single Record; 1 - Continuous Record
2	Probe 1 Trigger Signal	0 - HDI1; 1 - Z Signal
3	NA	Reserved

4	Probe 1 Rising Edge Action	0 - No Latch; 1 - Latch
5	Probe 1 Falling Edge Action	0 - No Latch; 1 - Latch
6	NA	Reserved
7	NA	Reserved
8	Probe 2 Function	0 - Disabled; 1 - Enabled
9	Probe 2 Mode	0 - Single Record; 1 - Continuous Record
10	Probe 2 Trigger Signal	0 - HDI2; 1 - Z Signal
11	NA	Reserved
12	Probe 12Rising Edge Action	0 - No Latch; 1 - Latch
13	Probe 2 Falling Edge Action	0 - No Latch; 1 - Latch
14	NA	Reserved
15	NA	Reserved

For absolute encoders, the Z signal refers to the 0 position of each single revolution.

3. Probe function Modbus corresponding address

Modbus Address Corresponding to Probe Function

Name	Modbus Address	Description
Probe Control Word（60B8）	1845	Same meaning as the probe function in the object dictionary of the EtherCAT machine model. For specific usage, refer to the EtherCAT machine manual.)
Probe Status Word（60B9）	1846	
Probe 1 Rising Edge Position（60BA）	1847	
Probe 1 Falling Edge Position（60BB）	1849	
Probe 2 Rising Edge Position（60BC）	1851	
Probe 2 Falling Edge Position（60BD）	1853	
Probe 1 Rising Edge Count（60D5）	1855	
Probe 1 Falling Edge Count（60D6）	1856	
Probe 2 Rising Edge Count（60D7）	1857	
Probe 2 Falling Edge Count（60D8）	1858	
DI4 Function	774	If using Probe 1 latching, this DI must be assigned as function 33 for Probe 1.
DI5 Function	776	If using Probe 2 latching, this DI must be assigned as function 34 for Probe 2.

4. Pulse servo as slave, modbus RTU communication with codesys for example

The pulse servo acts as a slave station, with Modbus RTU communication implemented using Codesys .

Chapter 6 Gain Adjustment

6.1 Purpose

In order for the servo system to quickly and accurately track commands from the host computer or internal settings, give full play to the mechanical performance, and improve the production beat and efficiency, it is necessary to make reasonable adjustments to the servo control loop gain.

Take the common screw load as an example, as shown in Fig: 6.1-1, the trajectory tracking effect can be greatly improved by reasonably increasing the relevant gain of the speed loop and the position loop, ensuring the gain matching, and cooperating with the speed feed-forward function.

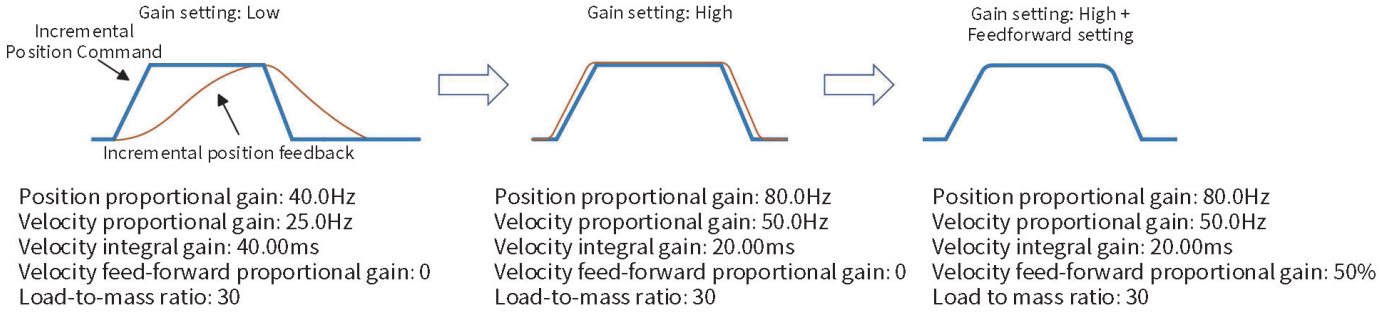


Figure : 6.1-1 Gain Setting Example

Basic servo loop gain parameters include.Position ring scale factorK_p,Velocity loop gain factorK_v,Velocity Ring Integral CoefficientK_i,Torque low-pass filter coefficientτ_m,Load moment of inertia ratioJ_r, etc.They affect each other, and it is generally necessary to ensure that the inner loop bandwidth is higher than the outer loop bandwidth to ensure the stability of the whole system. By setting these parameters in a reasonable combination, the servo system can achieve the ideal control effect in the two dimensions of followability and immunity. Therefore, in order to achieve the ultimate performance of the servo, the gain setting must take into account the balance between the various parameter settings, which puts forward a high degree of competence requirements for the field commissioning personnel. N3RP series of high-performance servo supports manual parameter setting and automatic parameter adjustment of the two modes, the general application scenarios, such as, for example, 3C, lithium-ion battery, TP, and other industries, the use of automatic adjustment function can meet the demand; in the pursuit of extreme performance of the servo system, the automatic adjustment function can meet the In the pursuit of the ultimate performance of the track application scenarios, such as semiconductor, machine tools, laser and other industries, the servo system parameters need to be set in detail to achieve the desired results; for high-speed and high-precision requirements of the P2P point application scenarios, such as high-speed dispenser, crystal solidifying machine, beam-splitter, etc., the N3RP series of servo gain switching function can be set through the reasonable gain, to achieve the ultimate tracking performance.

Before making gain adjustments, the test run operation in Chapter 4 must be performed to confirm that the motor can operate normally without interference!

6.2 TUNING METHODS

The general flow of gain adjustment is shown below:

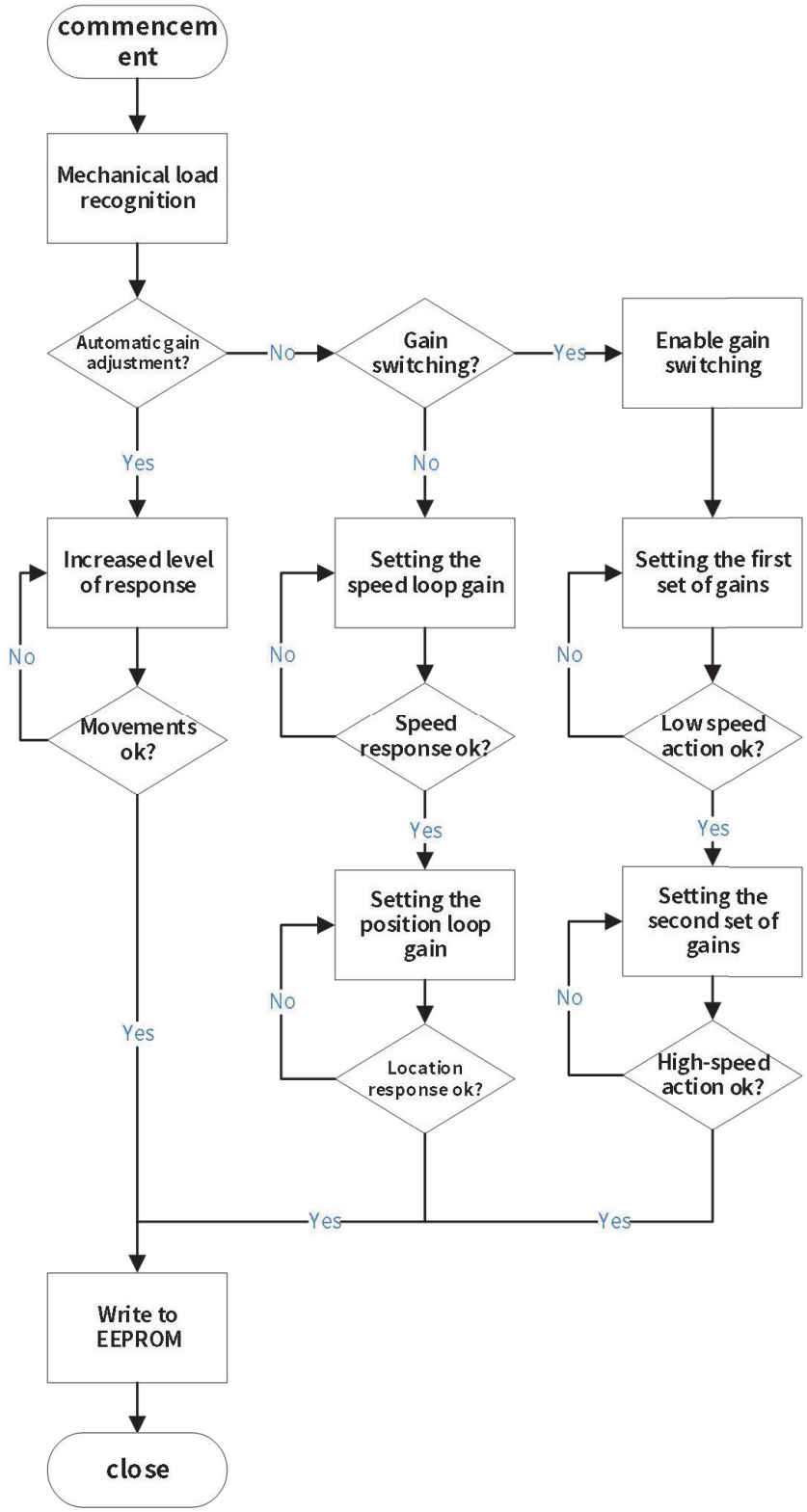


Figure : 6.2-1 Gain Adjustment Process

The N3RP series servo provides three gain adjustment modes, namely, "Auto Gain Adjustment", "Manual Gain

Adjustment", and "Gain Auto Switching". Among them

- "Automatic Gain Adjustment" mode, only need to set one parameter of P1A group - "Response Level Setting", can realise the linkage setting of multiple internal gain parameters to achieve the desired response action, the higher the response level, the faster the response; see section 6.2.4 for details. The higher the response level, the faster the response; for details, see Section 6.2.4, Automatic Gain Adjustment.
- "Manual Gain Adjustment" requires the user to switch off the automatic gain adjustment mode P1A group - "Real-time Self-Adjustment Settings" is set to "0-Off". To achieve the desired response performance, set the gain parameters of group P06, including the speed and position gain parameters, from the inner loop to the outer loop, in sequence;
- "Gain auto switching" needs to turn off the automatic gain adjustment mode P1A group - "Real-time self-adjustment setting" is set to "0 - off". Enable gain switching function parameter, group P06 - "Gain switching - Mode selection" is set to 1, group P06 - "Gain switching - Condition selection" is set to "10 - Position command + actual speed"

The above three gain adjustment methods, in order to achieve good tracking effect, the prerequisite is to implement rigorous "mechanical load recognition" procedures, N3RP series servo built-in mechanical load recognition algorithms, through the positive and negative operation, automatic identification of mechanical load conditions. The following is an introduction to mechanical load recognition, manual gain adjustment, automatic gain adjustment and gain switching.

6.2.1 Mechanical load identification

For the servo system, the mechanical load is the system is controlled by the object, is an important part of the system; mechanical load identification including load inertia, friction and load mechanical resonance point and other parts. Servo through the automatic identification of key mechanical characteristics, the control loop parameters and compensation parameters, automatic and reasonable settings, can be achieved to meet the application requirements of the dynamic response performance, greatly reducing the field debugging personnel to adjust the parameter pressure.

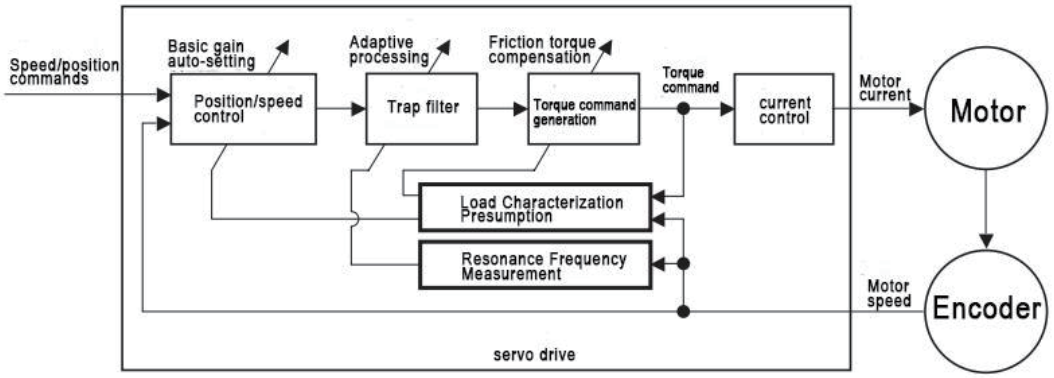


Figure: 6.2-2 Mechanical Load Identification

Usually, we are less concerned with the absolute value of the mechanical load inertia and more concerned with the relative size of the load inertia to the motor inertia, which is why it generally appears as an "inertia ratio" in the control loop.

"Load Inertia Ratio" means:

$$\text{Load Inertia Ratio} = \frac{\text{Mechanical load inertia}}{\text{Motor rotor inertia}}$$

Load inertia ratio is an important parameter of the servo system, and the correct setting of the load inertia ratio helps to complete the commissioning quickly.

The servo drive has a built-in load inertia recognition function, and the load inertia can be recognised automatically by executing the algorithm.

An automatic identification method for inertia recognition:

Inertia recognition is achieved by operating the keys on the servo drive panel to move the motor without the intervention of a host computer;

⚠ Caution:

Under the following conditions, normal mechanical load recognition may not be possible, in which case perform manual gain adjustment.

Table: 6.2-1 Influencing factors for mechanical load identification

	Factors affecting the identification of mechanical loads
load inertia	Inertia mismatch, load inertia ratio greater than 100 times Load inertia unstable, time-varying or slowly changing.
mechanical property	Extremely low mechanical rigidity, e.g. belt drive with untensioned belt, large backlash during operation or backlash in forward and reverse operation, and other non-linear factors, e.g. gear drive with non-centred gears.
sporting condition	When the movement speed is less than 150rpm, when the acceleration and deceleration torque is less than the bias load torque or less than the viscous friction torque, and when the acceleration speed is less than 3000rpm/s.

If the actual load inertia ratio is very large, resulting in slow motor action, then you can increase the P1A group - "Response Level Setting" and then re-perform the inertia recognition.

If vibration occurs during the identification process, stop the inertia identification immediately and lower the P1A group - "Response level setting".

Before performing offline inertia recognition, first confirm the following:

- The has more than 1 turn of positive and negative movable travel between mechanical limit switches:
- Before carries out offline inertia identification, please make sure that limit switches have been installed on the machinery to prevent over-travelling during the inertia identification process, which may cause accidents!

If the actual load inertia ratio is very large and the prediction is greater than the motor inertia by more than 30 times, there will be inertia mismatch phenomenon, resulting in sluggish motor action, at this time, the following two measures can be taken:

- preset load inertia ratio for a larger initial value, preset value is recommended to 5.00 times as the starting value, gradually increasing until the recognition is updated; load inertia ratio can be set through the panel setting "P06.10", can also be set through the background software "P06 Load inertia ratio can be set through the panel setting "P06.10" or through the background software setting "P06-Load inertia ratio".
- can be set by increasing the driver "P1A Advanced Adjustment - Response Level Setting" in the background or by function code "P1A.01".

The general process of panel operating inertia identification is as follows:

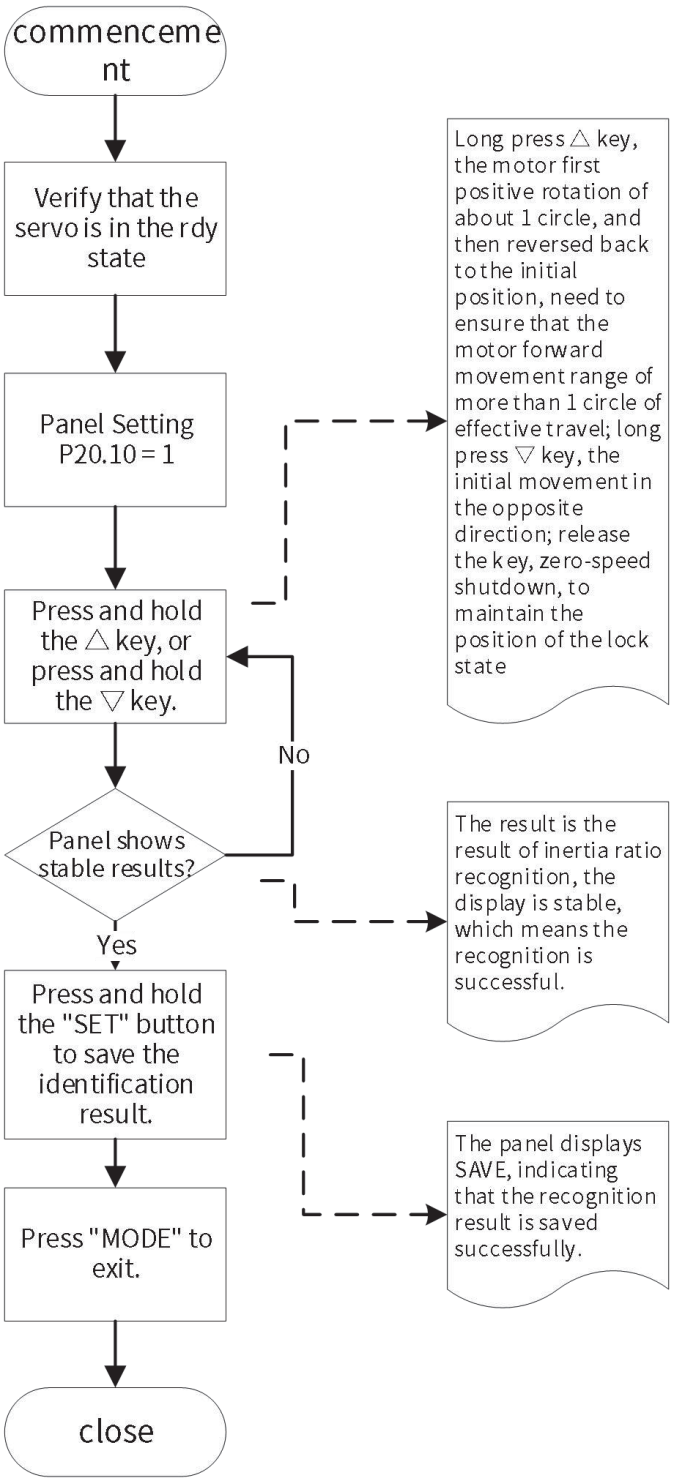


Fig. 6.2-3 Flowchart of panel operation inertia recognition

Inertia recognition adopts positive and negative triangular wave motion form, and the programme has defaulted the optimal motion parameters; users can fine-tune the motion parameter settings according to the actual application scenarios to achieve the recognition action that meets the on-site requirements. The motion curve and parameter settings of the recognition programme are as follows.

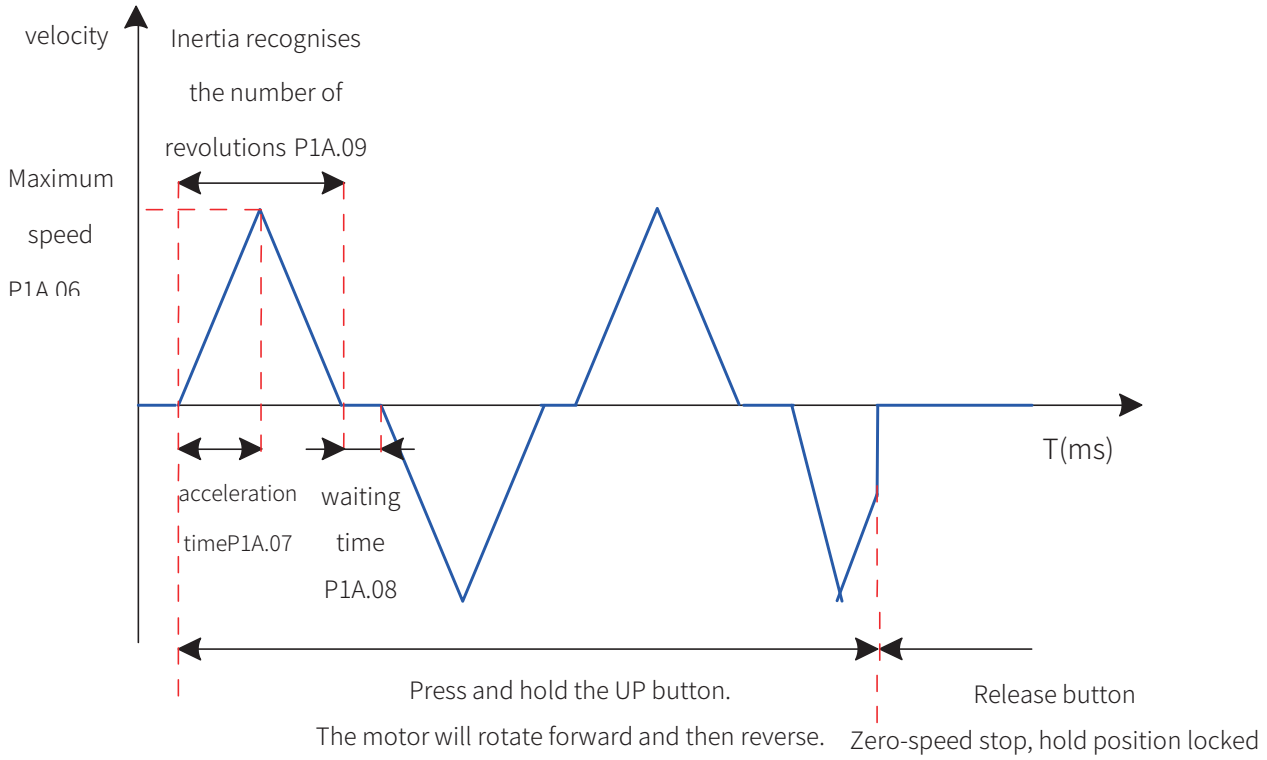


Figure: 6.2-4 Inertia Recognition Motion Graphs

Table: 6.2-2 Self-tuning Parameters Function Code

Function Code	P1A.06	P1A.07	P1A.08	P1A.09
Name	Inertia Recognition Maximum Speed	Inertia Recognition Acceleration Time	Inertia recognition Waiting time	Inertia Recognition Number of Turns
Accessibility	Readable/writable	Readable/writable	Readable/writable	Readable/writable
Unit (Of Measure)	rpm	ms	ms	circle
Default Value	500	125	800	1.00
Minimum Value	100	20	50	0
Maximum Values	1000	800	10000	655.35
Establishment, Mode Of Entry Into Force	Stop setting / Immediate effect	Stop setting / Immediate effect	Stop setting / Immediate effect	Stop setting / Immediate effect
Exegesis	Parameters for offline inertia recognition are set to optimal values by default, and generally do not need to be set.			

