Preface

This user manual is applicable to Wecon VD5 series bus servo drives.

In order to use this series of servo drives correctly, please read this manual carefully in advance and save it for later use.

During use, if you have any doubt about the function and performance of this equipment, please contact our technicians for relevant assistance to use this equipment smoothly.

The company's products are constantly being improved and upgraded, and the contents of this manual are subject to change without notice.

This manual is suitable for introductory and use reference books for elementary and intermediate readers. At the same time, all interpretation rights of this manual belong to our company.

Dangerous
The danger caused by failure to operate as required may result in serious injuries or even death.

Notice
The danger caused by failure to operate as required may result in moderate or minor injuries, and equipment damage.

User manual change record

Date	Version	Changed content	Applicable models
2024.12	V1.0	First edition	● VD5L-0□□SA1P ● V1.00
2025.05	V2.0	▪ Added VD5E model related content (VD5E 6-channel DI). ▪ Chapter 7 Deleted section 7.8.3 "Related function settings”; Deleted [60E6] position calculation method object dictionary. ▪ Chapter 8 Added [P01-20], [P06-34], [P05-20], [P05-21] function codes ; Added [60FE] object dictionary; Added monitoring quantity [U0-07] encoder communication error count; Added [U0-58] dynamic brake relay switching times; Added [U2-12] EtherCAT version number; Modified [P04-4] lower limit value, [P10-06] range, [U0-49] unit; Supplemented [605A] and [605D] descriptions.	● VD5L-0□□SA1P ● VD5E-0□□SA1G ● VD5E-0□□TA1G ● V1.01

Date	Version	Changed content	Applicable models
2026.03	V2.1	▪ Chapter 8 Added filter cascade function option in [P04-01]; Gear ratio settings: [P0-16] [P0-17], [P0-18]; Ramp deceleration-related function code settings, with the addition of the dynamic brake function option: [P0-05], [P0-07], [P1-35], [P1-36]; Gravity compensation-related function codes: [P02-40], [P02-41], [P02-42], [P02-43]; Quadrant protrusion compensation-related function codes: [P02-47], [P02-48], [P02-49], [P02-50]; High-precision probe-related function codes: [P05-25], [P05-26]; EEPROM storage for bus communication: [P12-04]; EtherCAT-related count error monitoring variables: [U0-61] to [U0-68]; Packet loss counter [U0-08]; VD5E single-board test result data: [01-26]; Default value adjustment for the software overcurrent detection window: [P1-20]. Added EtherCAT network fault codes: ER.101, ER.102, ER.103, ER.104.	● VD5L-0□□SA1P ● VD5L-0□□SA1D ● VD5E-0□□SA1G ● VD5E-0□□TA1G ● V1.02

Content

Chapter 1 Safety reminder

1.1 Safety precautions

This section describes the important items that users must observe, such as product confirmation, storage, transportation, installation, wiring, operation, inspection, and disposal. Please follow the steps required by this manual for trial operation.

⚠ Dangerous
◆After the power is turned off for more than 5 minutes and the power indicator is off, use a multi-meter to confirm that the voltage across the high-voltage capacitor has dropped to a safe voltage, and then proceed with the disassembly and assembly of the drive, otherwise the residual voltage may cause electric shock. ◆Please never touch the inside of the servo drive, otherwise it may cause electric shock. ◆Please insulate the connection part of the power terminal, otherwise it may cause electric shock. ◆The grounding terminal of the servo drive must be grounded, otherwise it may cause electric shock. ◆Please install the servo drive, servo motor, and external braking resistor on non-combustible materials, otherwise it may cause a fire. ◆Be sure to connect an electromagnetic contactor and a non-fuse circuit breaker between the power supply and the main circuit power supply of the servo drive. Otherwise, when the equipment fails, it may cause fire because it cannot cut off the large current. ◆In the servo drive and servo motor, please do not mix with oil, grease and other flammable foreign objects and screws, metal pieces and other conductive foreign objects, otherwise it may cause a fire. ◆When the servo motor is connected to the machine, in case of any error in operation, it will not only cause damage to the machine, but also sometimes cause personal safety accidents. ◆Do not damage or pull the cable forcefully, do not impose excessive force on the cable, or place heavy objects underneath, otherwise electric shock may occur, causing the product to stop operating or burn out. ◆Do not use the brake of the brake motor for normal braking, otherwise it may cause a malfunction. ◆Except for the designated operator, please do not set up, disassemble and repair the equipment, otherwise it may cause electric shock or injury. ◆Do not remove the cover, cables, connectors and optional accessories while the power is on, otherwise it may cause electric shock. ◆Please install a stop device on the machine side to ensure safety. ◆Please take measures to ensure that your personal safety will not be endangered when restarting, otherwise it may cause injury. ◆Do not modify this product, otherwise it may cause personal injury or mechanical damage.

1.2 Precautions for storage and transportation

Notice
Please store and install the product in the following environment: ◆Places without direct sunlight; ◆Places where the ambient temperature does not exceed product specifications; ◆Places where the relative humidity does not exceed product specifications; ◆Places where condensation will not occur due to rapid changes in temperature; ◆Places free of corrosive gas and flammable gas; ◆Places without combustible materials nearby; ◆Places with less dust, salt and metal powder; ◆Places where there is no splash of water, oil, medicine, etc.; ◆Places where vibration or shock will not affect the product (places that exceed product specifications); ◆Places that will not be exposed to radiation;
Storage or installation in environments other than the above may cause product failure or damage: ◆Please use the correct method for handling according to the weight of the product; ◆Do not hold the motor cable or motor shaft for transportation; ◆When operating the servo unit and servo motor, please pay attention to sharp parts such as the corners of the device.

1.3 Precautions during installation

Notice
◆Do not install this product in a p2lace free from water splashed or in an environment prone to corrosion; ◆Please be sure to comply with the device installation direction, otherwise it may cause device failure; ◆When installing, please make sure to keep the specified distance between the servo drive and the inner surface of the electric cabinet and other machines, otherwise it may cause fire or device failure; ◆Do not apply excessive impact, otherwise it may cause equipment failure; ◆Do not sit on the product or place heavy objects on it, otherwise it may cause personal injury; ◆Do not use this product near flammable gases and combustibles, otherwise there may be a risk of electric shock or fire; ◆Do not block the suction and exhaust ports, and do not allow foreign objects to enter the product, otherwise it may cause device failure or fire due to the aging of internal components.

1.4 Precautions during wiring

Notice
◆Do not connect the three-phase power supply to the output terminals U, V, W of the servo drive, otherwise it may damage the device or cause a fire; ◆Please connect the output U, V, W of the servo drive and the U, V, W of the servo motor directly. Do not use the electromagnetic contactor during the connection, otherwise it may cause abnormal operation or malfunction of the device; ◆When the DO output terminals are connected to the relay, please pay attention to the polarity of the freewheeling diode, otherwise the drive may be damaged and the signal can not be output normally; ◆Please fix the power terminal and the motor terminal firmly, otherwise it may cause a fire hazard; ◆Do not connect the 220V servo unit directly to the 380V power supply; ◆Do not pass the power cable and signal cable through the same pipe or bundle them together. When wiring, the power cable and signal cable should be placed at an interval of more than 30cm; ◆Use twisted-pair shielded cables for signal cables and encoder cables, and the shielding layer should be grounded at both ends; ◆The wiring length of the signal input cable is recommended to be within 3M, and the wiring length of the encoder is recommended to be within 15M; ◆When using in the following places, please take adequate shielding measures. When interference occurs due to static electricity. Places where strong electric or magnetic fields are generated; Places where there may be radiation; ◆When checking the status, please make sure that the CHARGE indicator is off.

1.5 Precautions during operation

Notice
◆During trial operation, in order to prevent accidents, please run the servo motor without load (not connected to the drive axis), otherwise it may cause injury. ◆When the servo motor is running, do not touch its rotating parts, otherwise it may cause injury. ◆Be sure to set the correct rotational inertia ratio, otherwise it may cause vibration. ◆When it is installed on the supporting machine and starts to run, please set the user parameters in accordance with the machine in advance. If the operation is started without parameter setting, the machine may lose control or fail. ◆When installing on the supporting machinery and starting to run, please put the servo motor in a state where it can be stopped in an emergency at any time, otherwise you may get injured. ◆When using a servo motor on a vertical axis, please install a safety device to prevent the workpiece from falling under states such as alarm and overrun. In addition, please perform servo lock stop setting when overrun occurs, otherwise the workpiece may fall in overrun state. ◆Since extreme user parameter adjustments and setting changes will cause the servo system to become unstable, please never make settings, otherwise it may cause injury. ◆When an alarm occurs, reset the alarm after removing the cause and ensuring safety, and restart the operation, otherwise it may cause injury. ◆Except for special purposes, do not change the maximum velocity threshold (P01-10). If user change it carelessly, it may damage the machine or cause injury. ◆When the power is turned on and within a period of time after the power is cut off, the cooling fin of the servo drive, the external braking resistor, the servo motor, etc. may be exposed to high temperature. Please do not touch it, otherwise it may cause burns. ◆If the power supply is restored after an instantaneous power failure occurs during operation, the machine may restart suddenly, so please do not stay close to the machine, and press the stop button when the power is off, and operate after the power supply is stable.

1.6 Precautions during maintenance and inspection

Notice
◆The power on and off operations should be carried out by professional operators. ◆When testing the insulation resistance of the drive, please cut off all the connections with the drive first, otherwise it may cause the drive to malfunction. ◆Do not use gasocable, alcohol, acid and alkacable detergents to avoid discoloration or damage to the casing. ◆When replacing the servo drive, please transfer the user parameters of the servo drive to be replaced to the new servo drive before restarting operation, otherwise the machine may be damaged. ◆Do not change the wiring when the power is on, otherwise it may cause electric shock or injury. ◆Do not disassemble the servo motor, otherwise it may cause electric shock or injury.

1.7 Leakage protection and circuit breaker

Servo drive			Recommended circuit breaker		
Voltage level	Drive model	Rated input current IN (A)	Manufacture	Current（A）	Model
VD5L-0xxSA1P					
Single phase 220V	VD5L-003SA1P	0.9	Schneider	2	OSMC32N2D2
	VD5L-010SA1P	3.61		6	OSMC32N2D6
	VD5L-014SA1P	6.76		16	OSMC32N2D16
	VD5L-015SA1P	6.76		16	OSMC32N2D16
VD5E-0xxSA1G					
Single phase 220V	VD5L-003SA1G	0.9	Schneider	2	OSMC32N2D2
	VD5L-010SA1G	3.61		6	OSMC32N2D6
	VD5L-014SA1G	6.76		16	OSMC32N2D16
	VD5L-015SA1G	6.76		16	OSMC32N2D16
VD5E-0xxTA1G					
Three phase 380V	VD5L-016SA1G	4.52	Schneider	10	OSMC32N3D10
	VD5L-050SA1G	22.61		32	OSMC32N2D32

Notice

If the device is to use a residual current device (RCD), please select it according to the following conditions:

◆ The drive device can generate DC leakage current in the protective conductor, so please be sure to use a type B residual current device (RCD);

◆ When the drive is running, a certain high-frequency leakage current will be generated. In order to avoid RCD misoperation, please select an RCD with an operating current of no less than 100mA for each drive;

◆ When multiple drives are connected in parallel to share one RCD, an RCD with an operating current of no less than 300mA should be selected;

◆ Do not change the wiring when the power is on, otherwise it may cause electric shock or injury;

◆ It is recommended to use RCDs from brands such as Chint and Schneider.

Chapter 2 Product information

2.1 Servo drive

2.1.1 Servo drive model naming

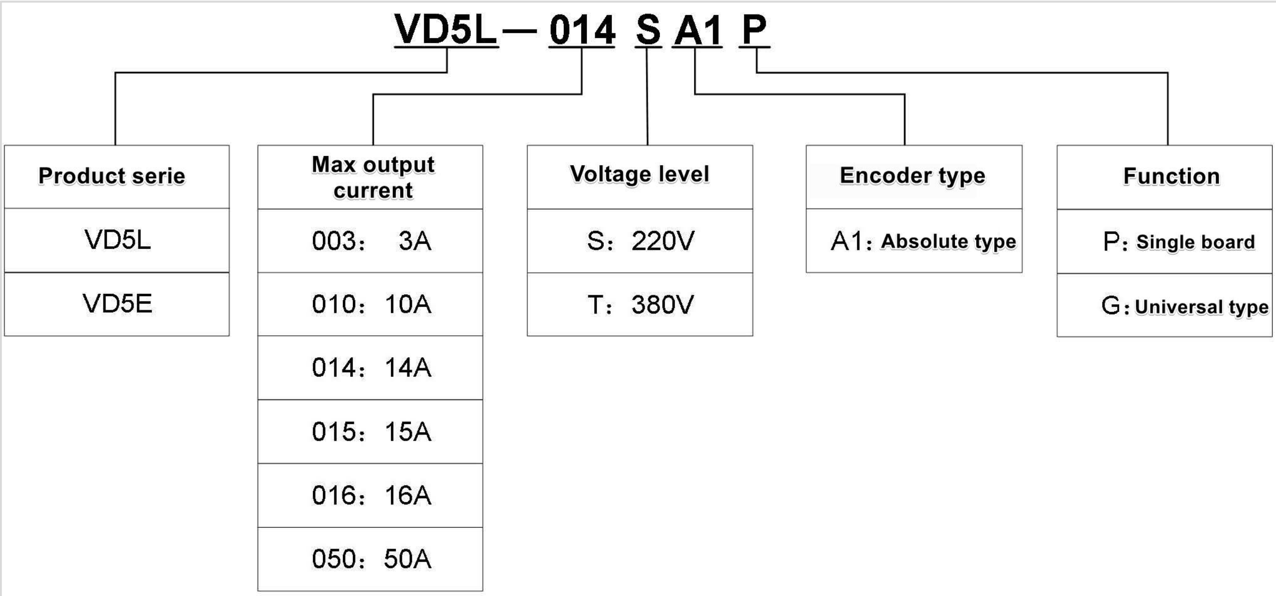


Figure 2-1 Servo drive model

Wecon VD5L, VD5E series bus servo drive nameplate and appearance are shown in Figure 2-2 and Figure 2-3.

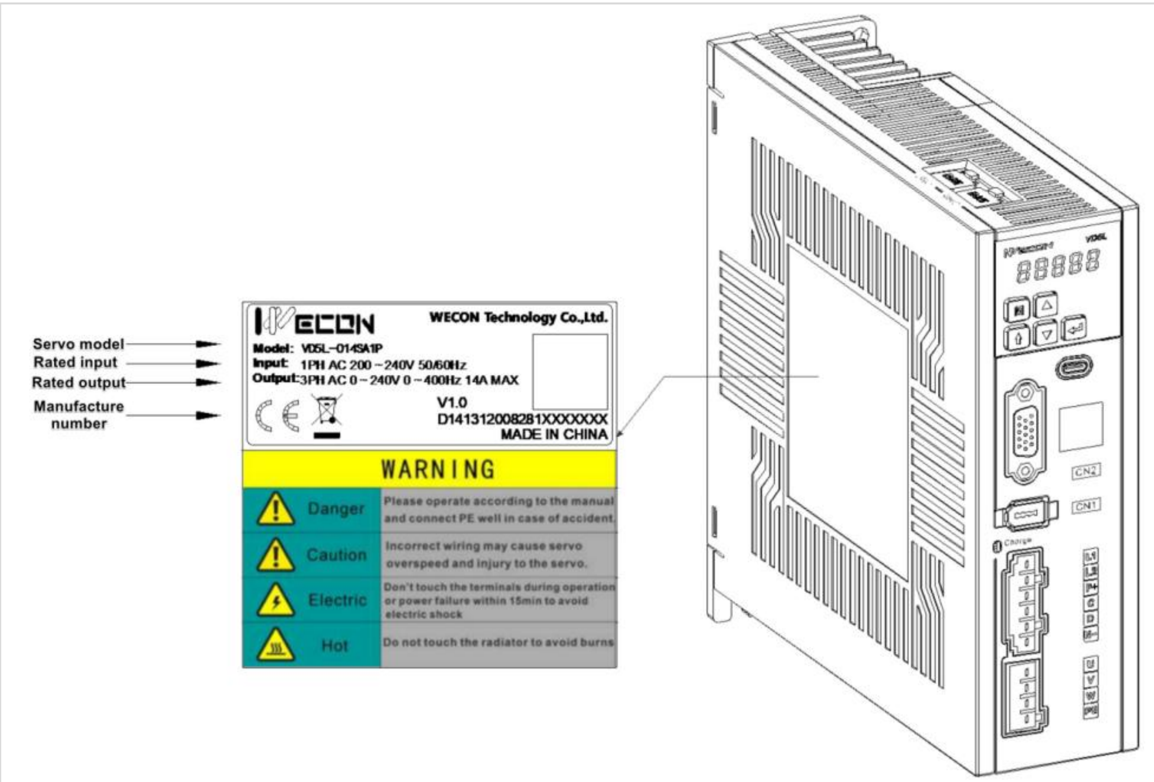


Figure 2-2 VD5L servo drive nameplate and appearance

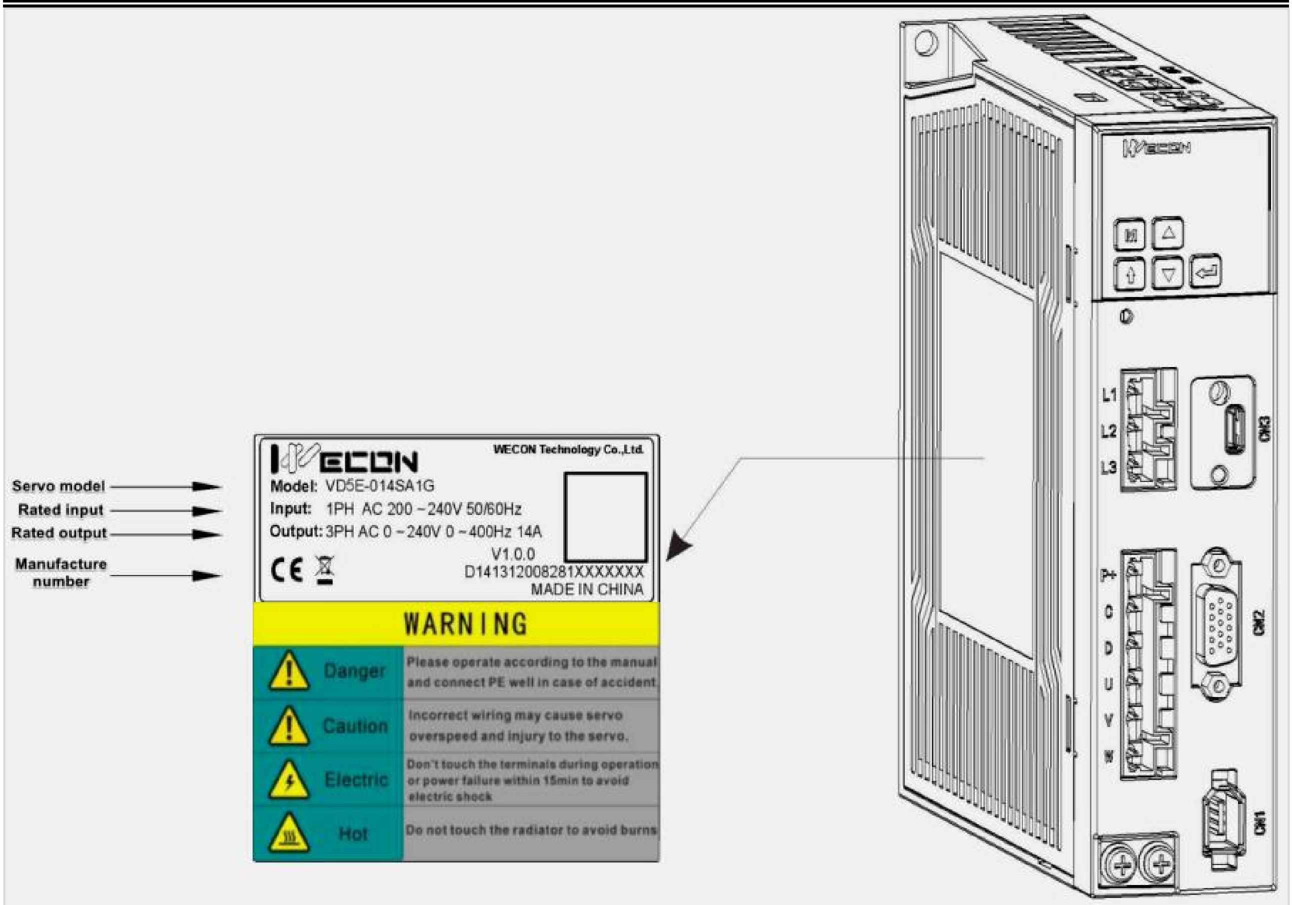


Figure 2-3 VD5E servo drive nameplate and appearance

2.1.2 The composition of servo drive

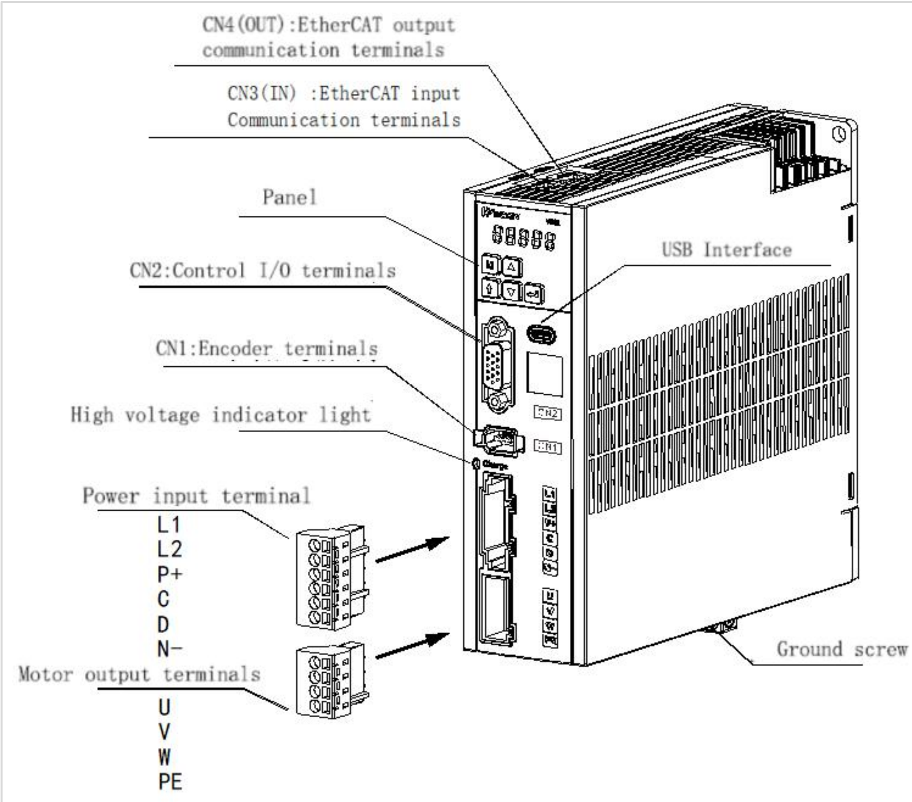


Figure 2-4 Composition of VD5L servo drive

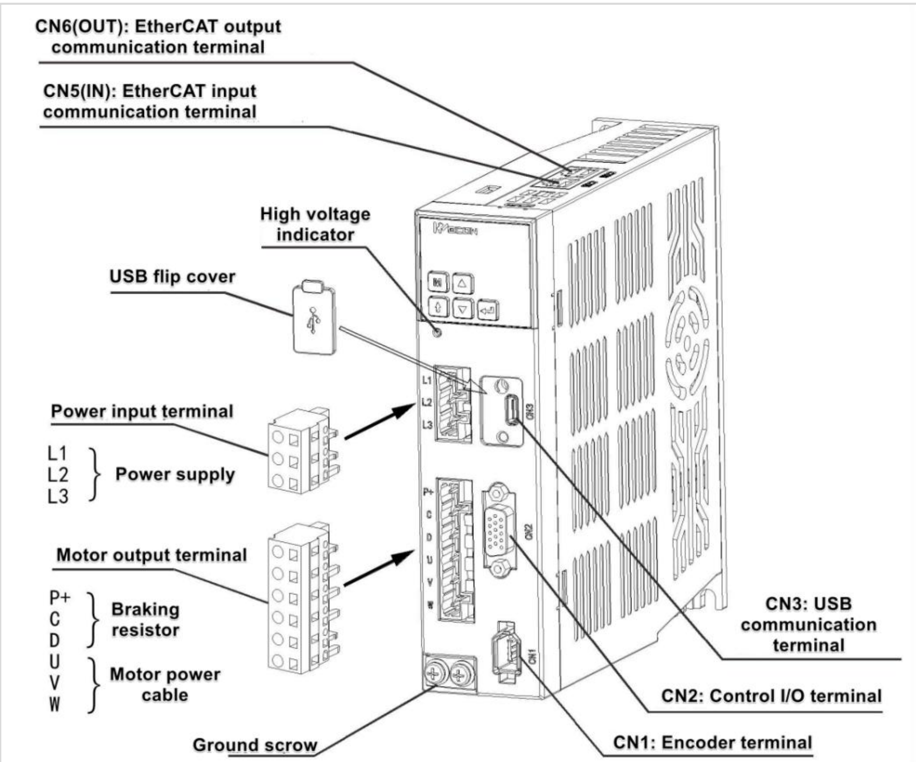


Figure 2-5 Composition of VD5E servo drive

✎**Note:** When using external braking resistor or internal braking resistor, special short-circuit treatment is required, which is shown in Figure 2-6.

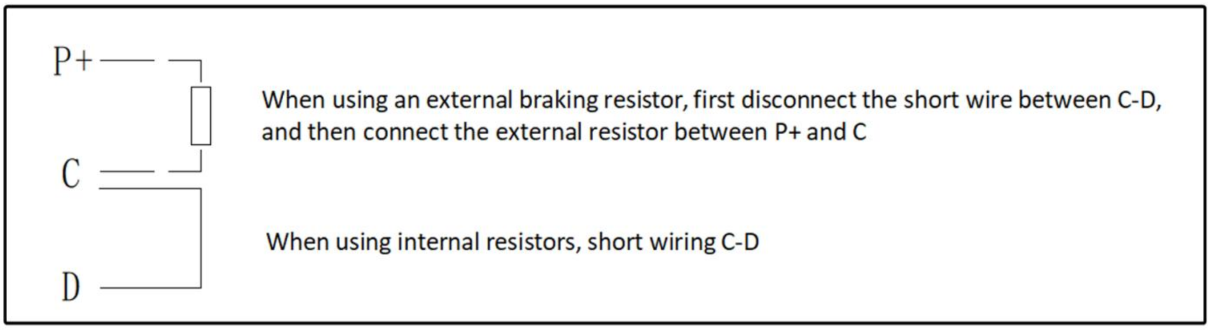


Figure 2-6 Short circuit schematic diagram of braking resistance

2.1.3 Servo drive specifications

(1) Electrical specification

Table 2-1 Electrical specification for single-phase 220V VD5L

Project	VD5L			
Model	VD5L-003SA1P	VD5L-010SA1P	VD5L-014SA1P	VD5L-015SA1P
Maximum output current	3A	10A	14A	15A
Control supply	-			
Power supply	Single-phase AC 198V to 242V 50/60 Hz			
Braking resistor	Support external connection		Support built-in and external connection	

Table 2-2 Electrical specification for single-phase 220V VD5E

Project	VD5E		
Model	VD5E-003SA1G	VD5E-010SA1G	VD5E-014SA1G
Maximum output current	3A	10A	14A
Control supply	-		
Power supply	Single-phase AC 198V to 242V 50/60 Hz		
Braking resistor	Support external connection		Support built-in and external connection

Table 2-3 Electrical specification for three-phase 380V VD5E

Project	VD5E	
Model	VD5E-003SA1P	VD5E-050SA1P
Maximum output current	16A	50A
Control supply	Single-phase AC 342V to 440V 50/60 Hz	
Power supply	Three-phase AC 342V to 440V 50/60 Hz	
Braking resistor	Support external connection	

(2) Basic specifications

Item			Description
Environment information	Use	Temperature	0 to 40℃
		Related humidity	20% to 90%, no condensation
		Shock	3M4, 3mm[2 to 9HZ], 1 category
		Vibration	3M4, 1G[9 to 200HZ], 1 category
	Storage	Temperature	-20℃ to 65℃
		Related humidity	20% to 90%, no condensation
		Vibration	2M2, 3.5mm[2 to 9Hz]
	Protection level		IP20
	Polluted level		II
	Overvoltage level		III

Item		Description
	Altitude	The maximum altitude is 2000m. ● No derating is required for use at 1000m and below; ● For altitudes above 1000 m, derate the ou tput by 1% for every 100 m increase in altitude. Please contact the manufacturer for altitudes above 2000m.
Basic information	Control method	IGBT PWM control, sine wave current drive mode
	Drive model	VD5L-0□□SA1P VD5E-0□□SA1G VD5E-0□□TA1G
	Encoder feedback	17bit absolute value encoder 23bit absolute value encoder
	Usage temperature	0 to 45℃
	Usage humidity	Below 90%RH (No condensation)
EtherCAT slave basic performance	Communication protocol	EtherCAT protocol
	Support services	CoE
	Synchronization mode	DC
	Physical layer	100 BASE-TX
	Baud rate	100 Mbit/s
	Duplex mode	Full duplex
	Topological structure	Ring, bus
	Slave station number	Less than 128 sets suggested for actual working
	Synchronous jitter	1 μs
EtherCAT configuration unit	FMMU unit	8
	Storage synchronization snap-in	8
	Process data RAM	8KB
	Distributed clock	64-bit
	EEPROM capacity	32Kbit
Input and output	Digital input (DI) signal	4-channel DI (VD5L) 6-channel DI (VD5E)
	Digital output (DO) signal	3-channel DO

(3) Support function

Item		Description
Input and output	Digital input (DI) signal	Servo enable (S-ON), fault and warning clear (A-CLR), forward drive disable (POT), reverse drive disable (NOT), error counter clear (CL), emergency stop (E-STOP), probe 1 function, probe 2 function, homing signal (HOMEORG)
	Digital output (DO) signal	Servo Ready (RDY), Fault Signal (ALM), velocity Limited (V-LIMIT) Brake output (BRK-OFF), warning signal (WARM signal), servo running state output (SRV-ST), rotation detection (TGON), communication VDO1 output (COM_VDO1), communication VDO2 output (COM_VDO2), communication VDO3 output (COM_VDO3) ZSP (Zero velocity Signal), Positioning Complete (P-COIN), velocity Approach (V-NEAR), Torque Arrival (T-COIN)
Built-in function	Electronic gear ratio	The range is "0.001 × Encoder Resolution/10000, 4000 × Encoder Resolution/10000"
	Protective function	Overcurrent protection, overvoltage protection, undervoltage protection, overload protection, main circuit lack of phase protection, Overtemperature protection, abnormal parameter protection, encoder protection, others
	LED display function	Panel 5-bit LED
	Others	Gain adjustment, fault and alarm recording, jog operation

2.2 Servo motors

2.2.1 Servo motor model naming

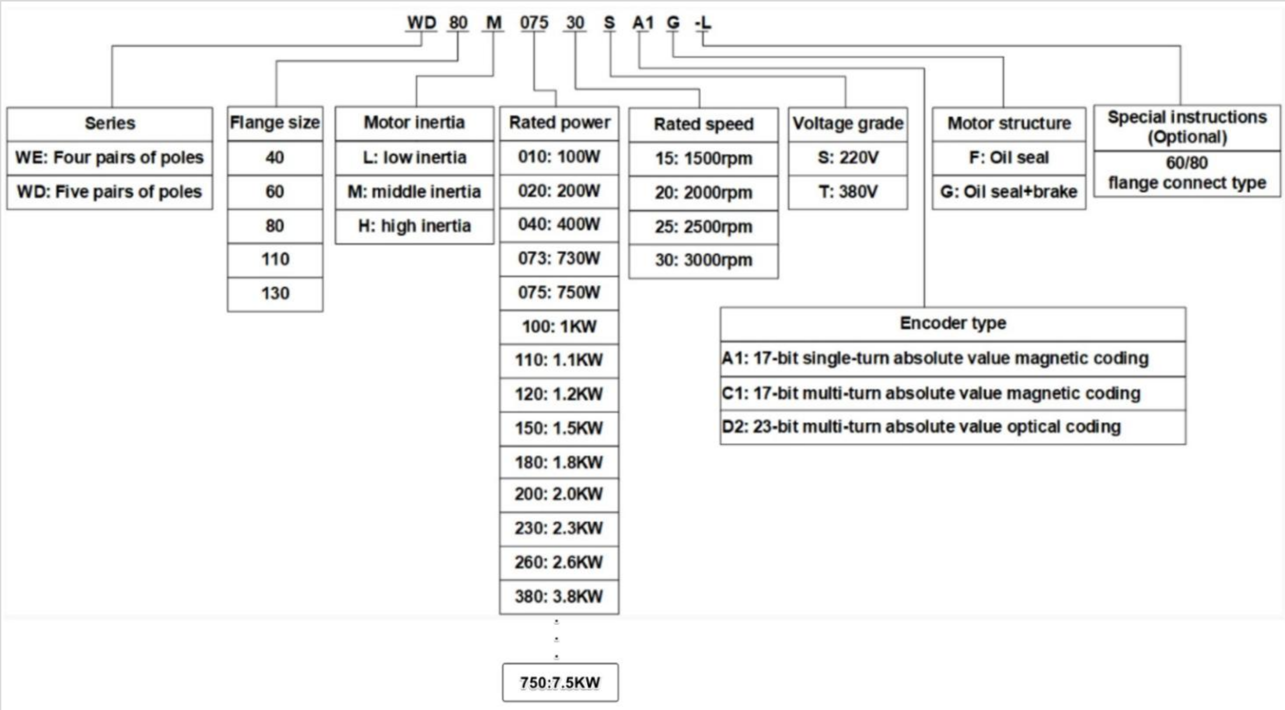


Figure 2-7 Naming of servo motor

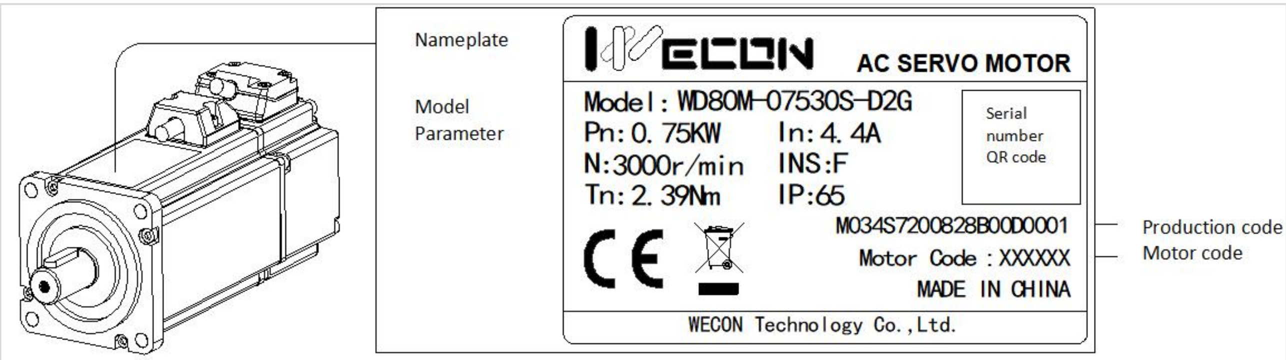


Figure 2-8 Servo motor nameplate

2.2.2 Composition of servo motor

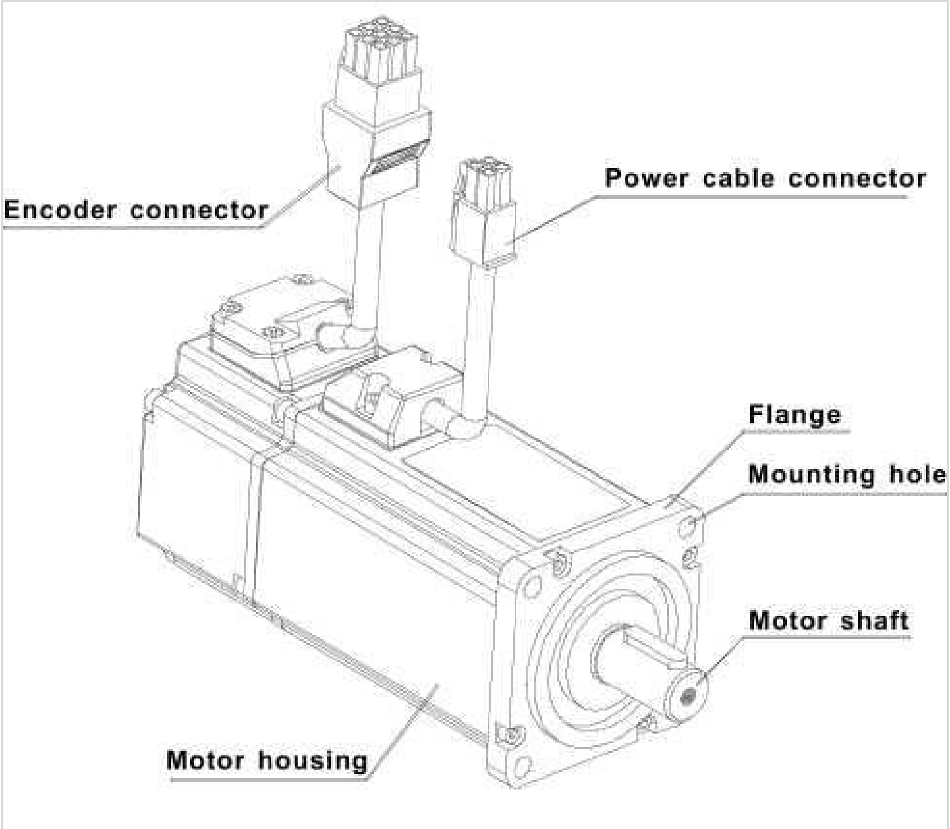


Figure 2-9 Composition of 40/60/80 flange of cable motor

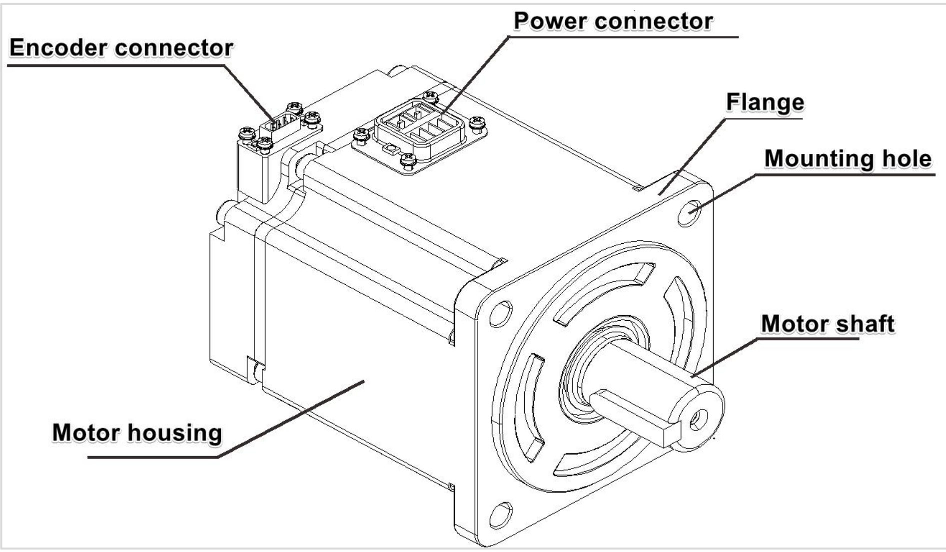


Figure 2-10 Composition of 40/60/80 flang of connector motor

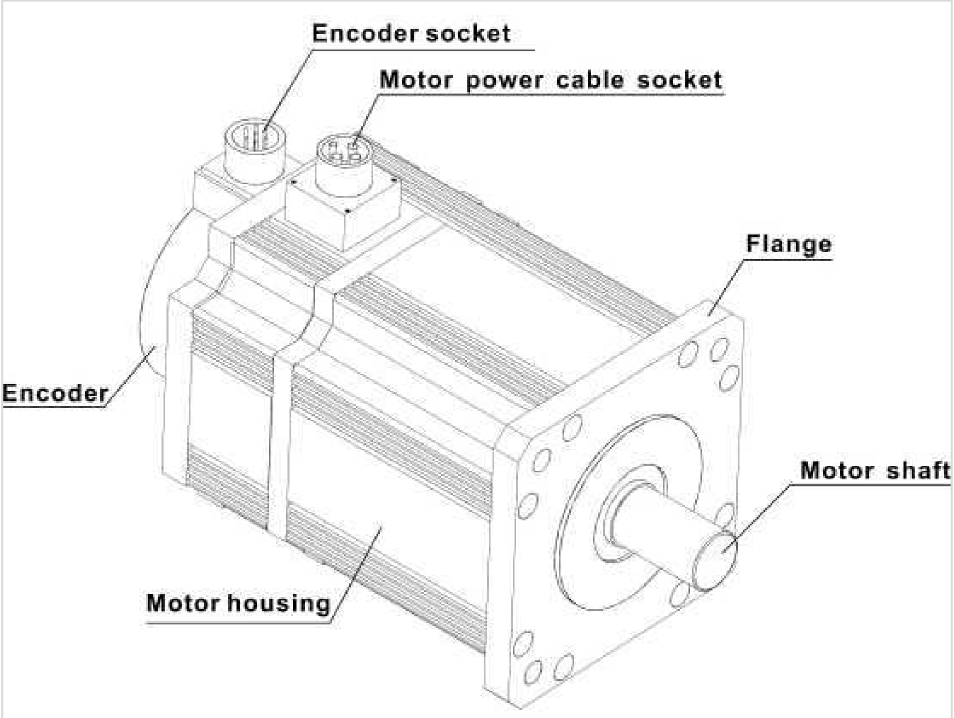


Figure 2-11 Composition of 110/130 flange motor

2.2.3 Specification of servo motor

Table 2-4 Wecon motor specifications

Wecon motor model	Motor Code	Flange size	Rated power (KW)	Rated torque (N*m)	Voltage (V)	Rated velocity (rpm)	Encoder type	Brake function
WE130M-10025S-A1F	A091	130	1.0	4.0	220	2500	17-bit single turn absolute magnetic	Not supported
WE130M-15025S-A1G	A111	130	1.5	6.0	220	2500	17-bit single turn absolute magnetic	Supported
WE130M-26025S-C1F	C191	130	2.6	10	220	2500	17-bit multi turn absolute magnetic	Not supported
WE80M-12030S-C1G	C231	80	1.2	4.0	220	3000	17-bit multi turn absolute magnetic	Supported
WE110M-18030S-D2G	D131	110	1.8	6.0	220	3000	23-bit multi turn absolute optical	Supported
WE130M-23015S-D2F	D161	130	2.3	15.0	220	1500	23-bit multi turn absolute optical	Not supported

✎**Note:** Only part of the motor models are displayed, please refer to the [Model Selection Manual] for details.

2.3 Servo system wiring diagram

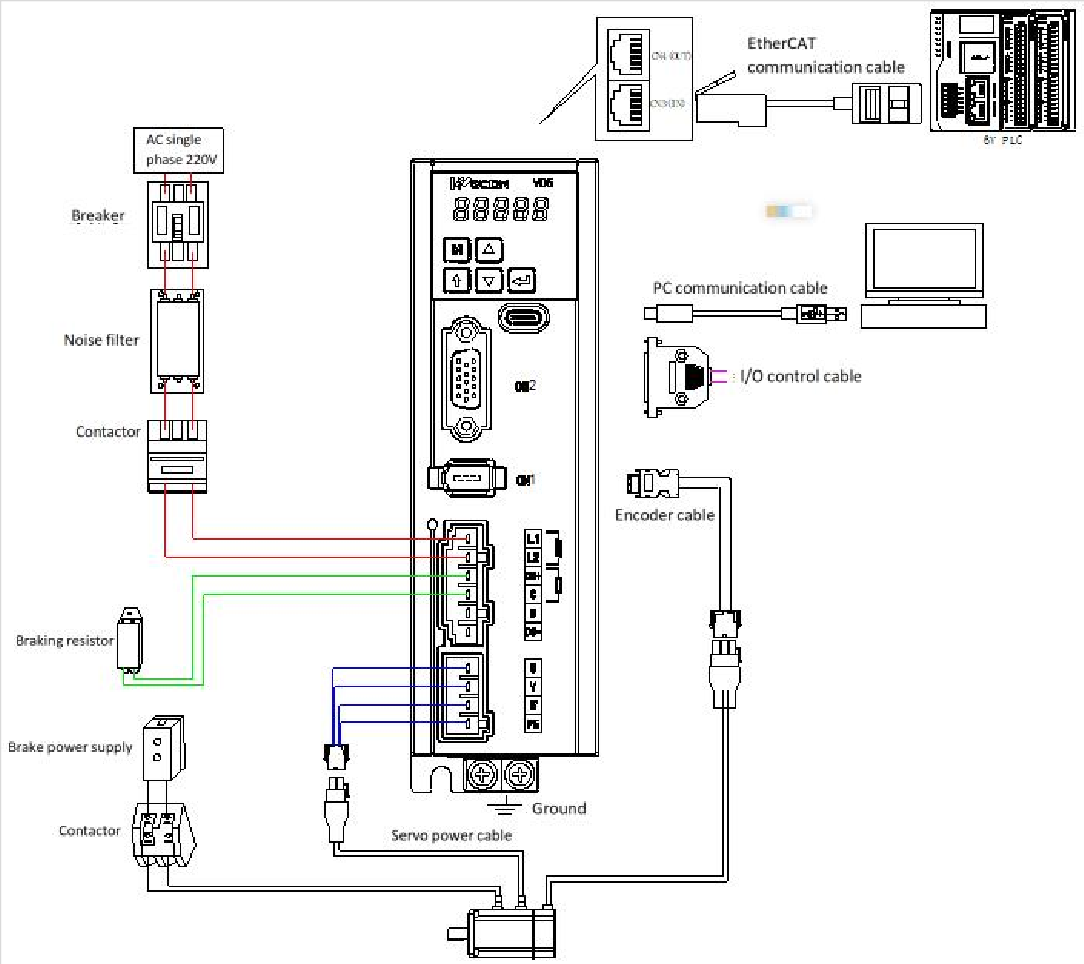


Figure 2-12 Wiring diagram of single-phase 220V servo drive system

Notice
① When using external brake, need to remove the shorting cap or short wiring between terminal C and D of servo drive before operating! ② Pay attention to the power capacity of the brake power supply. When powering multiple brake devices at the same time, if the power supply capacity is insufficient, the brake will fail! ③ It is strictly forbidden to use electromagnetic brake for motor operation and stop operation! Otherwise, the instantaneous high voltage generated by the motor may break down the contactor! ④ In order to prevent cross-shock accidents in the servo system, please use a fuse or a circuit breaker for wiring on the input power supply! ⑤ This series of products must strictly comply with the EMC-related electrical installation requirements in the manual to meet the EMC certification standards; ⑥ When the CE mark is affixed to equipment or devices equipped with this series of products, please confirm whether the final equipment complies with the European unified standards. The relevant responsibilities shall be borne by the customer who finally assembles the product; ⑦ For more product certification information, please consult our company's agent or sales manager.

Chapter 3 Installation of servo drive and motor

3.1 Installation of servo drive

3.1.1 Dimensions (Unit: mm)

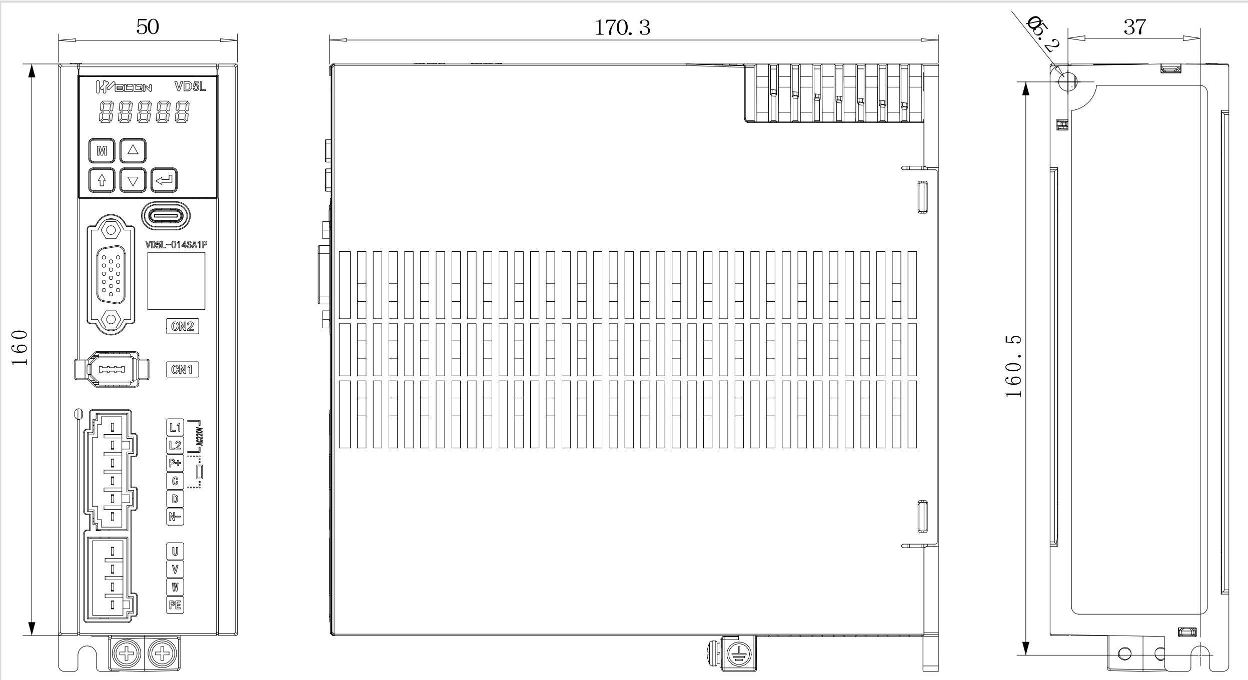


Figure 3-1 Installation dimensions of VD5L servo drive

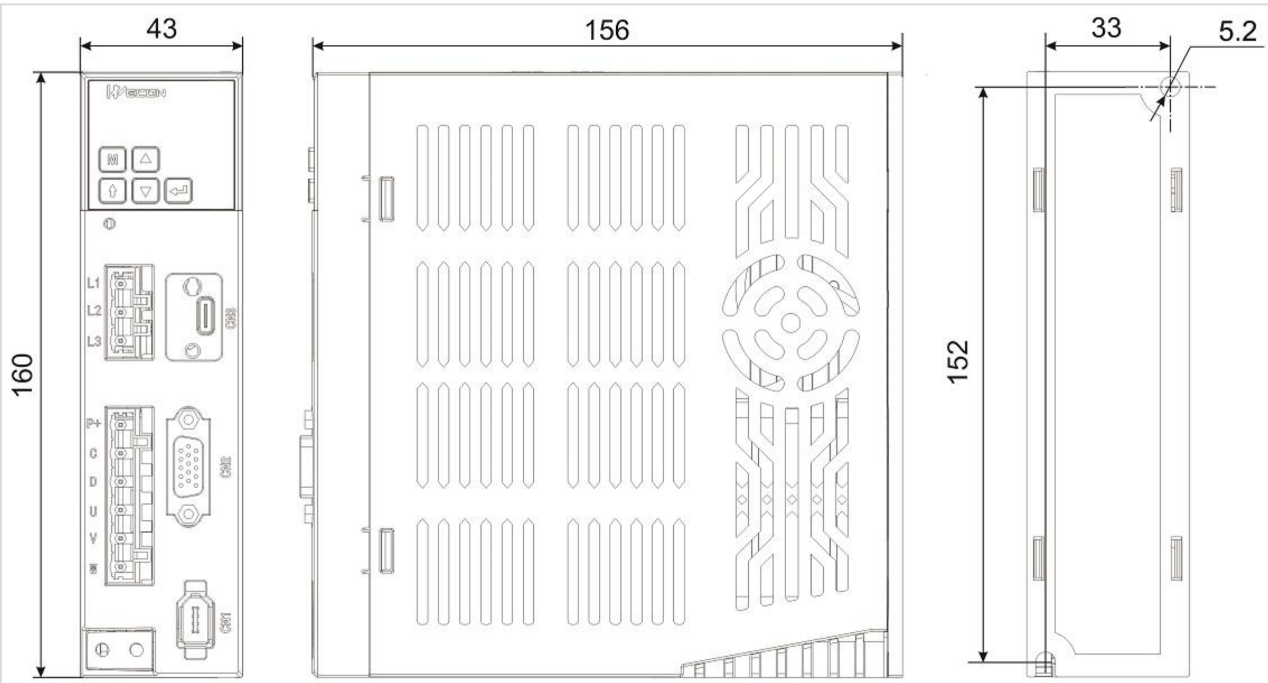


Figure 3-2 Installation dimensions of VD5E servo drive

3.1.2 Installation site

①Please install the device in an installation cabinet to protect it from sunlight and rain;
②Please install the device in a location free from vibration;
③Please do not install in the environment exposed to high temperature, humidity, dust and metal dust;
④Do not use this device in the presence of corrosive and flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali, salt or combustible materials.

3.1.3 Installation environment

The installation environment of the servo drive has a direct impact on the normal function of it and its service life. Therefore, the installation environment of servo drive must meet the following conditions:

Item	Specification
Ambient temperature	0℃ to 40℃ (No freezing)
Ambient humidity	20% to 90%RH (No condensation)
Storage temperature	-20℃ to 65℃
Storage humidity	20% to 90%RH (No condensation)
Protection level	IP20
Pollution level	II
Overvoltage level	III
Altitude	The maximum altitude is 2000m. ● No derating is required for altitudes up to 1000 m ● For altitudes above 1000 m, derate the output by 1% for every 100 m increase in altitude. Please contact the manufacturer for altitudes above 2000m.
Vibration	Less than 0.5G (4.9 m/s^2), 10 to 60Hz (Non-continuous operation)
Power systems	TN system*

✎**Note:** TN system means that the neutral point of the power system is directly connected to the ground, and the exposed metal components are connected to the ground through a protective grounding conductor.

3.1.4 Installation precautions

(1) Installation specifications

In order to achieve a good cooling cycle effect, ensure that there is enough ventilation space around it when installing the servo drive, and be sure to comply with the installation standards in the control cabinet shown in the figure below, otherwise it may cause the drive to malfunction. Please refer to Figure 3-3 and Figure 3-4 for the typical minimum installation size.

(2) Parallel installation

When multiple units are installed in parallel, the minimum distance between each other should be 20mm, and the distance between each other in vertical dimension should be at least 100mm. Please refer to Figure 3-4 and Figure for details (VD5E is the same as VD5L). To prevent temperature rise, a cooling fan can be placed on the upper part. For smaller spacing installation, please consult our company.

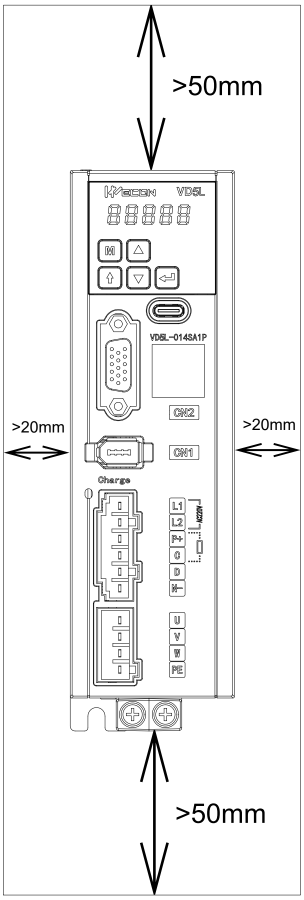


Figure 3-3 Minimum installation size for VD5L servo drive

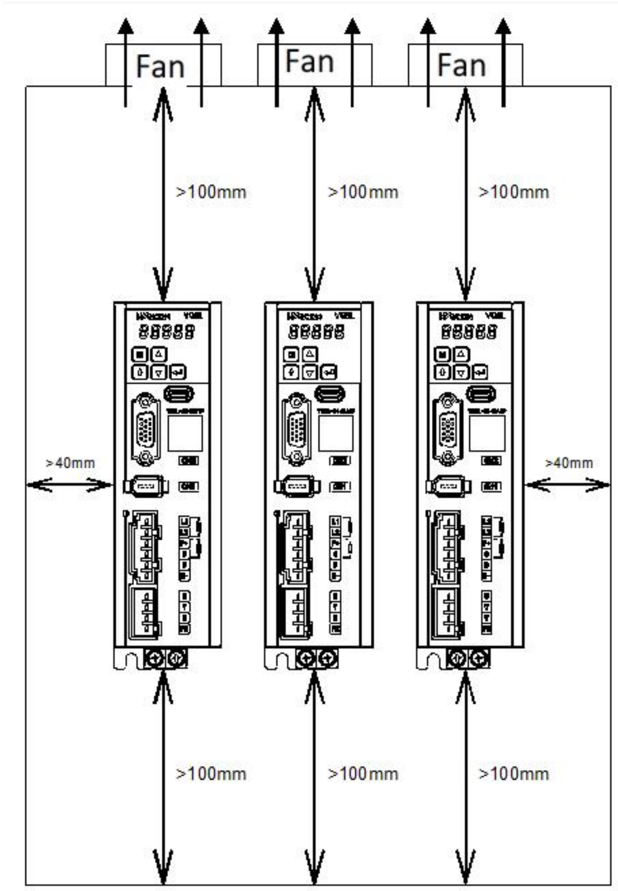


Figure 3-4 Mounting dimensions for multiple VD5L drives in parallel

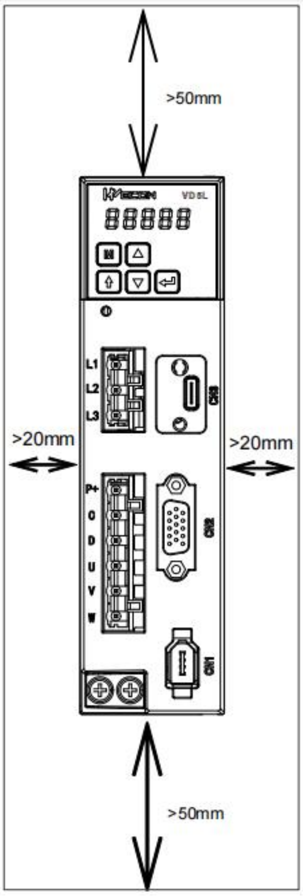


Figure 3-5 Minimum installation size for VD5E servo drive

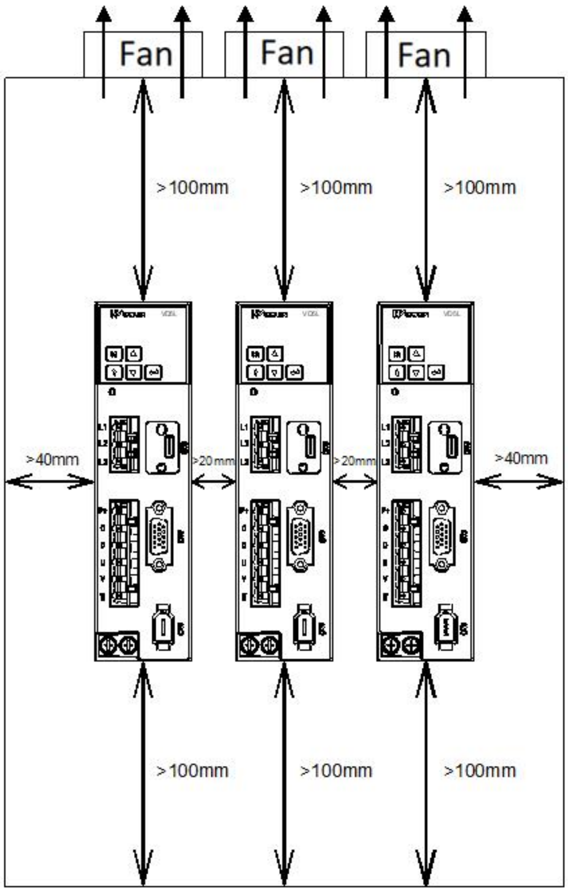


Figure 3-6 Mounting dimensions for multiple VD5E drives in parallel

(3) Installation direction

When installing the servo drive, face the front (panel interface) of the servo drive to the operator so that the servo drive is perpendicular to the wall.

3.2 Installation of servo motor

3.2.1 Dimensions (unit: mm)

(1) Installation dimensions of WD series 40 flange servo motor

Specification	WD series 40 flange motor
Rated torque (N*m)	0.318
LA without brake (mm)	74.8
LA with brake (mm)	108

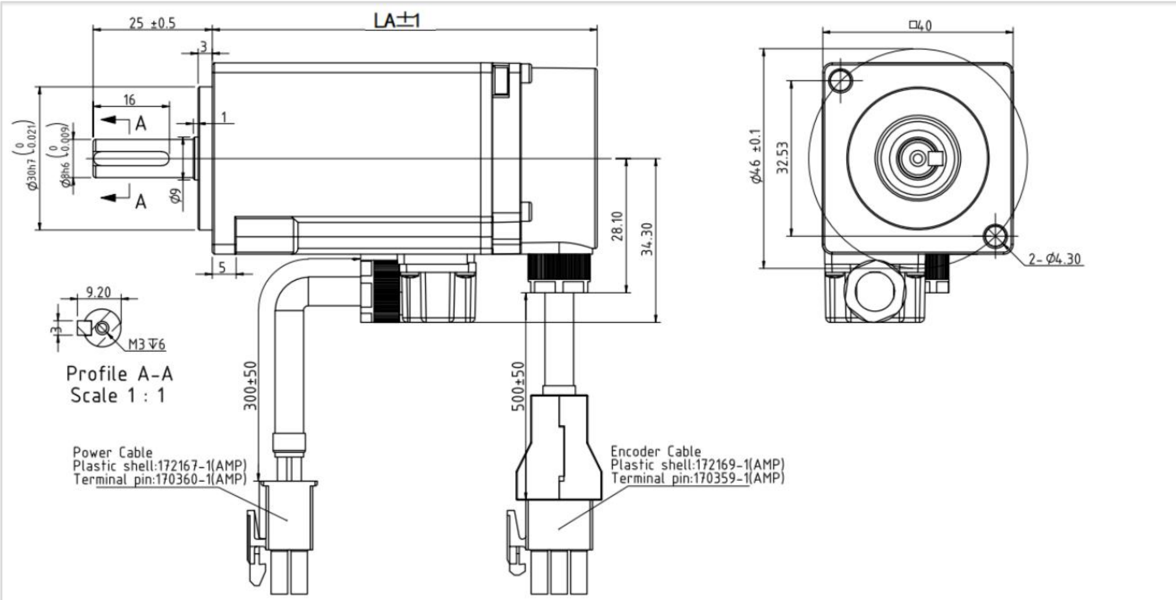


Figure 3-7 WD series 40 flange servo motor installation dimension drawing

(2) Installation dimensions of WD series 60 flange servo motor

Specification	WD series 60 flange motor	
Rated torque (N*m)	0.64	1.27
LA without brake (mm)	75	92
LA with brake (mm)	104.5	121.5

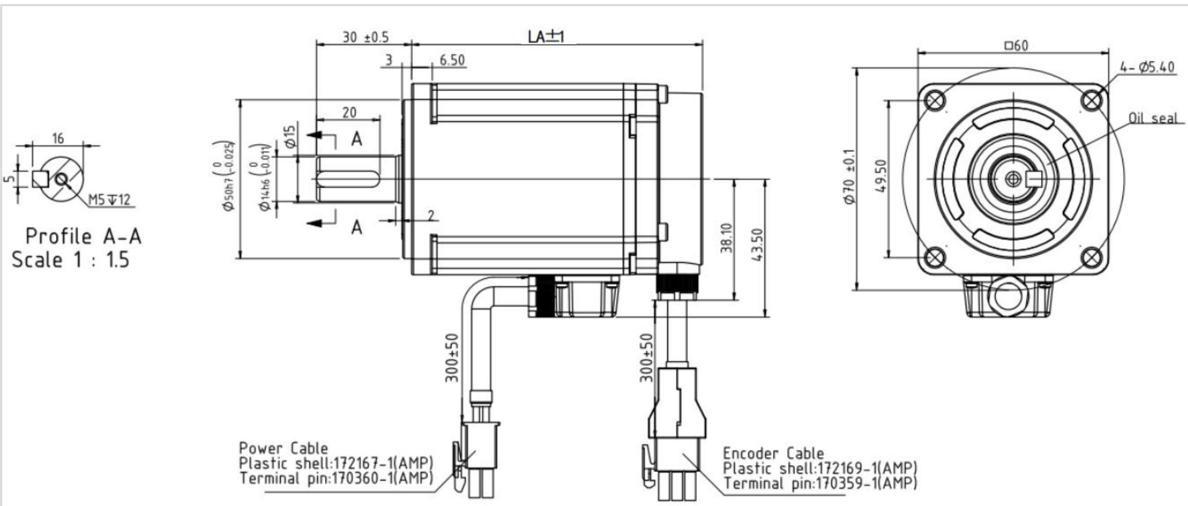


Figure 3-8 Installation dimension drawing of WD series 60 flange servo motor

(3) Installation dimensions of 80 flange servo motor

① WD series motor

Specification	WD series 80 flange motor
Rated torque (N*m)	2.39
LA without brake (mm)	98.5
LA with brake (mm)	132.5

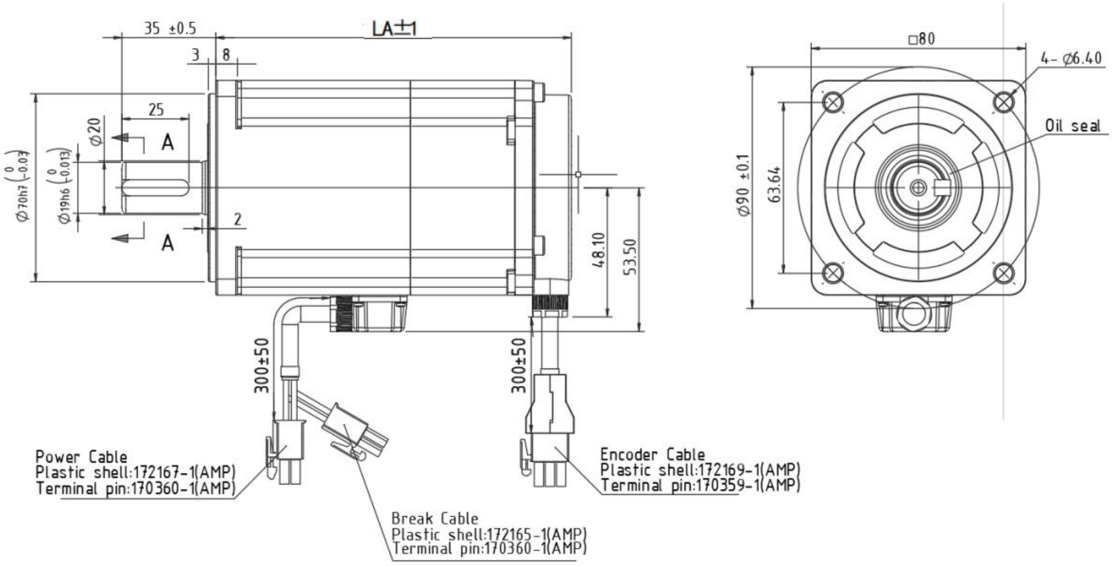


Figure 3-9 Installation dimension drawing of WD series 80 flange servo motor

② WE series motor

Specification	WE series 80 flange motor	
Rated torque (N*m)	3.5	4.0
LA without brake (mm)	179	191
LA with brake (mm)	221	233