6.2.2 Manual gain adjustment

1. 1. Basic gain parameters

In extreme performance demanding scenarios, the gain can be manually fine-tuned. Optimise debugging results with more fine-tuning.

The servo system consists of three control loops, the current loop, the speed loop and the position loop in order from inside to outside, and the basic control block diagram is shown below.

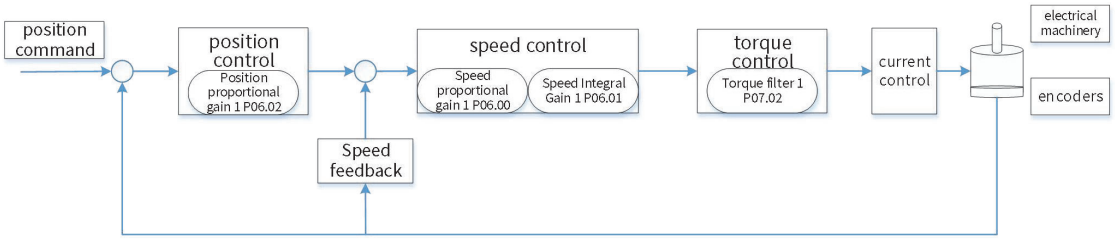


Figure: 6.2-5 Manual Gain Basic Description Block Diagram

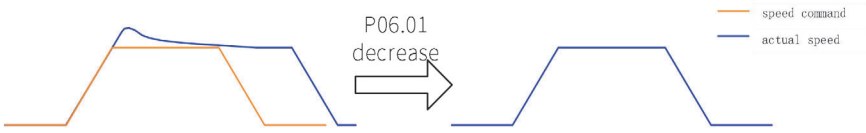
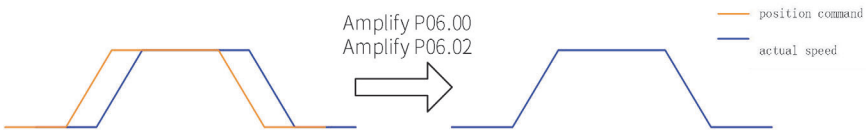
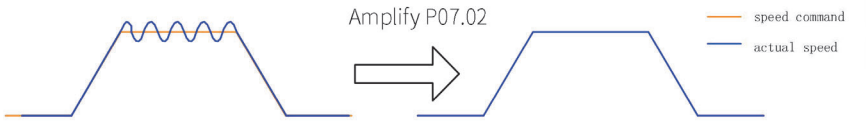
The more inner loop, the higher responsiveness is required. Generally the inner loop bandwidth should be set to more than 4 times the outer loop bandwidth, e.g. current loop bandwidth 2000Hz, speed loop bandwidth setting should not be higher than 500Hz, position loop bandwidth setting should not be higher than 125Hz. the principle should be adhered to as much as possible in the debugging process, or else it may lead to system instability!

The default current loop gain of the servo drive has ensured the responsiveness and generally does not need to be adjusted, and the only things that need to be adjusted are the position loop gain, speed loop gain and other auxiliary gains. Therefore, when making gain adjustments in the position control mode, if you want to improve the position response performance, in order to ensure the stability of the system, first increase the speed loop gain and ensure that the inner loop between the loops is higher than the outer loop bandwidth of 4 times the principle, and then increase the position loop gain to reduce the position tracking error. It must be ensured that the order from inside to outside for loop gain adjustment.

The basic gain parameters are adjusted as follows.

Table: 6.2-3 Loop Gain Parameter Adjustment Description

Move	Function Code	Name	Description Of Adjustments
1	P06.00	Speed proportional gain 1	Parameter role: Determines the maximum frequency of speed commands for changes that the speed ring can follow. It can be considered provided that the load inertia ratio average (P06.10) is set correctly: Speed ring maximum following frequency = P06.00 Adjustment method: Increasing this parameter without generating noise and vibration speeds up the positioning time and brings better speed stability and following; If noise is generated, reduce the parameter setting; When mechanical vibration occurs, the vibration can be suppressed by using a trap or torque low-pass filter function as described in Section 6.3.2, Vibration Suppression.
2	P06.01	Speed Integral Gain 1	Parameter role:

Move	Function Code	Name	Description Of Adjustments
			 Eliminate velocity loop deviations. Adjustment method: It is recommended that the values be taken according to the following relationship: 500≤P06.00×P06.01≤1000 For example, the velocity loop integration time constant should be satisfied for velocity loop gain P06.00 = 40.0 Hz: 12.50ms≤P06.01≤25.00ms。 Reducing the setting value can strengthen the integrating effect and speed up the positioning time, but too small a setting value is likely to cause mechanical vibration. Too high a setting will result in the speed loop deviation not always returning to zero. When P06.01 = 512.00ms, the integral is invalid.
3	P06.02	Position proportional gain 1	Parameter role: Determines the maximum frequency of position commands for changes that the position ring can follow. Position loop highest following angular frequency = P06.02  Adjustment method: In order to ensure the stability of the system, it should be ensured that the highest following frequency of the velocity loop is 3 to 5 times the highest following frequency of the position loop, therefore: $$3 \leq \frac{2 \times \pi \times P06.00}{P06.02} \leq 5$$ For example, the position loop gain should be satisfied when the velocity loop gain P06.00 = 40.0 Hz: 50.2Hz≤P06.02≤83.7Hz。 Adjustment is made according to the positioning time. Increasing this parameter speeds up the positioning time and improves the resistance to external disturbances when the motor is stationary. Too high a setting may cause the system to become unstable and oscillate.
4	P07.02	Torque Filter1	Parameter function: Eliminate high-frequency noise and suppress mechanical resonance. 

Move	Function Code	Name	Description Of Adjustments
			Adjustment method: It should be ensured that the cut-off frequency of the torque command low-pass filter is higher than four times the maximum following frequency of the speed loop, therefore: $\frac{1000}{2 \times \pi \times \mathrm{P07.02}} \geq \mathrm{P06.00} \times 4$ For example, the torque command filter time constant should be satisfied for speed loop gain P06.00 = 40.0 Hz: P07.02≤1.00ms。 If the vibration occurs by increasing P06.00, the vibration can be suppressed by adjusting P07.02. For details, refer to "6.3.2 Vibration Suppression - Low Pass Filter"; Too large a setting will result in a reduced response of the current loop; To suppress vibration during shutdown, try increasing P06.00 and decreasing P07.02; Excessive vibration in the motor stop state, try reducing the P07.02 setting.

Position Loop GainK_p,Velocity Loop GainK_v,Velocity loop integralT_i,Torque low-pass filtering timeT_f， is the basic servo control loop gain parameters, the four basic gain parameters need to maintain a certain relationship between the four basic parameters to ensure that the entire servo system in the stability and high performance to achieve a balance between the four basic parameters of the mathematical relationship between the following:

$$K_p \leq \frac{\pi}{2} \cdot K_v$$
$$T_i \geq 4 \cdot \frac{1}{K_v}$$
$$T_f \leq \frac{1}{4} \cdot \frac{1}{K_v}$$

The specific function codes for the gain category and torque control parameters are shown in the table below:

Table: 6.2-4 Gain Class and Torque Control Parameter Function Codes

function code	P06.00-Speed proportional gain 1	P06.01-Speed Integral Gain 1	P06.02-Position proportional gain 1	P07.02-Torque filter 1
unit (of measure)	0.1Hz	0.01ms	0.1Hz	0.01ms
default value	250	3183	400	79
minimum value	1	15	1	0
maximum values	20000	51200	20000	3000
Establishment, mode of entry into force	Stop setting / Immediate effect	Stop setting / Immediate effect	Stop setting / Immediate effect	Stop setting / Immediate effect
exegesis	-			

2. Feedforward control

- speed feedforward

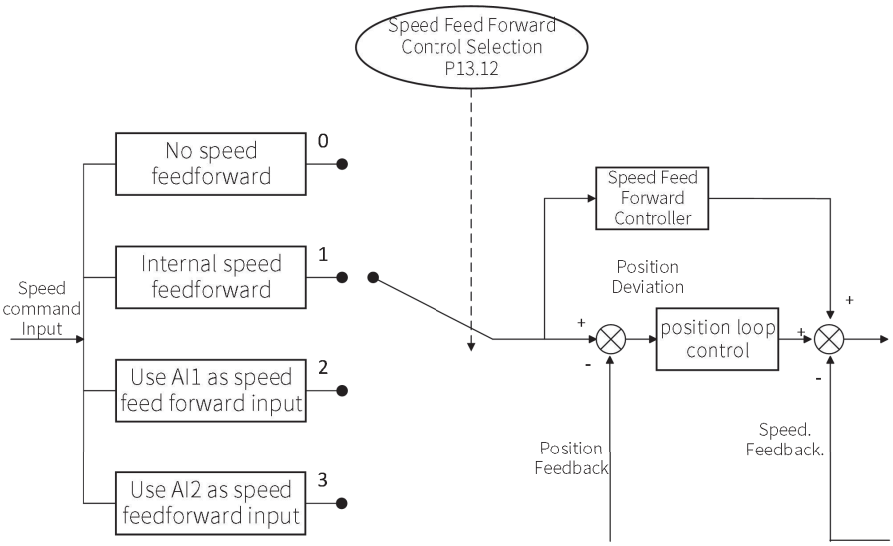


Fig: 6.2-11 Speed feed forward control block diagram

In the position control mode, the theoretical speed command required for the action is calculated directly from the internal position command and added to the speed command obtained from the closed-loop calculation of the position feedback and applied to the speed regulator command input, which significantly reduces the position tracking error and improves the response performance compared with the pure feedback control. Therefore, using the velocity feedforward function can improve the velocity command response and reduce the position deviation at a fixed velocity.

Theoretically, the relationship between the position follower deviation and the position loop gain and velocity feedforward gain is shown below. If the velocity feed-forward gain is set to 100%, the position deviation will theoretically become zero, but too large a feed-forward gain coefficient will cause too much velocity overshoot in the acceleration and deceleration section.

When the position command update period is smaller than the servo control period, the differential operation of the speed feedforward will cause a large differential error, which will be converted into a high-frequency torque command component, thus inducing electromagnetic noise in the operation process, in this case, please use the position command filter (FIR filter or sliding mean filter), or increase the value of the speed feedforward filter.

Position deviation[unit of command]=Instruction speed[unit of command/s]/Position Loop Gain[1/s] × (100-Velocity Feed Forward Gain[%]) /100

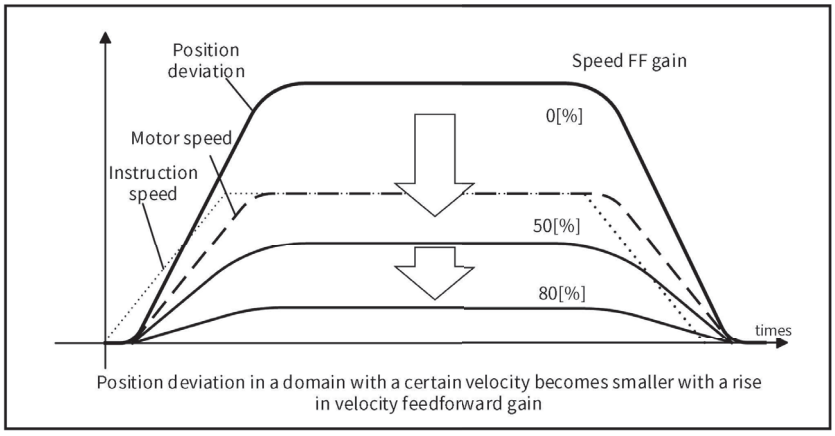


Fig: 6.2-12 Velocity Feed Forward Gain vs. Position Deviation

- Speed Feed Forward Function Operating Procedure:

a. Setting the speed feedforward signal source

Set P13.12 (speed feedforward control selection) to a non-zero value, the speed feedforward function takes effect, and the source of the speed feedforward signal can be selected from internal and external, as shown in the table below.

Table: 6.2-5 Speed Feed Forward Control and Selection Function Codes

function code	name	setpoint	note
P13.12	Speed feedforward control options	0 - no speed feedforward	-
		1-Internal velocity feedforward	The velocity information corresponding to the position command is used as the velocity feedforward signal source.
		2 - Use AI1 as a speed feed forward input	Use AI1 as the source of the velocity feedforward signal.
		3 - Use AI2 as a speed feed-forward input	Use AI2 as the source of the velocity feedforward signal.

b. Setting speed feedforward parameters

Includes velocity feedforward proportional gain (P6.08) and velocity feedforward filter time (P07.06).

Table: 6.2-6 Speed Feedforward Parameters Function Code

function code	name	Description of adjustments
P07.06	Speed feed-forward filter time	Decreasing the filtering time can suppress the speed overshoot during acceleration and deceleration; increasing the filtering time can suppress the noise in the case where the update period of the position command is long compared with the control period of the driver, and the pulse frequency of the position command is not uniform, and suppress the jitter of the positioning completion signal.
P06.08	Speed feedforward proportional gain	See figure: 6.2-12

- torque feedforward

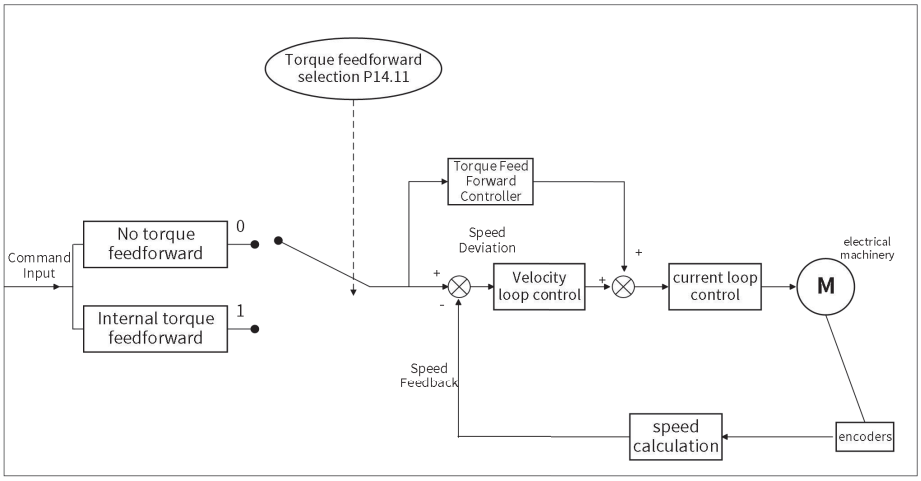


Figure: 6.2-13 Torque Feed Forward Control Operation Diagram

Position control mode, using torque feed-forward, can improve dynamic speed response and reduce positional

follower deviation during constant acceleration and deceleration. Using torque feed-forward requires setting the correct load torque-to-inertia ratio, please use the mechanical load identification results in section 5.2.1. The torque feedforward gain is set to a non-zero value, and the torque feedforward function is enabled. By increasing the torque feedforward gain, the position deviation during constant acceleration and deceleration can be controlled near 0, and the trapezoidal motion curve can be tracked perfectly without external torque interference.

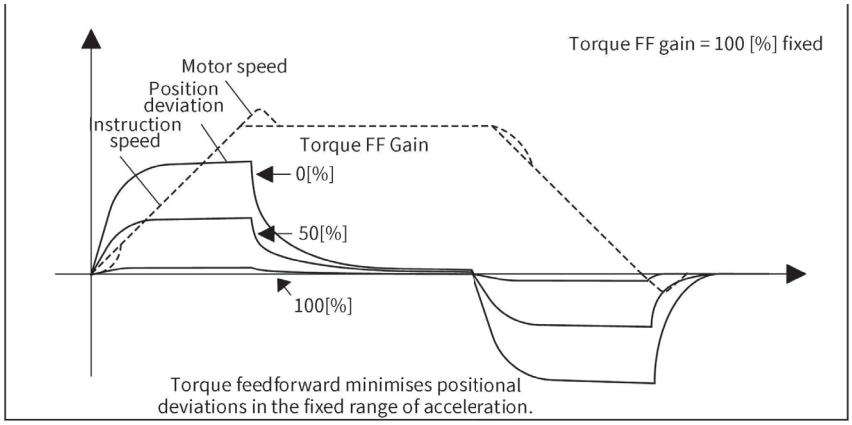


Fig: 6.2-14 Torque feed-forward gain vs. magnitude of positional deviation in acceleration/deceleration section

Torque Feed Forward Function Operating Procedure:

- sets the torque feedforward signal source

Set P14.11 (Torque Feedforward Selection) to a non-zero value to enable the torque feedforward function. The feedforward signal source can be selected from internal and external sources as shown in the table below.

Table: 6.2-7 Speed Feed Forward Control Selection Parameter Function Code

Function Code	Name	Setpoint	Note
P14.11	Torque Feed Forward Control Options	0 - no torque feedforward	-
		1-Internal torque feedforward	Use the speed command as a torque feed-forward signal source. In position control mode, the speed command comes from the output of the position controller.

- to set the torque feedforward parameters

Includes torque feedforward proportional gain (P06.09) and torque feedforward filtering time (P07.07).

Table: 6.2-8 Speed Feed Forward Parameter Function Codes

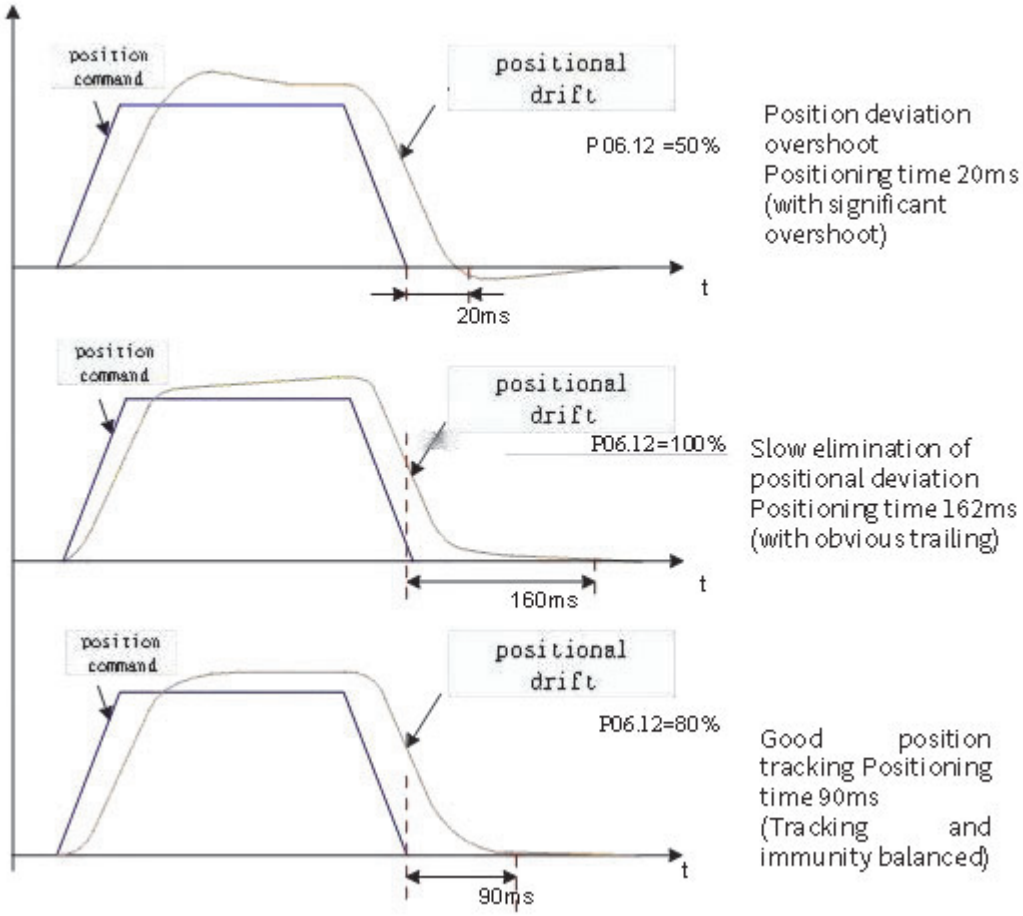
Function Code	Name	Description Of Adjustments
P07.07	Torque feed forward Filter time	Parameter function: Increase P06.09 to improve the response, but may produce overshoot during acceleration and deceleration; Decrease P07.07 to suppress overshoot during acceleration and deceleration; Increase P07.07 to suppress noise; Adjustment method: When adjusting, firstly, keep P07.07 as the default value; then, gradually increase the setting value of P06.09 from 0 until a certain setting value, the torque feed-forward achieves the effect. When adjusting, P07.07 and P06.09 should be adjusted repeatedly to find a well-balanced setting.
P06.09	Torque Feed Forward Proportional Gain	

3．Two degree of freedom control

In the non-torque control mode, the control effect can be improved by using the two-degree-of-freedom control coefficient, which is set to 100% for the normal PI control mode, and non-100% for the two-degree-of-freedom control, which can be used to increase the resistance to external forces and improve the speed response waveform.