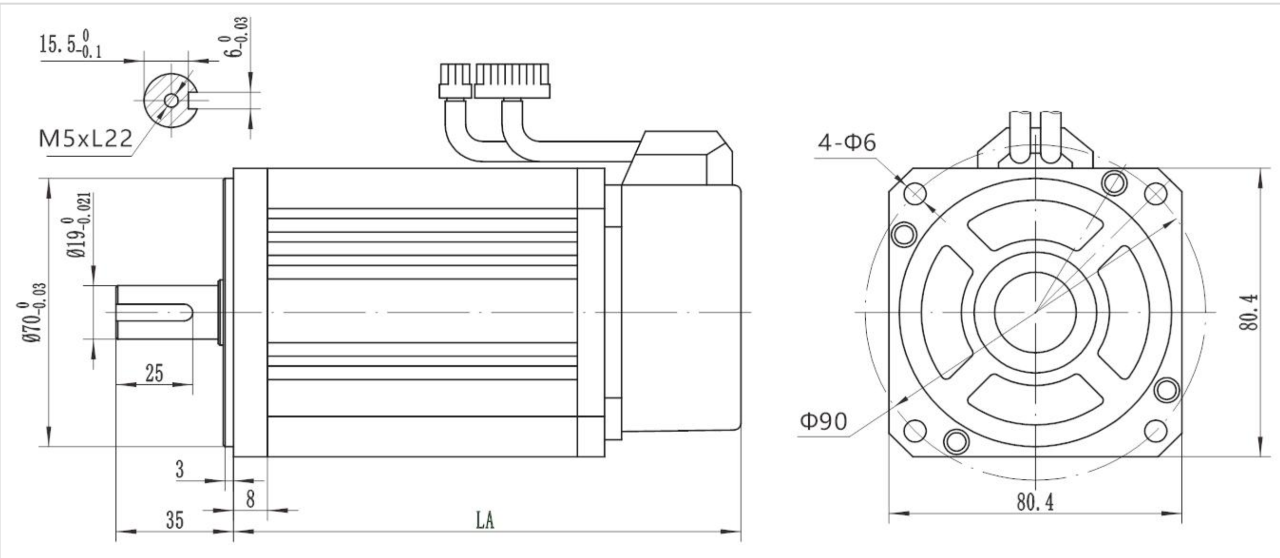


Figure 3-10 Installation dimension drawing of WE series 80 flange servo motor

(4) Installation dimensions of WE series 110 flange servo motor

Specification	WE series 110 flange motor		
Rated torque (N*m)	4	5	6
LA without brake (mm)	189	204	219
LA with brake (mm)	254	269	284

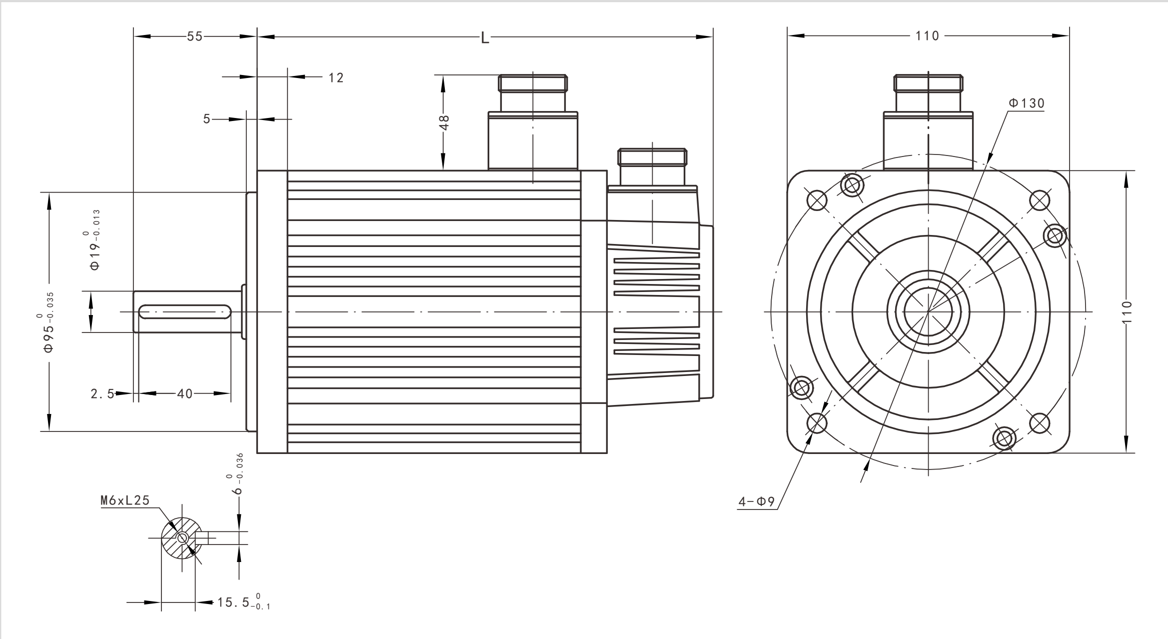


Figure 3-11 Installation dimensions of WE series 110 flange servo motor

(5) Installation dimensions of WE series 130 flange servo motor

Specification	WE series 130 flange motor							
Rated torque (N*m)	4	5	6	7.7	10		15	
					1500rpm	2500rpm	1500rpm	2500rpm
LA without brake (mm)	166	171	179	192	213	209	241	231
LA with brake (mm)	226	231	239	252	276	272	304	294

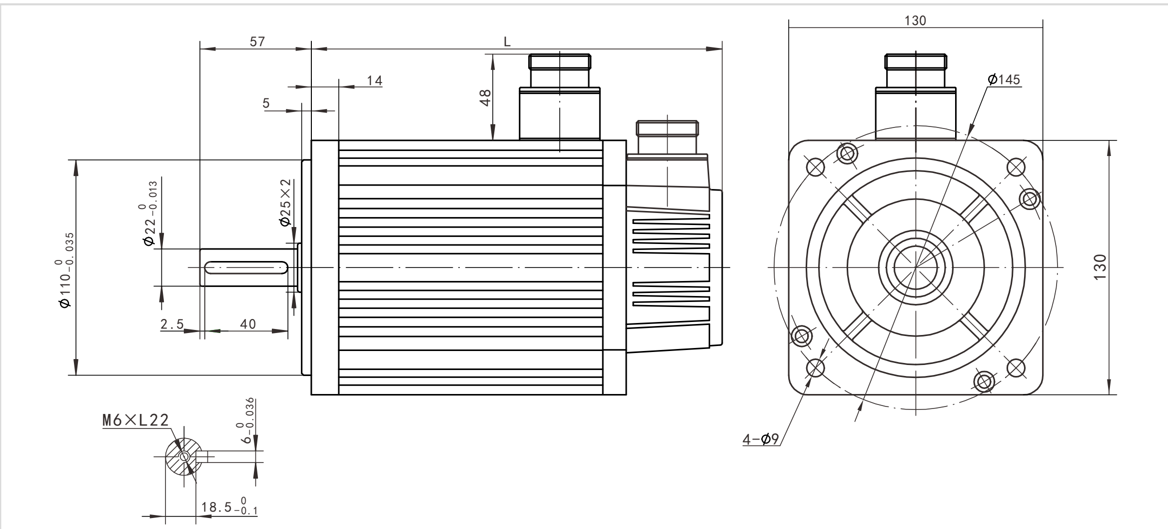


Figure 3-12 Installation dimension drawing of WE series 130 flange servo motor

(6) Installation dimensions of WE series 180 flange servo motor

Specification	WE series 180 flange motor					
Rated torque (N*m)	17	19	21.5	27	35	48
LA without brake (mm)	226	232	243	262	292	346
LA with brake (mm)	298	304	315	334	364	418

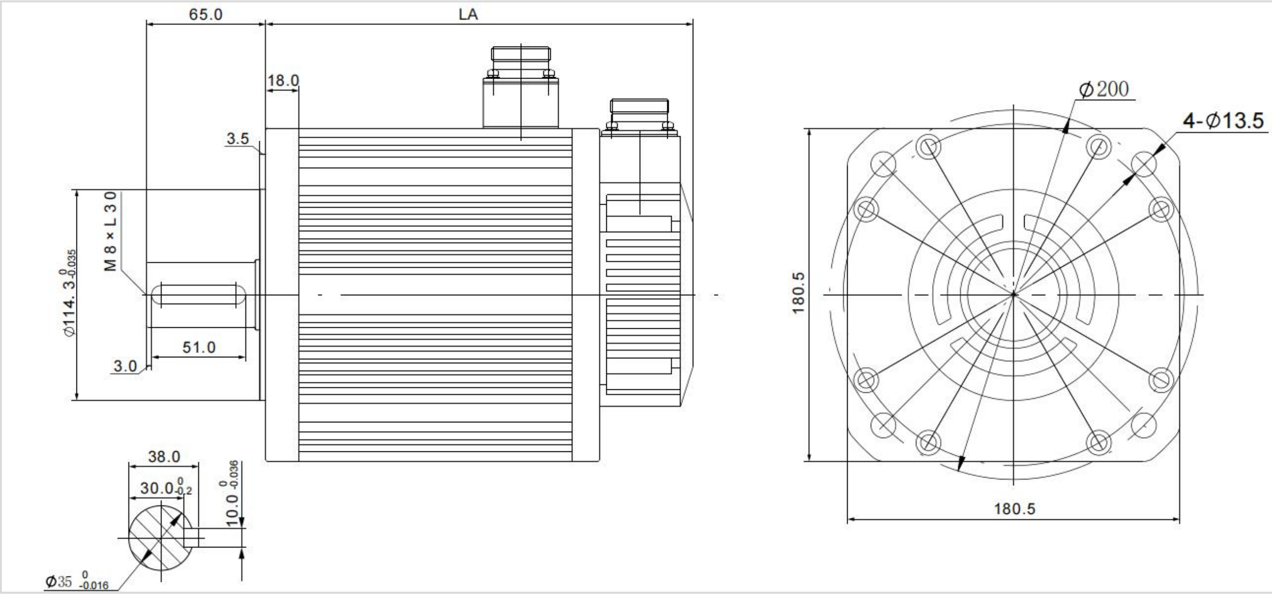


Figure 3-13 Installation dimension drawing of WE series 180 flange servo motor

3.2.2 Installation site

1. Do not use the motor near corrosive, flammable gas environment, combustible materials such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali, salt, etc.
2. Do not remove the oil seal in places where there is grinding fluid, oil mist, iron powder, cutting, etc.
3. Do not use the motor in a closed environment. A closed environment will cause high temperature of the motor and shorten the service life.
4. Install the motor far away from heat sources such as stoves.

3.2.3 Installation environment

The installation environment of the servo motor has a direct impact on the normal function of it and its service life. Therefore, the installation environment of the servo motor must meet the following conditions:

Project	Specification
Ambient temperature	-10℃ to 40℃ (no freezing)
Ambient humidity	-20% to 90%RH (no condensation)
Storage temperature	-20℃ to 60℃
Storage humidity	-20% to 90%RH (no condensation)
Protection level	IP65 (VD3E: Available, VD5: N/A)
Vibration	Less than 0.5G (4.9m/s^2), 10 to 60Hz (non-continuous operation)

3.2.4 Installation precautions

Project	Specification
Rust inhibitor	Before installation, please wipe clean the "anti-rust agent" on the shaft extension end of the servo motor, and then do the relevant anti-rust treatment.
Encoder notice	✎When installing a pulley on a servo motor shaft with a keyway, use a screw hole at the shaft end. In order to install the pulley, first insert the double-headed nail into the screw hole of the shaft, use a washer on the surface of the coupling end, and gradually lock the pulley into the pulley with a nut; ✎For the servo motor shaft with keyway, use the screw hole on the shaft end to install; ✎For axis without keyway, adopt friction coupling or similar methods ✎When removing the pulley, use a pulley remover to prevent the bearing from being strongly impacted by the load; ✎To ensure safety, install a protective cover or similar device in the rotating area, such as a pulley installed on the shaft.
Centering	When linking with the machine, please use the coupling, and keep the axis of the servo motor and the axis of the machine in a straight cable.
Installation direction	The servo motor can be installed horizontally or vertically.
Oil and water countermeasures	When using in a place with dripping water, please use it after confirming the protection level of the servo motor. When using it in a place where oil drips on the shaft penetration part, do not remove the oil seal of the servo motor. The use conditions of the servo motor with oil seal: ✎When using, please make sure the oil level is lower than the lip of the oil seal; ✎The oil seal can be used in a state with a good degree of splashing of oil foam; ✎When the servo motor is installed vertically upwards, please be careful not to accumulate oil on the oil seal lip.
Stress condition of the cable	Do not "bend" the wire or apply "tension" to it, especially the signal wire whose core diameter is 0.2mm or 0.3mm. During the wiring process, please do not make it too tight.

Project	Specification
Processing of the connector part	Regarding the connector part, please note the following matters: ✎When connecting the connector, please make sure that there is no foreign matter such as garbage or metal pieces in the connector; ✎When connecting the connector to the servo motor, be sure to connect it from the side of the main circuit cable of the servo motor first, and the grounding of the main cable cable must be reliably connected. If you connect one side of the encoder cable first, the encoder may malfunction due to the potential difference between PEs; ✎When connecting, please make sure that the pin arrangement is correct; ✎The connector is made of resin, please do not apply impact to avoid damage to the connector; ✎Do not apply stress to the connector part during handling while the cable is connected. If stress is applied to the connector part, the connector may be damaged.

Chapter 4 Wiring

4.1 Main circuit wiring

4.1.1 Main circuit terminals

(1) Main circuit terminal distribution of VD5L

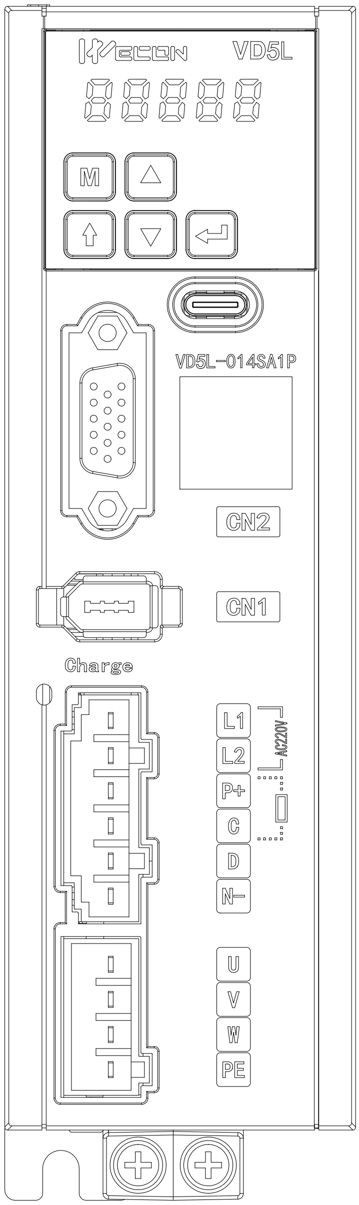


Figure 4-1 VD5L servo drive main circuit terminal schematic

Table 4-1 Name and function of main circuit terminal of VD5L type A servo drive

Terminal number	Terminal name	Terminal function
L1	Power supply input terminal	Single-phase 220V AC input is connected to L1 and L2.
L2		
P+	Braking resistor terminal	Use internal braking resistor: short connected C-D. Use an external braking resistor: please disconnect the short wire between C-D, and then connect the external braking resistor between P+ and C;
C		
D		
P+	Common DC bus terminal	Common DC bus terminal of servo drive
N-		
U	Motor power cable terminal	Connect with the U, V, W of the motor to supply power to the motor.
V		
W		
PE	Ground terminal	Grounding of the servo drive.

(2) Main circuit terminal distribution of VD5E

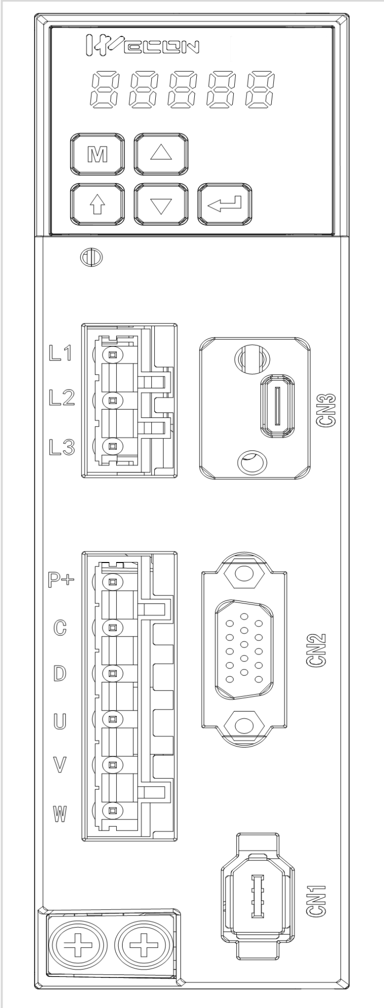


Figure 4-2 VD5E Servo drive main circuit terminal schematic

Table 4-2 Name and function of main circuit terminal of VD5E servo drive

Terminal number	Terminal name	Terminal function
L1	Power supply input terminal	Single-phase 220V AC input is connected to L1 and L3.
L2		
L3		
P+	Braking resistor terminal	Use internal braking resistor: short connected C-D. Use an external braking resistor: please disconnect the short wire between C-D, and then connect the external braking resistor between P+ and C;
C		
D		
U	Motor power cable terminal	Connect with the U, V, W of the motor to supply power to the motor.
V		
W		
PE	Ground terminal	Grounding of the servo drive.

4.1.2 Power wiring example

(1) VD5L servo driver three-phase 220V main circuit wiring

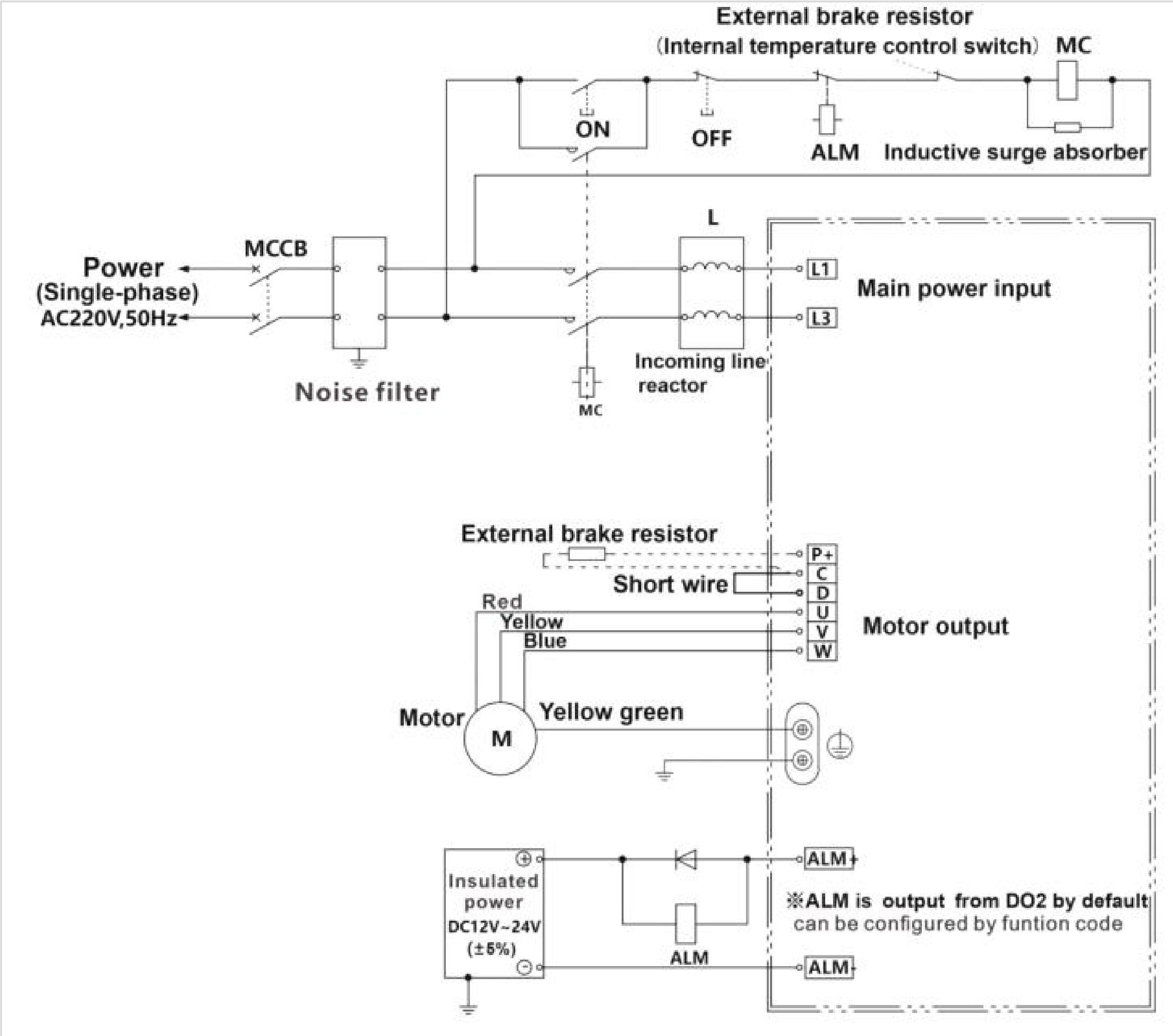


Figure 4-3 VD5L servo driver single-phase 220V main circuit wiring

(2) VD5E servo driver three-phase 380V main circuit wiring

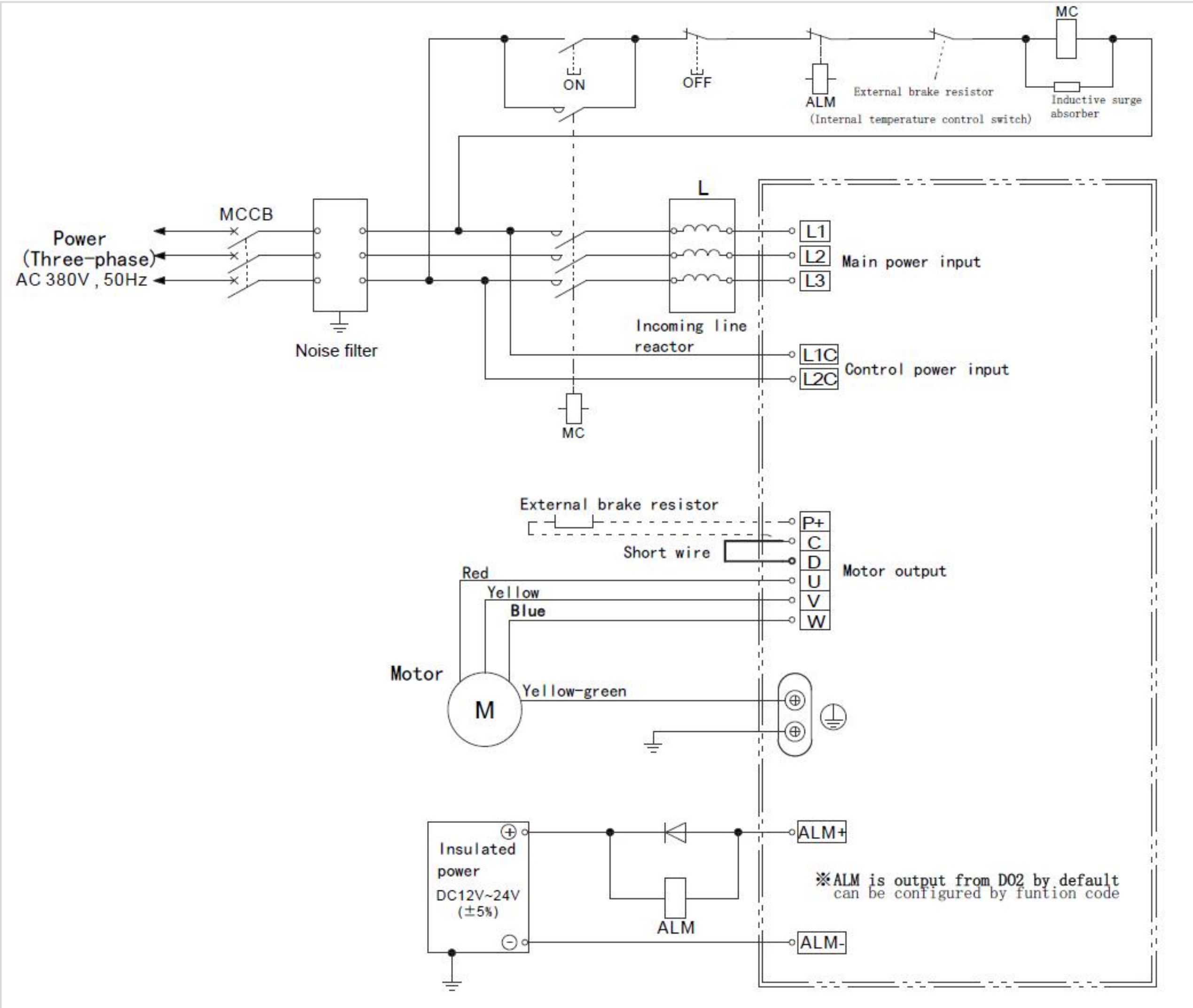


Figure 4-5 VD5E servo driver three-phase 380V main circuit wiring

4.1.3 Precautions for main circuit wiring

① The input power cable cannot be connected to the output terminals U, V and W, otherwise the servo drive will be damaged. When using the built-in braking resistor, C and D must be connected (factory default connection).

② When the cables are bundled and used in pipes, etc., due to the deterioration of heat dissipation conditions, please consider the allowable current reduction rate.

③ When the temperature in the cabinet is higher than the cable temperature limit, please choose a cable with a larger cable temperature limit, and it is recommended that the cable wire use Teflon wire. Please pay attention to the warmth of the cable in the low temperature environment. Generally, the surface of the cable is prone to hardening and breakage under the low temperature environment.

④ The bending radius of the cable should be more than 10 times the outer diameter of the cable itself to prevent the core of the cable from breaking due to long-term bending.

4.2 Power cable connection of servo drive and servo motor

4.2.1 Power cable

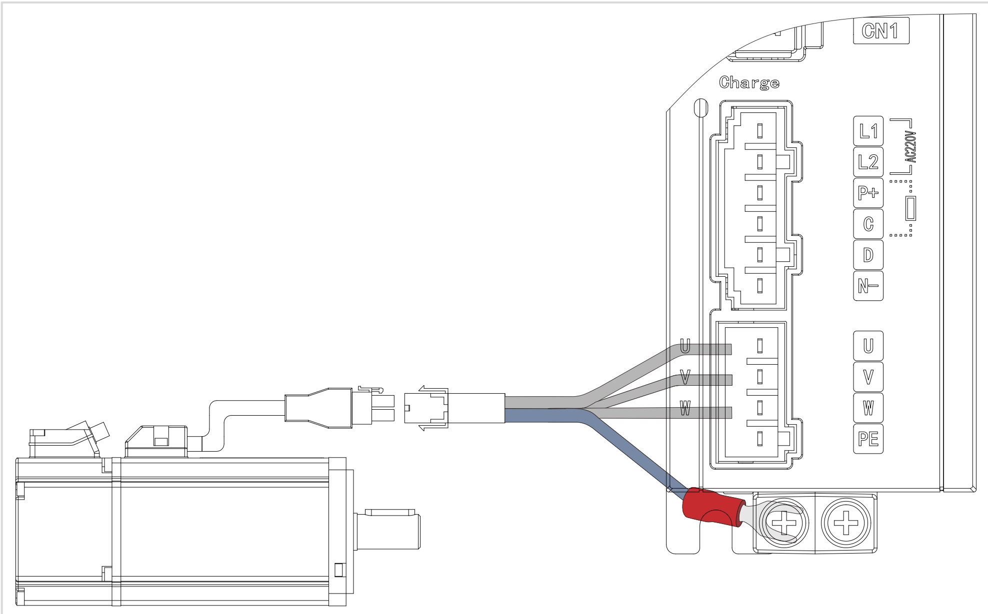
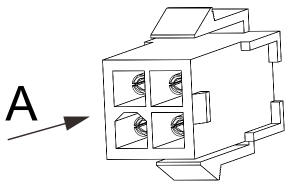
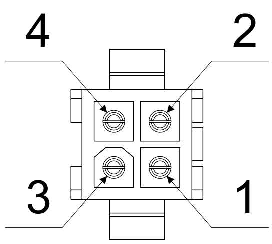
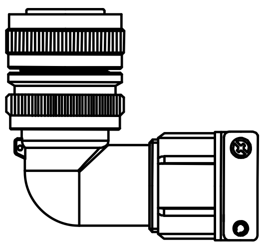
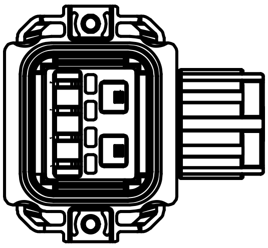
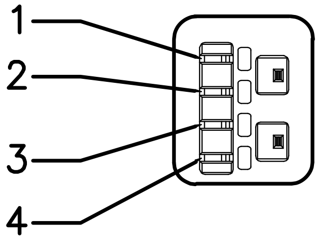


Figure 4-6 Connection schematic diagram of servo drive and servo motor

Wecon VD5 series servo drives have 3 kinds of interface power cables: rectangular plug, aviation plug and in-cable type.

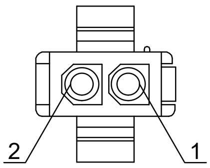
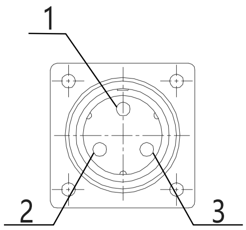
Table 4-3 Power cable servo motor side connector

Connector exterior	Terminal pin distribution	Pin description			Motor flange
		Rectangular plug			40 60 80
		Pin number	Signal name	Color	
		1	U	Red	
		2	V	White	
		3	W	Black	
		4	PE	Yellow-green	
		Aviation plug			110 130 180
		Pin number	Signal name	Color	
		2	U	Red	
		4	V	Yellow	
		3	W	Blue	
		1	PE	Yellow-green	

<table>
<tr><th>Connector exterior</th><th>Terminal pin distribution</th><th colspan="3">Pin description</th><th>Motor flange</th></tr>
<tr><td rowspan="6"></td><td rowspan="6">
</td><td colspan="3">In-cable type plug</td><td rowspan="6">60
80</td></tr>
<tr><th>Pin number</th><th>Signal name</th><th>Color</th></tr>
<tr><td>3</td><td>U</td><td>Red</td></tr>
<tr><td>1</td><td>V</td><td>White</td></tr>
<tr><td>2</td><td>W</td><td>Black</td></tr>
<tr><td>4</td><td>PE</td><td>Yellow-green</td></tr>
</table>

✎**Note:** The color of the cables is subject to the actual product. The cables described in this manual are all cables of Wecon.

4.2.2 Brake device cable

<table>
<tr><th colspan="2">Connector</th><th colspan="2">Pin description</th><th>Flange</th></tr>
<tr><td rowspan="3">WD Series</td><td rowspan="3">
</td><th>Pin number</th><th>Signal name</th><td rowspan="3">60
80</td></tr>
<tr><td>1</td><td>BR+</td></tr>
<tr><td>2</td><td>BR-</td></tr>
<tr><td rowspan="4">WE Series</td><td rowspan="4">
</td><th>Pin number</th><th>Signal name</th><td rowspan="4">80
110</td></tr>
<tr><td>1</td><td>DC 24V</td></tr>
<tr><td>2</td><td>GND</td></tr>
<tr><td>3</td><td>-</td></tr>
</table>

4.3 Encoder cable connection of servo drive and servo motor

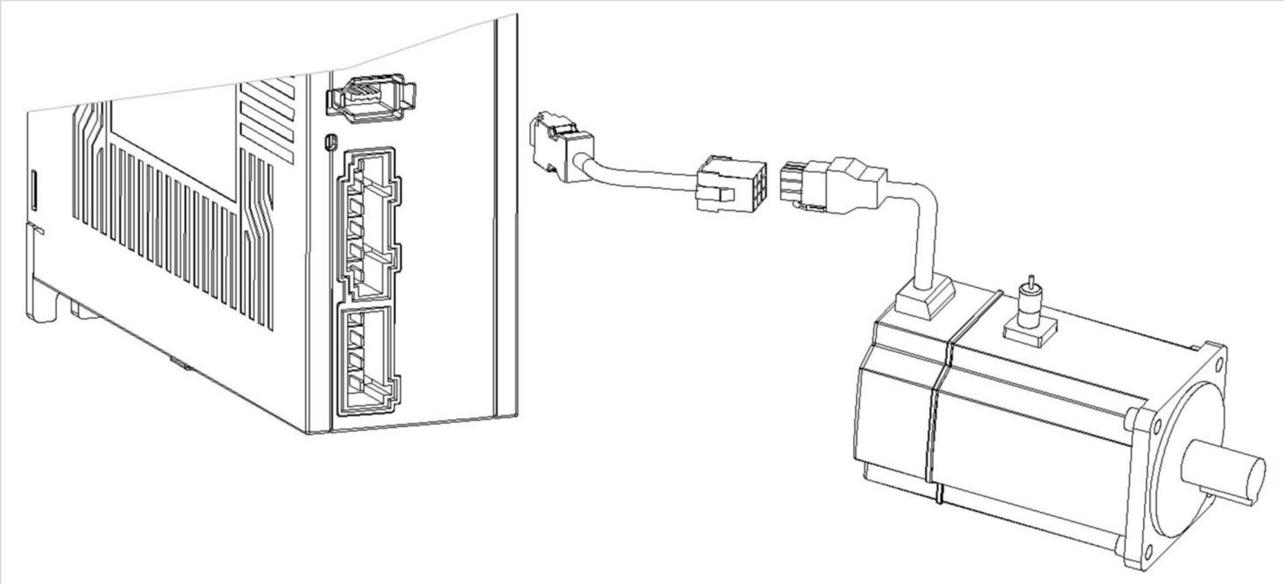


Figure 4-7 Encoder cable connection schema

Table 4-4 Encoder cable servo drive side connector

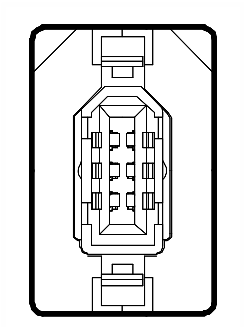
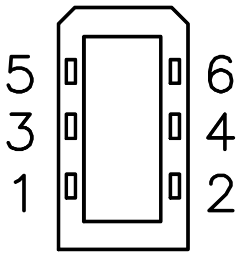
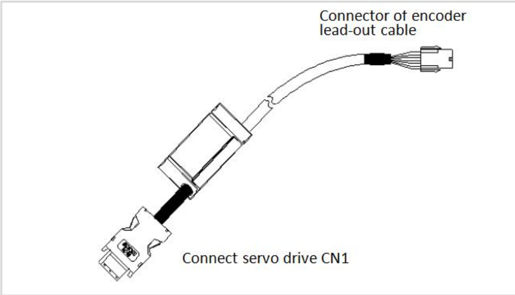
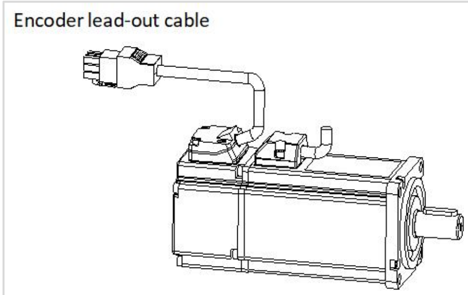
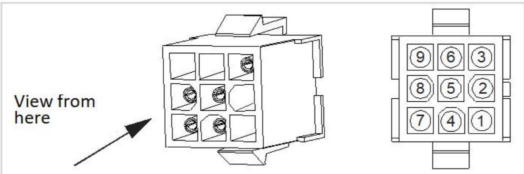
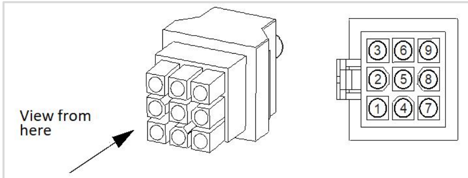
<table>
<tr><th>Connector exterior</th><th>Terminal pin distribution</th><th>Pin description</th></tr>
<tr>
<td></td>
<td>
</td>
<td>
<table>
<tr><th>Pin number</th><th>Signal name</th></tr>
<tr><td>1</td><td>5V</td></tr>
<tr><td>2</td><td>GND</td></tr>
<tr><td>3</td><td>-</td></tr>
<tr><td>4</td><td>-</td></tr>
<tr><td>5</td><td>SD+</td></tr>
<tr><td>6</td><td>SD-</td></tr>
</table>
</td>
</tr>
</table>

Table 4-5 Absolute encoder cable connector (Rectangular plug)

<table>
<tr><th colspan="2">Connector shape and terminal pin distribution</th><th>Adapted motor Flange</th></tr>
<tr><td>
</td><td>
</td><td rowspan="3">60
80</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">(see pin table below)</td></tr>
</table>

Pin number	Signal name
7	5V
8	GND
4	SD+
5	SD-
3	Shield
1	Battery+
2	Battery-

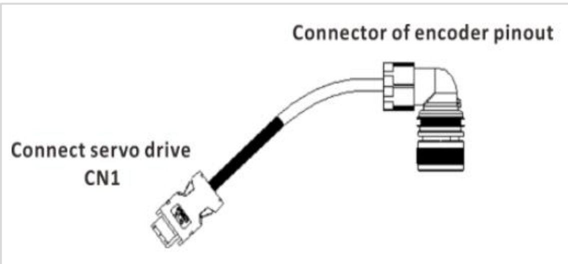
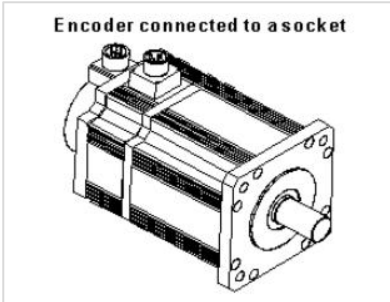
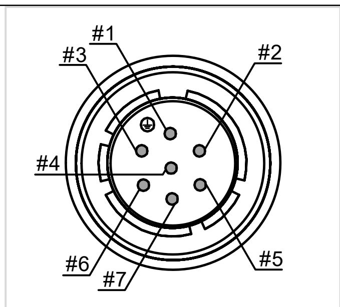
Table 4-6 Encoder cable pin connection relationship

Drive side J1394		Description	Motor side	
Pin number	Signal name		Rectangular plug pin number	Cable color
1	5V	Encoder +5V power	7	Blue
2	GND	Encoder power ground	8	Orange
5	SD+	Serial communication signal +	4	Green
6	SD-	Serial communication signal -	5	Brown
Shell	Shield	Shield	3	-
-	-	Battery+	1*	Pink
-	-	Battery-	2*	Pink-Black

The pin with "*" indicates the signal cable of encoder battery. If the multi-turn battery memory function is not used, you don't need to connect the signal cables. It is only used as single turn encoder cable at this time.

✎**Note:** The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!

Table 4-7 Absolute value encoder cable connector (aviation plug)

<table>
<tr><th colspan="2">Connector shape and terminal pin distribution</th><th>Adapted motor flange</th></tr>
<tr><td>
</td><td>
</td><td rowspan="3">110
130</td></tr>
<tr><td></td><td>
</td></tr>
<tr><td colspan="2">

Pin number	Signal name
7	5V
5	GND
6	SD+
4	SD-
1	Shield
3	Battery+
2	Battery-

</td></tr>
</table>

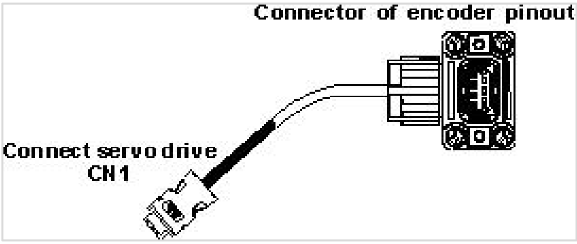
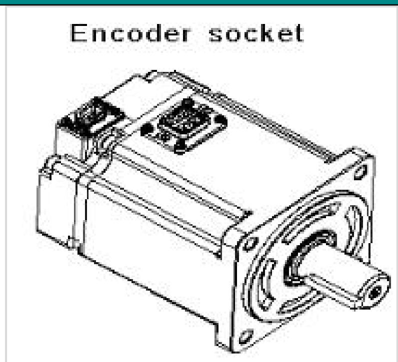
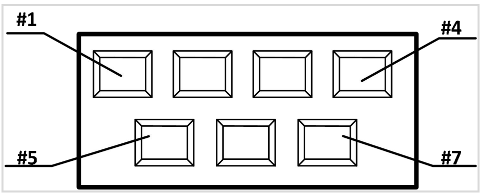
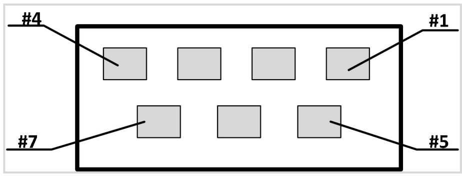
Table 4-8 Encoder cable pin connection relationship

Drive side J1394		Description	Motor side	
Pin number	Signal name		Aviation plug pin number	Cable color
1	5V	Encoder +5v power	7	Blue
2	GND	Encoder power ground	5	Orange
5	SD+	Serial communication signal +	6	Green
6	SD-	Serial communication signal -	4	Brown
Shell	Shield	Shield	1	-
-	-	Battery+	3*	Pink
-	-	Battery-	2*	Pink-Black

The pin with “*” indicates the signal cable of encoder battery. If the multi-turn battery memory function is not used, you don’t need to connect the signal cables. It is only used as single turn encoder cable at this time.

✎**Note:** The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!

Table 4-9 Absolute value encoder cable connector L type (Straight plug)

Connector shape and terminal pin distribution		Adapted motor Flange
		60 80
		

Pin number	Signal name
7	5V
5	GND
6	SD+
4	SD-
1	Shield
3	Battery+
2	Battery-

Table 4-10 Encoder cable pin connection

Drive side J1394		Description	Motor side	
Pin number	Signal name		Aviation plug pin number	Cable color
1	5V	Encoder +5v power	7	Blue
2	GND	Encoder power ground	5	Orange
5	SD+	Serial communication signal +	6	Green
6	SD-	Serial communication signal -	4	Brown
Shell	Shield	Shield	1	-
--	--	Battery+	3*	Brown
--	--	Battery-	2*	Black

The pins with * indicate the signal lines of the encoder battery. If the user does not use the multi-turn memory function, these two signal lines can be disconnected and they are only used as single-turn encoder lines.

✎**Note:** The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!

Table 4-11 Absolute value encoder cable connector L2 type (Straight plug)

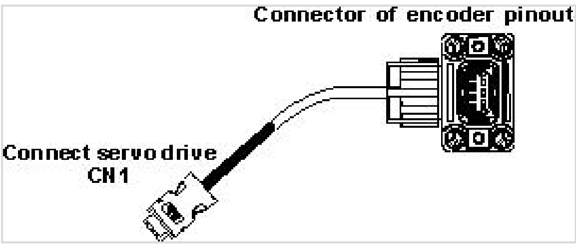
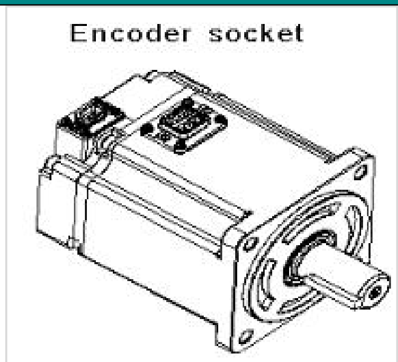
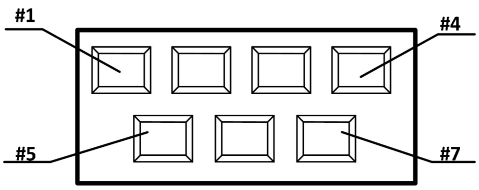
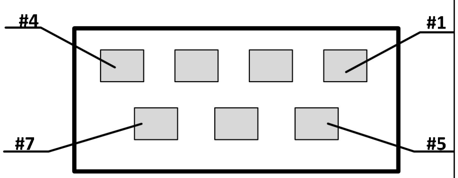
<table>
<tr><th colspan="2">Connector shape and terminal pin distribution</th><th>Adapted motor Flange</th></tr>
<tr><td></td><td></td><td rowspan="3">60
80</td></tr>
<tr><td></td><td></td></tr>
<tr><td colspan="2">
<table>
<tr><th>Pin number</th><th>Signal name</th></tr>
<tr><td>1</td><td>5V</td></tr>
<tr><td>2</td><td>GND</td></tr>
<tr><td>3</td><td>SD+</td></tr>
<tr><td>4</td><td>SD-</td></tr>
<tr><td>5</td><td>Shield</td></tr>
<tr><td>6</td><td>Battery+</td></tr>
<tr><td>7</td><td>Battery-</td></tr>
</table>
</td></tr>
</table>

Table 4-12 Encoder cable pin connection relationship

Drive side J1394		Description	Motor side	
Pin number	Signal name		Aviation plug pin number	Cable color
1	5V	Encoder +5v power	1	White
2	GND	Encoder power ground	2	Brown
5	SD+	Serial communication signal +	3	Green
6	SD-	Serial communication	4	Yellow

Drive side J1394		Description	Motor side	
Pin number	Signal name		Aviation plug pin number	Cable color
		signal -		
Shell	Shield	Shield	5	-
--	--	Battery+	6*	Pink
--	--	Battery-	7*	Black

The pins with * indicate the signal lines of the encoder battery. If the user does not use the multi-turn memory function, these two signal lines can be disconnected and they are only used as single-turn encoder lines.

✎**Note:** The color of the cable is subject to the actual product. The cables described in this manual are all cables of Wecon!

4.4 Servo drive control input and output terminal wiring

4.4.1 CN2 pin distribution

(1) The VD5L servo drive controls the pin distribution of the input and output (CN2 interface)

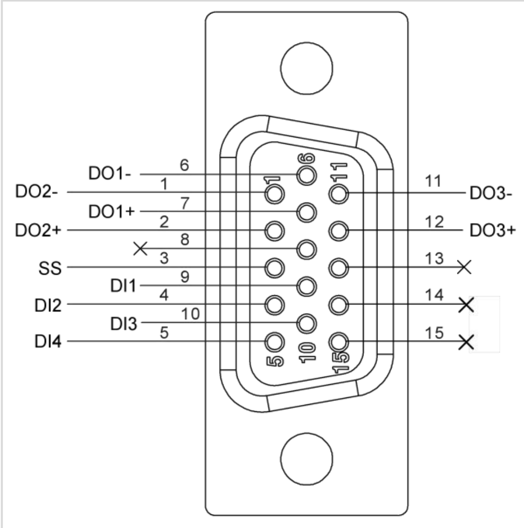


Figure 4-8 The VD5L drive controls the pin distribution of the input and output

Table 4-13 CN2 Interface Definition

Pin number	Signal name	Pin number	Signal name	Pin number	Signal name
1	DO2-	6	DO1-	11	DO3-
2	DO2+	7	DO1+	12	DO3+
3	SS	8	-	13	-
4	DI2	9	DI1	14	-
5	DI4	10	DI3	15	-

(2) The VD5E servo drive controls the pin distribution of the input and output (CN2 interface)

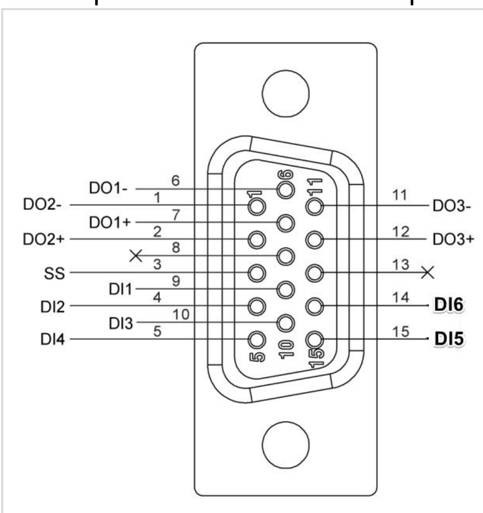


Figure 4-9 The VD5E drive controls the pin distribution of the input and output

Table 4-14 CN2 Interface Definition

Pin number	Signal name	Pin number	Signal name	Pin number	Signal name
1	DO2-	6	DO1-	11	DO3-
2	DO2+	7	DO1+	12	DO3+
3	SS	8	-	13	-
4	DI2	9	DI1	14	DI6
5	DI4	10	DI3	15	DI5

4.4.2 Digital input and output signals

Table 4-15 DI/DO signal description

Pin number	Signal name	Default function
9	DI1	None
4	DI2	Fault and warning clear
10	DI3	Forward drive prohibition
5	DI4	Reverse drive prohibition
14	DI6	None
15	DI5	None
3	SS	Power input (12 to 24V)
6	DO1-	Rotation detection
7	DO1+	
1	DO2-	Fault signal
2	DO2+	
11	DO3-	Servo ready
12	DO3+	

1) Digital input circuit

Taking DI1 as an example, the interface circuits of DI1 to DI6 are exactly the same.

When the control device(HMI/PLC) is relay output.

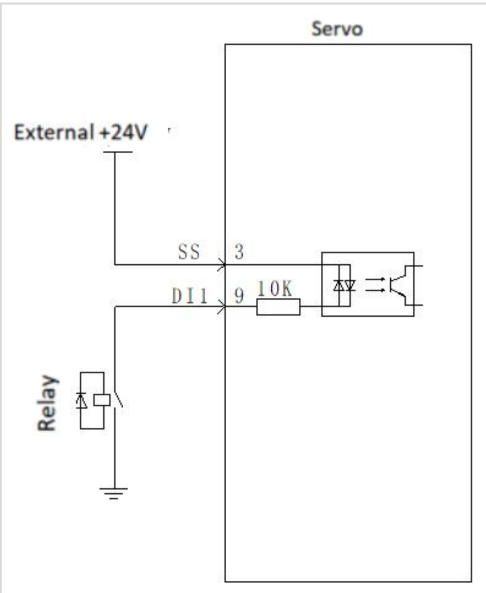


Figure 4-10 Relay output

When the control device(HMI/PLC) is open collector output

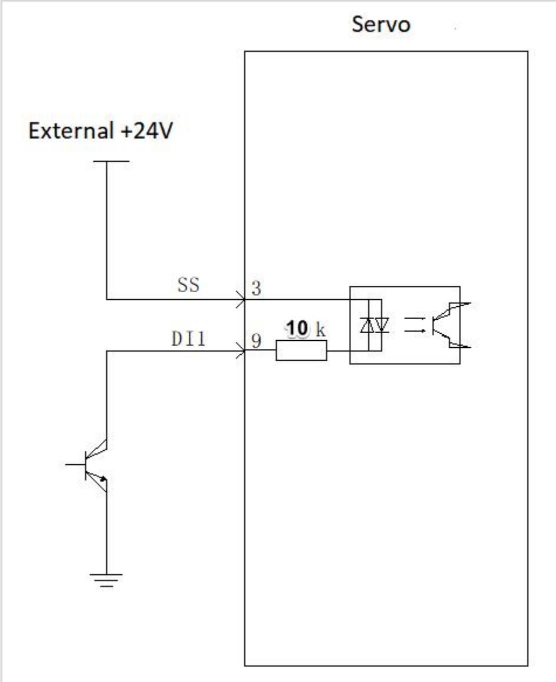


Figure 4-11 Open collector output

Digital output circuit

Taking DO1 as an example, the interface circuits of DO1 to DO3 are exactly the same.
When the control device(HMI/PLC) is relay input

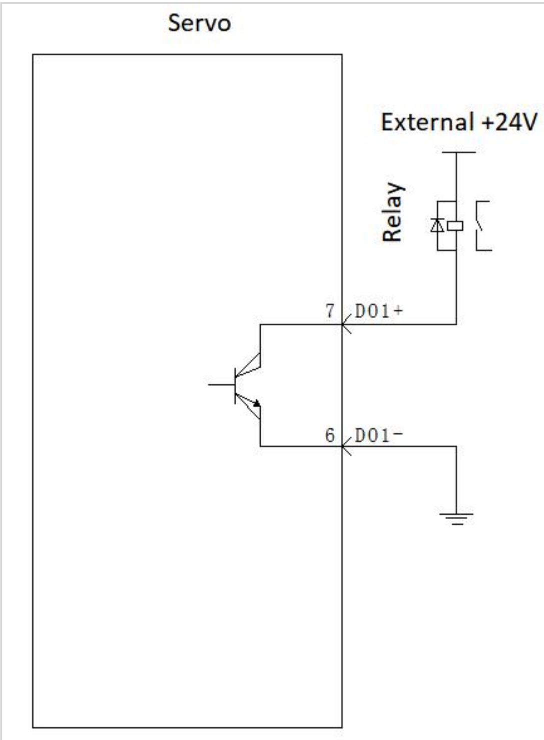


Figure 4-12 Relay input

When the control device(HMI/PLC) is optocoupler input

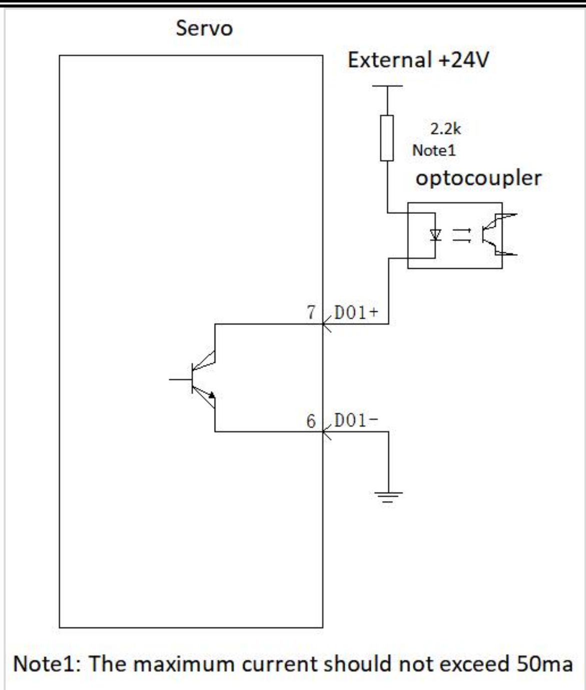


Figure 4-13 Optocoupler input

4.4.3 Brake wiring

The brake is a mechanism that prevents the servo motor shaft from moving when the servo drive is in a non-operating state, and keeps the motor locked in position, so that the moving part of the machine will not move due to its own weight or external force.

The brake input signal is non-polar, and the user needs to prepare 24V power supply. The standard connection diagram of brake signal BK and brake power supply is as follows:

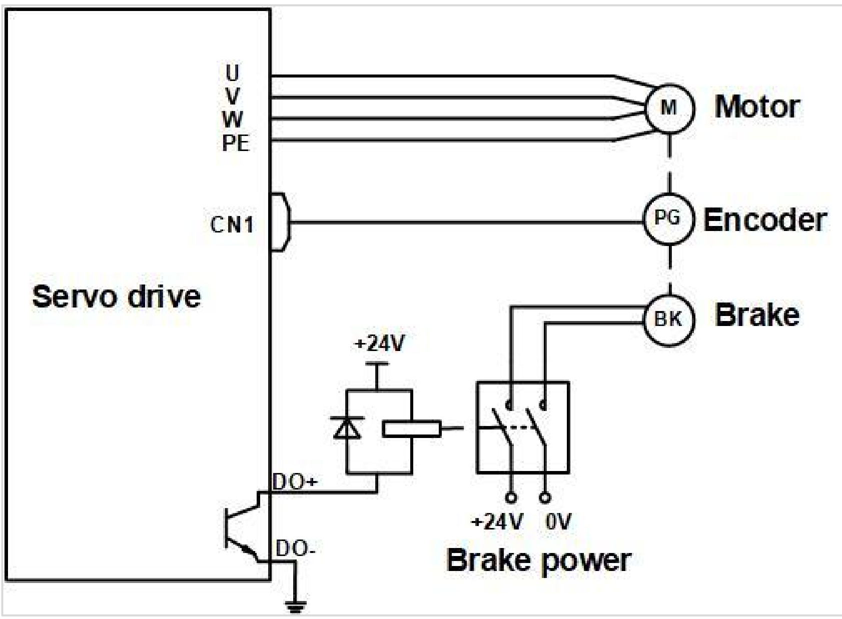


Figure 4-14 Brake wiring (Taking three-phase 220V input as an example)

4.5 Communication signal wiring

The CN5 port of the first servo drive is connected to Wecon PLC LX6V. (VD5L is the same as VD5E).

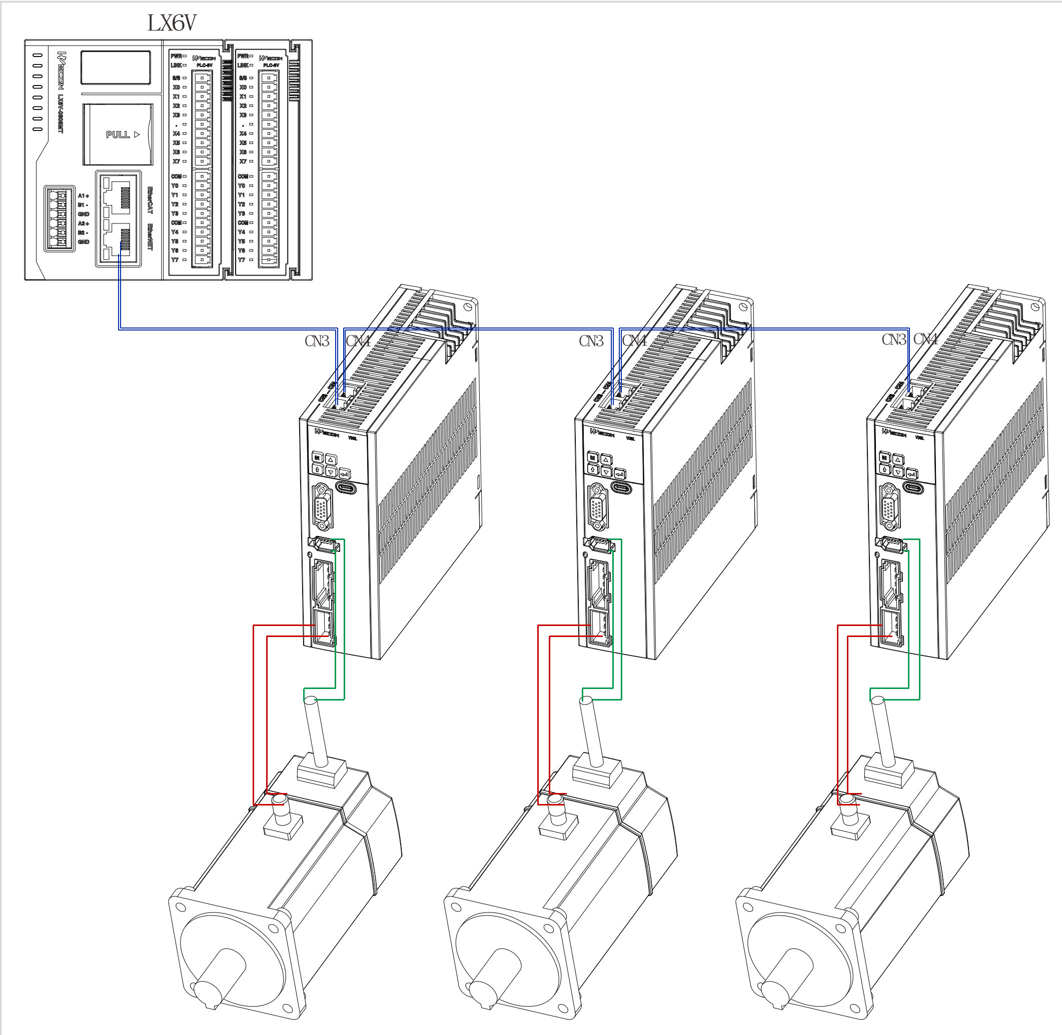


Figure 4-15 Communication topology networking schema

Table 4-16 CN3/ CN4 interface definition

Pin	Name	Function description
1	TX+	Data send+
2	TX-	Data send-
3	RX+	Data receive+
4	-	-
5	-	-
6	RX-	Data receive-
7	-	-
8	-	-

Chapter 5 Panel composition

5.1 Panel composition

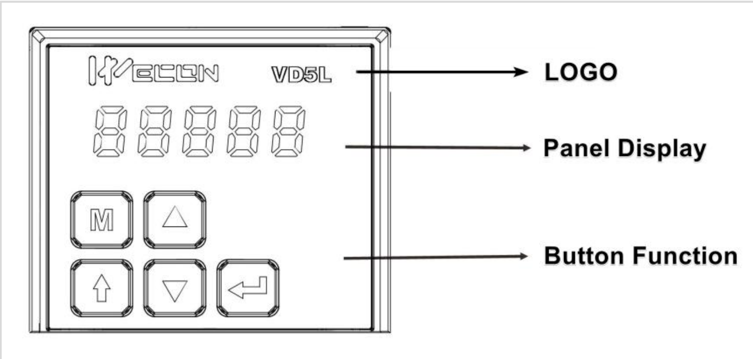
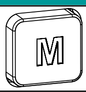
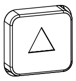
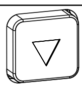
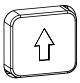
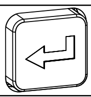


Figure 5-1 Appearance schematic diagram of servo drive panel

The panel of Wecon VD5 series bus servo drive is composed of a display (5-bit LED digital tube) and buttons, which can be used for various display and parameter setting functions of servo drive. Taking parameter setting as an example, the conventional functions of buttons are shown in Table 5-1.

Table 5-1 Brief introduction of button function

Icon	Name	Function
	Mode	①Mode switching ② Return to the previous menu
	Up	Increase the value of the LED flashing bit
	Down	Decrease the value of the LED flashing bit
	SHIFT	① Change the LED flashing bit ② View the high-order values of data with a length greater than 4-bit
	Confirm	① Enter the next menu ① Execute instructions such as storing parameter setting values

5.2 Panel display

When servo drive is in operation, the panel could be used for status display, parameter display, fault display and monitoring display of the servo.

Status display: Display the current operating status of servo drive.

Parameter display: Display the object dictionary and the setting value of the object dictionary corresponding to different functions.

Fault display: Display the fault code of servo drive.

Monitor display: Display the current operating parameter values of servo drive.

5.2.1 Display switching

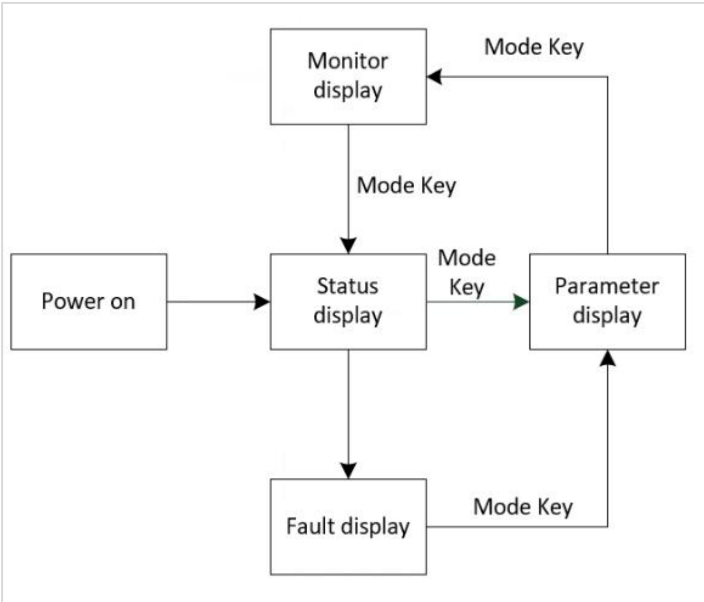


Figure 5-2 Switching schema of each display type of panel

Description:

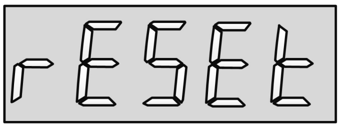
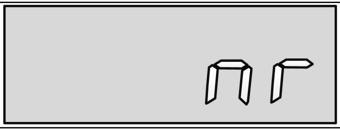
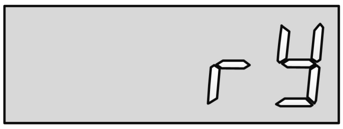
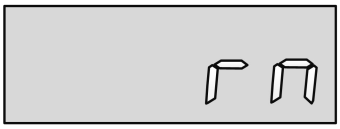
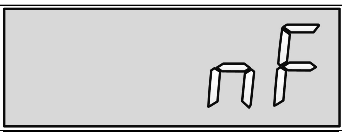
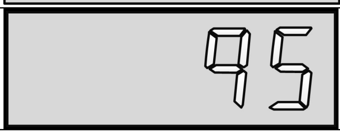
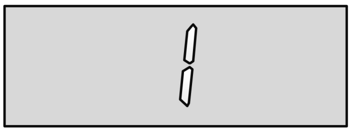
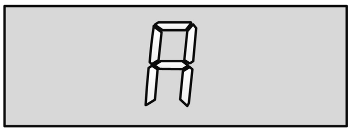
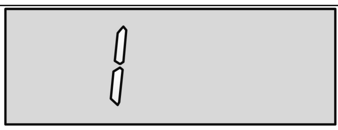
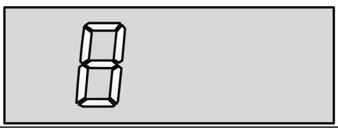
①Power on, the panel display of the servo drive enters [status display mode]

② When an operation failure occurs, the panel immediately switches to the bit failure display mode, and all the digital tubes flash synchronously, press the "mode" key to switch to the parameter display mode.

③Press the "Mode" key to switch between different display modes. The switching conditions are shown in Figure 5-2.

5.2.2 Status display

Table 5-2 Status display example

Display	Name	Display occasion	Meaning
	reset Servo initialization	Servo drive is powered on within 1 second	The servo drive is in an initialized or reset state. After waiting for initialization or reset to complete, automatically switch to other states
	nr Servo is not ready	After initialization is complete, but servo is not ready	The servo drive is in a non-operational state
	ry Servo ready	Servo ready	The servo is in a ready state, waiting for the upper computer to give an enable signal
	rn Servo is running	Servo enable signal is active (S-ON is ON status)	The servo drive is in operation
	nF Servo fault -free	Servo drive has no fault	Servo drive has no fault
	qs Servo fast stop	The servo is in fast stop state	The servo is in fast stop state
 	1 to A Control mode	-	Displays the current operation mode of the servo drive in hexadecimal digital form: 1: Profile Position Mode 3: Profile velocity mode 4: Profile torque mode 6: Homing mode 8: Cyclic Synchronous Position Mode 9: Cyclic Synchronous velocity Mode A: Cyclic synchronous torque mode
 	1 to 8 Communication status	-	Displays the Ether CAT state machine status of the slave station in character form: 1: Initialization state 2: Pre-operating status 4: Safe operation status

Display	Name	Display occasion	Meaning
			8: Operating status
	CN4 Interface connection indication	-	Keep dark constantly: No communication connection detected Keep bright constantly: A communication connection has been established
	CN3 Interface connection indication	-	

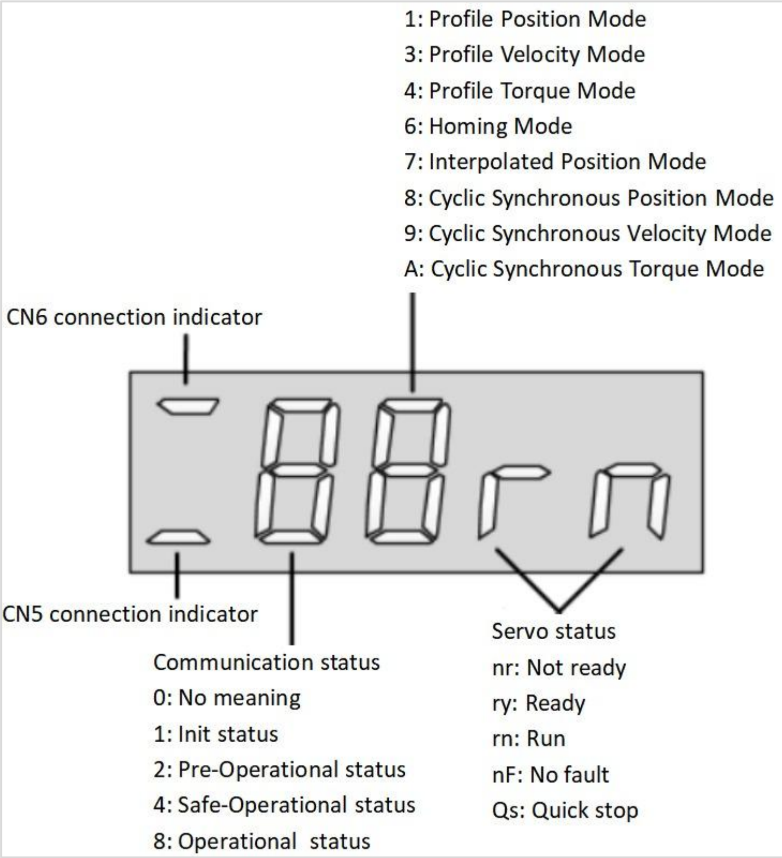


Figure 5-3 Status indication schema

5.2.3 Parameter display

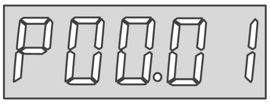
Wecon VD5 series bus servo drive is divided into 13 groups of function codes according to different parameters and functions, which can quickly locate the position of function codes according to the group of function codes. For specific parameters, please refer to “**Chapter 8 Object Dictionary**”.

(1) Parameter group display

The parameter display is the display of different function codes. The format of the function code is PXX.YY, where PXX represents the group number of the function code, and YY represents the number within the function code group.