The figure below shows the improvement of the two-degree-of-freedom control coefficients on the slow rise in

velocity as well as the slow completion of positioning.



Fig：6.2-15 Example of Two-Degree-of-Freedom Control

The two-degree-of-freedom control enhances the immunity of the velocity loop to interference and improves the following of velocity commands by adapting the velocity loop control method.

Table: 6.2-9 Two Degree of Freedom Feedforward Coefficient Function Codes

Function Code	Name	Description Of Adjustments
P06.12	Two Degree of Freedom Feedforward Coefficients	Function of the parameter: To change the control method of the speed loop in the non-torque control mode. Adjustment method: If P06.12 is set too small, the response of the speed loop will become slower; when there is overshoot in the speed feedback, reduce P06.12 from 100.0 gradually until the two-degree-of-freedom control achieves the effect under a certain setting value. When P06.12 = 100.0, the speed loop control method remains unchanged and is the default proportional-integral control.

6.2.3 Gain switching

The gain switching function is only valid in position and speed control modes and can be triggered by the servo's internal status or by an external DI. Using gain switching, the following functions are possible:

- can be switched to lower gain in the position-locked state when the motor is enabled to be stationary to

suppress vibration and reduce stationary noise;

- can be switched to higher gain during motor stopping when the position is rectified to shorten the positioning time;
- can be switched to higher gain in the running state of the motor to get better command tracking performance;
- can be switched to different gain settings by external signals according to the load equipment.

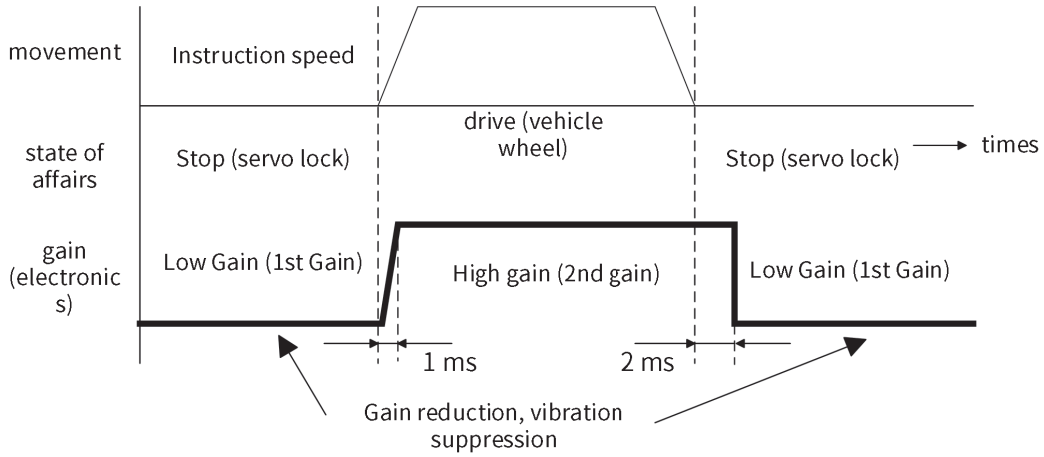


Figure: 6.2-16 Gain Switching Diagram

Examples:

In the LED solid crystal machine application scenario, the servo has a high speed, high precision and high response requirements, is a typical application of fast positioning P2P, using the gain switching function, not only to ensure the demand for rapid calibration, but also to reduce the servo enable the noise of stationary.

Table: 6.2-10 Speed Gain Adjustment Procedure

parameter group	Gain switching adjustment procedure	Manual gain adjustment without gain switching	The second gain is set to the same as the base gain	Enable gain switching function	When stationary, adjust the first set of gain parameters to eliminate stationary noise
P06	Speed proportional gain 1	35.0Hz			27.0Hz
P06	Speed Integral Gain 1	16.00ms			
P06	Position proportional gain 1	63.0Hz			
P07	Torque Filter 1	0.65ms			0.84ms
P06	Speed proportional gain 2		35.0Hz		
P06	Speed Integral Gain 2		16.00ms		
P06	Position proportional gain 2		63.0Hz		
P07	Torque Filter 2		0.65ms		
P06	Gain switching - mode selection	0		1	
P06	Gain Switching - Condition Selection			10	
P06	Load Inertia Ratio	Obtained by inertial discrimination			

The N3RP series servo supports the following 10 gain switching methods, one of which is external DI switching and nine of which are based on the servo's internal motion status:

0：First gain fixed (PS)

1：Switching with external DI (PS)

2：Large torque command (PS)

3：Speed command large (PS)

4：High rate of change of speed command (PS)

5：Speed command high and low speed thresholds (PS)

6：positional deviation greater than or equal to zero (P)

7：With positional commands (P)

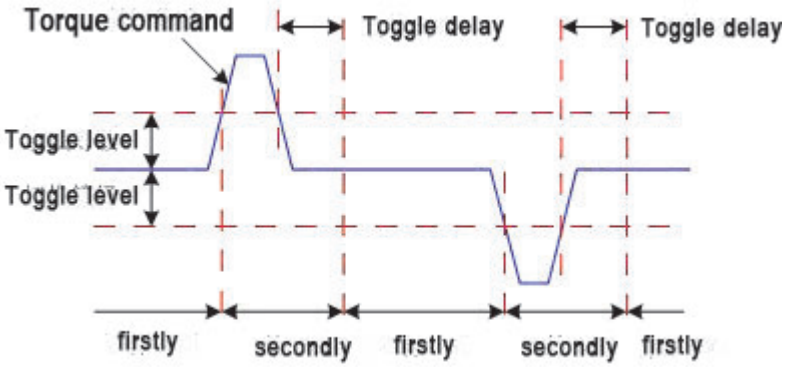
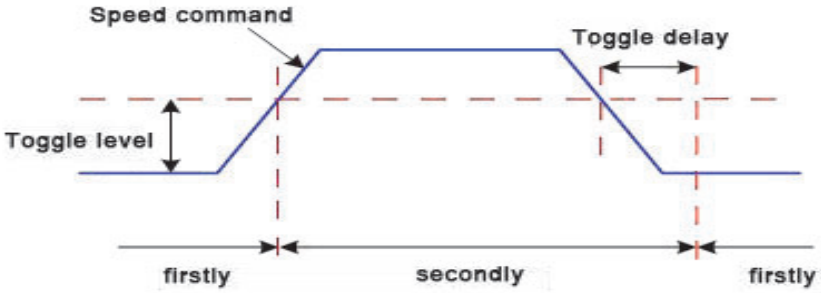
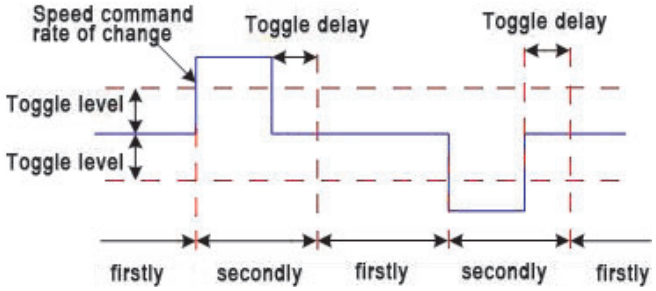
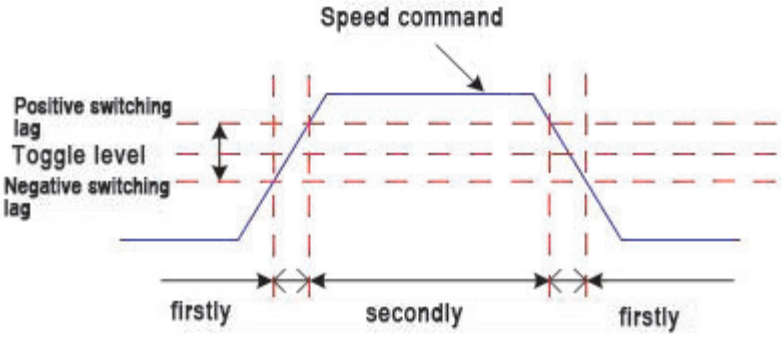
8：Positioning not completed (P)

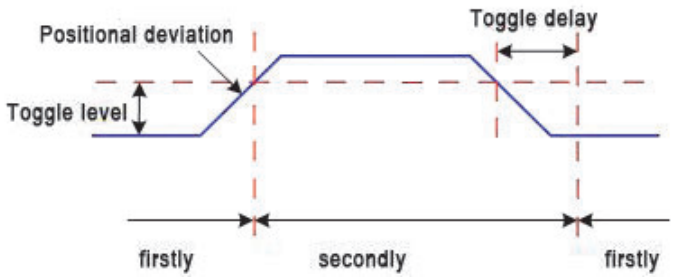
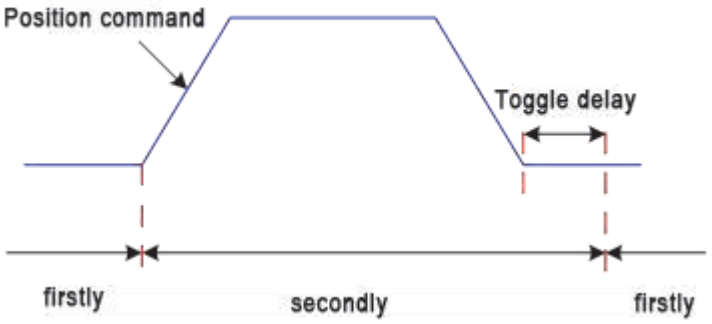
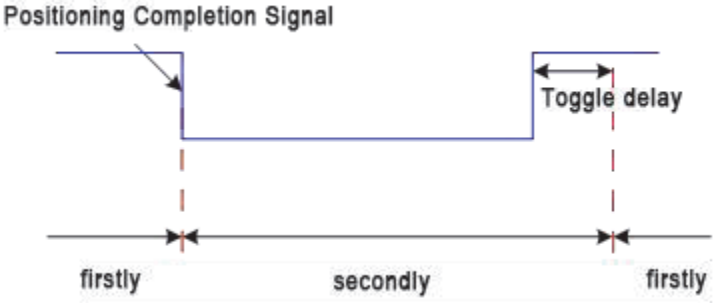
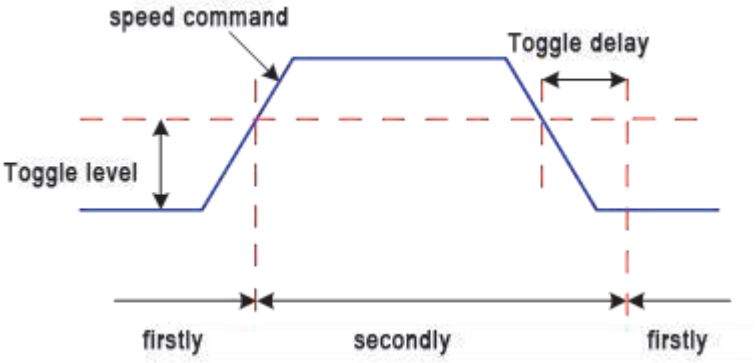
9：Actual speed (P)

10：With position command + actual speed (P)

Where (P) represents that the switching method supports only the position control mode, and (PS) represents that the switching method supports both position control and speed control modes. The following is a further explanation of the nine servo internal switching modes.

Table: 6.2-11 Changes in Servo Internal Switching Methods

Gain switching method	Change of switching method
2: Large torque command	
3: Large speed command	
4: High rate of change of speed command	
5: Speed command high and low speed thresholds	

Gain switching method	Change of switching method
6: Large positional deviation	
7: With positional instructions	
8: Positioning not completed	
9: Actual speed	
10: With position command + actual speed	The combination of mode 7 and mode 9, which is generally chosen, ensures fast and stable adjustment in place.

⚠ Caution:

The delay time "P06.17" is only valid when the second gain is switched to the first gain.

Table: 6.2-12 Gain Class Parameter Function Codes

function code	P06.15-Gain Switching-Mode Setting	P06.16-Gain Switching -Condition Selection	P06.17-Gain-Switching-Delay	P06.18-Gain-Switching-Levels	P06.19-Gain Switching-Time Lag	P06.20-Gain-Switching-Time
unit (of measure)	-	-	ms	-	-	ms
default value	1	0	5.0	50	30	3.0
minimum value	0:First gain fixed, P/PI switching using external DI 1:First gain and second gain switching valid, switching condition P06.16	0:First gain fixed (PS) 1:Switching with external DI (PS) 2:Large torque command (PS) 3:Large speed command (PS) 4:Large rate of change of speed command (PS) 5:High and low speed thresholds for speed command (PS) 6:Large positional deviation (P) 7:Positional command (P) 8:Positioning incomplete (P) 9:Actual speed (P) 10:Positional command+Actual speed (P) speed (P)	0	0	0	0
maximum values			1000.0	20000	20000	1000.0
Creation, entry into force	Run Setup/ Immediate	Run Setup/ Immediate	Shutdown Setting/ Immediate	Shutdown Setting/ Immediate	Shutdown Setting/ Immediate	Shutdown Setting/ Immediate

6.2.4 Automatic gain adjustment

Auto Gain Adjustment means that N3RP series servo drives will automatically generate a set of matching base gain parameters internally according to the "P1A Group - Advanced Adjustment Function - Response Level Selection" parameter setting to meet the needs for speed and stability.

The N3RP series servo provides two automatic gain adjustment modes, 1. basic mode and 2. positioning mode.

⚠ Caution:

Before using the automatic gain adjustment function, be sure to obtain the load inertia ratio correctly!

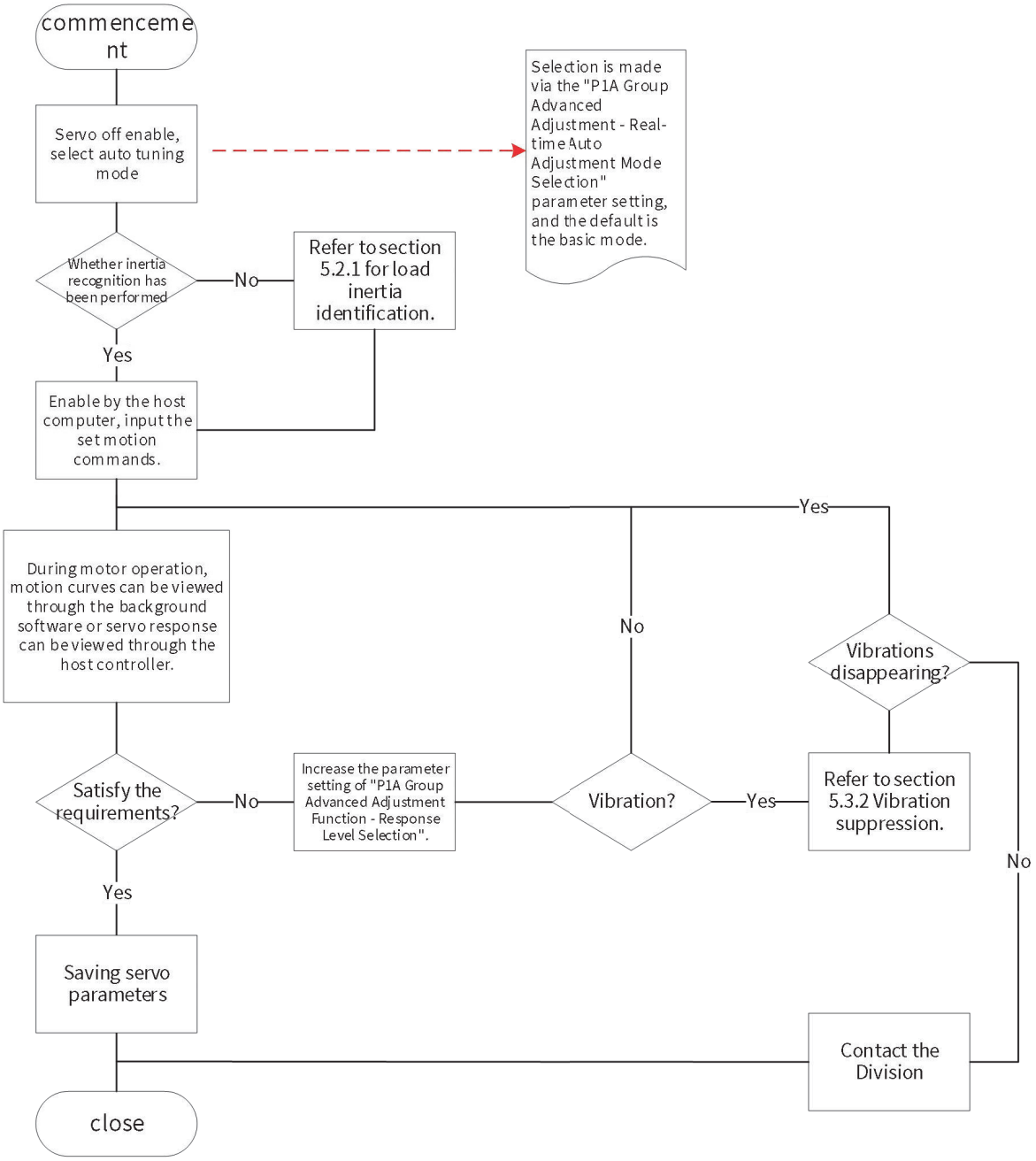


Figure : 6.2-17 Automatic Gain Adjustment Procedure

1. Standard rigid table model

Real-time self-adjusting setting - Standard rigid meter mode (P1A.00=1) is suitable for most occasions, and the response level (P1A.01) takes values between 0 and 40 levels. The higher the response level, the stronger the gain and the faster the response. Depending on the type of load, the following empirical values are available for reference:

Table: 6.2-13 Response Level Reference

Recommended Response Level	Type of load mechanism
Level 4 to 8	Some large machinery
Level 8 to 15	Applications with low rigidity such as belts
Level 15 to 20	Ball screws, direct link and other applications with high rigidity
Level 20 to 40	Direct connection for high rigidity, small inertia load applications

Real-time self-adjustment setting - Standard rigid meter mode (P1A.00=1), basic gain (P06.00~02, P07.02) parameters are automatically updated according to the response level set in P1A.01 and are stored in the corresponding function code:

Table: 6.2-14 Real-time auto tuning mode auto update parameters

function code	name
P06.00	Speed proportional gain 1
P06.01	Speed Integral Gain 1
P06.02	Position proportional gain 1
P07.02	Torque Filter 1

2. Rapid positioning mode

Rapid positioning mode (P1A.00=2)

The backend software parameters are set in the following locations.

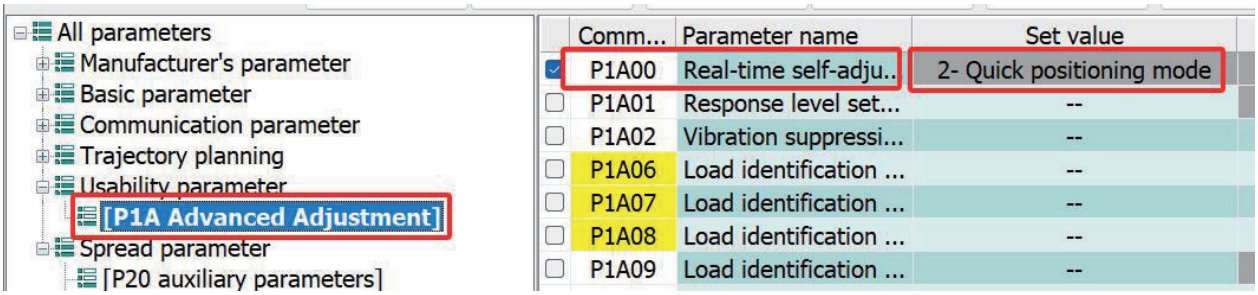


Figure: 6.2-18 Quick Position Mode Setting

The fast positioning mode automatically implements the gain switching function described in Section 6.2.3 and the feedforward control function described in Section 6.2.2 within the N3RP servo, combining the two to achieve the fast positioning effect. Based on the "Auto tuning - standard rigidity table", the second gain (P06.03~05, P07.03) parameter is also automatically updated according to the response level set in P1A.01 and stored in the corresponding function code, and the position loop gain of the second gain parameter should be one response level higher than that of the first gain parameter.