Display	Name	Content
PXX.YY	Function code group number	Function code group number

For example, the function code 2000.01 is shown as follows:

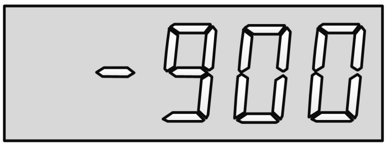
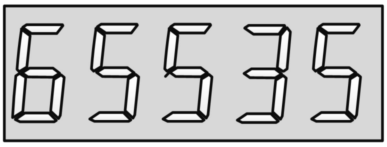
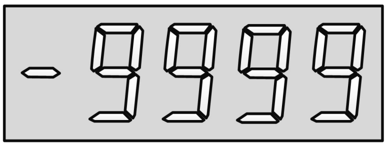
Display	Name	Content
	Function code 2000-01	00: Function code group number 01: Number in function code group

(2) Display data of different lengths

①Data display of four digits and below

Using single page display, if it is a signed number, the highest bit of the data is "-".

Example:

Display		
		

②Display data more than five-bits

Display in pages from low to high digits, each 4-bit is a page. Display method: current page + current value, as shown, switch the current page by pressing the "shift" key.

For example: 2147483646 is displayed as follows:

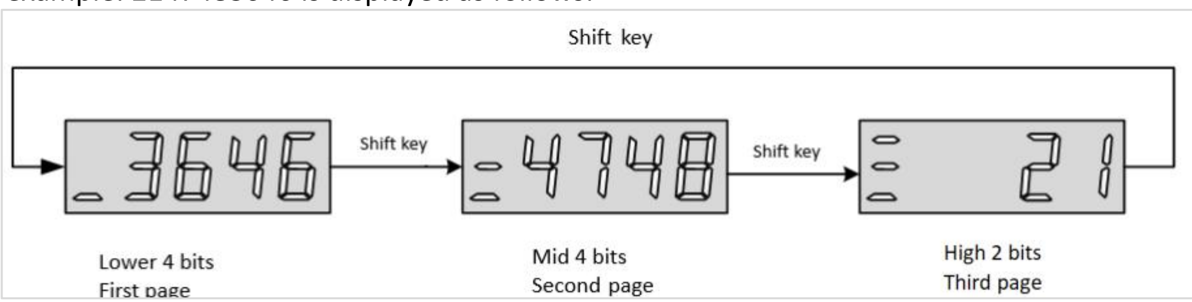


Figure 5-4 2147483646 Display action

For example: -2147483647 is displayed as follows:

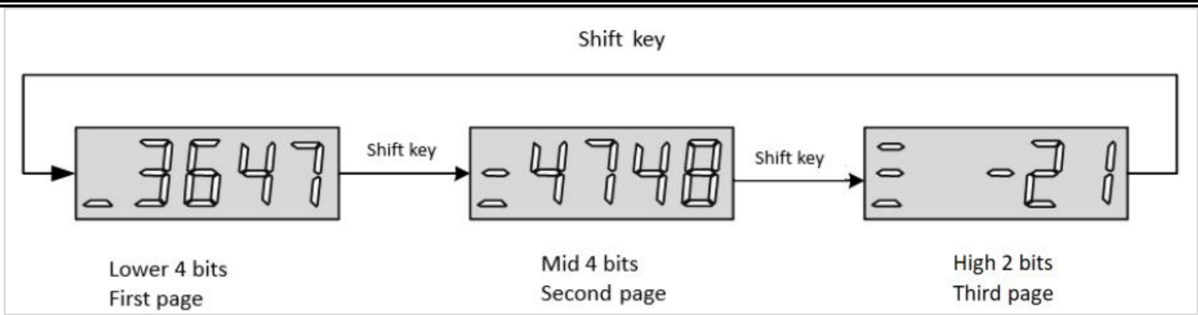
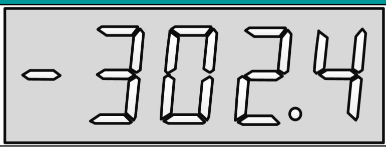
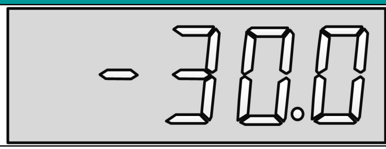


Figure 5-5 -2147483647 Display operation

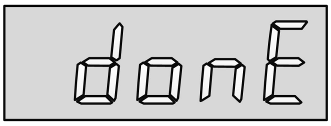
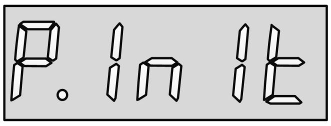
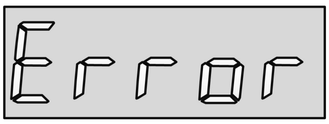
(3) Decimal point display

Digital tube of individual bit data ". " represents the decimal point, and the decimal point ". " no flashing, as shown below:

Display	
	

(4) Parameter setting display

Table 5-3 Parameter setting display

Display	Name	Display occasion	Meaning
	Done Parameter setting completed	When restoring factory settings	The servo driver is in the process of parameter recovery and factory settings.
	P.Init Parameter restore factory setting value	When restoring factory settings	The servo drive is in the process of parameter recovery and factory settings
	Error Parameter error	Parameter setting exceeds the limit (Or not allowed to exceed the limit)	The parameter setting exceeds the limit

5.2.4 Fault display

The panel can display current or historical fault and warning codes. Please refer to the analysis and troubleshooting of faults and warnings"Chapter 10 Malfunction".

When a single fault or warning occurs, the panel immediately displays the current fault or warning code; when multiple faults or warnings occur, the highest fault code is displayed. When a fault occurs, when switching from the auxiliary function to the parameter display function, the corresponding fault or warning code will be displayed. You can view the current fault and warning codes and the past five fault and warning codes through the monitor display on the panel. You can view the current fault and warning codes and the last five fault and warning codes through the monitoring display of the panel.

Table 5-4 Warning display case

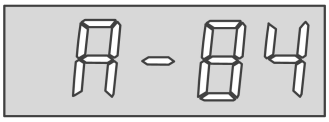
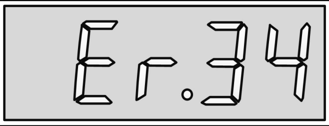
Display	Name	Content
	Parameter modification that needs to be powered on again	Modified the parameters that need to be re-powered on to take effect

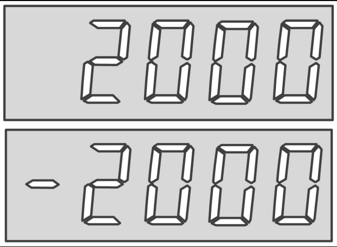
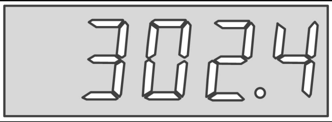
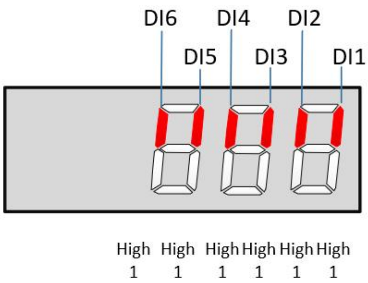
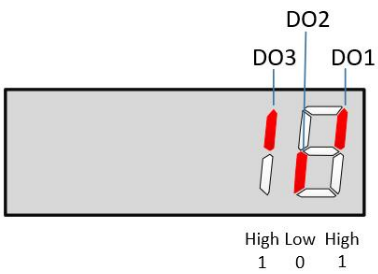
Table 5-5 Fault display case

Display	Name	Content
	Motor overload protection	Motor overload protection

5.2.5 Monitor display

After the servo drive is powered on or the servo enable is turned on, you can press the "Mode" key to enter the monitoring display mode.

Table 5-6 Monitoring display schema

Display	Monitoring volume	Name	Unit	Meaning
	U0-02	Servo motor velocity	rpm	Indicates the actual running velocity of servo motor, expressed in decimal system
	U0-31	Bus voltage	V	Indicates the voltage value , the DC bus voltage between P+ and - of the drive
	U0-17	Input signal status	-	Indicates the level status corresponding of the 6 DI terminals. The upper half of the LED light indicates high level, and the lower half light indicates low level.
	U0-19	Output signal status	-	Indicates the level status corresponding of the 3 DO terminals. The upper half of the LED light indicates high level, and the lower half light indicates low level.

5.3 Panel operation

5.3.1 Parameter setting

The servo drive panel can be used to set parameters. For details, please refer to "Chapter 8 Object Dictionary" Taking 2000.01 as an example, the control mode of servo drive is changed from position control mode to velocity control mode. The specific setting steps are shown in Figure 5-6.

Steps:

① The power supply is in nF state after power on.

② Press "Mode" to enter the function code parameter interface.

③ Press "Confirm" to enter the function code value modification interface after completing the function code selection.

④ Press the "Up" and "Down" to modify the parameter value.

⑤ Press the "Confirm" twice to complete the value modification.

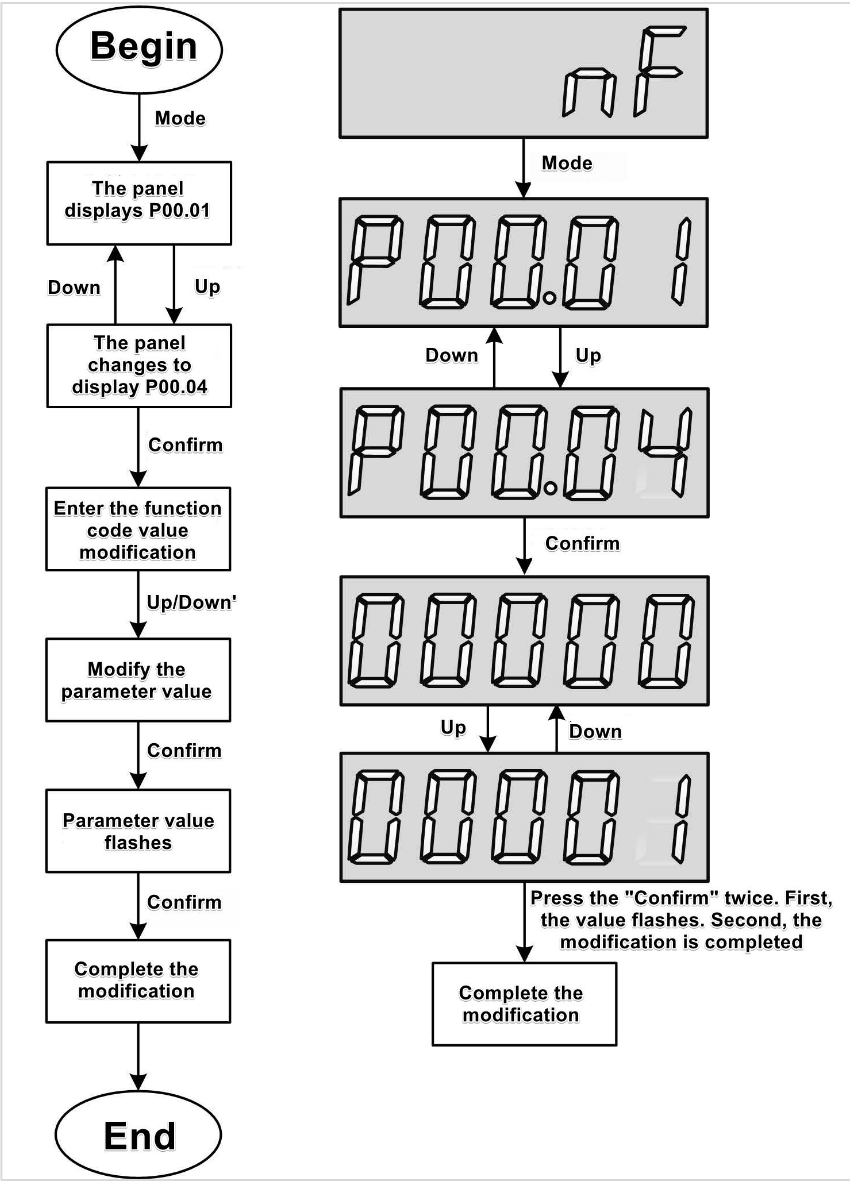


Figure 5-6 Schematic diagram of parameter setting steps

5.3.2 Jog operation

The jog function can be used for the test operation of the servo motor and drive. The operation steps are shown in the figure below.

Steps:

① Adjust the function code to P10.01 after powering on.

② Press the "Enter" key to access the function code parameter modification interface and set the “Jog velocity” value.

③ After the “Jog velocity” setting is completed, press the "Enter" key, the panel displays “JOG” in a flashing state, press the "Enter" key again to enter the JOG mode.

④ Long press the "Up" key and "Down" key to realize the forward and reverse rotation of the motor.

⑤ Press the "Mode" key to exit the JOG mode.

✎**Note 1:** Press the Up/Down key for a long time, and the motor will continue to rotate; Press the Up/Down key, and the motor will jogging and rotating.

✎**Note 2:** Exit the "Jog operation" status through the "Mode" keyboard and return to the superior menu at the same time.

✎**Note 3:** Display Error cause: Please refer to the corresponding fault code"Chapter 10 Malfunctions".

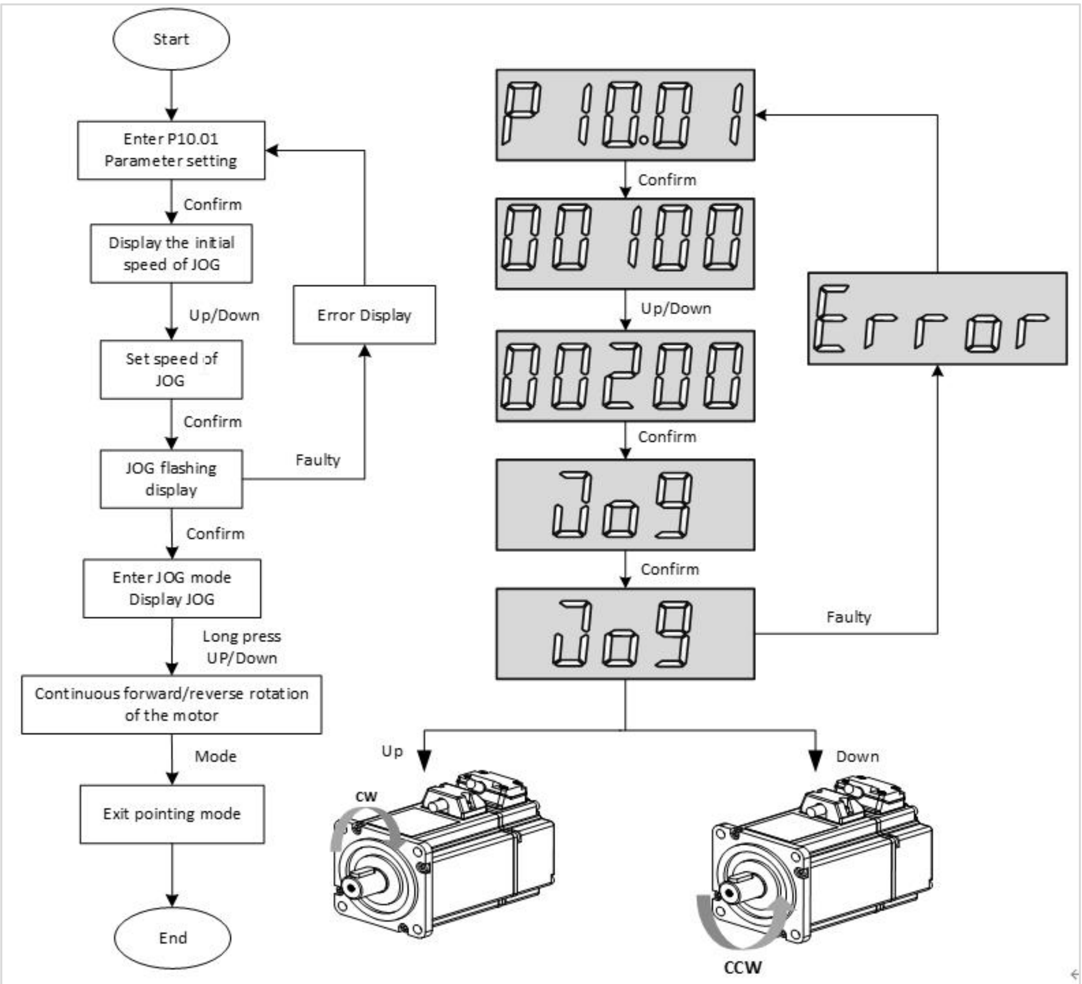


Figure 5-7 Jogging operation setting step

5.3.3 Factory reset

The factory settings can be restored through the servo drive panel. The specific operation steps are shown in the Figure 5-8.

Steps:

①After powering on, adjust the function code to P10.02.

②Press the "Enter" key to enter the next menu to set the parameters.

③ After the parameter is set to 1, press the "Confirm" key, at this time, the digital tube flashes to display "00001", and press the "Confirm" key again, and the digital tube displays P.init.

④Long press the "Enter" key for 3s, the panel digital tube will gradually light up from left to right until 8. 8. 8. 8. 8 is displayed.

⑤ Release the "confirm" key during the display of 8.8. 8.8. 8.

⑥ Digital tube shows done, indicating that the factory settings are restored. At this time, it is recommended to re-power up and down the servo drive.

✎**Note 1:** Display Error Reason: When the parameter value of P10.02 is set beyond the set range (0 to 1), Error will be displayed.

✎**Note 2:** When the setting value is displayed as 0, press the Down key, and the panel will display Error. After displaying for 1s, the setting value will automatically jump to 1.

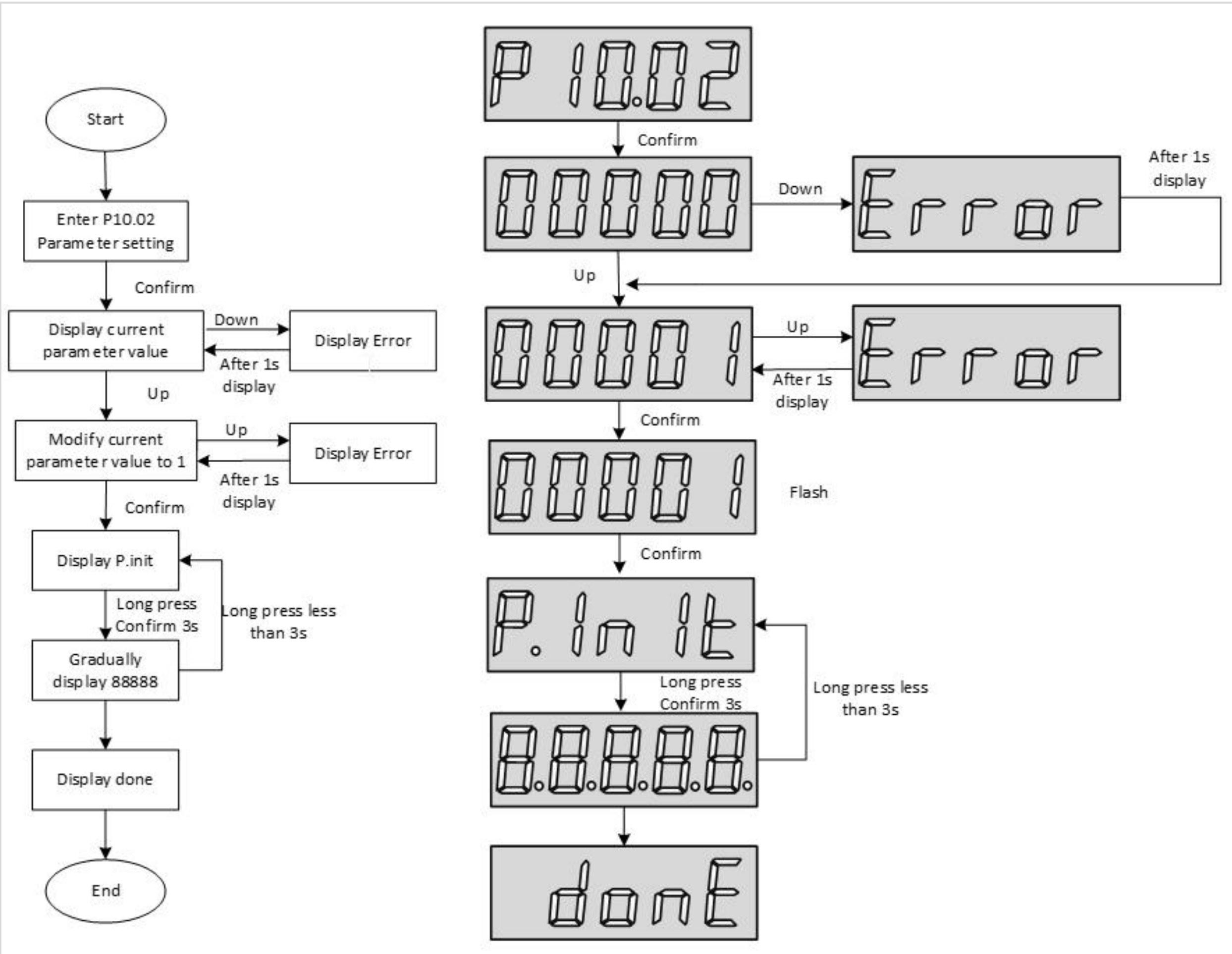


Figure 5-8 Restore factory setting steps

Chapter 6 Communication network configuration

6.1 EtherCAT operation

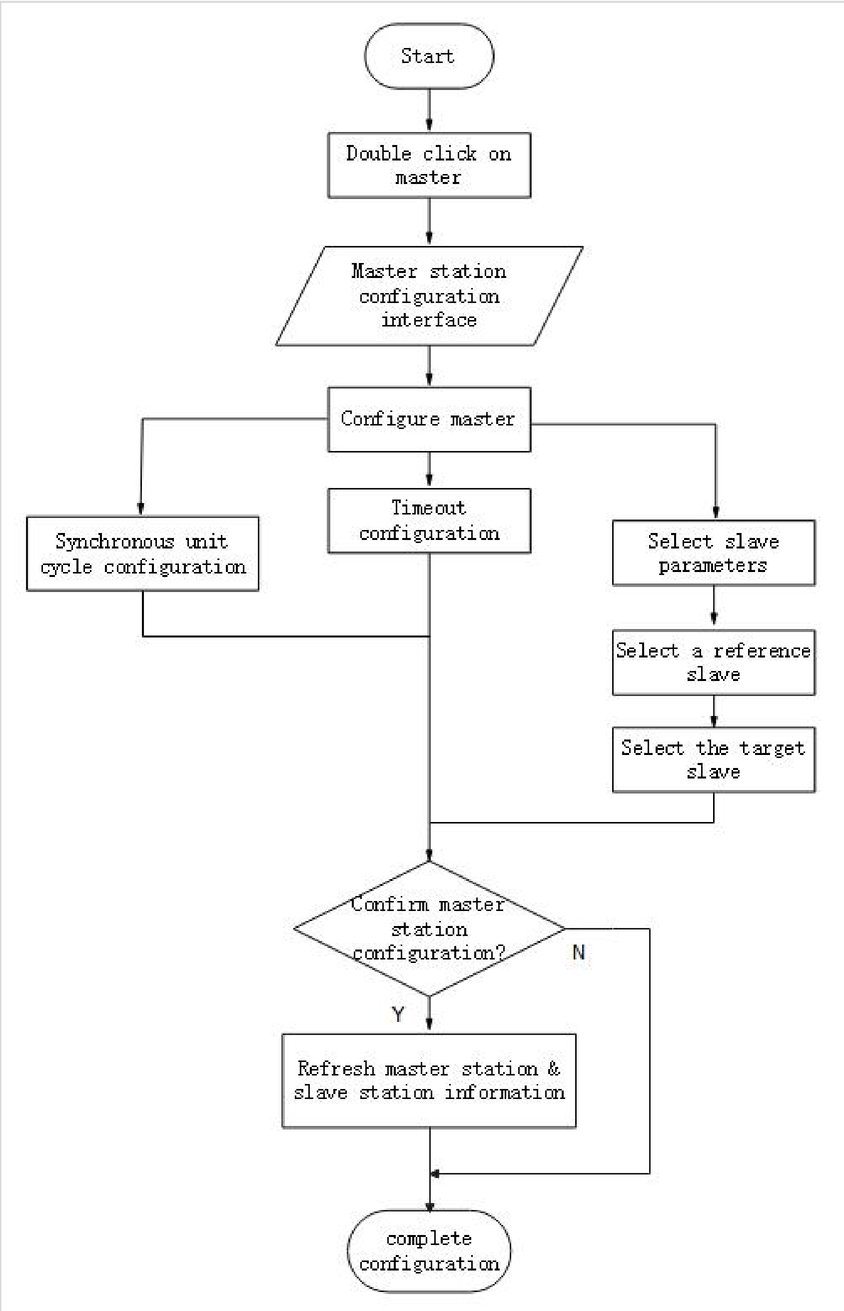


Figure 6-1 EtherCAT operation configuration

6.2 EtherCAT communication fundamentals

6.2.1 EtherCAT communication specification

Layer	Content	Specification
Application layer	PDO	Variable PDO mapping
	SDO	SDO request, SDO reply
	CIA 402	Cyclic Synchronous Position Mode (CSP) Cyclic Synchronous Velocity Mode (CSV) Cyclic Synchronous Torque Mode (CST) Profile Torque Mode (PT) Homing Mode (HM)
Physical layer	Transport protocol	100BASE-TX (IEEE802.3)
	Communication interface	RJ45 port * 2 (IN, OUT)

6.2.2 Communication structure

Wecon VD5 series bus servo drives adopt IEC 61800-7 (CiA402)-CANopen motion control sub-protocol.

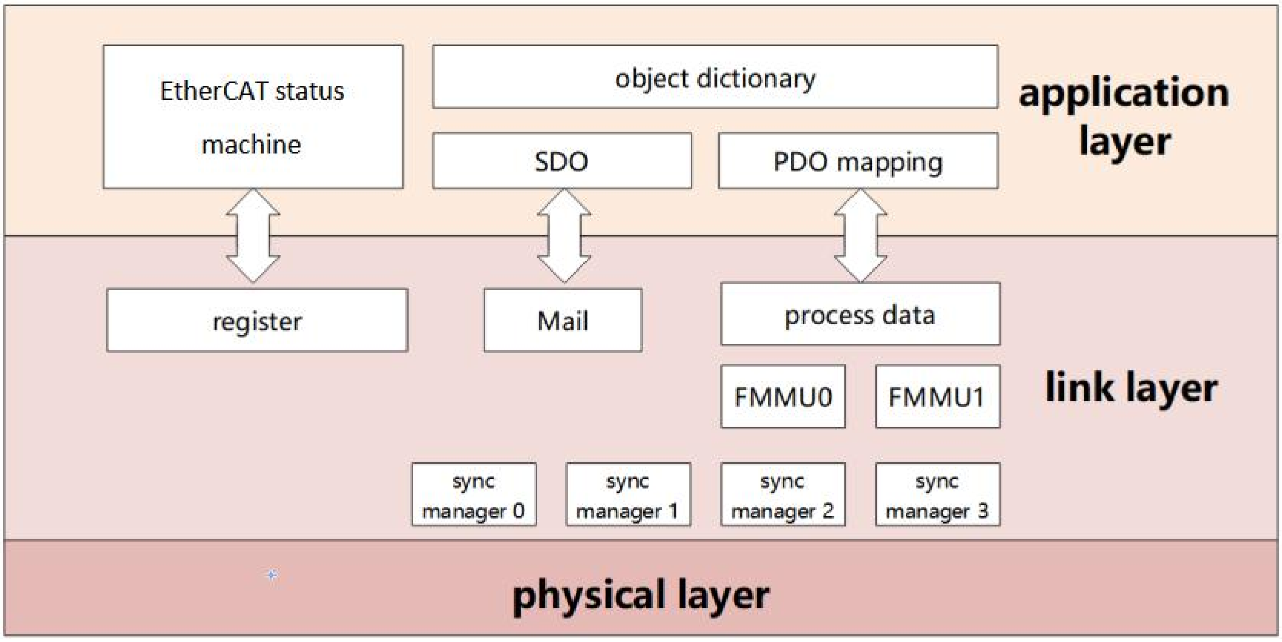


Figure 6-2 Communication structure

PDO (Process Data Object) is composed of Object Dictionary which can be mapped in PDO, and the content of process data is defined according to PDO mapping.

Email is a kind of a non-periodic communication and can read and write all object dictionaries.

6.2.3 State machines

EtherCAT devices support four states and are responsible for coordinating the state relationship between master and slave applications at initialization and running:

Init: Initialization, abbreviated as I;
Pre-Operational: Abbreviated as P;
Safe-Operational: Abbreviated as S;
Operational: Abbreviated as O.

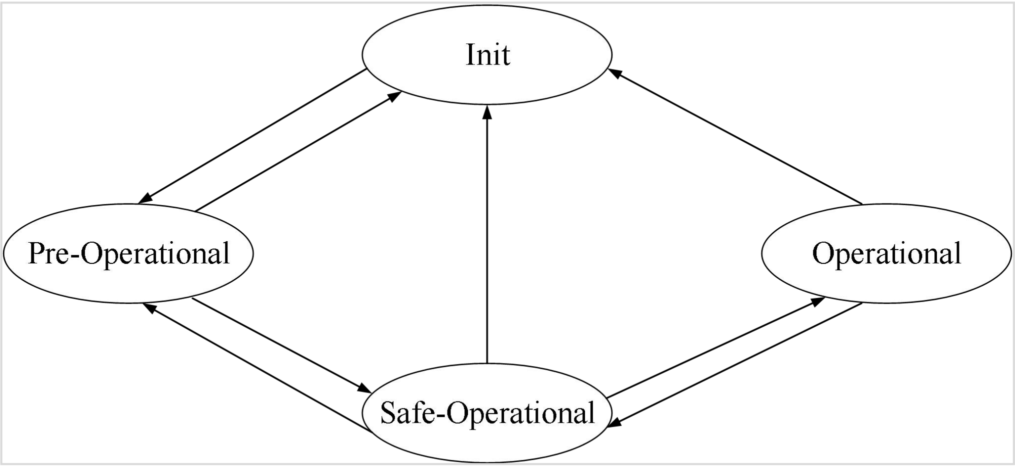


Figure 6-3 Communication structure

When changing from initialization state to operational state, it must be changed in the order of "Initialization → Pre-Operational → Safe-Operational → Operational"!
Leapfrog transition when returning from operational state. Refer to the following table for state transition operation and initialization process:

Status	Operation
Initialization	There is no communication in the application layer, and the master station can only read and write ESC registers
Initialization → Pre-Operational	The master station configures the site address of the slave station; Configure Email channels; Configure DC distributed clock; Request “Pre-Operational" status
Pre-Operation	Application Layer Email Data Communication (SDO)
Pre-Operation → Safe Operation	The master station uses Email to initialize the process data mapping; The master station configures the SM channel used for process data communication; The main station is configured with FMMU;; Request "Safe status"
Safe-Operation	Allow input data to be read without output signal (SDO, TPDO)
Safe-Operation → Operation	The master station sends valid output data; Request “Operation" status
Operation	Input and output are all valid and can use Email communication (SDO, TPDO, RPDO)

6.2.4 Communication indicator lamp

The communication indicator for the VD5 servo drive is located on the CN3 (IN), CN4 (OUT) sockets, as shown the Figure 6-4.

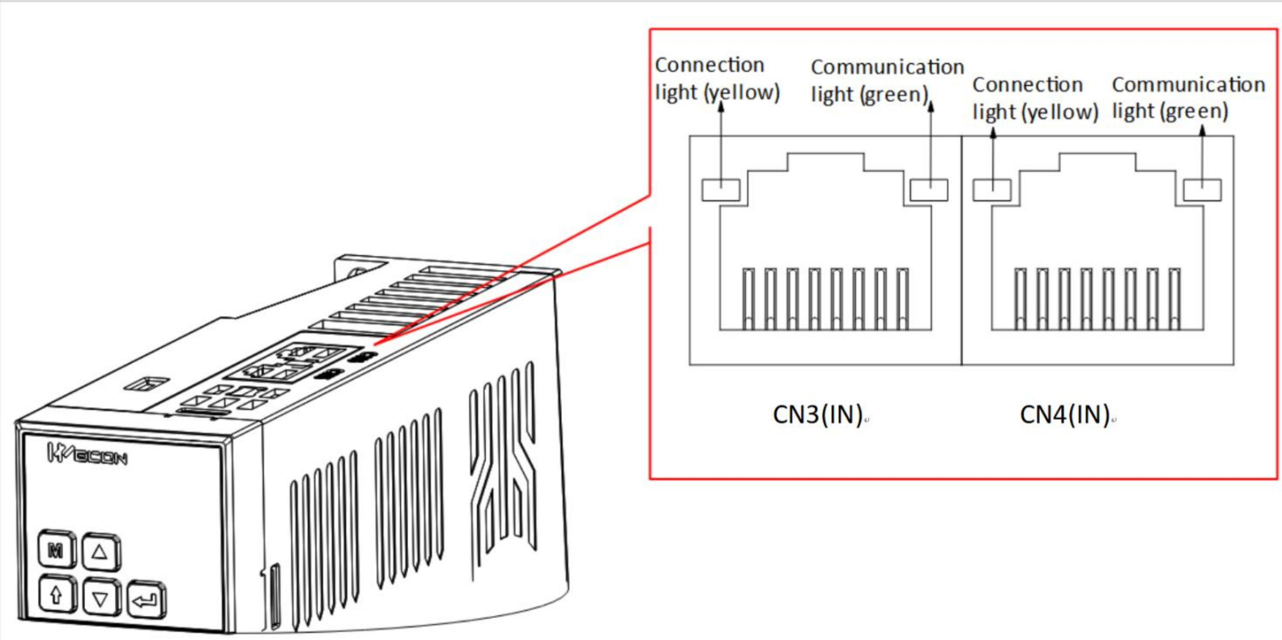


Figure 6-4 Communication indicator position

(1) Connection lamp (yellow)
Used to display the status of CN5 and CN6 communication interfaces, and the display contents are shown in the following table.

Connection lamp status	Explanation
OFF	The port is not connected to the network cable
ON	The port is connected to the network cable

(2) Communication lamp (green)
Used to display the status of CN5 and CN6 communication connections, as shown in the following table.

Connection lamp status	Explanation
ON	No communication connection with the master station
BLINKING	Communication with the master station is established

6.2.5 Process data PDO

PDO outputs process data in real time. PDO can be divided into RPDO (for receiving instructions from master station) and TPDO (for feeding back its own status from slave station).

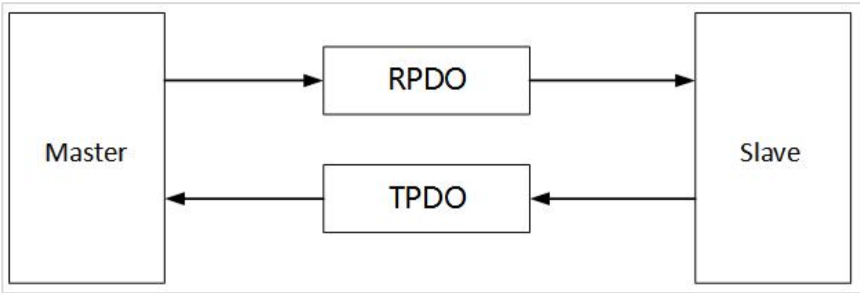


Figure 6-5 PDO schematic diagram

(1) PDO mapping parameters

PDO mapping is used to establish the mapping relationship between object dictionary and PDO. 1600h-17FFh is RPDO, 1A00h-1BFFh is TPDO:

Name	Parameter	Properties
RPDO	1600h	Variable mapping
	1701h to 1702h	Fixed mapping
TPDO	1A00h	Variable mapping
	1B01h	Fixed mapping

The following figure is an example of RxPDO mapping.

Index	Sub index	Name	Data type
6040	--	Control word	UINT
607A	--	Target position	DINT

RxPDO (1600h)

	Index	Sub-index	Data type
1	6040	00	UINT
2	607A	00	DINT
...	...	...	...
10	□□□□	□□	

Figure 6-6 Examples of RxPDO mapping

The data type is defined as follows:

Data type	Description	Numerical range
SINT	Signed 8bit	-128 to 127
USINT	Unsigned 8bit	0 to 255
INT	Signed 16bit	-32768 to 32767
UINT	Unsigned 16bit	0 to 65535
DINT	Signed 32bit	-21247483648 to 21247483647
UDINT	Unsigned 32bit	0 to 4294967295
STRING	String Value	ASCII

The following figure is an example of TxPDO mapping.

Index	Sub-index	Name	Data type
6041	--	Status word	UINT
6064	--	Position feedback	DINT
607A	--	Actual velocity	DINT

TxPDO (1A00h)

	Index	Sub-index	Data type
1	6041	00	UINT
2	6040	00	DINT
3	606C	00	DINT
...	...	...	...
10	□□□□	□□	

Figure 6-8 Examples of TxPDO mapping

The following figure is an example of a SyncManager PDO mapping.

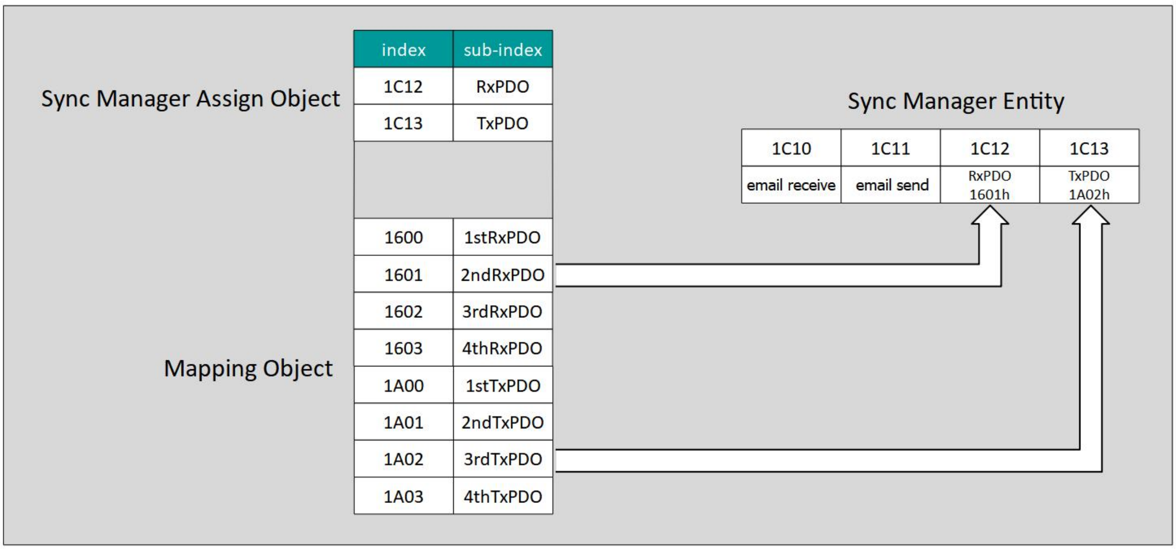


Figure 6-8 SyncManager PDO mapping example

(2) Synchronize management of PDO allocation settings

In EtherCAT periodic data communication, process data can contain multiple PDO mapping data objects. The data objects 0x1C10 to Ox1C2F used in CoE protocol define the corresponding PDO mapping object list of SM (Synchronous Management Channel), and multiple PDO can be mapped in different sub-indexes.

Index (hex)	Sub-index (hex)	Content
1C12	01	Choose to use one of 0x1600, 0x1701-0x1702 as the actual RPDO
1C13	01	Select to use one of 0x1A00, 0x1B01-0x1B01 as the actual TPDO

(3) PDO configuration

The PDO mapping parameter contains a pointer to the PDO corresponding process data that the PDO needs to send or receive, including index, sub-index and mapping object length. The sub-index 0 records the number N of objects mapped by the PDO, and the length of each PDO data can reach 4N bytes at most, which can map one or more objects at the same time. Sub-index to N is the mapping content. The mapping parameter content is defined as follows:

Number of digits	31	...	16	15	...	8	7	...	0
Description	Index			Sub-index			Object length		

The index and sub-index together determine the position of the object in the object dictionary, and the object length indicates the specific bit length of the object (hexadecimal representation)

Object length	Bit length
08h	8
10h	16
20h	32

For example, the mapping parameter of 6040h-00 (control word) is 60400010h

Notice

◆PDO configuration can only be designed when the EtherCAT communication state machine is in pre-operation (Pre-Operational, panel display **2**), otherwise .

◆PDO configuration parameters cannot be stored in the EEPROM. Therefore, after each power-on, please reconfigure the mapping object, otherwise, the mapping object is the default parameter of the drive.

◆The SDO fault codes are returned when:

①Modify PDO parameters in non-pre-running state;

②Pre-write values other than 1600/1701 to 1702 in 1C12;

③Pre-write values other than 1A00/1B01 in 1C13.

◆No more than 10 variable mappings can be added, otherwise servo activation will fail.

6.2.6 Email data SDO

EtherCAT Email data SDO is used to transmit aperiodic data, such as configuration of communication parameters, servo drive operation parameters and so on. EtherCAT's CoE service types include:
①Emergency information; ② SDO request; ③ SDO response; ④ TxPDO; ⑤ RxPDO;
⑥ Remote TxPDO sending request; ⑦ Remote RxPDO sending request; ⑧ SDO information.
Wecon VD5 series bus servo drives currently support ② SDO request and③ SDO response.

6.2.7 Distributed clock

Distributed clock enables all EtherCAT devices to use the same system time, thus controlling the synchronous execution of tasks of each device. The slave station device can generate a synchronization signal according to the synchronized system time. Wecon VD5 series bus servo drives only support DC synchronous mode.

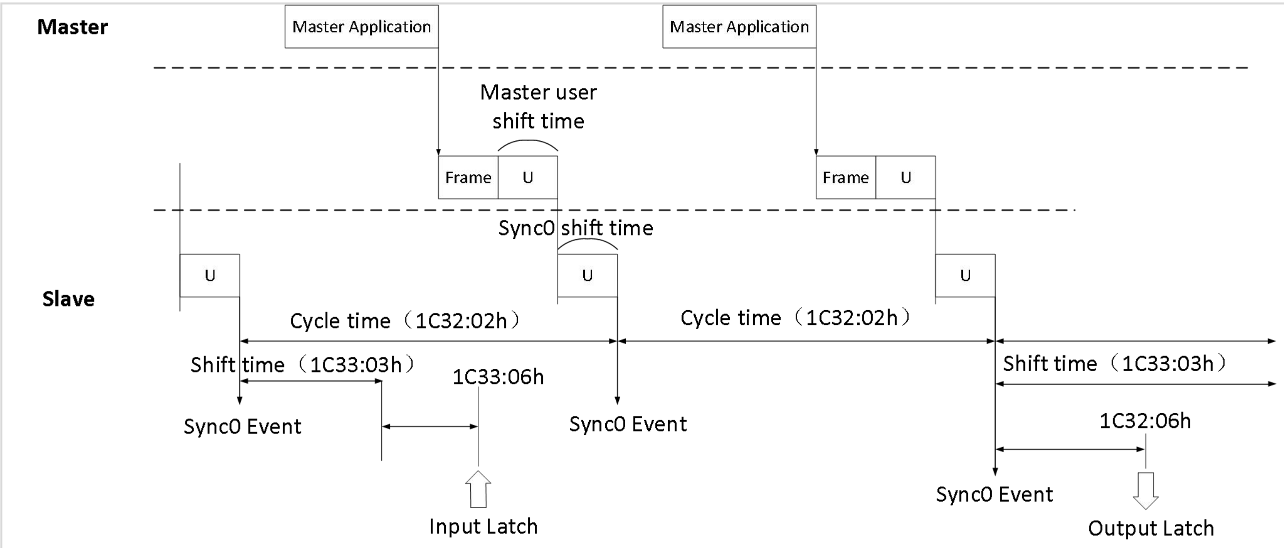


Figure 6-9 DC Synchronous mode schematic diagram

6.2.8 Status indication

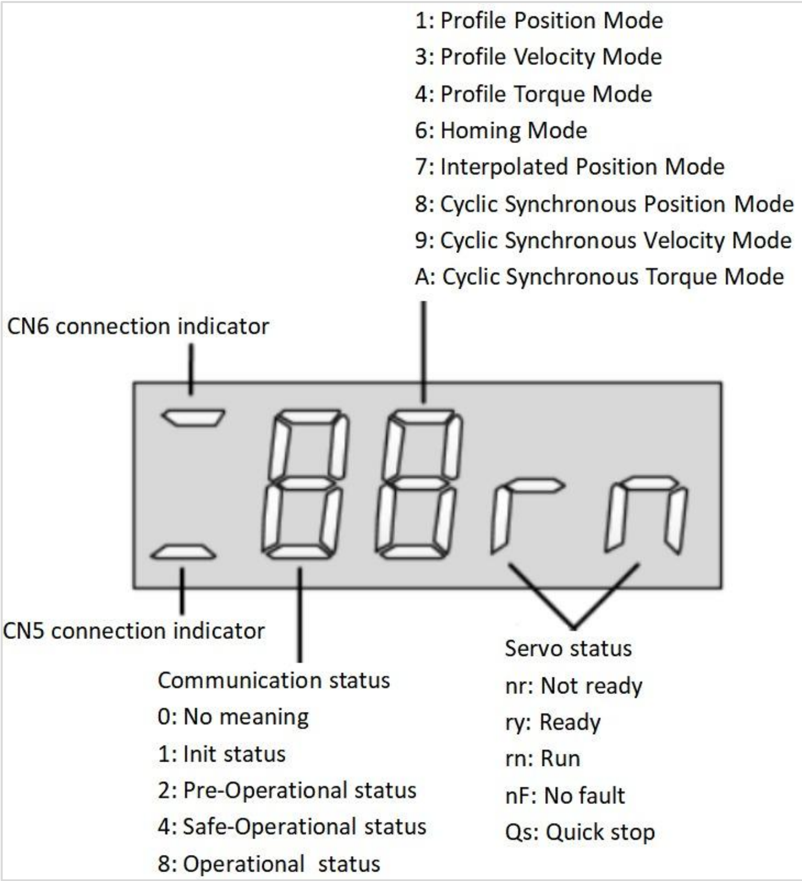


Figure 6-10 Status indication schema

Description:

(1) Communication connection status

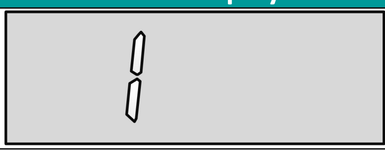
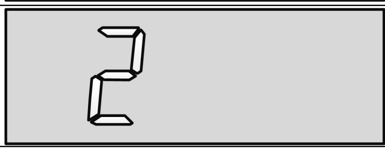
The first digit tube from the left of the 5-bit LED indicator on the servo drive panel is used to display the connection status of the two Ethernet communication ports: upper "-" CN6 (OUT) and lower "-" CN5 (IN)

Long dark: No communication connection detected

Long Bright: A communication connection has been established

(2) Communication operating status

The servo drive panel of the 5-bit LED indicator lamp is the second digit tube from the left, which is used to display the EtherCAT state machine status of the slave station in character form.

Panel display	Meaning
	Initialization state
	Pre-operation status

Panel display	Meaning
4	Safe operation status
8	Operating status

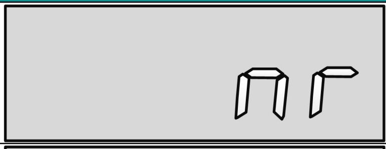
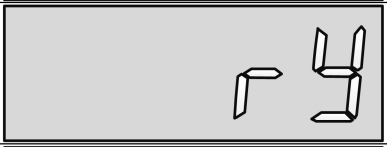
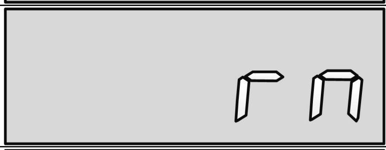
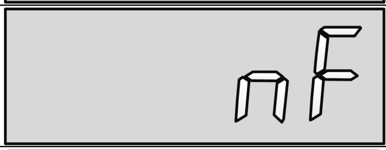
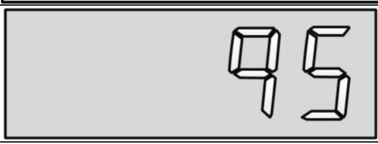
(3) Display of servo operation mode

Servo drive panel 5-bit LED indicator from the left of the third digit tube, used to display hexadecimal digital form display servo drive current operation mode.

Panel display	Meaning
1	Profile position control mode
3	Profile velocity control mode
4	Profile torque control mode
6	Homing mode
7	Interpolation mode
8	Cyclic Synchronous Position mode
9	Cyclic synchronous velocity mode
A	Cyclic synchronous torque mode

(4) Servo status display

Servo drive panel 5-bit LED indicator from the left of the fourth and fifth digit tube, used to display the servo status of the slave station.

Panel display	Meaning
	Not ready nr
	Get ready ry
	Run rn
	Failure-free nF
	Quick stop

6.2.9 CiA402 Control introduction

The use of Wecon VD5 Series Bus Type servo drives must be guided according to the procedure specified in Standard 402 Protocol.

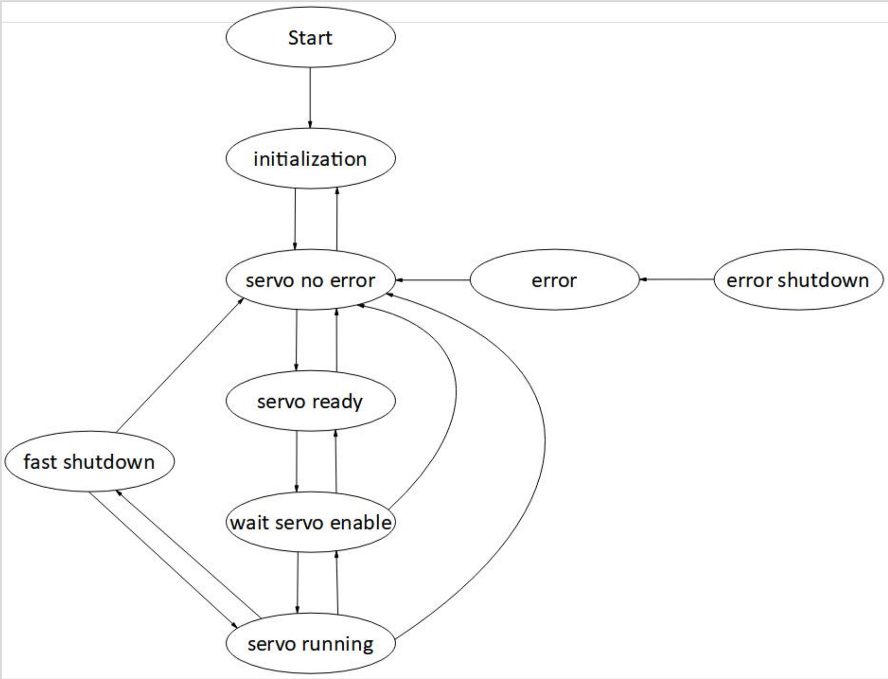
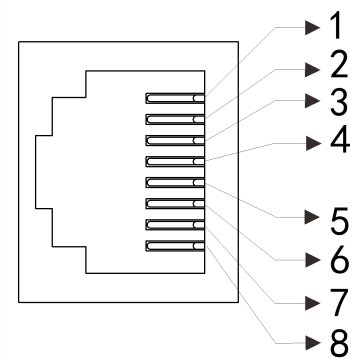


Figure 6-11 CiA402 state machine switching schema

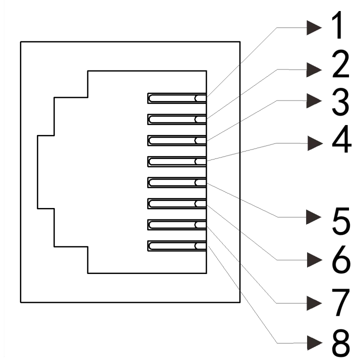
Status	Description
Initialization	Drive initialization, internal self-test has completed. Parameters cannot be set, and servo drive function cannot be performed.
Servo trouble-free	There is no fault in the servo drive. Parameters can be set.
Servo ready	Servo drives are ready. Parameters can be set.
Wait to turn on servo enable	The servo drive waits to turn on the servo enable. Parameters can be set.
Servo operation	The servo drive is running normally.
Quick shutdown	The servo drive is performing the quick shutdown function. Only function codes with the attribute "Run valid" can be set.
Malfunction shutdown	The servo drive is performing the fault shutdown function. Only function codes with the attribute "Run valid" can be set.
Fault	Failure shutdown is complete, and all drive functions are disabled. Allow parameters to be changed to troubleshoot.

6.2.10 Basic characteristics

The EtherCAT network cable is connected to the CN5 (IN), CN6 (OUT) interfaces, and its electrical characteristics conform to IEEE 802.3 standard.



(a) EtherCAT Ethernet communication connection port (IN)



(b) EtherCAT Ethernet communication connection port (OUT)

Figure 6-12 Communication port

Pin	Name	Function description
1	TX+	Sending data+
2	TX-	Sending data-
3	RX+	Receiving data+
4	-	-
5	-	-
6	RX-	Receiving data-
7	-	-
8	-	-

EtherCAT communication topology connections are very flexible, taking linear connections and ring connections as examples:

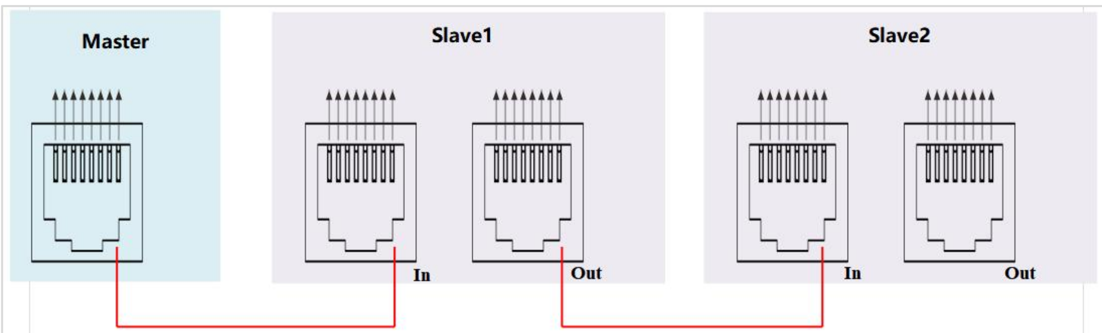


Figure 6-13 Linear connection

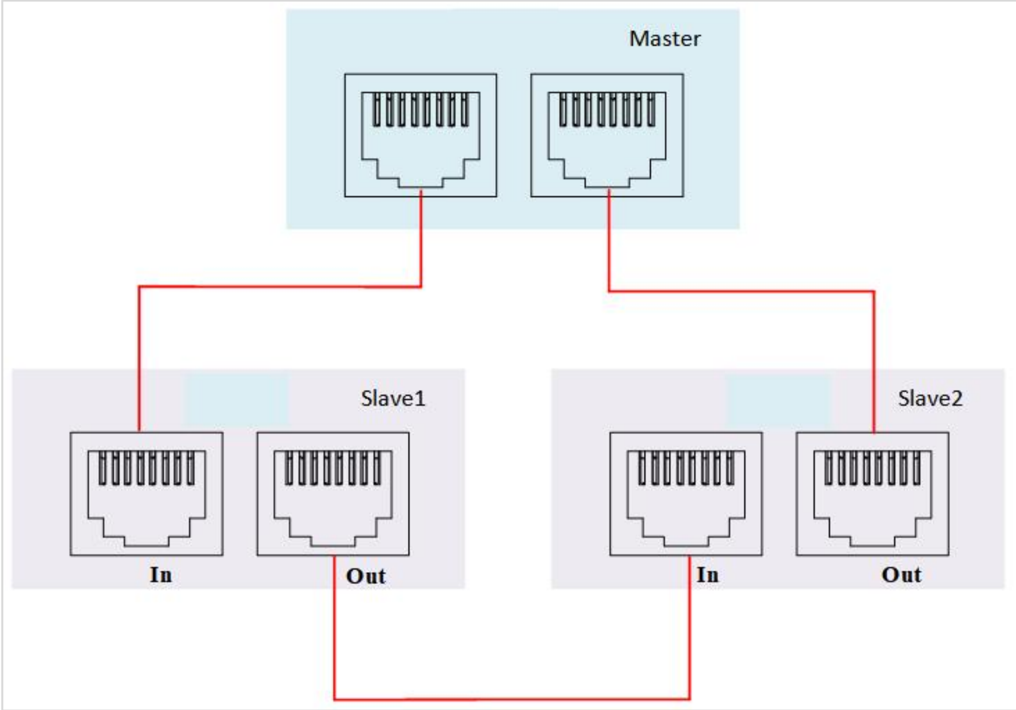


Figure 6-14 Ring connection

Chapter 7 Operation running

7.1 Basic settings

7.1.1 Pre-operation inspection

Table 7-1 Check contents before operation

Number	Content
	Wiring
1	The main circuit input terminals (L1, L2 and L3) of servo drive must be properly connected.
2	The main circuit output terminals (U, V, W) of the servo drive and the main circuit cables (U, V, W) of the servo motor must have the same phase and be connected correctly.
3	The main circuit power input terminals (L1, L2 and L3) and the main circuit output terminals (U, V and W) of servo drive cannot be short-circuited.
4	The wiring of each control signal cable of the servo drive is correct: the external signal wires such as brake and overtravel protection have been reliably connected.
5	Servo drive and servo motor must be grounded reliably.
6	When using an external braking resistor, the short wiring between drive C and D must be removed.
7	The force of all cables is within the specified range.
8	The wiring terminals have been insulated.
	Environment and machinery
1	There is no iron filings, metal, etc. that can cause short circuits inside or outside the servo drive.
2	The servo drive and external braking resistor are not placed on combustible objects.
3	The installation, axis and mechanical structure of the servo motor have been firmly connected.

7.1.2 Power on

(1) Connect the main circuit power supply

After power on the main circuit, the bus voltage indicator shows no abnormality, and the panel display "ry", indicating that the servo drive is in an operational state, waiting for the upper computer to give the servo enable signal.

If the drive panel keeps showing 'nr', please refer to "Chapter 10 Malfunction" to analyze and eliminate the cause of the fault.

(2) Set the servo drive enable (S-ON) to invalid (OFF)

Please refer to "6.2.9 CiA402 Control Introduction" for relevant process description

7.1.3 Jog operation

Jogging operation is used to judge whether the servo motor can rotate normally, and whether there is abnormal vibration and abnormal sound when rotating. Jogging operation can be through panel jogging operation function, and the motor takes the current stored value of object dictionary P10-01 (200A-01) as jogging velocity.

(1) Panel jog operation

Enter P10-01 (200A-01) through panel key operation. After pressing the confirmation key, the panel will display the current jogging velocity. At this time, the jogging running velocity can be adjusted by pressing the "up" or "down" key; After adjusting the jogging velocity, press the "Confirm" key. At this time, the panel displays "JOG" and is in a flashing state. Press the "Confirm" key again to enter the jogging operation mode (at this time, the motor is powered on!) . Press the "up" key and "down" key for a long time to realize the continuous forward or reverse rotation of the motor. Press the "Mode" key to exit the jogging operation mode. Please refer to "5.3.2 JOG running".

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
200A-01	JOG velocity	Operation setting	Valid immediately	0	0 to 3000	JOG velocity	rpm

(2) Jog operation of the servo debugging platform

Open the jog operation interface of the software “Wecon SCTool”, set the jog velocity value in the "set rotating velocity" in the "manual operation", click the "servo on" button on the interface, and then achieve the jog forward and reverse function through the "forward rotation" or "reverse rotation" button on the interface. After clicking the "Servo Close" button, exit the jogging operation mode.

Notice
◆The communication control function of EtherCAT master station and the jogging operation of servo drive can not be used at the same time; ◆If you enter the jogging mode, you need to exit the jogging operation before you can use EtherCAT to control; ◆If you enter the EhterCAT activation step, you need to exit the EtherCAT control before you can perform the jogging operation of the servo drive.

7.1.4 Rotation direction selection

By setting the rotate direction, the rotate direction of the motor can be changed without changing the polarity of the input instruction

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2000-04	Rotate direction	Shutdown Setting	Valid immediately	0	0 to 1	Forward rotation: Face the motor shaft to watch 0: Standard setting (CW is forward rotation) 1: Reverse mode (CCW is forward rotation)	-

7.1.5 Braking resistance

The servo motor is in the generator state when decelerating or stopping, the motor will transfer energy back to the drive, which will increase the bus voltage. When the bus voltage exceeds the braking point, The drive can consume the feedback energy in the form of thermal energy through the braking resistor. braking resistors can be built-in or external, but they cannot be used at the same time. When selecting an external braking resistor, the short tab on the servo drive needs to be removed.

The basis for judging whether the braking resistor is built-in or external.

① The maximum braking energy calculated value > the maximum braking energy absorbed by capacitor, and the braking power calculated value ≤ the built-in braking resistor power, use the built-in braking resistor.

② The maximum braking energy calculated value > the maximum braking energy absorbed by capacitor, and the braking power calculated value > the built-in braking resistor power, use external braking resistor.

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2000-09	Braking resistance setting	Operation setting	Valid immediately	0	0 to 3	0: Use the built-in braking resistor 1: Use an external braking resistor with natural cooling 2: Use an external braking resistor with forced air cooling (not configurable) 3: No braking resistor is used; energy is absorbed entirely by the capacitor	-
2000-0A	External braking resistor resistance	Operation setting	Valid immediately	50	0 to 65535	Used to set the resistance value of the external braking resistor of a certain type of drive	Ω
2000-0B	External braking resistor power	Operation setting	Valid immediately	100	0 to 65535	It is used to set the external braking resistor power of a certain type of drive.	W

7.1.6 Servo operation

(1) Set the servo enable (S-ON) to (ON)

The servo drive is in a operation state, and the monitor displays "rn", but because there is no instruction input at this time, the servo motor does not rotate and is in a locked state.

S-ON can be configured by selecting the appropriate DI terminal function in the "DIDO Configuration" section of the object dictionary.

(2) Input the instruction and the motor rotates

Input appropriate instructions during operation, first run the motor at a low velocity, and observe the rotation to see if it conforms to the set rotation direction. Observe the motor's actual running velocity, bus voltage, and other parameters through Wecon SCTools software.

(2) Timing diagram of power-on

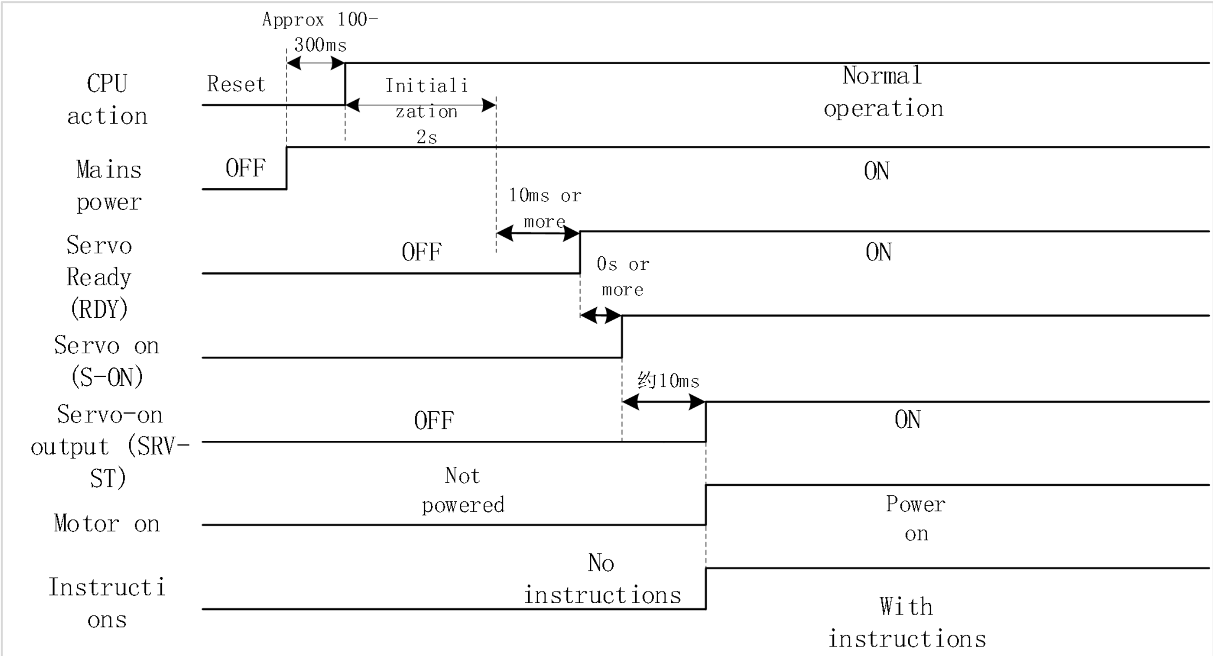


Figure 7-1 Power on timing diagram

7.1.7 Servo stop

According to different shutdown modes, it can be divided into free stop and zero-velocity stop, and their respective characteristics are shown in Table 7-2. According to the shutdown state, it can be divided into free running status and position keeping lock, as shown in Table 7-3:

Table 7-2 Comparison of two shutdown modes

Stop mode	Stop description	Stop characteristics
Free stop	Servo motor is not energized and decelerates freely to 0. The deceleration time is affected by factors such as mechanical inertia and mechanical friction.	Smooth deceleration, small mechanical shock, but slow deceleration process.
Zero-velocity stop	Servo drive outputs reverse braking torque, and the motor quickly decelerates to zero-velocity.	Rapid deceleration with mechanical shock, but fast deceleration process.

Table 7-3 Comparison of two shutdown state

Stop status	Free operation status	Position locked
Characteristics	After the motor stops rotating, the motor is not energized, and the motor shaft can rotate freely.	After the motor stops rotating, the motor shaft is locked and cannot rotate freely.

(1) Servo enable (S-ON) OFF shutdown mode

Relevant parameters of servo OFF shutdown mode are shown in Table 7-4.

Table 7-4 Parameter details of servo OFF shutdown mode

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2000-05	Servo OFF stop mode	Shutdown setting	Valid immediately	0	-2 to 2	0: Free stop and the motor shaft remains free state; 1: Zero-velocity shutdown, and the motor shaft remains in a free state.	-

(2) Emergency shutdown

It is free shutdown mode at present, and the motor shaft remains in a free state. The corresponding configuration and selection could be selected through the DI terminal function of the function code "DIDO configuration".

(3) Overtravel shutdown

Overtravel means that the movable part of the machine exceeds the set area. In some occasions where the servo moves horizontally or vertically, it is necessary to limit the movement range of the workpiece. The overtravel is generally detected by limit switches, photoelectric switches or the multi-turn position of the encoder, that is, hardware overtravel or software overtravel.

Once the servo drive detects the action of the limit switch signal, it will immediately force the velocity in the current direction of rotation to 0 to prevent it from continuing, and it will not be affected for reverse rotation. The overtravel shutdown is fixed at zero-velocity and the motor shaft remains locked.

The corresponding configuration and selection can be selected through the DI terminal function of the object dictionary "DIDO configuration". The default function of DI3 is POT and DI4 is NOT, as shown.

Function code	Name	Setting method	Effective time	Default	Range	Definition	Unit
P06-08	DI_3 channel function selection	Operation setting	Power on again	3	0 to 32	0: Off (Not in use) 01: S-ON 02: A-CLR 03: POT 04: NOT 06: CL 08: E-STOP 10:GAIN_SEL 18: Probe 1 19: Probe 2 26: HOMEORG Other: Reserved	-

Function code	Name	Setting method	Effective time	Default	Range	Definition	Unit
P06-09	DI_3 channel function select	Operation setting	Valid immediately	0	0 to 1	Select enabled DI_3 port type 0: Hardware DI_3 input port 1: Virtual VDI_3 input port	-
P06-10	DI_3 channel function select	Operation setting	Valid immediately	0	0 to 1	Select enabled DI_4 port type 0: Hardware DI_4 input port 1: Virtual VDI_4 input port	-
P06-11	DI_4 channel function select	Operation setting	Power on again	4	0 to 32	0: Off (Not in use) 01: S-ON servo enabled 02: A-CLR 03: POT 04: NOT 06: CL 08: E-STOP 26: HOMEORG Other: Reserved	-
P06-12	DI_4 channel function select	Operation setting	Valid immediately	0	0 to 1	DI port input logic validity function selection 0: Hardware DI_4 input port 1: Virtual VDI_4 input port	-
P06-13	DI_4 input channel function select	Operation setting	Valid immediately	0	0 to 1	Select enabled DI_4 port type 0: Hardware DI_4 input port 1: Virtual VDI_4 input port	-

(4) Malfunction stop

When the machine fails, the servo will perform a fault stop operation. The current stop mode is fixed to the free stop mode, and the motor axis remains in a free state.

7.1.8 Brake device

The brake is a mechanism that prevents the servo motor shaft from moving when the servo drive is in a non-operating state, and keeps the motor locked in position, so that the moving part of the machine will not move due to its own weight or external force.