Table: 6.2-15 Automatic update parameters for rapid positioning mode

Function Code	Name
P06.03	Speed proportional gain 2
P06.04	Speed Integral Gain 2
P06.05	Position proportional gain 2
P07.03	Torque Filter 2

The speed feedforward related parameters are set to fixed values:

Table: 6.2-16 Rapid Positioning Mode Fixed Parameters

Function Code	Name	Parameter Value
P06.08	Speed feedforward proportional gain	30.0%
P07.06	Speed feed-forward filter time	0.50ms

Gain switching related parameters are set to fixed values:

The gain switching function is automatically turned on when in fast positioning mode.

Table: 6.2-17 Fast Positioning Mode Gain Parameters

Function Code	Name	Parameter Value	Instructions
P06.15	Gain switching - mode selection	1	First gain (P06.00~02, P07.02) and second gain (P06.03~05, P07.03) switching is active during rapid positioning mode; outside of rapid positioning mode, the original setting is maintained.
P06.16	Gain Switching - Condition Selection	10	In rapid positioning mode, the gain switching condition is P06.16; outside of rapid positioning mode, the original setting is maintained.
P06.17	Gain Switching-Delay	5.0ms	The gain switching delay time is 5.0ms in fast positioning mode; outside of fast positioning mode, the original setting is maintained.
P06.18	Gain Switching - Level	50	The gain switching level is 50 when in rapid positioning mode; outside of rapid positioning mode, the original setting is maintained.
P06.19	Gain switching - time lag	30	30 gain switching time lag in fast positioning mode; outside of fast positioning mode, the original setting is retained.

Caution:

In Auto Gain Adjustment mode, parameters that are automatically updated with Response Level Selection (P1A.01) and those that are fixed values cannot be manually modified. To modify them, P1A.00 must be set to 0 to exit the real-time auto-tuning mode.

Table: 6.2-18 Advanced Adjustment Function Codes

Function Code	P1A.00 - Real-time self-adjustment setting	P1A.01-Response Level Setting
Accessibility	Readable/writable	Readable/writable
Unit (Of Measure)	-	-
Default Value	7	16
Minimum Value	0:Invalid	0
Maximum Values	1:Standard rigid table mode 2:Fast positioning mode 5:Adaptive interpolation mode 7:Adaptive positioning mode	40
Establishment, Mode Of Entry Into Force	Run Setup/Effective Immediately	Run Setup/Effective Immediately

6.3 Vibration suppression

6.3.1 Trap Filters

When the servo gain coefficient is relatively large, high-frequency vibration components can not be effectively attenuated, will stimulate the system resonance, in order not to weaken the servo response performance, in the case of gain does not reduce the smooth driving of mechanical loads, the need for effective suppression of resonance. General servo manufacturers will be set in the control loop before the item channel trap, through a fixed point to weaken the resonance point at the loop gain amplitude, to achieve the purpose of vibration suppression.

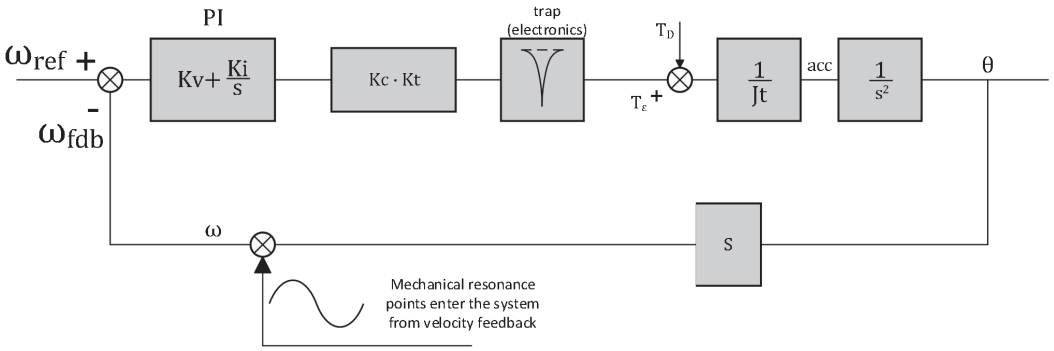


Figure: 6.3-1 Resonance suppression control block diagram

The trap filter transfer function is given by.

$$G_{notch}(s) = \frac{s^2+2\zeta_1\omega_n s+\omega_n{}^2}{s^2+2\zeta_2\omega_n s+\omega_n{}^2}$$

6.3.2 Vibration suppression

The N3RP series servo has a built-in adaptive vibration suppression algorithm, which achieves vibration suppression by extracting the vibration components in the motor speed, inferring the resonance frequency, and automatically setting the relevant parameters of the adaptive trap during actual operation.

1. Automatic trap

To open the adaptive trap function, just set "P1A Group-Advanced Adjustment-Vibration Suppression Mode Selection" to 1 or 2 in the background software; N3RP series servo supports up to four adaptive traps, and when there are five or more resonance points in the system, you need to manually set up the traps, which support up to four different trap frequency settings. When the system has 5 or more resonance points, you need to set the traps manually, and support up to 4 different trap frequency settings.

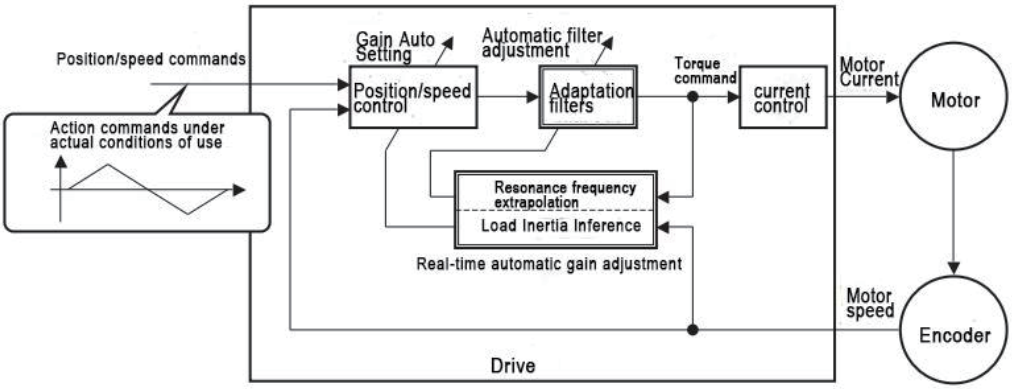


Fig: 6.3-2 Block diagram of adaptive vibration suppression principle

Caution:

Under the following conditions, normal automatic vibration suppression may not be possible, in which case, perform manual vibration suppression.

Table: 6.3-1 Adaptive Vibration Influences

	Factors affecting adaptive vibration suppression
resonance property	When the resonance frequency is lower than the speed response frequency; when there are more than 3 resonance points; when the vibration amplitude is small, or the control gain is low and the effect on the motor speed is not obvious.
mechanical property	Non-linear factors such as excessive mesh backlash during operation or excessive backlash in forward and reverse operation, e.g., gearing mechanism, gear installation is not concentric; vibration components appear randomly and when they appear for a short period of time.
sporting condition	When acceleration and deceleration are rapid and acceleration is greater than 30,000 rpm/s; when the servo is operated in Torque Mode.

2. Manual traps

1) Analyse the resonance frequency;

When using a manual trap, you need to set the trap frequency to the actual resonance frequency that occurs.

The resonance frequency can be obtained through the driver debugging platform oscilloscope interface in the following two ways:

a. Obtain the motor current through the oscilloscope interface display (phase current, torque command, current

feedback are available). the measured period is 0.625ms and the resonant frequency is calculated:

$$f = 1/t = 1600 \text{ Hz}$$

b. Obtained through the "resonance point identification" function of the oscilloscope interface. the measured resonance frequency is 1593.750Hz.

2.Input the resonance frequency obtained in step 1) into a certain trap frequency parameter of the trap, and other parameters generally do not need to be set;

☐	P0710	Vibration suppressi...	--	5000	5000	Hz	[50, 5000]
☐	P0711	Vibration suppressi...	--	2	2	-	[0, 20]
☐	P0712	Vibration suppressi...	--	0	0	-	[0, 99]
☐	P0713	Vibration suppressi...	--	5000	5000	Hz	[50, 5000]
☐	P0714	Vibration suppressi...	--	2	2	-	[0, 20]
☐	P0715	Vibration suppressi...	--	0	0	-	[0, 99]
☐	P0716	Vibration suppressi...	--	5000	5000	Hz	[50, 5000]
☐	P0717	Vibration suppressi...	--	2	2	-	[0, 20]
☐	P0718	Vibration suppressi...	--	0	0	-	[0, 99]
☐	P0719	Vibration suppressi...	--	5000	5000	Hz	[50, 5000]
☐	P0720	Vibration suppressi...	--	2	2	-	[0, 20]
☐	P0721	Vibration suppressi...	--	0	0	-	[0, 99]

Figure : 6.3-5 Notch Filter Parameter Settings

If the resonance is suppressed, it means that the trap has achieved the effect, you can continue to adjust the gain, if the gain is increased, a new resonance appears, repeat steps 1) ~ 2);

If the vibration cannot be eliminated for a long time, please turn off the servo enable in time to reduce the loop gain.

3． Low-pass filters

It is also possible to attenuate the amplitude of all high-frequency vibration components above the turning frequency to below the sensitive value by setting up a suitable torque low-pass filter.

The torque command filtering can be set via the "P07 Filter Parameters - Torque Command Filtering Time Constant" in the background commissioning software.

By setting the filtering time constant, the torque command is attenuated in the high-frequency band above the cut-off frequency to suppress mechanical resonance.

The torque low-pass filter setting parameter is the filter time constant in 0.01ms, and the conversion relationship between the filter time constant and the filter cut-off frequency is:

$$f_c = \frac{1}{2\pi \times \tau_m \times 0.001}$$

6.4 Common Application Scenarios

6.4.1 Ball Screw Loads

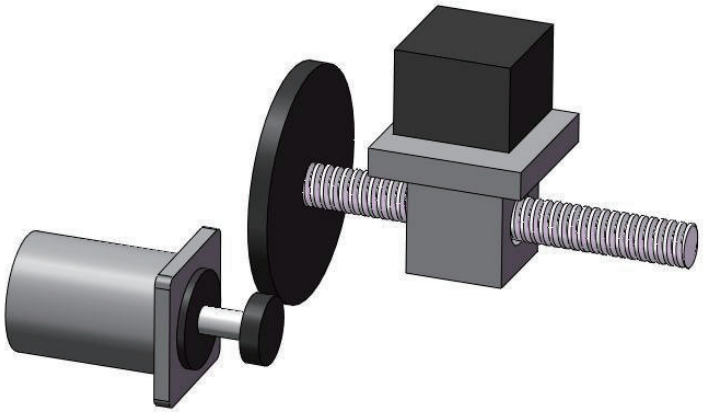


Figure: 6.4-1 Ball Screw Drive Chain

1. Characteristics of ball screws

- small friction resistance, the difference between dynamic and static friction is extremely small, which can ensure smooth movement and is not easy to produce low-speed crawling phenomenon. Small abrasion, long service life, good precision retention.
- With double nut preloading, the clearance can be well eliminated and the transmission rigidity is high.
- Low friction loss, high transmission efficiency, up to 90% to 96%.

2. Debugging Points of Attention

- screw load drive stiffness is higher, generally easier to adjust, the general inertia ratio is reasonable only need to identify the inertia, according to section 6.2.4 of the automatic gain adjustment for automatic gain adjustment can be.
- If the response performance is required to be very high, it is also necessary to carry out the necessary manual gain adjustment as described in Section 6.2.2 Manual Gain Adjustment, or even resonance analysis and suppression, refer to Section 6.3 Vibration Suppression.

6.4.2 Timing belt loads

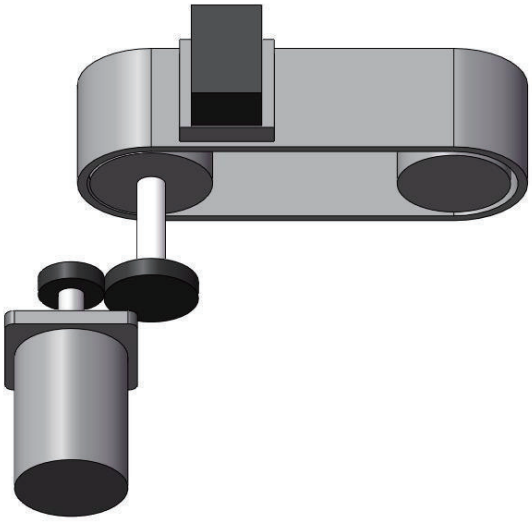


Figure: 6.4-2 Synchronous belt drive chain

1．1. Features of synchronous belt drives

- When is running, the convex teeth of the timing belt mesh with the grooves of the pulley to transfer motion and power.
- There is no sliding during the working process and there is an accurate transmission ratio, so it is called synchronous belt.
- has high transmission efficiency and good energy saving. There is a high transmission efficiency, generally up to 98 per cent.
- has a wide range of ratios, is compact and less rigid.

2． Debugging Points of Attention

- shorter length synchronous belts are still easy to commission, with reasonable inertia ratios, it is only necessary to recognise the inertia ratios and make automatic gain adjustments.
- If the synchronous belt is longer and has a larger inertia, it will be easy to overshoot and overshoot when running at this point. Higher requirements for the position command form, servo below the position command filtering can be.

6.4.3 Rack and pinion loads

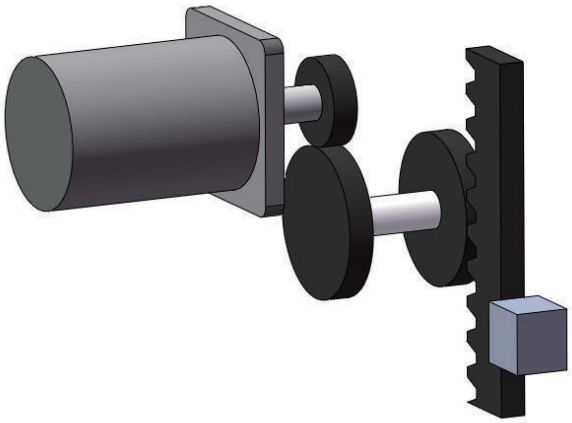


Figure: 6.4-3 Rack and pinion drive chain

1. Rack and pinion drive characteristics

- can be configured with larger reduction ratios and high load driving capacity. Increased output torque by reducing load running speed.
- The drive has a large backlash and loses some of the accuracy of the drive.

2. Debugging Points of Attention

- with reducer can generally be very effective in reducing the load inertia ratio, so such equipment inertia ratio are relatively small, debugging is simple, generally using automatic gain adjustment can be.
- different position rack mounting rigidity, rack processing accuracy may have differences, need to ensure that the full operating range, no vibration, no running noise.

6.4.4 Inertia disc loads

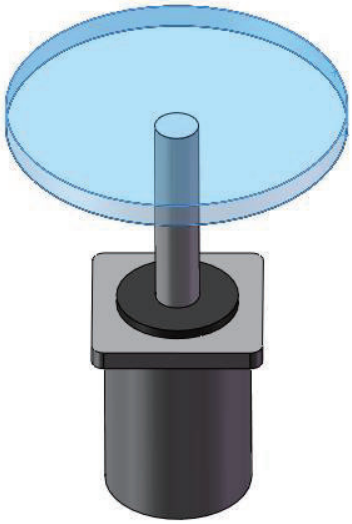


Figure: 6.4-4 Directly connected inertia discs

1．Characteristics of directly connected inertia disc loads

- direct-connected inertia disc loads have good transmission accuracy.
- and the motor are highly synchronised, with no backlash and high transmission rigidity.
- The antiresonance frequency is low, and based on the antiresonance point it is known that the maximum attainable bandwidth of the system should be below the antiresonance point in addition to being away from the resonance point.

2．Debugging Points of Attention

- This type of connection will inevitably give the motor a large inertia ratio, so the speed gain cannot be set too high.
- motors are mounted vertically and are commonly used in indexing applications where fast, accurate start/stop is required, and can be adjusted using gain switching as described in Reference 6.2.3.
- motors are horizontally mounted for working conditions, which generally have greater inertia and are more prone to vibration; the gain cannot be set too high and resonance analysis and suppression is required.

6.4.5 Long cantilever loads

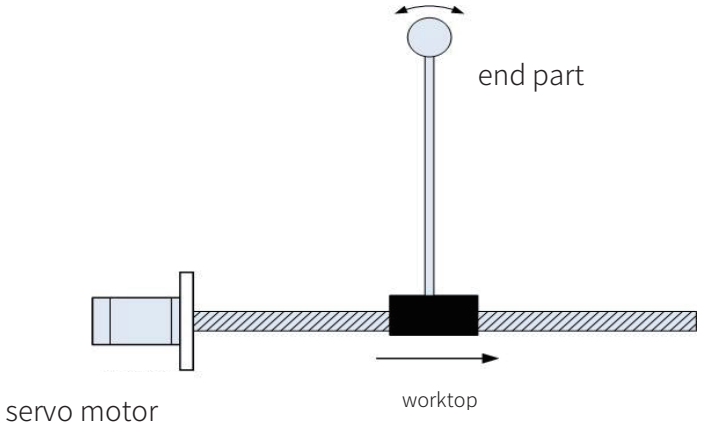


Figure: 6.4-5 Long Cantilever Loads

For long cantilever loads, end jitter or overall equipment shaking usually occurs at high speeds, which can be suppressed by eliminating the frequency components from the position command. Vibration can be suppressed by eliminating the frequency component of the position command, and the N3RP series servo provides a vibration suppression filter to effectively suppress end jitter, and the low-frequency jitter can be suppressed by setting the parameter "Filter Parameter - Position Trap Frequency A" in the background software.

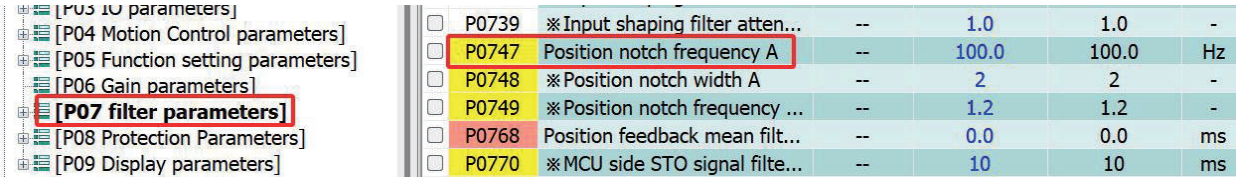


Fig. 6.4-6 Screenshot of function code "Position Trap Frequency".

There are two ways to obtain the jitter frequency:

- obtains the mechanical load end jitter frequency through an external sensor, as shown in Figure: 6.4-7;
- obtains the jitter frequency at the motor end by observing the background software waveform, as shown in Figure:6.4-8.

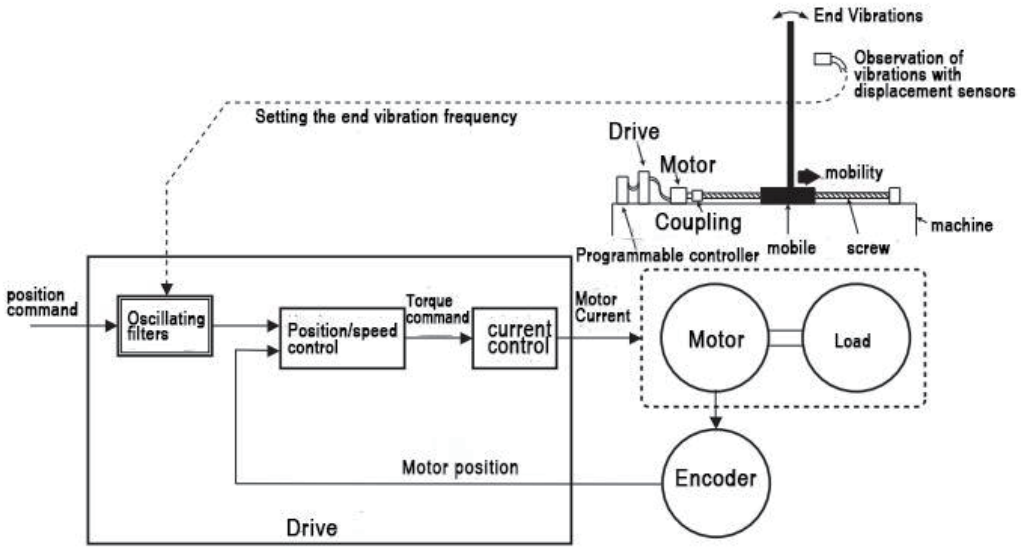


Fig: 6.4-7 Long cantilever load vibration frequency acquisition and suppression method

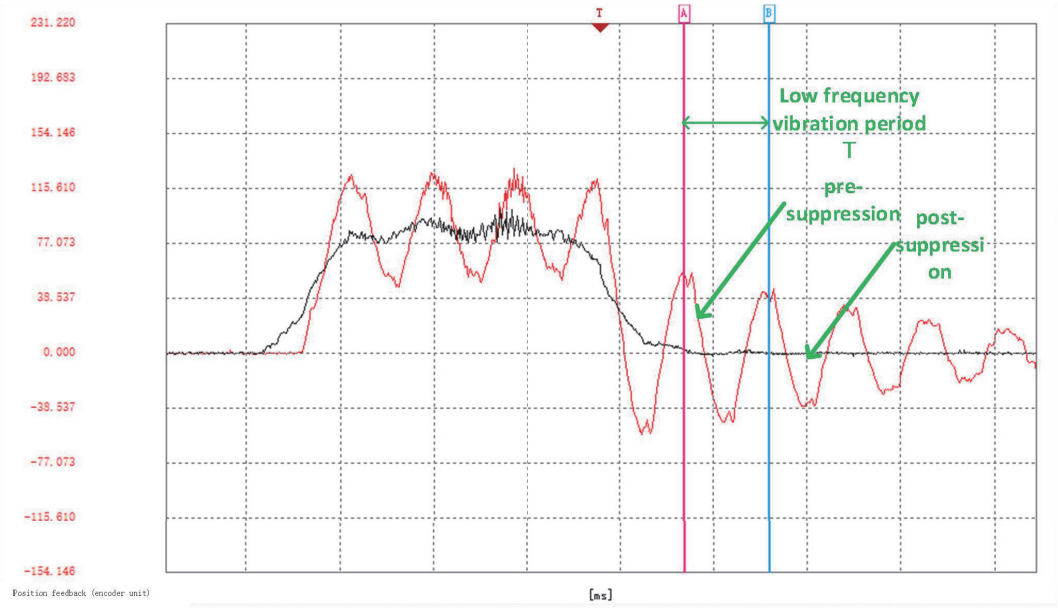


Fig. 6.4-8 Comparison of vibration frequency acquisition and suppression effect before and after long cantilever loads

After measuring the low-frequency vibration period through the background, you can calculate the low-frequency resonance frequency through "$f = \frac{1}{T}$", and set the parameter "P07 Group Filtering Parameter - Position Trap Frequency A" directly. Note that the unit of this parameter is 0.1Hz.