Notice
The brake device is built into the servo motor, which is only used as a non-energized fixed special mechanism. It cannot be used for braking purposes, and can only be used when the servo motor is kept stopped; ✎ After the servo motor stops, turn off the servo enable (S-ON) in time; ✎The brake coil has no polarity; ✎When the brake coil is energized (that is, the brake is open), magnetic flux leakage may occur at the shaft end and other parts. If users need to use magnetic sensors and other device near the motor, please pay attention! ✎When the motor with built-in brake is in operation, the brake device may make a clicking sound, which does not affect the function.

(1) Wiring of brake device

Brake input signal is no polar. You need to use 24V power . The standard wiring between brake signal BK and brake power is as below.

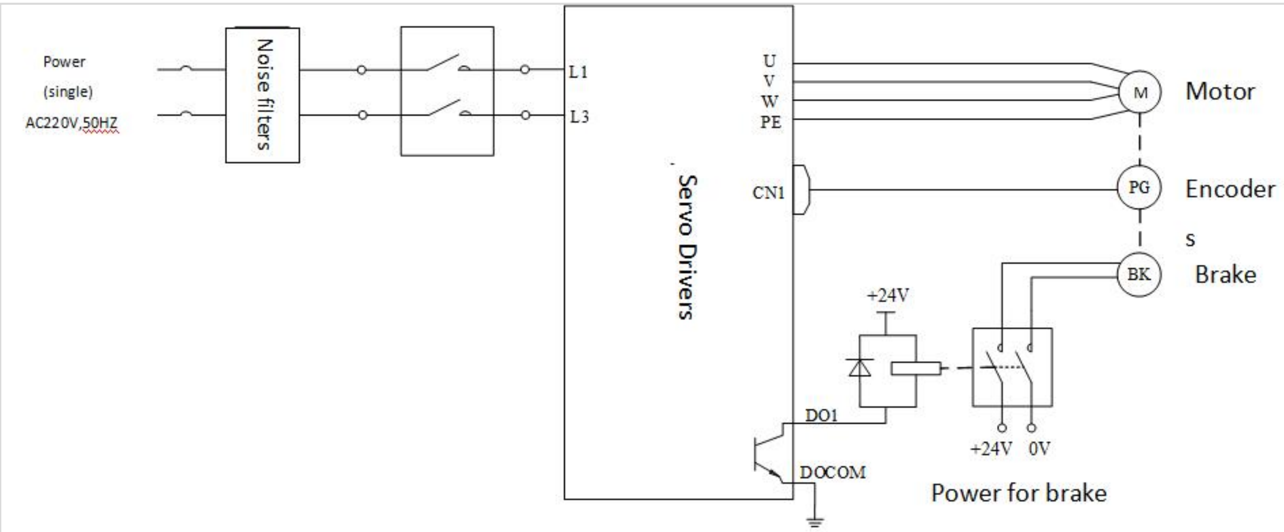


Figure 7-2 Brake wiring

Notice
① The length of the motor brake cable needs to fully consider the voltage drop caused by the cable resistance, and the brake operation needs to ensure that the voltage input is 24V. ② It is recommended to use the power supply alone for the brake device. If the power supply is shared with other electrical device, the voltage or current may decrease due to the operation of other electrical device, which may cause the brake to malfunction. ③It is recommended to use cables above 0.5 mm².

(2) Brake software setting

For a servo motor with brake, one DO terminal of servo drive must be configured as function 141 (BRK-OFF, brake output), and the valid logic of the DO terminal must be determined.

Related function code

DO function code	Function name	Function
141	BRK-OFF, brake output	The output signal indicates that the brake of the servo motor is released

Table 7-6 Relevant parameters of brake setting

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2001-1E	Delay from brake output to instruction reception	Operation setting	Valid immediately	250	0 to 500	Set delay that from the brake (BRK-OFF) output is ON to servo drive allows to receive input instruction. Between. When the brake output (BRK-OFF) is not allocated, this function code has no effect.	ms
2001-1F	In the static state, delay from the brake output is OFF to the motor is not energized.	Operation setting	Valid immediately	150	1 to 1000	When the motor is in a static state, set the delay time from the brake (BRK-OFF) output is OFF to the servo drive is in the non-powered state. When the brake output (BRK-OFF) is not allocated, this function code has no effect.	ms
2001-20	Rotation status, when the brake output OFF, the velocity threshold.	Operation setting	Valid immediately	30	0 to 3000	When the motor is rotating, the motor velocity threshold that is allowed when the brake (BRK-OFF) output is OFF. When the brake output (BRK-OFF) is not allocated, this function code has no effect.	rpm

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2001-21	Rotation status, servo enable OFF to brake output OFF Delay	Operation setting	Valid immediately	500	1 to 1000	The motor is rotating, the delay time that is allowed from the brake (BRK-OFF) output OFF to the servo enable (S-ON) OFF. When the brake output (BRK-OFF) is not allocated, this function code has no effect.	ms

According to the state of the servo drive, the working sequence of the brake mechanism can be divided into the brake sequence in the normal state of the servo drive and the brake sequence in the fault state of the servo drive.

(3) Servo drive brake timing in normal status

The brake timing of the normal state can be divided into:

The servo motor is stationary (the actual velocity of the motor is lower than 20rpm) and the servo motor is rotating (the actual velocity of the motor is 20 rpm and above).

1) Brake timing when the servo motor is stationary

When the servo enable is changed from ON to OFF, if the actual velocity of the current motor is lower than 20rpm, the servo drive acts according to the stationary braking timing, and the specific timing actions are as followsFigure 7-18As shown in.

Notice
● After the brake output is set from OFF to ON, do not input the position/velocity/torque instruction during 2001-1Eh, otherwise the instruction will be lost or run incorrectly. ● When applied to a vertical axis, the external force or the weight of the mechanical moving part may cause the machine to move slightly. When the servo motor is stationary, and the servo enable is OFF, the brake output will be OFF immediately. However, the motor is still powered on within the time of 2001-1Fh to prevent mechanical movement due to its own weight or external force.

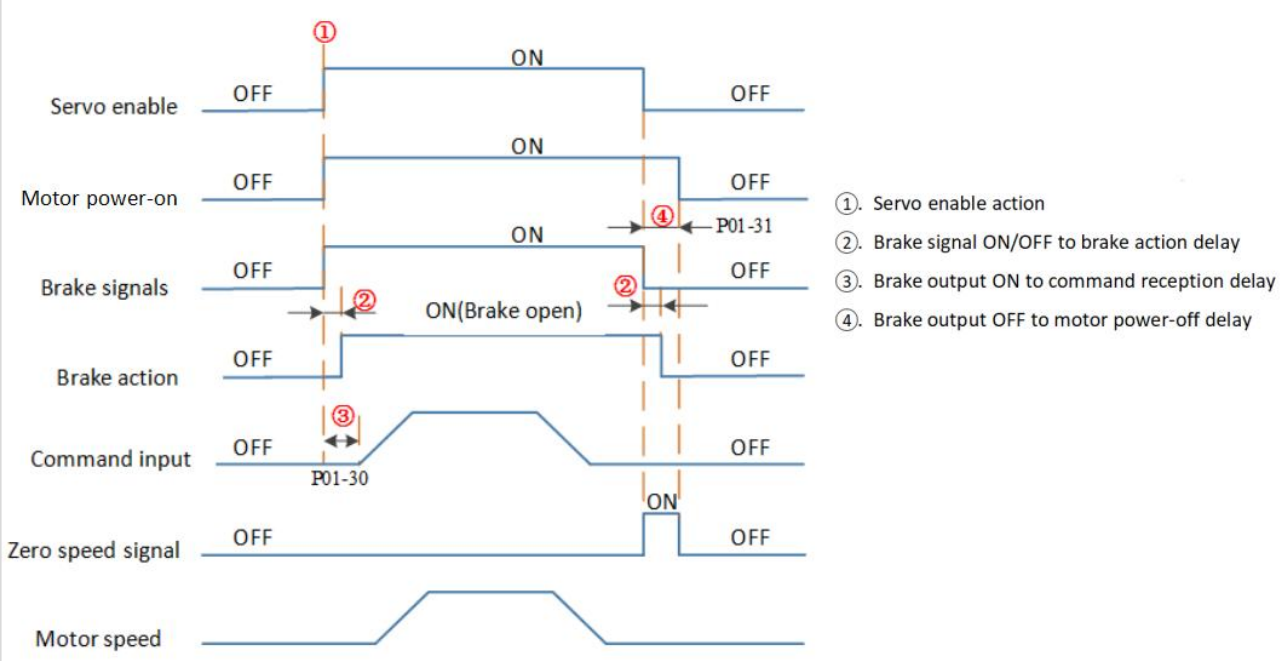


Figure 7-3 Braking timing when the motor is stationary

✎**Note:** Please refer to the relevant specifications of the motor for the delay time of the brake contact at ② in the figure.

2) The brake timing when the servo motor is rotating

When the servo enable is from ON to OFF, if the actual motor velocity is greater than or equal to 20 rpm, the drive will act in accordance with the rotation brake sequence. The specific sequence action is shown in Figure 7-4.

Notice
● When the servo enable is turned from OFF to ON, within 2001-30, do not input position, velocity or torque instructions, otherwise the instructions will be lost or operation errors will be caused; ● When the servo motor rotates, the servo enable is OFF and the servo motor is in the zero-velocity shutdown state, but the brake output must meet any of the following conditions before it could be set OFF: 2001-21h time has not arrived, but the motor has decelerated to the velocity set in 2001-20h; 2001-21h time is up, but the motor velocity is still higher than the set value of 2001-20h. ● After the brake output changes from ON to OFF, the motor is still in communication within 50ms to prevent the mechanical movement from moving due to its own weight or external force.

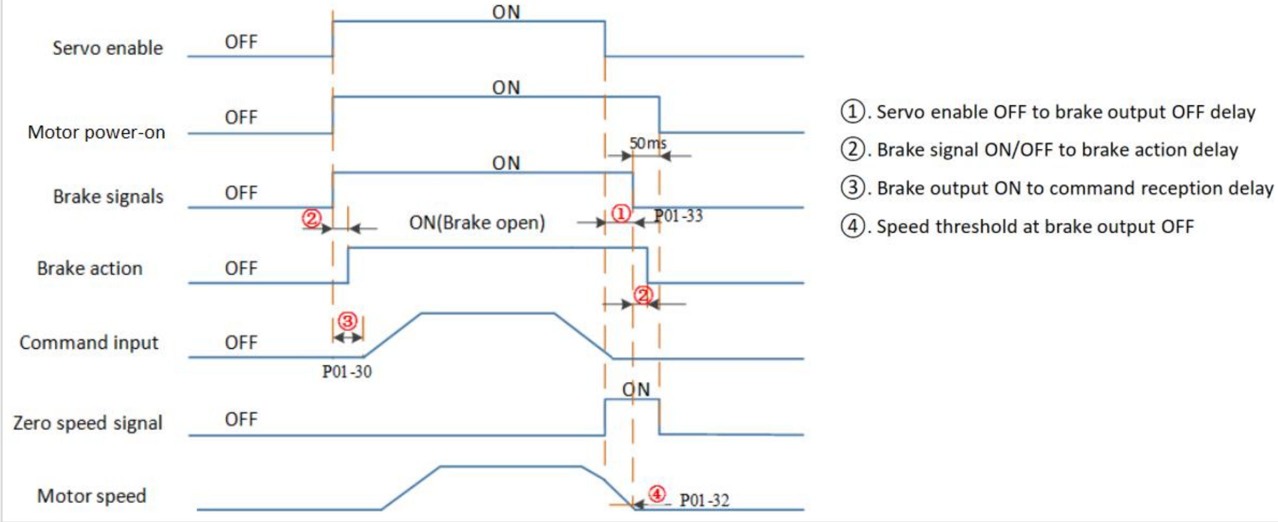


Figure 7-4 Braking timing when the motor rotates

(4) Brake timing when the servo drive fails

The brake timing (free stop) in the fault status is as follows.

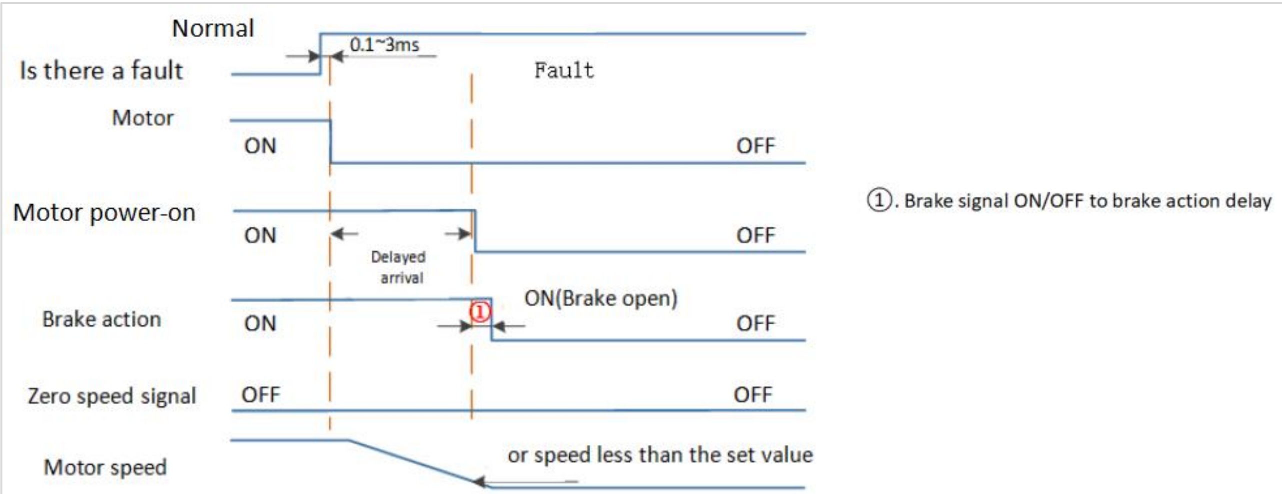


Figure 7-5 Braking timing in fault state (free stop)

✎**Note:** The "delay arrival" of the brake signal is about 20ms, and the actual parameter is subject to the motor manufacturer.

7.2 Servo state setting

The use of Wecon VD5 series bus type servo drives must be guided according to the procedure specified in standard 402 protocol.

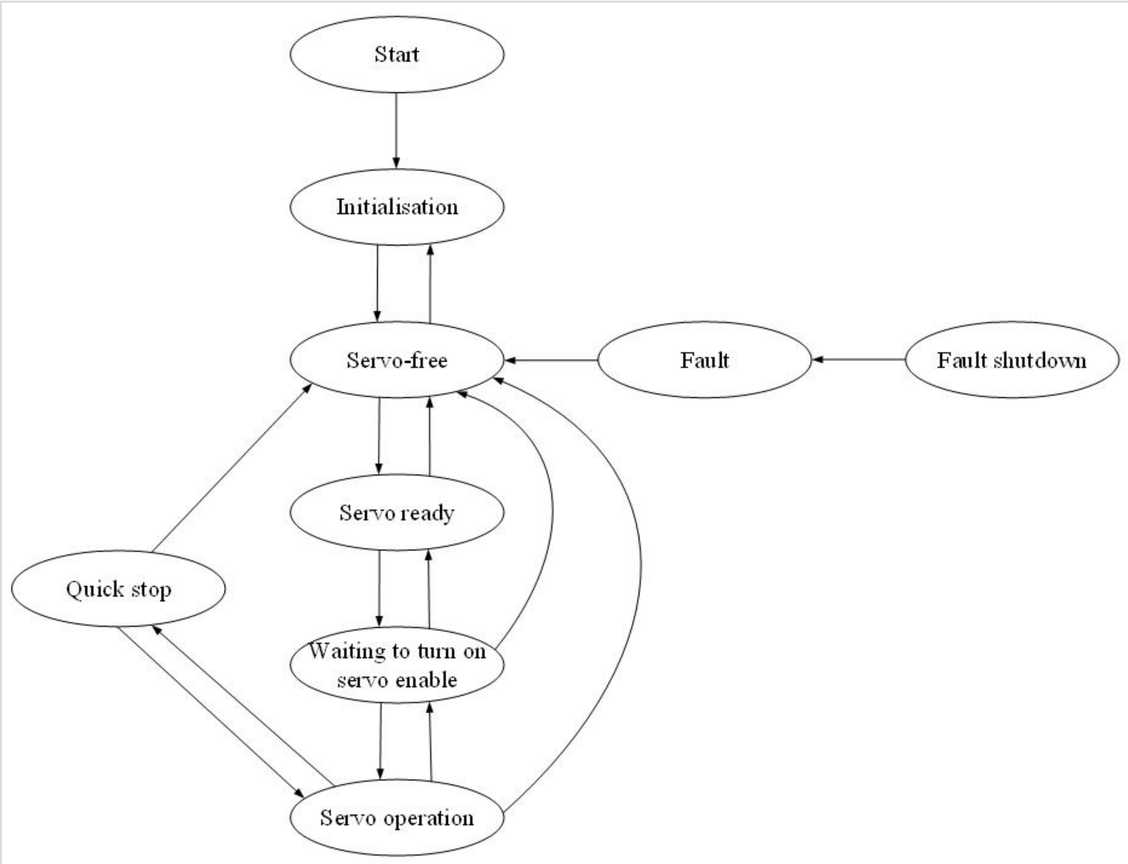


Figure 7-6 CiA402 state machine switching schema

Status	Description
Initialization	Drive initialization, internal self-test has completed. Parameters cannot be set, and servo drive function cannot be performed.
Servo-free	There is no fault in the servo drive. Parameters can be set.
Servo ready	Servo drives are ready. Parameters can be set.
Waiting to turn on servo enable	Waiting to turn on servo enable Parameters can be set.
Servo operation	The servo drive is running normally.
Quick shutdown	The servo drive is performing the quick shutdown function. Only function codes with the attribute "Run valid" can be set.
Fault shutdown	The servo drive is performing the fault shutdown function. Only function codes with the attribute "Run valid" can be set.
Fault	Fault shutdown is complete, and all drive functions are disabled. Allow parameters to be changed to troubleshoot.

State switching	Control word 6040h
Power on => Initialization	Natural transition without control instruction
Initialization => Servo-free	Natural transition without control instruction If there is an error in the initialization process, go directly to the "Fault shutdown" status.
Servo-free => Servo ready	0x0006
Servo ready => Waiting to turn on servo enable	0x0007
Waiting to turn on servo enable => Servo operation	0x000F
Servo operation => Waiting to turn on servo enable	0x0007
Waiting to turn on servo enable => Servo ready	0x0006
Servo ready => Servo-free	0x0000
Servo run => Servo ready	0x0006
Servo run => Servo-free	0x0000
Waiting to turn on servo enable => Servo-free	0x0000
Servo operation => Quick shutdown	0x0002
Quick shutdown => Servo-free	The quick shutdown mode 605A is selected as 0 to 3. After the shutdown is completed, it will transition naturally without control instruction.
Servo-free = >Fault shutdown	Once the servo drive fails, it automatically switches to the "Fault shutdown" state without control instruction.
Fault shutdown => Fault	After the fault shutdown is completed, it will make a natural transition without control instructions.
Fault => Servo-free	0x80
Quick shutdown => Servo operation	The quick shutdown mode 605A is selected as 0 to 3, and 0x0F is sent after the shutdown is completed.

7.2.1 Control word

6040h	Name	Setting method	Valid time	Default	Set range	Application category	Unit
	Control word	Operation setting	Valid immediately	0	0 to 65535	Basic settings	-

Used to set control instructions. It is meaningless to assign each-bit of a control word separately, and it must be combined with other-bits to form a certain control instruction.
bit0 to-bit3 have the same meaning in each control mode of servo drive, and instructions must be sent in sequence before the servo drive can be switched according to CiA402 state machine.

Bit	Name	Description
0	Servo operation can be started	0: Invalid
		1: Valid
1	Turn on the main circuit	0: Invalid
		1: Valid
2	Quick stop	0: Invalid
		1: Valid
3	Enable operation	0: Invalid
		1: Valid
4 to 6	Operation mode	It is related to the operation mode of servo drive
7	Fault reset	Used to clear reset faults: The rising edge of-bit7 is valid; bit7 is kept at 1, and other control instructions are invalid.

7.2.2 Status word

6041h	Name	Setting method	Valid time	Default	Set range	Application category	Unit
	Status word	Operation setting	Valid immediately	0	0 to 65535	-	-

Used to reflect the status of servo drive.

Bit	Name	Description	Bit	Name	Description
0	Servo ready	0: Invalid	6	Servo disable	0: Invalid
		1: Valid	7	Warning	1: Valid
1	Servo enable	0: Invalid			0: Invalid
		1: Valid			1: Valid
2	Servo operation	0: Invalid	8	-	-
		1: Valid	9	Remote control	0: Invalid
3	Fault	0: Invalid	10	Target reached	1: Valid
		1: Valid			0: Invalid
4	Main circuit power	0: Invalid			1: Valid
		1: Valid	......		
5	Quick stop	0: Invalid			
		1: Valid			

Bit0 to bit9 have the same meaning in all control modes of servo drive. After the control word 6040h sends instructions in sequence, the servo feeds back the determined state.

Setting value (binary number)	Description
xxxx xxxx x0xx 0000	Servo not ready
xxxx xxxx x1xx 0000	Start disabled
xxxx xxxx x01x 0001	Servo ready
xxxx xxxx x01x 0011	Start
xxxx xxxx x01x 0111	Servo enable
xxxx xxxx x00x 0111	Fault shutdown valid
xxxx xxxx x0xx 1111	Fault response valid
xxxx xxxx x0xx 1000	Fault

7.3 Servo mode settings

7.3.1 Servo mode introduction

The object dictionary 6060h is used to display servo modes supported by servo drives.

6060h	Name	Setting method	Valid time	Default	Set range	Application category	Unit
	Modes of operation	Shutdown setting	Valid immediately	0	0 to 10	-	-

Used to set the operation mode of servo drive.

Setting value	Name	Remark
0	-	
1	Profile position control mode	
2	-	
3	Profile velocity control mode	
4	Profile torque control mode	Please refer to "7.7 Profile torque mode (PT)" for details
5	-	
6	Homing mode	Please refer to "7.5 Homing mode (HM)" for details
7	Interpolation mode	
8	Cyclic Synchronous Position mode	Please refer to "7.4 Cyclic Synchronous position mode (CSP)" for details
9	Cyclic synchronous velocity mode	Please refer to "7.5 Cyclic Synchronous velocity mode (CSP)" for details
10	Cyclic synchronous torque mode	Please refer to "7.6 Cyclic synchronous torque mode (CSP)" for details

7.3.2 Mode switch

Pay attention to the following when switching modes:

① Whatever the servo drive state is, the unexecuted position instruction will be discarded after switching from the Cyclic Synchronous Position mode to other modes.

② Whatever the servo drive state is, after switching into other modes from the cyclic synchronous velocity mode, servo first executes ramp shutdown, and then switch to other modes after the shutdown is completed.

③ When the servo drive is running the homing mode, it is not allowed to switch to other modes; When homing is completed or interrupted (failure or invalid enable), other modes can be switched into.

④ When the servo drive is in run state, when switching from other modes to cyclic synchronous mode, please send instruction at an interval of at least 1ms, otherwise instructions will be lost or error.

7.3.3 Communication cycles supported by different modes

Mode / Cycle time	Cyclic synchronous Position mode	Cyclic synchronous velocity mode	Homing Mode
125us	✔	✔	✔

7.4 Cyclic synchronous position mode (CSP)

7.4.1 Control block diagram

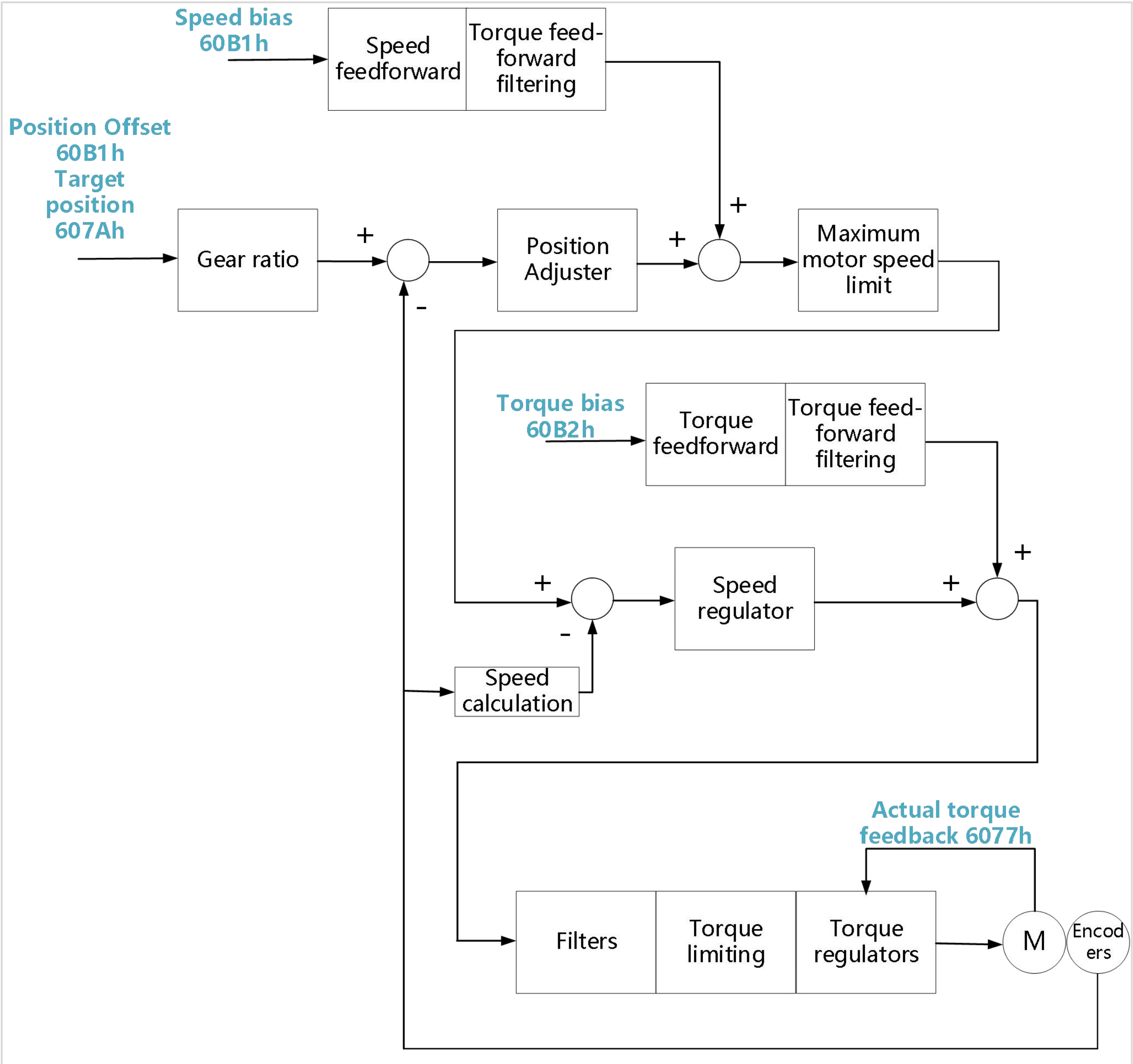


Figure 7-7 Cyclic synchronous position mode control block diagram

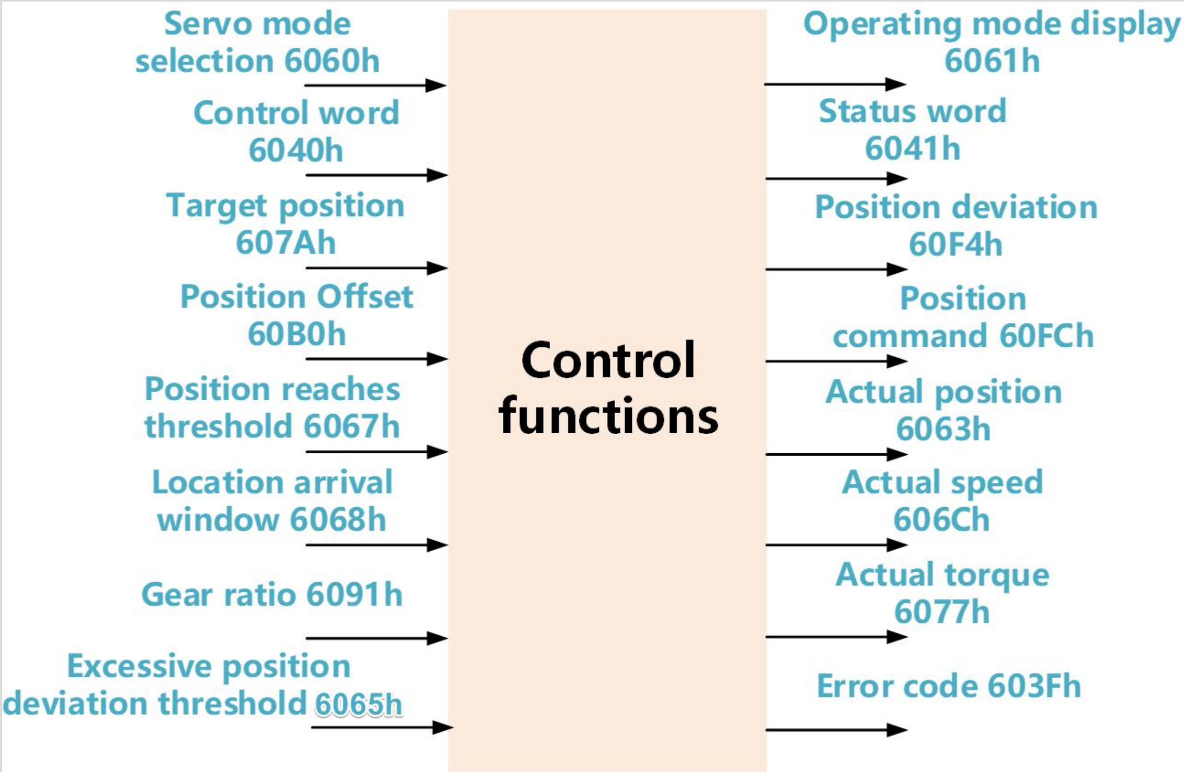


Figure 7-8 Inpu and output objects

7.4.2 Related objects

(1) Control word 6040h

Bit	Name	Description
0	Servo operation can be started	When bit0 to bit3 are all 1, it indicates the start of operation
1	Turn on the main circuit	
2	Quick stop	
3	Servo operation	

(2) Status word 6041h

Bit	Name	Description
10	Target reached	-
11	Software internal position overlimit	-
12	Slave station following instruction	-
13	Following error	-
14	DDL motor angle identification complete	-
15	Homing completed	-

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Set range
603F	Error code	Read-only	-	16	0 to 65535
6040	Control word	Read and write	-	16	0 to 65535
6041	Status word	Read-only	-	16	0 to 65535
6060	Modes of operation	Read and write	-	8	0 to 10
6061	Modes of operation	Read-only	-	8	0 to 10
6062	Position demand value	Read-only	Instruction unit	32	-
6063	Position actual value	Read-only	Encoder unit	32	-
6064	Position actual value	Read-only	Instruction unit	32	-
6065	Following Error Window	Read and write	Instruction unit	32	0 to 2^{32}-1
6067	Position window	Read and write	Instruction unit	32	0 to 2^{32}-1
6068	Position window time	Read and write	ms	16	0 to 65535
606C	Velocity actual value	Read-only	Instruction unit/s	32	$-2^{31}$to 2^{31}-1
6077	Torque actual value	Read-only	0.1%	16	-3000 to 3000
607A	Target position	Read and write	Instruction unit	32	-2^{31} to 2^{31}-1
6091: 01	Motor revolutions	Read and write	-	32	1 to 2^{32}-1
6091: 02	Shaft revolution	Read and write	-	32	1 to 2^{32}-1
2002-01	1st position loop gain	Read and write	0.1Hz	16	0 to 6200
2002-02	1st velocity loop gain	Read and write	0.1Hz	16	0 to 35000
2002-03	1st velocity loop integral time constant	Read and write	0.1ms	16	100 to 65535
2002-09	velocity feedforward gain	Read and write	0.1%	16	0 to 1000
2002-0A	velocity feedforward filter time constant	Read and write	1ms	16	0 to 500
2002-0B	Torque feedforward gain	Read and write	0.1%	16	0 to 2000
2002-0C	Torque feedforward filter	Read and	0.01ms	16	0 to

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Set range
	time constant	write			10000

7.4.3 Related function settings

(1) Positioning completion

Index (Hex)	Name	Content
6067	Position window	When the position deviation is in the range of 6067 and the time reaches 6068, the positioning completion signal is valid.
6068	Position window time	

(2) Position deviation limit

Index (Hex)	Name	Content
6065	Following Error Window	When the position deviation is greater than the set value of this parameter, Er.36 (excessive position deviation) will occur.