Chapter 7 Troubleshooting and Warning

7.1 Display and viewing

Alarms for N3RP series servos are classified as faults and warnings. The main difference between the two is that the servo stops when a fault occurs, and the servo still operates normally when a warning occurs. According to the display of faults or warnings on the panel, you can check the detailed description and treatment of the corresponding faults or warnings in this manual.

When the servo panel does not light up or the last three digits of the display do not show "rdy" after the power is turned on, the possible causes and treatments are as follows:

Table: 7.1-1 Troubleshooting for Electric Servo Not Ready

Serial Number	Reason For Failure	Confirmation Method
1	Control power supply voltage failure	After unplugging CN1 and CN2, the fault still exists; Measure the AC voltage between L1 and L2.
2	Mains voltage failure	Referring to the specifications, confirm that the 220VAC power supply to the drive is normal.
3	Servo drive failure	Contact the manufacturer's after-sales service.

After powering up, the panel will give the appropriate display when a servo fault or warning occurs. Among them, each display is defined as follows:

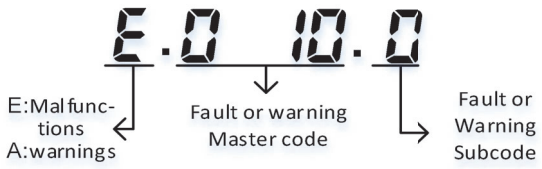


Figure: 7.1-1 Fault Demonstrate Example

For example, the panel displays E.010.0, which indicates that the servo drive has failed, the fault master code is 0x010 and the fault subcode is 0x0; the panel displays A.218.0, which indicates that the servo drive has had a warning, the warning master code is 0x218 and the warning subcode is 0x0.

After troubleshooting the above faults, the panel should display "rdy".

The N3RP series servo drives have a fault logging function that records the names of the last 10 faults and warnings and the status parameters of the servo drive at the time the fault or warning occurred. If a duplicate fault or warning has occurred for the last 5 times, the fault or warning code, i.e., the status of the drive, is recorded only once.

After a fault or warning is reset, the fault history will still hold the fault and warning. The history can be viewed and cleared using the Fault & Warning Management module in the DriveStart Commissioning Software. For details, refer to Servo Commissioning Software User's Manual.

In addition, a detailed description of the current fault, as well as a fault reset, can be viewed via the Fault & Warning Management module in DriveStart.

7.2 List of Fault Codes

Table: 7.2-1 Fault Code List

Trouble Code	Fault Name	Can It Be Reset
E.010	Software parameter failure	×
E.011	Software internal communication initialisation failure	×
E.012	Software version and product model mismatch failure	×
E.013	Software Internal Interrupt Timeout Fault	×
E.014	Software internal communication timeout failure	×
E.015	Current Sampling Timeout Fault	×
E.016	Torque command update timeout fault	×
E.017	Parameter storage failure	×
E.018	Parameter out of range fault	×
E.019	Product Matching Failure	×
E.210	hardware overcurrent fault	×
E.211	Output short circuit fault to ground	×
E.212	UVW phase sequence fault	×
E.213	flying car trouble	×
E.214	Control power supply undervoltage fault	×
E.215	AI sampling fault	√
E.216	STO failure	√
E.910	Faulty encoder parameters	×
E.911	Encoder communication failure	×
E.912	Encoder parameter calibration error fault	×
E.913	Encoder three-phase Hall logic error fault	×
E.914	Encoder broken wire fault	×
E.411	DI function assignment fault	√
E.412	DO Function Assignment Failure	√
E.413	Current Calculation Overflow Fault	√
E.414	DC bus undervoltage fault	√
E.415	DC bus overvoltage fault	√
E.416	overspeed fault	√

Trouble Code	Fault Name	Can It Be Reset
E.417	High startup speed fault	√
E.710	overspeed fault	√
E.711	Inertia Fault Recognition	√
E.712	Magnetic pole fault identification	√
E.715	Motor parameter recognition failure	√
E.716	Gain self-adjustment fault	√
E.916	Encoder broken wire fault	√
E.217	Input phase failure	√
E.218	Servo Emergency Stop Fault	√
E.219	Drive Temperature Failure	√
E.227	Output phase failure	√
E.228	Abnormal pre-charging fault	√
E.418	Servo Repeat On Enable Fault	√
E.419	Drive Overload Failure	√
E.420	Crossover output frequency too high fault	√
E.421	Electronic gear ratio setting error	√
E.423	Excessive position deviation fault	√
E.424	Position command overspeed fault	√
E.429	Excessive gantry synchronisation deviation	√
E.430	Gantry compensates for data overflow	√
E.917	Encoder battery failure	√
E.918	Encoder multiturn count error	√
E.919	Encoder multi-turn counter overflow fault	√
E.922	Encoder overheat warning	√
E.B10	Motor overload faults	√
E.B11	Motor blocking faults	√
E.B13	Motor vibration faults	√
E.B14	Operational anomaly detection	√
E.B15	Motor PTC failure	√
E.D15	Soft limit upper and lower limits set incorrectly	√
E.D16	Home bias out of soft limit range	√

Caution:

“√" indicates that the fault is allowed to be reset, see section 7.6 for details of the reset method. It should be noted that the fault can be successfully reset provided that the source of the fault has been lifted.

"×" indicates that the fault does not allow resetting and must be powered up and down again.

7.3 List of Warning Codes

All warnings can be reset automatically when the warning condition is removed. Or reset by pressing any key on the control panel.

Table: 7.3-1 List of warning codes

Warning Display	Name Of Warning
A.220	Positive overtravel warning
A.221	Negative overtravel warning
A.222	Input out-of-phase warning
A.224	Brake resistor overload warning
A.226	Warning of low resistance of external braking resistor
A.227	Output out-of-phase warning
A.425	Home Zero Failure Warning
A.426	Re-powering warning required
A.427	Parameter Storage Exception Warning
A.428	Crossover output setting error warning
A.920	Encoder Abnormal Warning
A.921	Encoder battery low voltage warning
A.922	Encoder overheat warning
A.928	ABZ Encoder Feedback Overclocking

7.4 Troubleshooting

Table: 7.4-1 Troubleshooting List

Fault Codes And Their Descriptions	Reason For Failure	Cure
E.010.0 Manufacturer parameter calibration abnormality	1. Upgraded the new firmware. 2. 2. Wrote abnormal parameters.	Restore the factory parameters (P0501=1) and check whether the "Factory parameters" are abnormal.
E.011.0 Software internal communication initialisation exception	1. FPGA and MCU software version mismatch. 2. 2.FPGA failure.	1. Consult our technical support to update the matching FPGA or MCU software. 2. Contact the manufacturer's technical support.
E.012.0 Mismatch between software version and product model	1. FPGA version is too low. 2. FPGA failure.	1. Update the software of FPGA or MCU that matches each other. 2. Contact the manufacturer for technical support.
E.013.0 FPGA interrupt signal loss	1. FPGA failure. 2. Internal hardware abnormality.	Replace the servo drive.
E.014.0 MCU and FPGA communication timeout	1. MCU communication timeout. 2.Encoder communication timeout.	1. Use our standard motor cable and encoder cable. 2. Check the cable connection for damage. 3.Separate the strong and weak power cables.
E.015.0 Current chip sampling timeout	1. Power line disconnection or poor contact. 2. Faulty current sampling.	1. Check the cable connection for damage. 2.Replace the servo drive.
E.016.0 Torque command update timeout	1. Servo drive failure.	1. Replace the servo drive. 2. Contact factory technical support.
E.017.0 Parameter storage write exception	1. EEPROM data error fault.	1. Re-energise after the system parameters are restored to initialisation (P0501=1). 2. Replace the servo drive.
E.018.0 Manufacturer's parameters out of range	1. Upgraded with new firmware. 2.EEPROM failure.	1. Restore the factory parameters (P0501=1) and check whether the "factory parameters" are abnormal. 2. Replace the servo drive.
E.019.0 Encoder Matching Fault	1. Product number (encoder or motor or drive) is not supported. 2. Motor rated current is greater than drive rated current.	1. Set the correct encoder type (P0100). 2. Replace with a higher power drive.
E.210.0 P and N phase overcurrent	1. Drive failure. 2. Motor burnt out. 3. Gain parameters are not set reasonably, motor oscillation.	1. Replace the drive. 2. Replace the motor. 3. Redo the gain adjustment.

Fault Codes And Their Descriptions	Reason For Failure	Cure
E.211.0 Bus voltage overvoltage due to output short circuit to ground	1. Motor shorted to ground. 2. Servo drive failure. 3. Bus voltage drain point (P0219) is set too low.	1. Check drive power cable insulation. 2. Replace the drive. 3. Set bus voltage relief point (P0219) correctly.
E.212.0 UVW phase sequence error	The UVW phase sequences of the drive and motor do not match.	1. Connect the UVW cables in the correct phase sequence.
E.213.0 flying car trouble	1. UVW phase sequence wiring error. 2. Wrong initial electrical angle of motor. 3. Vertical axis working condition, gravity load is too large.	1. Connect the UVW cables in the correct phase sequence. 2. Re-perform angle self-learning. 3. Reduce the vertical axis load or shield the fault without compromising safety.
E.214.0 Control power supply undervoltage	1. Unstable power supply voltage or power loss of the control power supply. 2. Bad contact of control power cable.	1. Check the wiring or replace the cable. 2. Re-energise, if abnormal power drop, need to make sure the power supply is stable. 3. Increase power supply capacity.
E.216.0 STO terminal not connected	1. STO is not connected causing STO to take effect.	1.STO correctly wired. 2.Replace the servo drive.
E.217.0 Three-phase input missing one phase	1. Three-phase power specification input driver connected to single-phase input. 2. Three-phase power input wiring is bad. 3. Three-phase voltage imbalance or three-phase voltage is too low.	1. Check three-phase power wiring. 2. Three-phase specification drive and allow single-phase operation (below 1Kw), turn off the alarm (set P0800=2).
E.218.0 Servo Emergency Stop Fault	1. DI function2: Emergency stop triggered. 2. 2.Background communication emergency stop is triggered.	1. Check the mode of operation and confirm that it is safe to deactivate the DI brake active signal (the fault is automatically reset when the emergency stop active signal is deactivated).
E.219.0 Drive Temperature Failure	1. Ambient temperature is too high. 2. After overload, reset the overload fault by switching off the power and repeat several times. 3. The fan is damaged and cannot work properly. 4. The installation direction of the servo drive and the interval with other servo drives are not reasonable.	1. Improve the cooling conditions of the servo drive and reduce the ambient temperature. 2. Change the fault reset method, wait 30s after overload and then reset. Increase the capacity of the drive and motor, increase the acceleration and deceleration time, and reduce the load. 3. Install according to the installation standard of servo drive. 4. Replace the servo drive.
E.227.0 UVW output out of phase	1. Motor U or V or W phase power line disconnection.	1. Check motor power cable wiring, rewire and replace cable if necessary.
E.228.0 Precharge relay not	1. Hardware damage.	1. Replace the servo drive. 2. Contact factory technical support.

Fault Codes And Their Descriptions	Reason For Failure	Cure
engaged		
E.228.0 Pre-charge blocking circuit	1. Pre-charge blocking circuit	1. Contact the manufacturer for technical support.
E.411.0 DI Function Assignment Repeat	1. When DI function is assigned, the same function is repeatedly assigned to multiple DI terminals.	1. Redistribute DI functions to avoid duplication.
E.412.0 DO Functional assignments outside the defined range	1. DO function number exceeds the number of DO functions.	1. Restore factory parameters and re-power up.
E.413.0 Current Calculation Overflow Fault	1. DQ axis current overflow.	1. Restore factory parameters and re-power up and down. 2. Replace the servo drive.
E.414.0 DC bus undervoltage fault	1. Instantaneous power drop occurs. 2. Power supply voltage drops during operation. 3. Three-phase input is connected to only a single phase.	Check the input power supply.
E.415.0 DC bus overvoltage fault	1. Main circuit input voltage is too high. 2. The motor is in rapid deceleration state and the regenerative resistor fails.	1. Check the input power supply. 2. Replace the regeneration resistor.
E.416.0 Speed exceeds maximum speed	1. Motor cable U V W phase sequence is wrong. 2. Incorrect motor or encoder parameter setting, 3. Motor initial angle recognition error. 4. Motor speed closed-loop overshoot.	1. Wiring according to the correct U, V, W phase sequence. 2. Set motor parameters or encoder resolution correctly. 3. Re-angle recognition. 4. Re-gain adjustment.
E.417.0 Starting speed greater than rated speed	1. The actual motor speed is greater than the rated speed when enabled on the drive.	1. Reset the fault, reduce the actual speed of the motor and run it again.
E.418.0 Enable on Servo Repeat	1. Communication servo enable is valid with internal enable.	1. Turn off the servo enable signal of the upper unit.
E.419.0 Drive overload faults	1. The processing beat is frequent, the acceleration and deceleration time is set too short, and the load is too heavy. 2. The drive power model is selected small.	1. Reduce the machining beat and increase the acceleration and deceleration time. 2. Replace the drive with a higher power.
E.420.0 Crossover output frequency too high fault	1. The output pulse frequency exceeds the upper frequency limit allowed by the hardware (4MHz for single circuit).	1. Reduce the number of encoder crossover output pulses (P1316). 2. Use twisted shielded cable to prevent interference pulses from being superimposed on the real pulses, resulting in false alarm faults.
E.421.0 Local electronic gear ratio setting error	1. Electronic gear ratio setting value exceeds the above range. 2. Parameter change sequence problem.	1. Set the gear ratio by referring to the electronic gear ratio range setting specification. 2. Use the fault reset function or Re-energise.

Fault Codes And Their Descriptions	Reason For Failure	Cure
E.422.0 Inner and outer ring switching is not possible when using multi-segment absolute Position Mode in full closed loop.	1. In Full Closed Loop Position Mode, the source of the position command is the internal position command, but the inner and outer loop switching modes are used.	1. When full closed-loop function is used and the source of the position command is an internal position command, only the external encoder feedback mode can be used, i.e., P2200 can only be 1.
E.423.0 Excessive deviation of the inner ring position	1. Drive UVW output is out of phase or disconnected. 2. Encoder inserted wrongly. 3. Motor blocking due to mechanical factors. 4. Servo drive gain is low. 5. Position command increment is too large. 6. Deviation threshold 6065h/P0806 is too small.	1. Check the UVW output cable. 2. Check the encoder cable. 3. Troubleshoot mechanical factors. 4. Perform manual gain adjustment or automatic gain adjustment. 5. Increase the acceleration/deceleration ramp of the position command. 6. Increase deviation threshold 6065h/P0806.
E.424.0 Position Command Multiple Times Overspeed	1. The servo receives a position command with too large an increment. 2. Motor speed limit is set incorrectly.	1. Decrease the target position command increment. 2. Set the host computer planning speed less than the maximum motor speed.
E.429.0 Excessive deviation during gantry synchronisation	1. During the synchronous operation of the gantry, the two motors run with too large a deviation.	1. Rectify the physical jamming phenomenon to ensure that the gantry operates normally. 2. Modify (P0401 Motor Running Direction) to ensure that the gantry motor running direction is the same as the commanded direction. 3. Modify (P2202 External Encoder Direction Selection) to ensure that the direction of change of the internal and external encoders of the two gantries is in the same direction as the running direction. 4. Adjust the values of the second drive (P2205 Outer Ring Electronic Gear Ratio Numerator) and (P2206 Outer Ring Electronic Gear Ratio Numerator). 5. Adjust (P2234 Synchronised Position Gain) and (P2235 Synchronised Position Differential) as appropriate.
E.430.0 Gantry compensates for data write overflow	reservation	reservation
E.710.0 FPGA internal speed measurement overflow	1. FPGA internal speed measurement calculation overflow.	1. Check to make sure the encoder cable is connected correctly. 2. Re-power up and down and try to run again. 3. Replace the motor or drive.

Fault Codes And Their Descriptions	Reason For Failure	Cure
E.711.0 Offline Inertia Fault Recognition	1. Offline inertia identification was not completed.	1. Contact the manufacturer for technical support.
E.712.0 Magnetic pole fault identification	1. Motor initial pole angle recognition failure.	1. Disconnect the motor shaft and redo the angle identification.
E.715.0 Abnormal parameter identification results	1. Identification result is 0	1. Contact the manufacturer for technical support.
E.716.0 Self-adjusting gain too small	1. Self-adjusting gain too small	1. Re-perform the self-adjustment; 2. Contact the manufacturer's technical support.
E.910.0 Abnormal encoder parameter check at power-up	1. Mismatch between drive and motor type. 2. Parameter checking error in the bus type incremental encoder ROM or no parameter is stored.	1. Replace the drive and motor with the one that matches each other. 2. Check the encoder cable, please use our standard encoder cable. 3. Separate encoder cable and power cable.
E.911.0 (to be distinguished by detailed definitions)	1. Encoder wiring error. 2. Loose encoder cable. 3. Encoder Z signal is disturbed (EMC related problem). 4. Faulty encoder.	1. Re-wire the encoder according to the correct wiring diagram. 2. Re-wire the encoder and make sure the encoder terminals are tightly connected. 3. Use our standard encoder cable. 4.Replace the servo motor.
E.912.0 Encoder parameter calibration error	1. The bus type incremental encoder cable is broken or loose. 2. Bus type incremental encoder parameters read and write abnormally.	1. Confirm that the encoder cable is not misconnected, or disconnected, or has poor contact. 2. Route the encoder cable and power cable separately. 3. Replace the servo motor.
E.913.0 Power-on initialisation read initial angle error	1. Drive and motor type mismatch. 2. Encoder cable broken.	1. Replace with matching motor and drive. 2. Replace the encoder cable in good condition and tighten the connection.
E.914.0 Z signal line disconnected	1. Failure of encoder leads to loss of Z signal. 2. Bad or wrong wiring leads to loss of Z signal of encoder.	1. Replace the servo motor. 2. Check if the encoder wire is in good contact, rewire or replace the cable.
E.917.0 Encoder battery failure	1. Absolute encoder, during power failure, without battery connected. 2. Encoder battery voltage too low.	1. Reconnect the battery, or replace it with a new one. 2. Set P2005=1 to clear the fault.
E.918.0 Encoder multiturn count error	1. Faulty encoder.	1. Set P2005=2 to clear the fault, Re-energise. 2. Replace the motor.

Fault Codes And Their Descriptions	Reason For Failure	Cure
E.919.0 Encoder multi-turn counter overflow	Multiturn data is 32767 or 32768.	Set P2005=2 to clear the encoder multiturn data, Re-energise.
E.922.0 Encoder overheat warning	1. The temperature of the encoder is too high.	1. Stop the drive from running for a period of time. 2. Make sure the encoder is well ventilated to reduce the ring temperature.
E.B10.0 Motor overload faults	1. The processing beat is frequent, the acceleration and deceleration time is set too short, and the load is too heavy. 2. The motor power model is selected small.	1. Reduce the processing beat and increase the acceleration and deceleration time. 2. Replace the motor with a higher power.
E.B11.0 Motor blocking protection	1. Motor cable U V W phase sequence is wrong. 2. Motor angle error. 3. Incorrect encoder communication protocol (P0100) setting. 4. Motor blocking due to mechanical factors, resulting in excessive load during operation.	1. Wiring in correct U, V, W phase sequence. 2. Re-angle identification. 3. Set correct P0100 parameters. 4. Check the mechanical structure.
E.B13.0 Excessive motor vibration	1. Excessive motor vibration	1. Adjust the gain parameter 2. Switch on vibration suppression
E.B14.0 Position anomaly detection	reservation	reservation
E.B15.0 Thermistor disconnected or thermistor not connected	1. Thermistor disconnected or thermistor not connected	1. Check the thermistor and its connecting wires.
E.D15.0 Soft limit upper and lower limits set incorrectly	1. The lower limit value of the software limit is greater than or equal to the upper limit value of the soft limit.	1. Reset the parameters to ensure that 607D-01h is less than 607D-02h (P0B45 is less than P0B47).
E.D16.0 Home bias out of soft limit range	1. The home position is offset outside the soft limit position range.	1. Reset the parameters and set 607D-01h and 607D-02h (P0B45 and P0B47) reasonably.

7.5 Warning handling

Table: 7.5-1 List of Warnings Handled

Name Of Warning	Warning Of Possible Causes	Cure
A.220.0 Positive overtravel warning	Positive limit input is valid.	After confirming safety, give the motor a reverse command to invalidate the forward limit.
A.221.0 Negative overtravel warning	Negative limit input is valid.	After confirming safety, give the motor a positive rotation command to invalidate the negative limit.
A.222.0 Input out-of-phase warning	1. Three-phase power input is out of phase.	1. Check three-phase power wiring. 2. Three-phase specification drive and allow single-phase operation (below 1kW), turn off the alarm (set P0800=2).
A.224.0 Regenerative Resistor Overload Warning	1. The regeneration resistor is not connected or connected wrongly. 2. The power of the regenerative resistor is too small. 3. Regenerative resistor related parameters are set incorrectly: type, resistance value, power, etc.	1. Check the regenerative resistor wiring. 2. Replace the regenerative resistor with a higher power one. 3. Set the regenerative resistor parameters correctly.
A.226.0 External regeneration resistor low resistance warning	The external regenerative resistance value is less than the minimum value allowed by the specification.	Correctly set the parameters related to the external regenerative resistor.
A.227.0 Output out-of-phase warning	1. The motor power cord is disconnected.	1. Check motor power cable wiring, rewire and replace cable if necessary.
A.425.0 Home Zero Failure Warning	1. The stroke is too long and the time limit for searching the home position is too short. 2. The speed of searching home switch signal is too small. 3. Switch abnormality: Positive limit or negative limit or home switch is in effect at the same time or no switch signal is detected.	1. Increase the origin finding time P1349. 2. Increase the return-to-zero speed 6099-01h. 3. Check the switching signals.
A.426.0 Re-powering warning required	1. The parameters have been changed and need to be re-powered for the parameters to take effect.	1. Re-power up and down.
A.427.0 Parameter storage exception warning	1. Writes data to the EEPROM very frequently and in large amounts.	1. Reduce the number of unnecessary parameters to be written to the EEPROM. 2. Set P05.10 to 0 and do not store parameters to the EEPROM.
A.428.0	1. When the encoder crossover output function	1. Reset the number of encoder

Name Of Warning	Warning Of Possible Causes	Cure
Crossover output setting error warning	(P13.15=0) is used, the encoder crossover pulse number (P13.16) setting is out of range.	crossover pulses (P13.16) so that it meets the specified range.
A.713.2 Sampling Error Warning	1. Contact the manufacturer for technical support.	1. Parameter identification can be repeated for several attempts. 2. Contact the manufacturer's technical support.
A.713.3 Check Rise Time Error Warning	1. Contact the manufacturer for technical support.	1. Parameter identification can be repeated for several attempts. 2. Contact the manufacturer's technical support.
A.713.4 Check overshoot error warning	1. Contact the manufacturer for technical support.	1. Parameter identification can be repeated for several attempts. 2. Contact the manufacturer's technical support.
A.713.5 Q axis current steady state error check warning	1. Contact the manufacturer for technical support.	1. Parameter identification can be repeated for several attempts. 2. Contact the manufacturer's technical support.
A.713.6 D-axis current steady state error check warning	1. Contact the manufacturer for technical support.	1. Parameter identification can be repeated for several attempts. 2. Contact the manufacturer's technical support.
A.920.0 Warning of internal encoder algorithm error	1. Encoder zero search algorithm failed. 2. 2. Encoder divider counting algorithm error.	1. Servo drive re-power up and down. 2. Replace the servo motor.
A.921.0 Encoder battery low voltage warning	The voltage of the absolute encoder battery is below 3.0V.	Check the encoder power cable or replace the battery with a new one.
A.922.0 Encoder overheat warning	1. The temperature of the encoder is too high.	1. Stop the drive from running for a period of time. 2. Make sure the encoder is well ventilated to reduce the ring temperature.
A.928.0 ABZ Encoder Feedback Overclocking	1. The feedback frequency corresponding to the maximum speed calculated within the servo exceeds the hardware limit due to incorrect parameter setting (P0018, P0105) or too high motor encoder feedback frequency.	1. Modify parameters such as P0018 and P0105. 2. Contact the manufacturer's technical support.

Name Of Warning	Warning Of Possible Causes	Cure
A.D35.0 Return to zero mode P13.45 parameter setting error	The return-to-zero method is set incorrectly.	Set the 6098h correctly (Zero return method 15/16/31/32 etc. is not supported).
nrd Servo not ready	1. Control circuit voltage is too low; 2. Power circuit bus voltage is too low; 3. Encoder feedback is abnormal;	1. Refer to the specification and confirm that the drive 220VAC/380VAC power supply is normal. 2. Release the motor from being back-dragged structure, or replace the motor encoder.

7.6 Reset methods

There are two ways to reset faults and warnings of N3RP series servo:

1) Setting parameter P20.03 = 1 for reset;

2) Resetting by DI input (function5, fault reset);

In this case, for resetting a fault, the servo enable is switched off first and then the fault reset signal is given; for resetting a warning, the fault reset signal can be given directly. A fault can be successfully reset only if the fault condition has been lifted. Warnings are automatically reset after the warning condition is lifted.

Chapter 8 Description of parameters

8.1 List of Function Code Assignments

Table: 8.1-1 List of function code assignments

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
00 Motor parameters							
P0003	Motor Properties	RW	-	0~65535	0	Changes in downtime	with immediate effect
P0005	Motor Temperature Sensor Settings	RW	-	0-Sensorless 1-PTC(Thermistor) 2-NTC(Thermistor) 3-Thermostat (switching type)	0	Changes in downtime	Re-energise
P0010	Rated voltage of the machine	RW	V	0-220V 1-380V	0	Changes in downtime	Re-energise
P0011	Motor rated current	RW	0.01A	0~65535	470	Changes in downtime	Re-energise
P0012	Motor rated power	RW	0.01kW	0~65535	75	Changes in downtime	Re-energise
P0013	Rated torque	RW	0.01Nm	0~4294967295	239	Changes in downtime	Re-energise
P0017	rated speed	RW	rpm	0~65535	3000	Changes in downtime	Re-energise
01 Encoder parameters							
P0100	Encoder Communication Protocol	RW	-	0~65535	11233	Changes in downtime	Re-energise
P0103	Encoder version number	RO	-	0~65535	0	Demonstrate	With immediate effect
P0105	Number of encoder lines	RW	-	0~4294967295	1048576	Changes in downtime	Re-energise
02 Drive parameters							
P0200	MCU Software Version Number	RO	-	0~65535	0	Demonstrate	With immediate effect
P0201	FPGA Software Version Number	RO	-	0~65535	0	Demonstrate	With immediate effect
P0202	MCU off-specification	RO	-	0~4294967295	0	Demonstrate	With immediate effect
P0204	FPGA off-specification	RO	-	0~4294967295	0	Demonstrate	With immediate effect
P0212	Driver Input Voltage	RO	-	0~65535	220	Demonstrate	With immediate effect
P0213	Drive Power Rating	RO	0.01kW	1~65535	75	Demonstrate	With immediate effect
P0215	Driver Rated current	RO	0.01A	1~65535	550	Demonstrate	With immediate effect
P0234	Braking Resistor	RW	-	0-Built-in brake	0	Changes in	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	Selection			1-Natural cooling with external brake 2-External brake forced air-cooled 3-No braking resistor		downtime	immediate effect
P0235	Brake Resistor Heat Dissipation Coefficient	RW	-	10~100	30	Changes in downtime	With immediate effect
P0236	Built-in braking resistor power	RO	W	1~65535	40	Demonstrate	With immediate effect
P0237	Built-in regeneration Resistance value	RO	Ω	1~1000	50	Demonstrate	With immediate effect
P0238	External regeneration Resistance min.	RO	Ω	1~1000	40	Demonstrate	With immediate effect
P0239	External regeneration Resistor power	RW	W	1~65535	40	Changes in downtime	With immediate effect
P0240	External regeneration Resistance value	RW	Ω	1~1000	50	Changes in downtime	With immediate effect
03 IO parameters							
P0300	DI1 function	RW	-	0-Undefined 1-Servo Enable 2-Emergency stop 3-Prohibition on directive 4-Positional error clearing 5-fault reset 6-zero-speed hold 7-forward pointing 8-inverse pointing 9-Positive Limit 10-Reverse Limit 11-Home switch 12-Zero enable 13-Speed Limit Selection 14-Positive Torque Limit Selection 15-Reverse torque limit selection 16-Preset position enable 19-Torque command direction switching 20-Speed command direction switching 21-Position command direction switching 22-Gain switching selection 23-Running command switching 24-Mode switching 1 25-Mode switching 2 26-Electronic gear switching 27-Preset command selection 1 28-Preset command	9	Changes in downtime	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				selection 2 29-Preset command selection 3 30-Preset command selection 4 31-Use the current DI trigger point as the origin			
P0301	DI1 polarity	RW	-	0-normally open 1-Normally Closed	0	Changes in downtime	With immediate effect
P0302	DI2 Functions	RW	-	Reference to DI1 function	10	Changes in downtime	With immediate effect
P0303	DI2 Polarity	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0304	DI3 Functions	RW	-	Reference to DI1 function	11	Changes in downtime	With immediate effect
P0305	DI3 Polarity	RW	-	0-Normally open 1-Normally Closed	0	Changes in downtime	With immediate effect
P0306	DI4 Functions	RW	-	Reference to DI1 function	1	Changes in downtime	With immediate effect
P0307	DI4 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0308	DI5 function	RW	-	Reference DI1 Function	5	Changes in downtime	With immediate effect
P0309	DI5 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0310	DI6 function	RW	-	Reference DI1 Function	4	Changes in downtime	With immediate effect
P0311	DI6 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0312	DI7 function	RW	-	Reference DI1 Function	6	Changes in downtime	With immediate effect
P0313	DI7 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0314	DI8 function	RW	-	Reference DI1 Function	0	Changes in downtime	With immediate effect
P0315	DI8 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0316	HDI2 function	RW	-	Reference DI1 Function	0	Changes in downtime	With immediate effect
P0317	HDI2 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0318	initial entry into force DI function 1	RW	-	0-undefined 1-Servo Enable 2-emergency stop	0	Changes in downtime	Re-energise

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				3-prohibition on directive			
				4-positional error clearing			
				5-fault reset			
				6-Zero Lock			
				7-forward pointing			
				8-inverse pointing			
				9-Positive Limit			
				10-Reverse Limit			
				11-Home switch			
				12-Zero enable			
				13-Speed Limit Selection			
				14-Forward Torque Limit Selection			
				15-Reverse Torque Limit Selection			
				16-Preset position enable			
P0319	Initialisation DI Function 2	RW	-	0-undefined 19-Torque command direction switching 20-Speed command direction switching 21-Position command direction switching 22-Gain switching selection 23-Speed command source switching 24-Mode switch 1 25-Mode switching 2 26-Electronic Gear Switching 27-Preset command selection 1 28-Preset command selection 2 29-Preset command selection 3 30-Preset command selection 4 31-Take the current DI trigger point as the origin.	0	Changes in downtime	Re-energise
P0320	DO1 Function	RW	-	0-undefined 1-Servo ready (rdy). 2-servo operation(Run) 3-Servo warning output（Warn） 4-Servo Fault Output（Error） 5-motor movement(TGon) 6-Zero Speed Signal(Zero) 7-speed (VCmp) 8-speed (VArr) 9-Torque Arrival (TArr) 10-Proximity of positioning (Near) 11-Location Arrival(Coin) 12-Torque Limit (Clt) 13-speed limit (Vlt)	17	Changes in downtime	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				14-Return to zero complete. (HomeOK) 15-Electrical return to zero complete(eHomeOK) 17-Holding brake control (BK) 18-Dynamic braking (DB) 19-Magnetic pole identification complete. (AngRdy)			
P0321	DO1 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0322	DO2 function	RW	-	Reference DO1 Function	2	Changes in downtime	With immediate effect
P0323	DO2 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0324	DO3 function	RW	-	Reference DO1 function	4	Changes in downtime	With immediate effect
P0325	DO3 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0326	DO4 function	RW	-	Reference DO1 function	11	Changes in downtime	With immediate effect
P0327	DO4 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0328	DO5 function	RW	-	Reference DO1 function	14	Changes in downtime	With immediate effect
P0329	DO5 polarities	RW	-	0-normally open 1-normally closed	0	Changes in downtime	With immediate effect
P0330	DIDO Forced Output	RW	-	0-no operation 1-Force DI Enable 2-Forced DO Enable 3-Force DIDO to enable	0	Arbitrary changes	With immediate effect
P0331	DI Forced Output Value	RW	-	0~511	511	Arbitrary changes	With immediate effect
P0332	DO Forced Channel Selection	RW	-	0~31	0	Arbitrary changes	With immediate effect
P0334	Communication forced DO output enable switch	RW	-	0~7	0	Changes in downtime	With immediate effect
P0344	AI1 input filter time	RW	0.01ms	0~65535	200	Arbitrary changes	With immediate effect
P0345	AI1 input median filter enable	RW	-	0~1	1	Arbitrary changes	With immediate effect
P0348	AI2 Input filter time	RW	0.01ms	0~65535	200	Arbitrary changes	With immediate effect
P0349	AI2 input median filter enable	RW	-	0~1	1	Arbitrary changes	With immediate

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
							effect
P0356	AO1 signal selection	RW	-	0-Motor speed （1V/1000rpm） 1-speed command （1V/1000rpm） 2-Torque command (1V/100 times rated torque) 3-Position deviation (0.05V/1 command unit) 4-Position deviation (0.05V/1 encoder unit) 5-Position command speed （1V/1000 rpm） 6-Positioning complete 7-Speed Feed Forward （1V/1000rpm） 8-AI1 voltage 9-AI2 voltage	0	Arbitrary changes	With immediate effect
P0359	AO2 signal selection	RW	-	Reference AO1 signal selection	0	Arbitrary changes	With immediate effect
P0362	Analogue 10V corresponds to speed	RW	rpm	0~6000	3000	Changes in downtime	With immediate effect
P0363	Analogue 10V corresponds to torque	RW	倍	0~800	100	Changes in downtime	With immediate effect
P0364	AI1 deviation	RW	mV	-5000-5000	0	Arbitrary changes	With immediate effect
P0365	AI2 deviation	RW	mV	-5000-5000	0	Arbitrary changes	With immediate effect
04 Motion Control Parameters							
P0400	control mode	RW	-	0-Speed Mode 1-Position Mode 2-Torque Mode 3-Torque Mode->Speed Mode 4-Speed Mode->Position Mode 5-Torque Mode->Position Mode 6-Torque Mode->Speed Mode->Position Mixing Mode	1	Changes in downtime	With immediate effect
P0401	Motor running direction	RW	-	0-CCW as positive direction 1-With CW as the positive direction	0	Changes in downtime	Re-energise
P0402	Position feedback system	RW	-	0-incremental model 1-Absolute linear mode 2-Absolute rotation mode	0	Changes in downtime	Re-energise
P0410	Class 1 Failure Shutdown Mode	RW	-	0-Free stop, stay free 1-DB downtime, keep it free 2-DB shutdown, maintain	2	Changes in downtime	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				DB status			
P0411	Type II Failure Shutdown Mode	RW	-	0 - Free stop, remain free 1 - Zero-speed stop, remain free 2 - Zero speed stop, keep DB status 3-DB shutdown to remain free 4-DB shutdown to maintain DB status	2	Changes in downtime	With immediate effect
P0412	Disable stop mode selection	RW	-	0 - free stop 1-DB shutdown 2-Zero speed stop	2	Changes in downtime	With immediate effect
P0413	Disable Enable Stop State Selection	RW	-	0 - Remain free 1 - Maintain DB status	1	Changes in downtime	With immediate effect
P0414	Power-down shutdown mode selection	RW	-	0-according to the disconnect enable mode 1-Forced zero speed method	0	Changes in downtime	With immediate effect
P0415	Overtravel stop mode	RW	-	0 - Free stop, maintain free running status 1 - Zero speed stop, position remains locked 2 - Zero-speed shutdown to maintain free-running status	1	Changes in downtime	With immediate effect
P0423	Emergency torque stopping torque value	RW	0.1%	0~3000	1000	Changes in downtime	With immediate effect
05 Function Setting Parameters							
P0500	Manufacturer's password	RW	-	0~65535	0	Arbitrary changes	With immediate effect
P0501	Initialisation of system parameters	RW	-	0-no operation 1-Parameter initialisation	0	Changes in downtime	With immediate effect
P0510	Communication Write Parameter Save	RW	-	0-Not saved 1 - Preservation	1	Arbitrary changes	With immediate effect
P0511	Power down parameter saving	RW	-	0 - not saved 1 - Preservation	0	Arbitrary changes	With immediate effect
P0512	Brake Enable Switch	RW	-	0 - not enabled 1-enable	1	Changes in downtime	With immediate effect
P0513	Delay from release of the holding brake to receive a command	RW	ms	0~500	250	Arbitrary changes	With immediate effect
P0514	Zero speed holding time	RW	ms	1~1000	150	Arbitrary changes	With immediate effect
P0515	Threshold of holding brake closing speed	RW	rpm	0~3000	30	Arbitrary changes	With immediate effect
P0516	Clamping time threshold	RW	ms	1~1000	500	Arbitrary changes	With immediate effect
P0519	Precharge detection enable	RW	-	0 - not enabled 1-enable	1	Changes in downtime	With immediate

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
							effect
P0523	Crossover Output Phase	RW	-	0-A ahead of B 1-A lag B	0	Changes in downtime	Re-energise
P0543	Soft Limit Setting	RW	-	0-Unrestricted 1 - Restrictions 2 - Restrictions after return to zero	0	Changes in downtime	With immediate effect
06 Gain parameters							
P0600	Speed proportional gain 1	RW	0.1Hz	1~20000	250	Arbitrary changes	With immediate effect
P0601	Speed Integral Gain 1	RW	0.01ms	15~51200	3183	Arbitrary changes	With immediate effect
P0602	Position proportional gain 1	RW	0.1Hz	0~20000	400	Arbitrary changes	With immediate effect
P0608	Speed feedforward proportional gain	RW	0.1%	0~1000	0	Arbitrary changes	With immediate effect
P0609	Torque Feed Forward Proportional Gain	RW	0.1%	0~2000	0	Arbitrary changes	With immediate effect
P0610	Load Inertia Ratio	RW	-	0~12000	200	Arbitrary changes	With immediate effect
07 filtering parameter							
P0700	Position command FIR filtering	RW	0.1ms	0~65535	0	Changes in downtime	With immediate effect
P0701	Position command mean value filtering	RW	0.1ms	0~1280	0	Changes in downtime	With immediate effect
P0702	Torque Filter 1	RW	0.01ms	0~3000	79	Arbitrary changes	With immediate effect
P0706	Speed feed-forward filter time	RW	0.01ms	0~6400	50	Arbitrary changes	With immediate effect
P0707	Torque feed-forward filtering time	RW	0.01ms	0~6400	50	Arbitrary changes	With immediate effect
P0710	Vibration suppression frequency1	RW	Hz	50~5000	5000	Arbitrary changes	With immediate effect
P0711	Vibration suppression bandwidth1	RW	-	0~20	2	Arbitrary changes	With immediate effect
P0712	Vibration suppression attenuation1	RW	-	0~99	0	Arbitrary changes	With immediate effect
P0713	Vibration suppression frequency2	RW	Hz	50~5000	5000	Arbitrary changes	With immediate effect
P0714	Vibration suppression bandwidth2	RW	-	0~20	2	Arbitrary changes	With immediate effect
P0715	Vibration suppression attenuation2	RW	-	0~99	0	Arbitrary changes	With immediate effect
P0716	Vibration	RW	Hz	50~5000	5000	Arbitrary	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	suppression frequency3					changes	immediate effect
P0717	Vibration suppression bandwidth3	RW	-	0~20	2	Arbitrary changes	With immediate effect
P0718	Vibration suppression attenuation3	RW	-	0~99	0	Arbitrary changes	With immediate effect
P0719	Vibration suppression frequency4	RW	Hz	50~5000	5000	Arbitrary changes	With immediate effect
P0720	Vibration suppression bandwidth4	RW	-	0~20	2	Arbitrary changes	With immediate effect
P0721	Vibration suppression attenuation4	RW	-	0~99	0	Arbitrary changes	With immediate effect
P0747	Positional trap frequency A	RW	Hz	10~1000	1000	Changes in downtime	With immediate effect
P0774	Low-speed pulse command filtering	RW	25ns	0~255	30	Changes in downtime	Re-energise
P0775	High-speed pulse command filtering	RW	25ns	0~255	3	Changes in downtime	Re-energise
P0776	Speed arrival signal filtering	RW	ms	0~5000	10	Changes in downtime	With immediate effect
08 Protection parameters							
P0800	Input out-of-phase detection	RW	-	0 - Fault Detection 1 - Detecting faults and warnings 2 - No testing	0	Arbitrary changes	With immediate effect
P0801	Encoder multi-turn overflow fault detection	RW	-	0 - not tested 1 - Detection	1	Changes in downtime	With immediate effect
P0803	Overspeed judgement threshold	RW	rpm	0~10000	0	Arbitrary changes	With immediate effect
P0808	Position deviation removal method	RW	-	0 - Cleared when servo is not RUN 1-Servo OFF or DI signal effectively cleared	0	Changes in downtime	With immediate effect
P0809	Flying car protection detection	RW	-	0 - not tested 1 - Detection	1	Arbitrary changes	With immediate effect
P0810	Flying car current judgement threshold	RW	0.1%	1000~4000	2000	Arbitrary changes	With immediate effect
P0811	Speed judgement threshold for flying cars	RW	rpm	1~1000	10	Arbitrary changes	With immediate effect
P0812	Flying car speed feedback filter time	RW	0.1ms	1~1000	20	Arbitrary changes	Re-energise
P0813	Flying car protection check-out time	RW	ms	10~1000	30	Arbitrary changes	With immediate effect
P0814	Motor overload protection gain	RW	%	50~300	100	Changes in downtime	With immediate effect
P0816	Motor overload detection	RW	-	 1 - Detection	1	Changes in downtime	With immediate

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
							effect
P0817	Blocking detection	RW	-	0 - not tested 1 - Detection	1	Arbitrary changes	With immediate effect
P0818	Blocking protection time	RW	ms	10~65535	200	Arbitrary changes	With immediate effect
P0821	Drive over-temperature protection point	RW	°C	0~100	0	Changes in downtime	Re-energise
P0831	Motor over-temperature fault detection	RW	-	0 - not tested 1 - Detection	0	Arbitrary changes	With immediate effect
P0832	Motor temperature sensor resistance	RO	Ω	0-65535	0	Demonstrate	With immediate effect
P0833	Motor Thermistor Over Temperature Failure Alarm Thresholds	RW	Ω	0-65535	1000	Arbitrary changes	With immediate effect
P0834	Motor thermistor over-temperature fault clearing thresholds	RW	Ω	0-65535	250	Arbitrary changes	With immediate effect
09 Demonstrate parametric							
P0900	Position command speed	RO	rpm	-32767~32767	0	Demonstrate	With immediate effect
P0901	speed command	RO	rpm	-32767~32767	0	Demonstrate	With immediate effect
P0902	Torque command	RO	0.1%	-32767~32767	0	Demonstrate	With immediate effect
P0903	Position feedback speed	RO	rpm	-32767~32767	0	Demonstrate	With immediate effect
P0904	Actual RPM	RO	rpm	-32767~32767	0	Demonstrate	With immediate effect
P0906	Actual speed (accuracy 0.1rpm)	RO	rpm	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0910	busbar voltage	RO	0.1V	0~65535	0	Demonstrate	With immediate effect
P0911	Control voltage	RO	0.1V	0~65535	0	Demonstrate	With immediate effect
P0912	Driver output phase current RMS (U phase)	RO	0.01A	0~65535	0	Demonstrate	With immediate effect
P0913	Driver Output Line Voltage RMS	RO	0.1V	0~65535	0	Demonstrate	With immediate effect
P0914	Average load factor	RO	0.1%	0~8000	0	Demonstrate	With immediate effect
P0915	Drive Temperature	RO	°C	0~65535	0	Demonstrate	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
P0917	Electrical angle	RO	0.1°	0~65535	0	Demonstrate	With immediate effect
P0918	DI input level monitoring	RO	-	0~65535	0	Demonstrate	With immediate effect
P0920	DO output level monitoring	RO	-	0~65535	0	Demonstrate	With immediate effect
P0922	AI1 Voltage Sampling Value	RO	V	-32767~32767	0	Demonstrate	With immediate effect
P0923	AI2 Voltage Sampling Value	RO	V	-32767~32767	0	Demonstrate	With immediate effect
P0925	Total running time	RO	0.1s	0~4294967295	0	Demonstrate	With immediate effect
P0927	Current power-up runtime	RO	-	0~4294967295	0	Demonstrate	With immediate effect
P0930	Real-time Command Counter	RO	Instruction Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0932	Run Instruction Counter	RO	Instruction Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0934	Position Feedback Counter	RO	Instruction Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0936	Position Feedback Counter	RO	Encoder Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0938	positional drift	RO	Instruction Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0940	positional drift	RO	Encoder Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0942	Encoder Multiturn	RO	circle	0~65535	0	Demonstrate	With immediate effect
P0943	Encoder single-turn position	RO	p	0~2147483647	0	Demonstrate	With immediate effect
P0945	Encoder absolute position (low 32 bits)	RO	Encoder Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0947	Encoder absolute position (high 32 bits)	RO	Encoder Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0949	Mechanical absolute position (low 32 bits)	RO	Encoder Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0951	Mechanical absolute position (high 32 bits)	RO	Encoder Unit	-2147483648~2147483647	0	Demonstrate	With immediate effect
P0953	Rotating load one-turn position (low 32 bits)	RO	Encoder Unit	0~4294967295	0	Demonstrate	With immediate effect
P0955	Rotating load one-	RO	Encode	0~4294967295	0	Demonstrat	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	turn position (high 32 bits)		r Unit			e	immediate effect
P0957	Rotating load one-turn position (high 32 bits)	RO	Instruction Unit	0~4294967295	0	Demonstrate	With immediate effect
0A Communication parameters							
P0A00	Slave station number	RW	-	1~247	1	Arbitrary changes	With immediate effect
P0A02	ModBus communication baud rate	RW	-	0-2400bps 1-4800bps 2-9600bps 3-19200bps 4-38400bps 5-57600bps 6-115200bps	6	Arbitrary changes	With immediate effect
P0A03	ModBus communication protocol	RW	-	0-no parity, 2 end bits (8-N-2) 1-even parity, 1 end bit (8-O-1) 2-odd parity, 1 end bit (8-E-1) 3-no parity, 1 end bit (8-N-1)	0	Arbitrary changes	With immediate effect
13 Position control parameters							
P1300	Location command source	RW	-	0-Pulse command 1-Preset position command	0	Changes in downtime	With immediate effect
P1301	Number of command pulses per revolution of the motor	RW	1P/REV	0~1048576	0	Changes in downtime	Re-energise
P1303	Electronic tooth ratio molecules	RW	-	1~1073741824	4	Arbitrary changes	With immediate effect
P1305	Electronic tooth count score master	RW	-	1~1073741824	1	Arbitrary changes	With immediate effect
P1307	Position arrival signal output condition	RW	-	0 - Output when absolute value of position deviation is less than P13.08 1 - Output when the absolute value of position deviation is less than P13.08 and the filtered position command is 0 2 - Output when the absolute value of position deviation is less than P13.08 and the position command before filtering is 0 3 - Position deviation absolute value is less than P13.08, at least keep P13.10 setting time valid, and output when the position command before filtering is 0	0	Arbitrary changes	With immediate effect
P1308	Position Arrival	RW	Encoder	1~65535	7	Arbitrary	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	Signal Window		Unit			changes	immediate effect
P1309	Positioning proximity signal window	RW	Encoder Unit	1~65535	65535	Arbitrary changes	With immediate effect
P1310	Position arrival signal hold time	RW	ms	0~30000	0	Arbitrary changes	With immediate effect
P1312	Speed feedforward control options	RW	-	0 - no speed feedforward 1-Internal velocity feedforward 2 - Use AI1 as a speed feedforward input 3 - Use AI2 as a speed feed-forward input	1	Changes in downtime	With immediate effect
P1313	Pulse command high and low speed selection	RW	-	0 - low speed 1--High speed	0	Changes in downtime	With immediate effect
P1314	pulse command form	RW	-	0-direction + pulse, positive logic 1-direction + pulse, negative logic 2-AB quadrature pulse, 4x frequency 3-CW+CCW	0	Changes in downtime	Re-energise
P1315	Servo pulse output method selection	RW	-	0-Encoder divided output 1-Pulse command synchronised output 2-Split or Synchronised Output Disable	0	Changes in downtime	Re-energise
P1316	Number of encoder divided pulses	RW	P/REV	35~1073741824	2500	Changes in downtime	Re-energise
P1318	Position pulse edge selection	RW	-	0 - valid on falling edge 1 - Rising edge active	0	Arbitrary changes	Re-energise
P1323	Multi-turn absolute position bias L32	RW	Encoder Unit	-2147483648~2147483647	0	Changes in downtime	With immediate effect
P1325	Multi-turn absolute position offset H32	RW	Encoder Unit	-2147483648~2147483647	0	Changes in downtime	With immediate effect
P1327	Mechanical Gear Ratio Molecule	RW	-	1~65535	1	Changes in downtime	With immediate effect
P1328	Mechanical gear ratio Denominator	RW	-	1~65535	1	Changes in downtime	With immediate effect
P1329	Mechanical absolute position upper limit L32	RW	Encoder Unit	0~4294967295	0	Changes in downtime	With immediate effect
P1331	Mechanical absolute position upper limit H32	RW	Encoder Unit	0~4294967295	0	Changes in downtime	With immediate effect
P1344	Home return enable	RW	-	0-Close Home Reset function 1 - Enable origin reversion via DI function 2 - Immediate origin reversion	0	Arbitrary changes	With immediate effect
P1345	(math.) origin reversion model	RW	-	-2~35	1	Changes in downtime	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
P1346	Origin high speed search speed	RW	rpm	0~3000	100	Arbitrary changes	With immediate effect
P1347	Home low search speed	RW	rpm	0~1000	10	Arbitrary changes	With immediate effect
P1348	Home return plus or minus speed	RW	rpm/s	0~65535	1000	Arbitrary changes	With immediate effect
P1349	Home search time	RW	s	0~655.35	500.00	Arbitrary changes	With immediate effect
P1351	Mechanical offset from the origin	RW	Instruction Unit	-1073741824~1073741824	0	Arbitrary changes	With immediate effect
P1354	Crash Hard Limit Speed Threshold	RW	rpm	0~1000	2	Arbitrary changes	With immediate effect
P1355	Crash Hard Limit Duration	RW	ms	0~65535	20	Arbitrary changes	With immediate effect
P1356	Mechanical limit torque	RW	-	0~3000	1000	Arbitrary changes	With immediate effect
P1359	Electronic Gear Switching Enable	RW	-	0-position command equals 0 toggle 1 - Real-time switching	0	Changes in downtime	With immediate effect
P1360	Positioning completion filter time	RW	ms	0~30000	0	Arbitrary changes	With immediate effect
P1363	Positive position software limit	RW	Instruction Unit	-2147483648~2147483647	2147483647	Changes in downtime	With immediate effect
P1365	Reverse Position Software Limit	RW	Instruction Unit	-2147483648~2147483647	-2147483648	Changes in downtime	With immediate effect
14 Speed control parameters							
P1400	Speed command source selection	RW	-	0 - Source A 1 - Source B 2 - Source A+B 3-Source A\B DI Switching 4-Communication given	0	Changes in downtime	With immediate effect
P1401	Speed command source A	RW	-	0 - keyboard given 1-Preset speed given 2-AI1 given 3-AI2 given	0	Changes in downtime	With immediate effect
P1402	Speed command source B	RW	-	0 - keyboard given 1-Preset speed given 2-AI1 given 3-AI2 given	1	Changes in downtime	With immediate effect
P1403	Maximum speed limit value	RW	rpm	0~60000	10000	Arbitrary changes	With immediate effect
P1404	Positive Speed Limit	RW	rpm	0~60000	10000	Arbitrary changes	With immediate effect
P1405	Speed Reverse Limit	RW	rpm	0~60000	10000	Arbitrary changes	With immediate effect
P1406	Speed DI Tap	RW	rpm	0~60000	100	Arbitrary	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	Setting					changes	immediate effect
P1407	Speed command keypad setpoint	RW	rpm	-9999~30000	200	Arbitrary changes	With immediate effect
P1408	Speed command acceleration ramp time	RW	ms	0~65535	0	Arbitrary changes	With immediate effect
P1409	Speed command deceleration ramp time	RW	ms	0~65535	0	Arbitrary changes	With immediate effect
P1410	Zero Lock Speed Threshold	RW	rpm	0~6000	10	Arbitrary changes	With immediate effect
P1411	Torque Feed Forward Selection	RW	-	0 - no torque feedforward 1-Internal torque feedforward	1	Arbitrary changes	With immediate effect
P1412	Motor Motion State Threshold	RW	rpm	0~1000	20	Arbitrary changes	With immediate effect
P1413	Speed-consistent signal width	RW	rpm	0~100	10	Arbitrary changes	With immediate effect
P1414	Velocity reaches signal threshold	RW	rpm	10~6000	1000	Arbitrary changes	With immediate effect
P1415	Zero speed output signal threshold	RW	rpm	1~6000	10	Arbitrary changes	With immediate effect
15 Torque control parameters							
P1500	Torque command source selection	RW	-	0 - Source A 1-Source B 2-Source A+B 3-Source A\B DI Switching 4-Communication given	0	Changes in downtime	With immediate effect
P1501	Torque command source A	RW	-	0 - keyboard given 1-AI1 given 2-AI2 given	0	Changes in downtime	With immediate effect
P1502	Torque command source B	RW	-	0 - keyboard given 1-AI1 given 2-AI2 given	0	Changes in downtime	With immediate effect
P1503	Torque limiting source selection	RW	-	0 - Internal torque limit value 1 1 - External AI restrictions 2-DI switching of internal torque limit value 1 and limit value 2 3-DI switching between internal torque limit value 1 and external AI limit 4 - Internal torque limit value 1 and external AI limit min.	0	Arbitrary changes	With immediate effect
P1504	Torque Limit AI Selection	RW	-	1-AI1 limit 2-AI2 limit	0	Arbitrary changes	With immediate effect
P1505	Positive internal torque limit value1	RW	%	0~3000	3000	Arbitrary changes	With immediate effect
P1506	Reverse internal	RW	%	0~3000	3000	Arbitrary	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	torque limit value 1					changes	immediate effect
P1507	Positive internal torque limit value2	RW	%	0~3000	3000	Arbitrary changes	With immediate effect
P1508	Reverse internal torque limit value 2	RW	%	0~3000	3000	Arbitrary changes	With immediate effect
P1509	Speed Limit Source Selection in Torque Mode	RW	-	0 - Internal speed limit 1-DI selects the speed limit 2 - External AI speed limit	1	Arbitrary changes	With immediate effect
P1510	Speed Limit AI Selection	RW	-	1-AI1 2-AI2	1	Arbitrary changes	With immediate effect
P1511	Internal speed positive limit value for torque control	RW	rpm	0~6000	3000	Arbitrary changes	With immediate effect
P1512	Negative internal speed limit value for torque control	RW	rpm	0~6000	3000	Arbitrary changes	With immediate effect
P1513	Torque command keypad setting	RW	%	-3000~3000	0	Arbitrary changes	With immediate effect
P1516	Torque reaches reference value	RW	-	0~3000	0	Arbitrary changes	With immediate effect
P1517	Torque Arrival Hysteresis Loop RMS	RW	-	5394~3000	200	Arbitrary changes	With immediate effect
P1518	Torque Reach Hysteresis Invalid Value	RW	-	0~5393	100	Arbitrary changes	With immediate effect
P1523	Speed limited Regulator selection	RW	-	0~1	0	Arbitrary changes	With immediate effect
P1524	Speed Limit Window	RW	-	5~300	10	Arbitrary changes	With immediate effect
16 Preset speed task parameters							
P1600	Preset speed command operation mode	RW	-	0 - single run 1 - Cyclic operation 2-DI switching operation	1	Changes in downtime	With immediate effect
P1601	Speed command end segment selection	RW	-	1~16	16	Changes in downtime	With immediate effect
P1602	Runtime unit selection	RW	-	0-s 1-min	0	Changes in downtime	With immediate effect
P1603	Acceleration time 1	RW	ms	0~65535	10	Changes in downtime	With immediate effect
P1604	Deceleration time 1	RW	ms	0~65535	10	Changes in downtime	With immediate effect
P1605	Acceleration time 2	RW	ms	0~65535	50	Changes in downtime	With immediate effect
P1606	Deceleration time 2	RW	ms	0~65535	50	Changes in downtime	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
P1607	Acceleration time 3	RW	ms	0~65535	100	Changes in downtime	With immediate effect
P1608	Deceleration time 3	RW	ms	0~65535	100	Changes in downtime	With immediate effect
P1609	Acceleration time 4	RW	ms	0~65535	150	Changes in downtime	With immediate effect
P1610	Deceleration time 4	RW	ms	0~65535	150	Changes in downtime	With immediate effect
P1620	Paragraph 1 instructions	RW	rpm	-6000~6000	0	Changes in downtime	With immediate effect
P1621	Running time of segment 1	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1622	1st lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1623	Paragraph 2 instructions	RW	rpm	-6000~6000	100	Changes in downtime	With immediate effect
P1624	Running time of paragraph 2	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1625	2nd lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1626	Paragraph 3 instructions	RW	rpm	-6000~6000	300	Changes in downtime	With immediate effect
P1627	Running time of paragraph 3	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1628	3rd lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1629	Paragraph 4	RW	rpm	-6000~6000	500	Changes in	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	instructions					downtime	immediate effect
P1630	Running time of paragraph 4	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1631	4th lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1632	Paragraph 5 instructions	RW	rpm	-6000~6000	700	Changes in downtime	With immediate effect
P1633	Running time of paragraph 5	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1634	Paragraph 5 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1635	Paragraph 6 instructions	RW	rpm	-6000~6000	900	Changes in downtime	With immediate effect
P1636	Running time of paragraph 6	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1637	Paragraph 6 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1638	Paragraph 7 instructions	RW	rpm	-6000~6000	600	Changes in downtime	With immediate effect
P1639	Running time of paragraph 7	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1640	Paragraph 7 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3	0	Changes in downtime	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				4 - Acceleration and deceleration time 4			
P1641	Paragraph 8 instructions	RW	rpm	-6000~6000	300	Changes in downtime	With immediate effect
P1642	Running time of paragraph 8	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1643	Paragraph 8 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1644	Paragraph 9 instructions	RW	rpm	-6000~6000	100	Changes in downtime	With immediate effect
P1645	Running time of paragraph 9	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1646	Paragraph 9 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1647	Paragraph 10 instructions	RW	rpm	-6000~6000	-100	Changes in downtime	With immediate effect
P1648	Running time of paragraph 10	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1649	10th lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1650	Paragraph 11 instructions	RW	rpm	-6000~6000	-300	Changes in downtime	With immediate effect
P1651	Running time of paragraph 11	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1652	Paragraph 11 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and	0	Changes in downtime	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4			
P1653	Paragraph 12 instructions	RW	rpm	-6000~6000	-500	Changes in downtime	With immediate effect
P1654	Running time of paragraph 12	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1655	Paragraph 12 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1656	Paragraph 13 of the directive	RW	rpm	-6000~6000	-700	Changes in downtime	With immediate effect
P1657	Running time of paragraph 13	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1658	Paragraph 13 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1659	Paragraph 14 instructions	RW	rpm	-6000~6000	-900	Changes in downtime	With immediate effect
P1660	Running time of paragraph 14	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1661	Paragraph 14 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
P1662	Paragraph 15 instructions	RW	rpm	-6000~6000	-600	Changes in downtime	With immediate effect
P1663	Running time of paragraph 15	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1664	Paragraph 15 lift time	RW	-	0-zero acceleration and deceleration time	0	Changes in downtime	With immediate

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4			effect
P1665	Paragraph 16 instructions	RW	rpm	-6000~6000	-300	Changes in downtime	With immediate effect
P1666	Running time of paragraph 16	RW	P1602	0~65535	50	Changes in downtime	With immediate effect
P1667	Paragraph 16 lift time	RW	-	0-zero acceleration and deceleration time 1 - Acceleration and deceleration time 1 2 - Acceleration and deceleration time 2 3 - Acceleration and deceleration time 3 4 - Acceleration and deceleration time 4	0	Changes in downtime	With immediate effect
17 Preset position task parameters							
P1700	Preset position task run mode	RW	-	0 - single run 1 - Cyclic operation 2-DI switching operation 3 - Sequential operation	1	Changes in downtime	With immediate effect
P1701	Displacement Execution Segment Selection	RW	-	1~16	1	Changes in downtime	With immediate effect
P1702	Residual treatment method	RW	-	0 - Continue to run unfinished segments 1 - Restart operation from paragraph 1	0	Changes in downtime	With immediate effect
P1703	waiting time unit	RW	-	0-ms 1-s	0	Changes in downtime	With immediate effect
P1704	Bit Shift Instruction Type Selection	RW	-	0-Relative Displacement Command 1-Absolute displacement instruction	0	Changes in downtime	With immediate effect
P1705	Cycle mode start segment selection	RW	-	0~16	0	Changes in downtime	With immediate effect
P1712	Paragraph 1 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1714	Movement speed in paragraph 1	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1715	1st movement acceleration and deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1716	Waiting time after completion of the first displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1717	Paragraph 2 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
P1719	Movement speed in paragraph 2	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1720	2nd movement acceleration and deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1721	Waiting time after completion of the second displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1722	Paragraph 3 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1724	Paragraph 3 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1725	3rd movement acceleration and deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1726	Waiting time after completion of segment 3 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1727	Paragraph 4 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1729	Paragraph 4 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1730	4th movement acceleration and deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1731	Waiting time after completion of segment 4 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1732	Paragraph 5 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1734	Paragraph 5 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1735	Paragraph 5 movement acceleration and deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1736	Waiting time after completion of paragraph 5 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1737	Paragraph 6 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1739	Paragraph 6 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1740	Paragraph 6 movement acceleration and deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1741	Waiting time after	RW	P1703	0~10000	10	Arbitrary	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	completion of paragraph 6 displacement					changes	immediate effect
P1742	Paragraph 7 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1744	Paragraph 7 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1745	Paragraph 7 movement acceleration and deceleration times	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1746	Waiting time after completion of paragraph 7 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1747	Paragraph 8 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1749	Paragraph 8 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1750	Paragraph 8 movement plus deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1751	Waiting time after completion of paragraph 8 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1752	Paragraph 9 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1754	Paragraph 9 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1755	Paragraph 9 movement plus deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1756	Waiting time after completion of paragraph 9 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1757	Paragraph 10 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1759	Paragraph 10 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1760	10th movement acceleration and deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1761	Waiting time after completion of paragraph 10 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1762	Paragraph 11 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1764	Paragraph 11 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
							effect
P1765	Paragraph 11 movement acceleration and deceleration times	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1766	Waiting time after completion of paragraph 11 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1767	Paragraph 12 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1769	Paragraph 12 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1770	Paragraph 12 movement acceleration and deceleration times	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1771	Waiting time after completion of paragraph 12 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1772	Paragraph 13 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1774	Paragraph 13 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1775	Paragraph 13 movement acceleration and deceleration times	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1776	Waiting time after completion of paragraph 13 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1777	Paragraph 14 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1779	Paragraph 14 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1780	Paragraph 14 movement acceleration and deceleration times	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1781	Waiting time after completion of paragraph 14 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1782	Paragraph 15 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1784	Paragraph 15 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1785	Paragraph 15 movement plus deceleration time	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1786	Waiting time after	RW	P1703	0~10000	10	Arbitrary	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	completion of paragraph 15 displacement					changes	immediate effect
P1787	Paragraph 16 mobile displacement	RW	Instruction Unit	-1073741824~1073741824	10000	Arbitrary changes	With immediate effect
P1789	Paragraph 16 Movement speed	RW	rpm	1~6000	200	Arbitrary changes	With immediate effect
P1790	Paragraph 16 movement acceleration and deceleration times	RW	ms	0~65535	10	Arbitrary changes	With immediate effect
P1791	Waiting time after completion of paragraph 16 displacement	RW	P1703	0~10000	10	Arbitrary changes	With immediate effect
P1792	Current paragraph Demonstrate	RW	-	0~16	0	Changes in downtime	With immediate effect
1A Advanced adjustments							
P1A00	Real-time self-adjusting settings	RW	-	0-Close 1 - Standard rigid table model 2-Rapid Positioning Mode 5-Adaptive interpolation mode 7-Adaptive positioning mode	7	Arbitrary changes	With immediate effect
P1A01	Response Level Setting	RW	级	0~40	16	Arbitrary changes	With immediate effect
P1A02	Vibration suppression mode selection	RW	-	0-Close 1 - Vibration suppression 3 effective 2 - Vibration suppression 3 and 4 effective 3-P1A.14Demonstrate resonant frequencies 4 - Restoration of vibration suppression 3 and 4	0	Arbitrary changes	With immediate effect
P1A06	Inertia Recognition Maximum Speed	RW	rpm	100~1000	500	Changes in downtime	With immediate effect
P1A07	Inertia Recognition Acceleration Time	RW	ms	20~800	125	Changes in downtime	With immediate effect
P1A08	Waiting time for inertia recognition	RW	ms	50~10000	800	Changes in downtime	With immediate effect
P1A09	Inertia recognises the number of revolutions	RW	0.01 圈	0~65535	100	Arbitrary changes	With immediate effect
P1A18	Disturbance compensation gain	RW	0.1%	-1000~1000	0	Arbitrary changes	With immediate effect
P1A19	Disturbance filter time	RW	ms	0~2500	50	Arbitrary changes	With immediate effect
P1A20	Offset	RW	0.1%	-1000~1000	0	Arbitrary	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	Compensation					changes	immediate effect
P1A21	Positive friction compensation	RW	0.1%	-1000~1000	0	Arbitrary changes	With immediate effect
P1A22	Reverse friction compensation	RW	0.1%	-1000~1000	0	Arbitrary changes	With immediate effect
P1A23	Friction compensation speed	RW	0.1rpm	1~300	20	Arbitrary changes	With immediate effect
P1A24	Friction compensation speed selection	RW	-	0~18	0	Arbitrary changes	With immediate effect
P1A25	Low frequency vibration detection enable	RW	-	0-Close 1-Open	0	Arbitrary changes	With immediate effect
20 Auxiliary parameters							
P2002	emergency stop	RW	-	0 - no operation 1 - Emergency shutdown	0	Arbitrary changes	With immediate effect
P2003	fault reset	RW	-	0- no operation 1-Fault reset	0	Changes in downtime	With immediate effect
P2004	software reset	RW	-	0-no operation 1-Software reset	0	Changes in downtime	With immediate effect
P2005	Encoder reset	RW	-	0-no operation 1-Reset fault 2-Reset faults and turns	0	Changes in downtime	With immediate effect
P2006	Encoder parameter reading and writing	RW	-	0 - no operation 1-Write operation 2-Read operations	0	Changes in downtime	With immediate effect
P2038	Call Enable	RW	-	0~1	0	Arbitrary changes	With immediate effect
P2040	Bus reads servo status	RO	-	0~65535	0	Demonstrate	With immediate effect
P2041	The bus reads the DO low 16-bit function.	RO	-	0~65535	0	Demonstrate	With immediate effect
P2042	The bus reads the DO high 16-bit function.	RO	-	0~65535	0	Demonstrate	With immediate effect
P2043	Bus reads pulse command samples	RO	p	0~65535	0	Demonstrate	With immediate effect
P2050	Bus given VDI level	RW	-	0~65535	0	Arbitrary changes	With immediate effect
P2051	Bus given DO output	RW	-	0~31	0	Arbitrary changes	With immediate effect
21 Troubleshooting parameters							
P2100	Exception parameter group number	RO	-	0~65535	0	Demonstrate	With immediate effect
P2101	Abnormal parameter intra-group bias	RO	-	0~65535	0	Demonstrate	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
P2102	FPGA-side system status information	RO	-	0~65535	0	Demonstrate	With immediate effect
P2103	FPGA-side system fault information	RO	-	0~65535	0	Demonstrate	With immediate effect
P2104	FPGA Side Timeout Fault Message	RO	-	0~65535	0	Demonstrate	With immediate effect
P2105	FPGA Side Encoder Fault Message	RO	-	0~65535	0	Demonstrate	With immediate effect
P2106	Encoder status information	RW	-	0~65535	0	Arbitrary changes	With immediate effect
P2108	current fault code	RO	-	0~65535	0	Demonstrate	With immediate effect
P2130	Fault Record Enquiry	RW	-	0 - current fault 1 - Last failure 2 - Last 2 failures 3 - Last 3 failures 4 - Last 4 failures 5 - Last 5 failures 6 - Last 6 failures 7 - Last 7 failures 8 - Last 8 failures 9 - Last 9 failures	0	Arbitrary changes	With immediate effect
P2131	Fault code for the selected fault	RO	-	0~65535	0	Demonstrate	With immediate effect
P2132	Internal fault code at selected fault	RO	-	0~65535	0	Demonstrate	With immediate effect
P2133	Selected Fault Timestamp	RO	0.1s	0~4294967295	0	Demonstrate	With immediate effect
P2135	Rotation speed at selected fault	RO	rpm	-32767~32767	0	Demonstrate	With immediate effect
P2136	U-phase current at selected fault	RO	0.01A	-32767~32767	0	Demonstrate	With immediate effect
P2137	V-phase current at selected fault	RO	0.01A	-32767~32767	0	Demonstrate	With immediate effect
P2138	Bus voltage at selected fault	RO	0.1V	0~65535	0	Demonstrate	With immediate effect
P2139	DI input status at selected fault	RO	-	0~65535	0	Demonstrate	With immediate effect
P2140	DO output state at selected fault	RO	-	0~65535	0	Demonstrate	With immediate effect
P2141	System state information on the FPGA side at the time of the selected failure	RO	-	0~65535	0	Demonstrate	With immediate effect
P2142	FPGA-side system	RO	-	0~65535	0	Demonstrat	With

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
	failure information at the time of the selected failure					e	immediate effect
P2143	FPGA-side timeout fault information for selected faults	RO	-	0~65535	0	Demonstrate	With immediate effect
P2144	FPGA-side encoder fault information at selected faults	RO	-	0~65535	0	Demonstrate	With immediate effect
P2145	Encoder status information at selected fault	RO	-	0~65535	0	Demonstrate	With immediate effect
22 Full closed-loop parameters							
P2200	Encoder Selection	RW	-	0 - Internal encoder feedback 1-External encoder feedback 2-DI switches inner and outer encoder feedback when switching electronic gear ratios	0	Changes in downtime	With immediate effect
P2201	External encoder enable selection	RW	-	0 - Disable external encoder 1-Enable external ABZ encoder	0	Changes in downtime	Re-energise
P2202	External encoder direction selection	RW	-	0 - use default direction 1-Use reverse direction	0	Changes in downtime	With immediate effect
P2203	Number of external encoder pulses for one motor revolution	RW	p	1~1073741824	10000	Changes in downtime	With immediate effect
P2205	The second group of electronic teeth is larger than the molecule	RW	-	1~1073741824	4	Arbitrary changes	With immediate effect
P2207	Second set of electronic teeth counting and scoring	RW	-	1~1073741824	1	Arbitrary changes	With immediate effect
P2210	Full closed-loop deviation filter time	RW	0.1ms	0~65535	0	Changes in downtime	With immediate effect
P2211	Mixed control deviation threshold	RW	-	0~1073741824	1000	Arbitrary changes	With immediate effect
P2213	Mixing Control Deviation Clear Setting	RW	-	0~100	1	Arbitrary changes	With immediate effect
P2214	Fully closed loop external position error	RO	p	-1073741824~1073741824	0	Demonstrate	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
P2216	Internal encoder feedback value	RO	p	-1073741824~1073741824	0	Demonstrate	With immediate effect
P2218	External encoder feedback value	RO	p	-1073741824~1073741824	0	Demonstrate	With immediate effect
23 Virtual IO parameters							
P2300	VDI enable	RW	-	0 - not enabled 1-enable	0	Changes in downtime	With immediate effect
P2301	VDI power-up initial state	RW	-	0~65535	0	Arbitrary changes	Re-energise
P2302	VDO Enable	RW	-	0 - not enabled 1-enable	0	Changes in downtime	With immediate effect
P2303	Default value when VDO is undefined	RW	-	0x0-VDO1 default value 0x1-VDO2 default value 0x2-VDO3 default value 0x3-VDO4 default value 0x4-VDO5 default value 0x5-VDO6 default value 0x6-VDO7 default value 0x7-VDO8 default value 0x8-VDO9 default value 0x9-VDO10 default value 0xa-VDO11 default value 0xb-VDO12 default value 0xc-VDO13 default value 0xd-VDO14 default value 0xe-VDO15 default value 0xf-VDO16 default value	0	Changes in downtime	With immediate effect
P2306	VDI1 function	RW	-	0-undefined 1-Servo Enable 2-Emergency shutdown 3-Directive Prohibition 4-Position deviation clearing 5-Fault reset 6 - Zero Speed Hold 7 - Positive Tap 8-Reverse Tap 9-Positive Limit 10-Reverse Limit 11-Home switch 12 - Zero enable 13-Speed Limit Selection 14-Forward Torque Limit Selection 15 - Reverse Torque Limit Selection 16-Preset position enable 19-Torque command direction switching 20-Speed command direction switching 21-Position command direction switching 22-Gain switching selection	0	Arbitrary changes	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				23-Run command switching 24-Mode switching 1 25 - Mode switching 2 26-Electronic Gear Switching 27-Preset command selection 1 28-Preset command selection 2 29-Preset command selection 3 30-Preset command selection 4 31 - Take the current DI trigger point as the origin			
P2307	VDI1 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2308	VDI2 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2309	VDI2 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2310	VDI3 function	RW	-	Reference VDI1 function 1-Servo Enable	0	Arbitrary changes	With immediate effect
P2311	VDI3 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2312	VDI4 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2313	VDI4 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2314	VDI5 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2315	VDI5 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2316	VDI6 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2317	VDI6 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2318	VDI7 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2319	VDI7 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2320	VDI8 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2321	VDI8 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid	0	Arbitrary changes	With immediate

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				(0->1)			effect
P2322	VDI9 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2323	VDI9 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2324	VDI10 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2325	VDI10 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2326	VDI11 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2327	VDI11 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2328	VDI12 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2329	VDI12 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2330	VDI13 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2331	VDI13 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2332	VDI14 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2333	VDI14 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2334	VDI15 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2335	VDI15 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2336	VDI16 function	RW	-	Reference VDI1 function	0	Arbitrary changes	With immediate effect
P2337	VDI16 polarities	RW	-	0 - Write 1 valid 1-Write rising edge valid (0->1)	0	Arbitrary changes	With immediate effect
P2342	VDO 输出电平	RO	-	0~65535	0	Demonstrate	With immediate effect
P2343	VDO1 function	RW	-	0-undefined 1-Servo ready (rdy) 2-servo operation(Run) 3-Servo warning output （Warn） 4-Servo Fault Output （Error）	0	Arbitrary changes	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
				5-motor movement(TGon) 6-Zero Speed Signal(Zero) 7 - Consistent speed (VCmp) 8 - Speed Arrival (VArr) 9-Torque arrival (TArr) 10-Positioning proximity (Near) 11-Position Arrival (Coin) 12-Torque limitation(Clt) 13-Speed Limit (Vlt) 14 - Return to zero complete(HomeOK) 15 - Electrical return to zero complete(eHomeOK) 17-Holding brake control(BK) 18-Dynamic Braking(DB) 19 - Magnetic pole identification complete(AngRdy)			
P2344	VDO1 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2345	VDO2 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2346	VDO2 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2347	VDO3 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2348	VDO3 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2349	VDO4 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2350	VDO4 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2351	VDO5 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2352	VDO5 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2353	VDO6 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2354	VDO6 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2355	VDO7 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2356	VDO7 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect

Parametric	Name	Causality	Unit (Of Measure)	Setting Range	Factory Value	Setting Method	Mode Of Entry Into Force
P2357	VDO8 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2358	VDO8 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2359	VDO9 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2360	VDO9 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2361	VDO10 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2362	VDO10 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2363	VDO11 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2364	VDO11 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2365	VDO12 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2366	VDO12 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2367	VDO13 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2368	VDO13 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2369	VDO14 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2370	VDO14 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2371	VDO15 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2372	VDO15 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect
P2373	VDO16 function	RW	-	Reference VDO1 function	0	Arbitrary changes	With immediate effect
P2374	VDO16 polarities	RW	-	0 - Output 1 when valid 1 - Output 0 when valid	0	Arbitrary changes	With immediate effect

8.2 DIDO Functional Definitions

Function Number	Function Name	descriptions
Input Signal Function Description		
1	Servo Enable	Valid - servo motor power-up enable; Invalid - servo motor enable disabled
2	emergency stop	Effective - Position locked after zero speed stop; Invalid-No effect on the current run state.
3	prohibition on directive	Valid-disable position command input; Invalid - Allow position command input
4	Position deviation clearing (along active function)	Valid - position deviation is cleared; Invalid - position deviation is not cleared.
5	Fault reset (edge-on function)	Invalid - disable; Valid - enable.
6	zero-speed hold	Valid - enables the zero lock function; Invalid - disables the zero lock function.
7	forward pointing	Valid - input according to the given command; Invalid - run command to stop input.
8	inverse pointing	Valid - reverses the input according to the given command; Invalid - runs the command to stop the input.
9	Positive Limit	Valid - Forward drive is prohibited; Invalid - Forward drive is allowed.
10	Reverse Limit	Valid - reverse drive is prohibited; Invalid - reverse drive is allowed.
11	Home switch	Invalid - not triggered; Valid - triggered.
12	Zero enable	Invalid-Prohibit; Valid-Enable
13	Speed Limit Selection	Valid - the absolute value of the torque command reaches the set value; Invalid - the absolute value of the torque command is less than the set value.
14	Forward Torque Limit Selection	Switching of the torque limiting source is performed according to the selection of P15.03.
15	Reverse Torque Limit Selection	Switching of the torque limiting source is performed according to the selection of P15.03.
16	Preset position enable	Valid - the servo motor is running a multi-stage position command; Invalid - the servo motor is in a locked state;
19	Torque command direction switching	Ineffective - positive direction; Effective - negative direction.
20	Speed command direction selection	Ineffective - positive direction; Effective - negative direction.
21	Position command direction switching	Invalid - the actual position command direction is the same as the set position command direction; Valid - the actual position command direction is opposite to the set position command direction.
22	Gain switching selection	P06.15=0: Invalid - speed control loop is PI control; Valid - speed control loop is P control. If P06.15=1,

Function Number	Function Name	descriptions
		the setting of P06.16 is used.
23	Run command switching	Invalid - the current running instruction is A; Valid - the current running instruction is B
24	Mode switch 1	Switching between speed, position and Torque Mode according to the selected control mode (3, 4, 5).
25	Mode switching 2	Switching between speed, position, and Torque Mode according to the selected control mode (6)
26	Electronic Gear Switching	Invalid - electronic gear ratio 1; Valid - electronic gear ratio 2
27	Preset command selection 1	16-segment preset command selection
28	Preset command selection 2	16-segment preset command selection
29	Preset command selection 3	16-segment preset command selection
30	Preset command selection 4	16-segment preset command selection.
31	Use the current DI trigger point as the origin	Effective: triggered; Ineffective: not triggered

Function Number	Function Name	descriptions	note
Output Signal Function Description			
1	Servo ready(rdy)	The servo status is ready to receive the S-ON valid signal: Valid - servo ready; Invalid - servo not ready.	Servo not ready: A Type I or Type II fault has occurred in the servo, or a DI emergency stop is in effect.
2	servo operation(Run)	The servo is currently in the RUN state and can receive commands: Valid - the servo can run; Invalid - the servo cannot run.	-
3	Servo warning output（Warn）	Warning output signal is active. (Conducted)	-
4	Servo Fault Output（Error）	Status is valid when a fault is detected.	-
5	motor movement(TGon)	When the speed of the servo motor is higher than the motor motion status threshold P14.12: Valid - the motor motion signal is valid; Invalid - the motor motion signal is invalid.	-
6	Zero Speed Signal(Zero)	Output signal when servo motor stops rotating : Valid - motor speed is zero; Invalid - motor speed is not zero.	-
7	Speed Consistency(VCmp)	For speed control, the absolute value of the difference between the servo motor speed and the speed command is less than the P14.14 speed arrival threshold and the time satisfies P07.76, which is valid.	-

8	Speed Arrival (VArr)	Valid - speed feedback reaches set value; Invalid - speed feedback does not reach set value.	-
9	Torque Arrival (TArr)	Valid - the absolute value of the torque reaches the set value; Invalid - the absolute value of the torque is less than the set value.	-
10	Proximity of positioning (Near)	For position control, the position deviation pulse is valid when it reaches the set value of the positioning proximity signal amplitude P13.09.	-
Function Number	**Function Name**	**descriptions**	**note**
11	Location Arrival(Coin)	For position control, the position deviation pulse is valid if it satisfies the position arrival signal window P13.08 and the time satisfies the position arrival signal hold time P13.10.	-
12	Torque Limit(Clt)	Confirmation signal for torque limitation: Valid - motor torque limited; Invalid - motor torque not limited.	-
13	speed limit(Vlt)	Acknowledgement signal for speed limitation during torque control: Valid - motor speed is limited; Invalid - motor speed is not limited.	-
14	Return to zero complete.(HomeOK)	Valid - Home return to zero is complete; Invalid - Home return to zero is not complete.	-
17	Holding brake control (BK)	Brake signal output: Valid - close, release the brake; Invalid - start the brake.	-
18	Dynamic braking （DB）	Effective - the dynamic brake relay is open and the dynamic brake is active; Ineffective - the dynamic brake relay is engaged and the dynamic brake is not active;	-
19	Magnetic pole identification complete. （AngRdy）	Valid - pole recognition is complete; Invalid - pole recognition is complete;	-