7.4.4 Recommended configuration

Please refer to the following table for the basic configuration of this mode:

RPDO	TPDO	Remark
6040 (Control word)	6041 (Status word)	Required
607A (Target position)	6064 (Position actual valu)	Required
6060 (Modes of operation)	6061 (Modes operation)	Optional

7.5 Cyclic synchronous velocity (CSV)

7.5.1 Control diagram

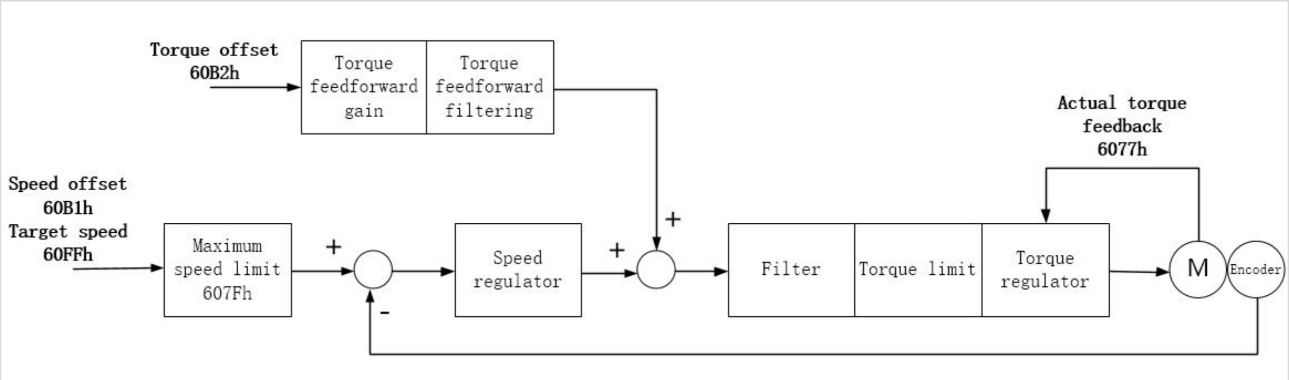


Figure 7-9 Cyclic synchronous velocity mode control block diagram

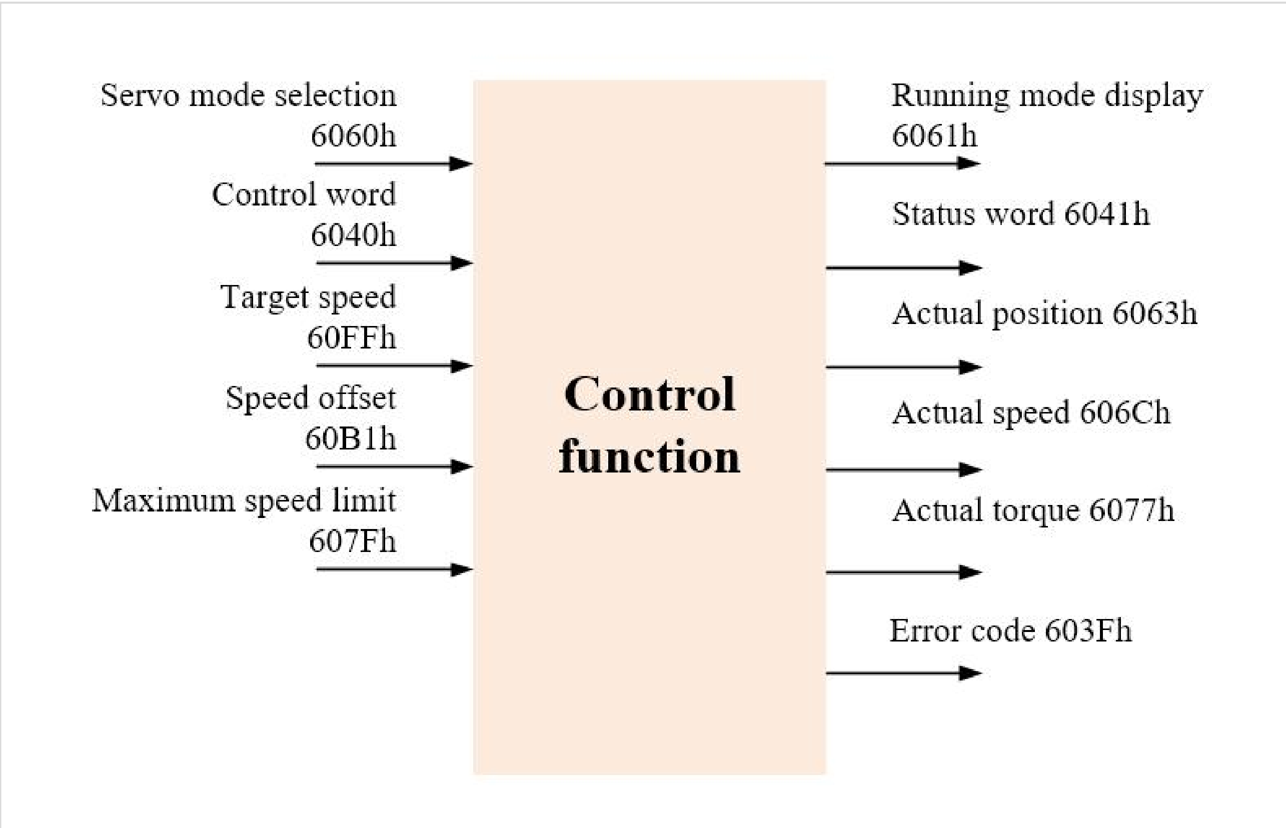


Figure 7-10 Input and output objects

7.5.2 Related objects

(1) Control word 6040h

Bit	Name	Description
0	Servo operation can be started	When all of bit0 to bit3 is 1, it means that it starts running
1	Connect the main circuit	
2	Quick stop	
3	Servo running	
8	Pause	

(2) Status word 6041h

Bit	Name	Description
10	Target reached	--
11	Software internal position overlimit	--
12	Slave station following instruction	--
15	Homing completed	--

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Range
603F	Error code	Read only	--	16	0 to 65535
6040	Control word	Read and write	--	16	0 to 65535
6041	Status word	Read only	--	16	0 to 65535
6060	Modes of operation	Read and write	--	8	0 to 10
6061	Modes of operation	Read only	--	8	0 to 10
6063	Position actual value	Read only	Encoder unit	32	--
6064	Position actual value	Read only	Instruction unit	32	--
606C	Velocity actual value	Read only	Instruction unit/s	32	--
6077	Torque actual value	Read only	0.1%	16	-3000 to 3000
607F	Maximum velocity	Read and write	Instruction unit/s	32	0 to 2^{32}-1
6083	Profile acceleration	Read and write	Instruction unit/s^2	32	0 to 2^{32}-1
6084	Profile deceleration	Read and write	Instruction unit/s^2	32	0 to 2^{32}-1
60B1	Velocity offset	Read and write	Instruction unit/s	32	-2^{31} to 2^{31}-1
60B2	Torque offset	Read and write	0.1%	16	-3000 to 3000
60E0	Forward Direction Torque Limit Value	Read and write	0.1%	16	0 to 3000

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Range
60E1	Reverse Direction Torque Limit Value	Read and write	0.1%	16	0 to 3000
60FF	Target velocity	Read and write	Instruction unit/s	32	-2^{31} to 2^{31}-1
2002-02	1st velocity loop gain	Read and write	0.1Hz	16	0 to 35000
2002-03	1st velocity loop integration time constant	Read and write	0.1ms	16	10 to 65535
2002-0B	Torque feedforward gain	Read and write	0.1%	16	0 to 2000
2002-0C	Torque feedforward filter time constant	Read and write	0.01ms	16	0 to 10000

7.5.3 Related function settings

Velocity arrival function

Index (Hex)	Name	Content
606D	Velocity window	When the difference between the target velocity 60FF (converted to motor velocity/rpm) and the actual motor velocity is in the ±606D interval, and the time reaches 606E, the velocity arrival signal is valid.
606E	Velocity window time	

7.5.4 Recommended configuration

Please refer to the following table for the basic configuration of this mode:

RPDO	TPDO	Remark
6040 (Control word)	6041 (Status word)	Required
60FF (Target velocity)	/	Required
/	6064 (Position actual value)	Optional
/	606C (Velocity actual value)	Optional
6060 (Modes of operation)	6061 (Modes of opration display)	Optional

7.6 Cyclic synchronous torque mode (CST)

7.6.1 Control block diagram

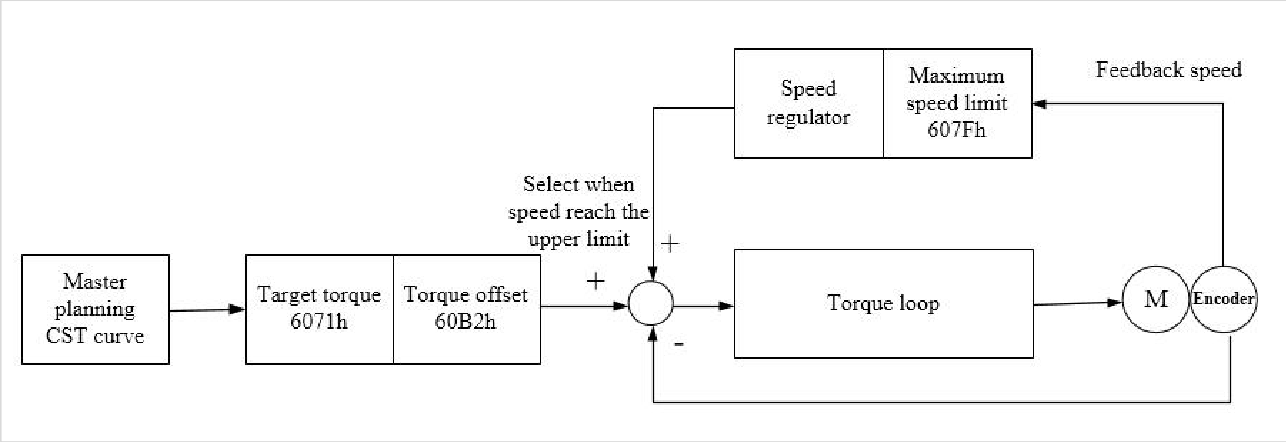


Figure 7-11 Cyclic synchronous torque mode control block diagram

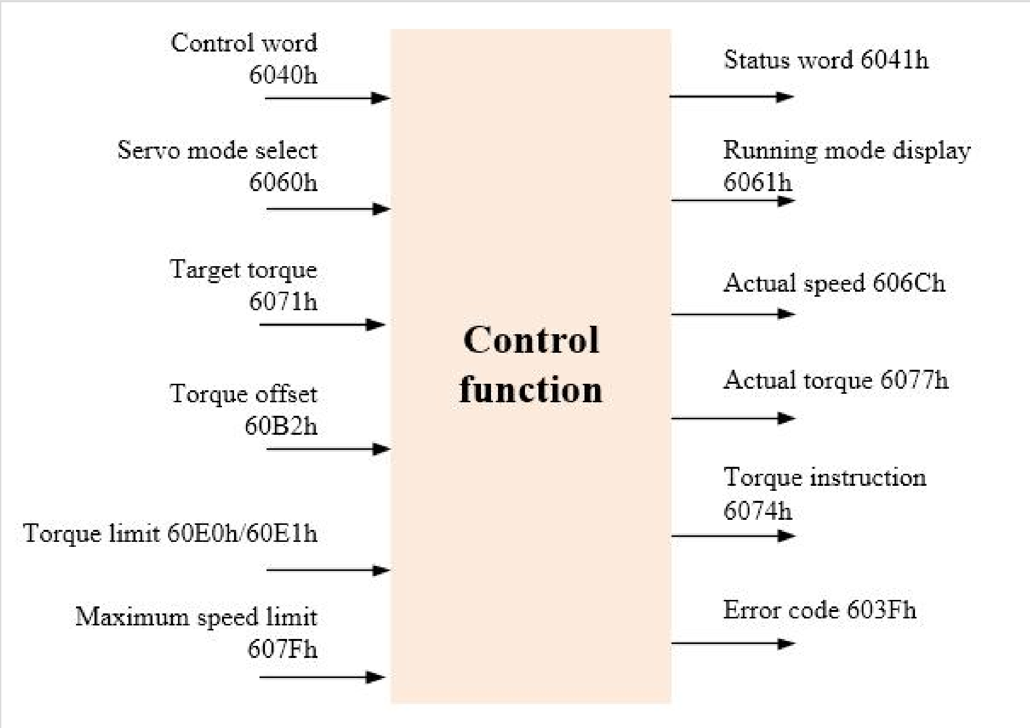


Figure 7-12 Input and output objects

7.6.2 Related objects

(1) Control word 6040h

Bit	Name	Description
0	Servo operation can be started	When all of bit0 to bit3 is 1, it means that it starts running
1	Connect the main circuit	
2	Quick stop	
3	Servo operation	
8	Pause	0: Servo settings at bit0 to bit3 1: The servo is set at 605Dh

(3) Status word 6041h

Bit	Name	Description
10	Target reached	--
12	Slave station following instruction	--
15	Homing completed	--

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Range
603F	Error code	Read-only	--	16	0 to 65535
6040	Control word	Read and write	--	16	0 to 65535
6041	Status word	Read-only	--	16	0 to 65535
6060	Modes of operation	Read and write	--	8	0 to 10
6061	Modes of operation display	Read-only	--	8	0 to 10
606C	Velocity actual value	Read-only	Instruction unit/s	32	-2^{31} to $2^{31}-1$
6071	Target torque	Read and write	0.1%	16	-3000 to 3000
6074	Torque demand value	Read-only	0.1%	16	-3000 to 3000
6077	Torque actual value	Read-only	0.1%	16	-3000 to 3000
607F	Maxi velocity	Read and write	Instruction unit/s	32	0 to $2^{32}-1$
60B2	Torque offset	Read and write	0.1%	16	-3000 to 3000
60E0	Forward Direction Torque Limit Value	Read and write	0.1%	16	0 to 3000
60E1	Reverse Direction Torque Limit Value	Read and write	0.1%	16	0 to 3000
2002-02	1st velocity loop gain	Read and write	0.1Hz	16	0 to 35000
2002-03	1st velocity loop integration time	Read and write	0.1ms	16	10 to 65535

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Range
	constant				
2002-0B	Torque feedforward gain	Read and write	0.1%	16	0 to 2000
2002-0C	Torque feedforward filter time constant	Read and write	0.01ms	16	0 to 10000

7.6.3 Recommended configuration

Please refer to the following table for the basic configuration of this mode:

RPDO	TPDO	Remark
6040 (Control word)	6041 (Status word)	Required
6071 (Target torque)	/	Required
/	6064(Position actual value)	Optional
/	606C (Velocity actual value)	Optional
/	6077 (Torque actual value)	Optional
6060 (Mode of selection)	6061 (Modes of operation display)	Optional

7.7 Profile torque mode (PT)

7.7.1 Control block diagram

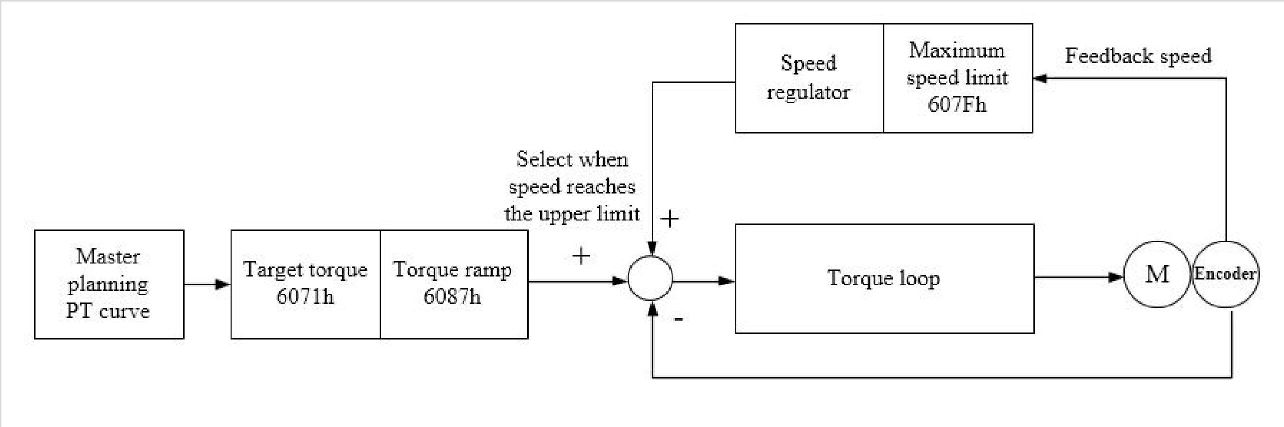


Figure 7-13 Profile torque mode control block diagram

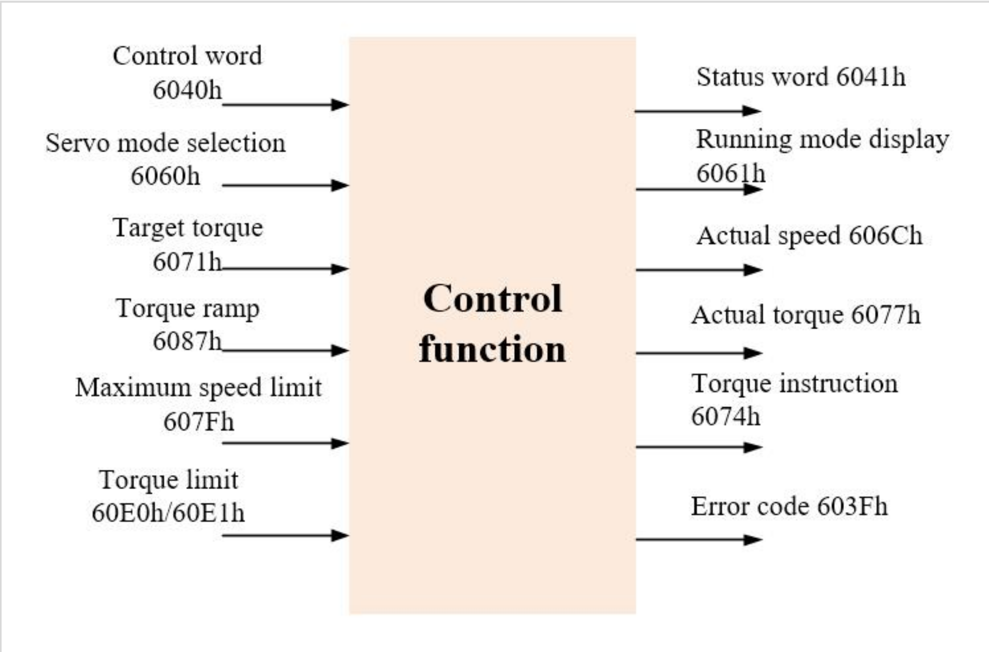


Figure 7-14 Input and output objects

7.7.2 Related objects

(1) Control word 6040h

Bit	Name	Description
0	Servo can be started	When all of bit0 to bit3 is all 1, it means that it starts running
1	Connect the main circuit	
2	Quick stop	
3	Servo running	
8	Pause	0: Servo settings at bit0 to bit3 1: The servo is set at 605Dh

(2) Status word 6041h

Bit	Name	Description
10	Target reach	--
11	Software internal position overlimit	--
15	Homing completed	--

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Range
603F	Error code	Read only	--	16	0 to 65535
6040	Control word	Read and write	--	16	0 to 65535
6041	Status word	Read only	--	16	0 to 65535
6060	Modes of operation	Read and write	--	8	0 to 10
6061	Modes of operation display	Read only	--	8	0 to 10
606C	Velocity actual value	Read only	Instruction unit/s	32	-2^{31} to $2^{31}-1$
6071	Target torque	Read and write	0.1%	16	-3000 to 3000
6072	Maxi torque	Read and write	0.1%	16	-3000 to 3000
6074	Torque demand value	Read only	0.1%	16	-3000 to 3000
6077	Torque actual value	Read only	0.1%	16	-3000 to 3000
607F	Maxi velocity	Read and write	Instruction unit/s	32	0 to $2^{32}-1$
6087	Torque slope	Read and write	0.1%/s	32	0 to $2^{32}-1$
60E0	Forward Direction Torque Limit Value	Read and write	0.1%	16	0 to 3000
60E1	Reverse Direction Torque Limit Value	Read and write	0.1%	16	0 to 3000

Index (Hex)	Object dictionary name	Accessibility	Unit	Bit length	Range
2002-02	1st velocity loop gain	Read and write	0.1Hz	16	0 to 35000
2002-03	1st velocity loop integration time constant	Read and write	0.1ms	16	10 to 65535
2002-0B	Torque feedforward gain	Read and write	0.1%	16	0 to 2000
2002-0C	Torque feedforward filter time constant	Read and write	0.01ms	16	0 to 10000

7.7.3 Recommended configuration

Please refer to the following table for the basic configuration of this mode:

RPDO	TPDO	Remark
6040 (Control word)	6041 (Status word)	Required
6071 (Target torque)	/	Required
/	6064 (Position feedback)	Optional
/	606C (Velocity feedback)	Optional
/	6077 (Torque feedback)	Optional
6060 (Servo mode selection)	6061 (Running mode display)	Optional

7.8 Homing mode (HM)

Homing mode is used to find the mechanical origin and locate the positional relationship between the mechanical origin and the mechanical zero.
Mechanical origin: A fixed position on the machine can correspond to a certain origin switch, which can correspond to the Z signal of the motor.
Mechanical origin: Mechanical absolute origin position.
After homing, the stop position of the motor is the mechanical origin. By setting 607Ch, the relationship between the mechanical origin and the mechanical zero can be set:
Mechanical origin = mechanical zero + 607Ch (origin offset)
When 607Ch=0, the mechanical origin is the same with mechanical zero.

7.8.1 Control block diagram

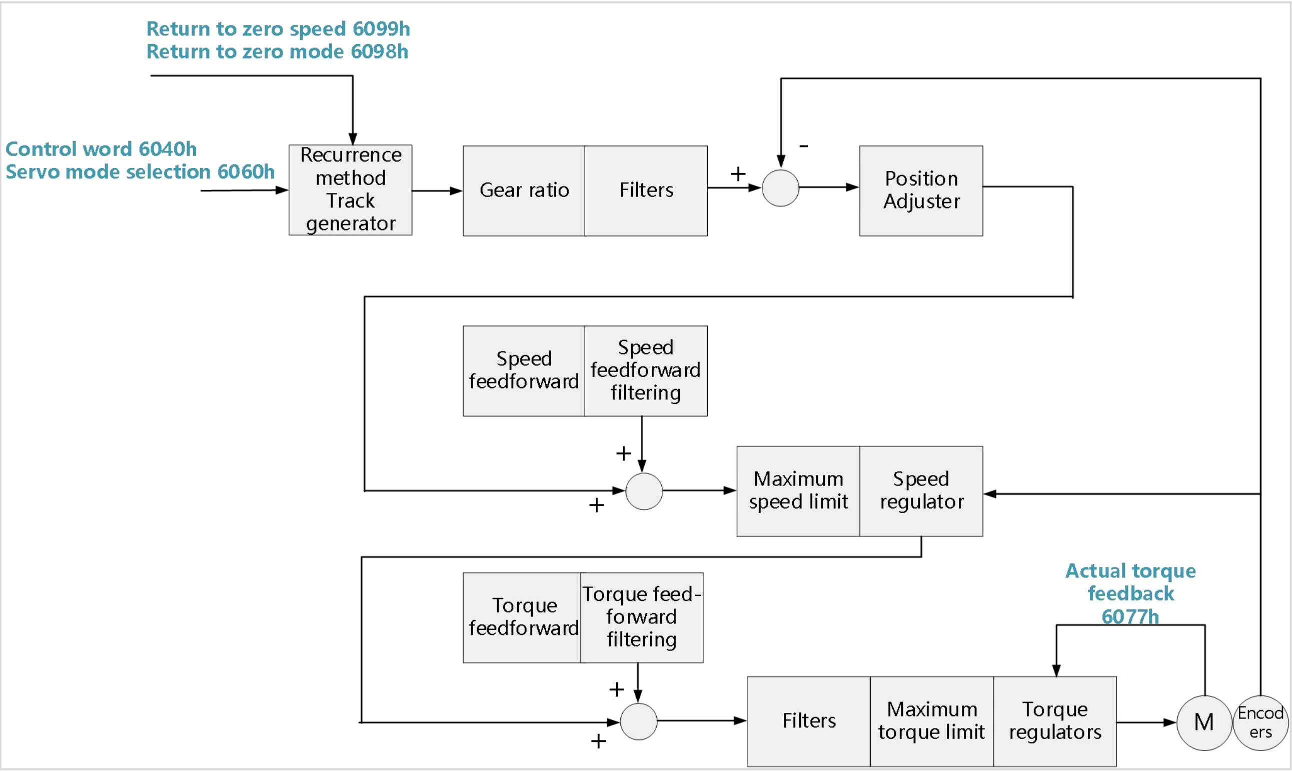


Figure 7-15 Homing mode control block diagram

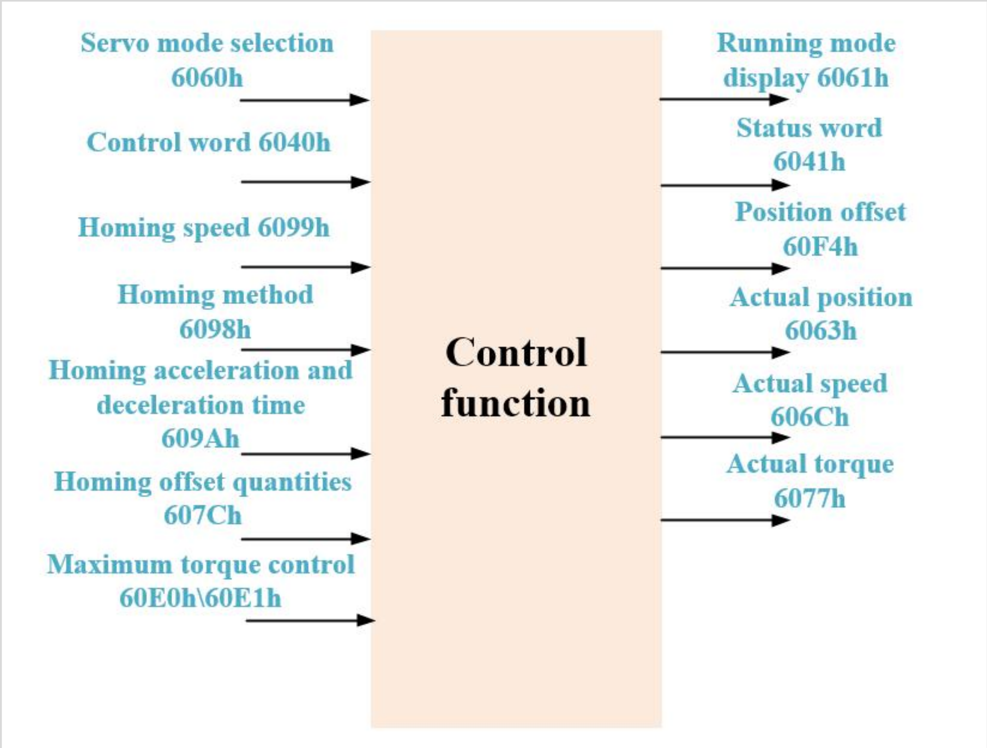


Figure 7-16 Homing mode control block diagram

7.8.2 Related objects

(1) Control word 6040h

Bit	Name	Description
0	Servo ready	When bit0 to bit3 are all 1, it indicates the start of operation
1	Turn on the main circuit	
2	Quick stop	
3	Servo operation	
4	Homing	0 → 1: Start homing 1 → 0: End homing

(2) Status word 6041h

Bit	Name	Description
10	Target reached	-
12	Slave station following instruction	-
13	Following error	-
15	Homing completed	-

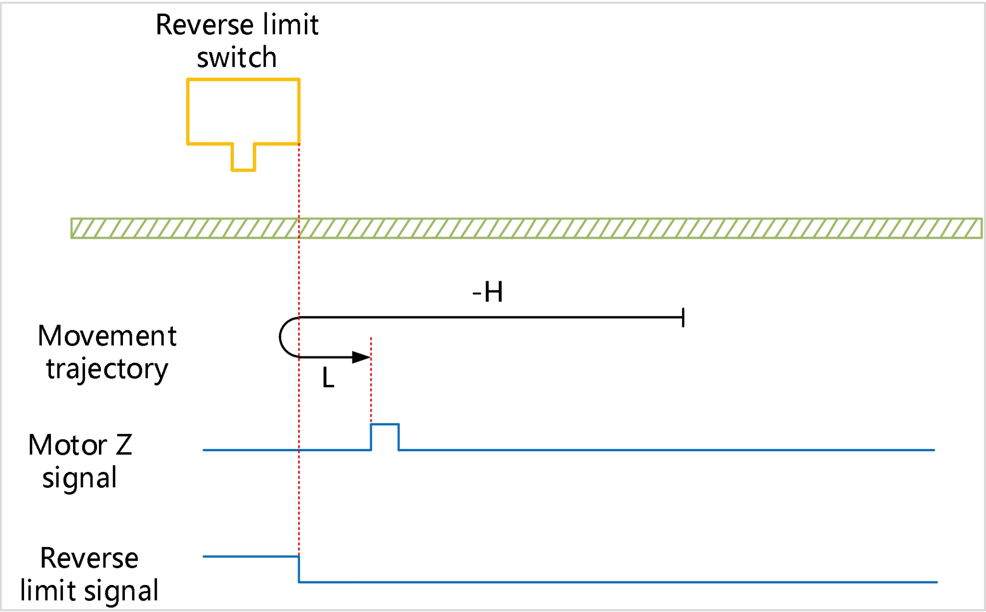
7.8.3 Introduction of homing mode

In the figure, "H" stands for 6099: 01h (search for deceleration point signal speed), and "L" stands for 6099: 02h (search for origin signal speed).

(1) 6098H = 1

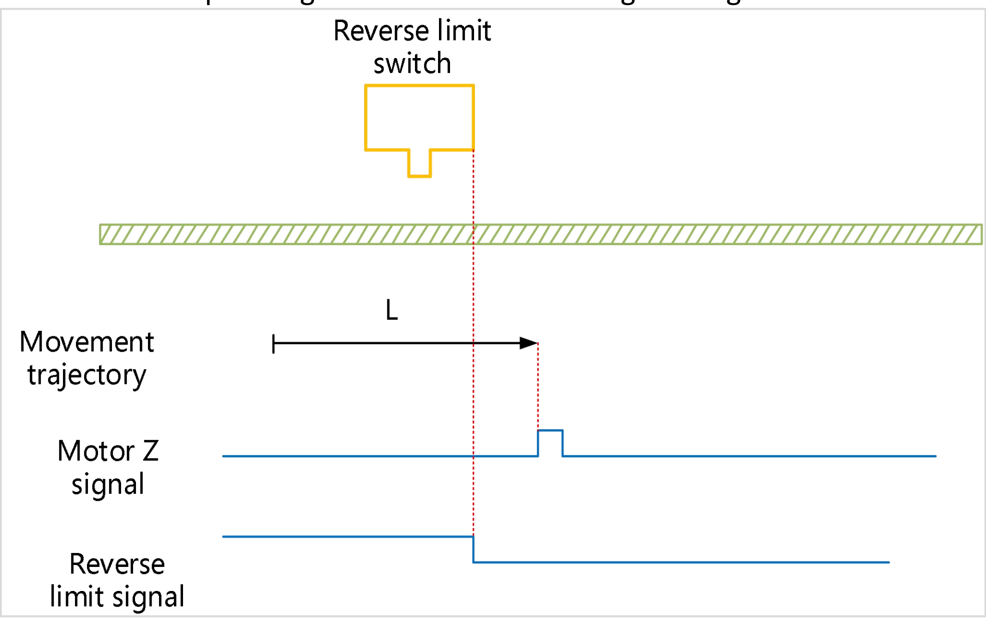
Mechanical origin: Motor Z signal
Deceleration point: Reverse limit switch (NOT)

① The deceleration point signal is invalid when starting homing



When homing starts (NOT=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of NOT, it decelerates, reverses direction, and runs forward at low speed. It will stop at the first Z signal after the falling edge of NOT.

② The deceleration point signal is valid when starting homing

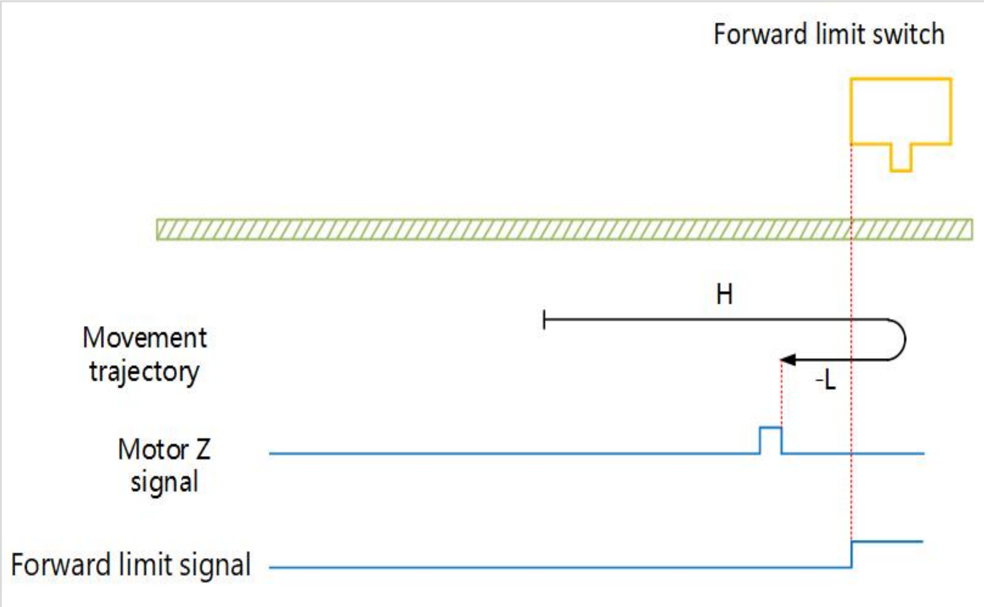


When homing starts (NOT=1), the motor runs at low speed in the forward direction and stops at the first Z signal after encountering the falling edge of NOT.

(2) 6098H = 2

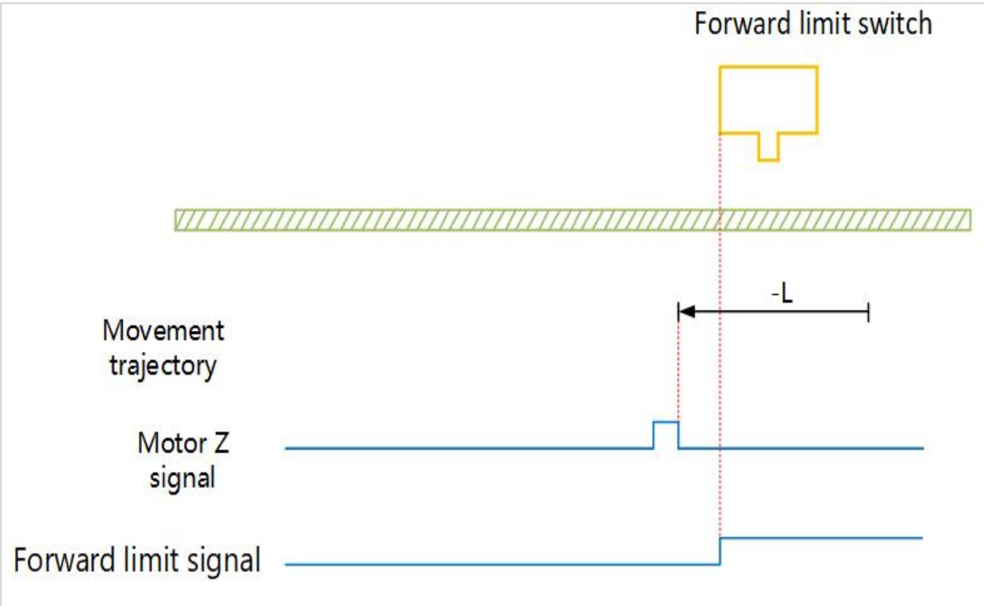
Mechanical origin: Motor Z signal
Deceleration point: Forward limit switch (POT)

① The deceleration point signal is invalid when starting homing



When homing starts (POT=0): the motor runs at high speed in the forward direction. After encountering the rising edge of POT, the motor will decelerate, reverse direction, and run in reverse at low velocity. It will stops at the first Z signal after encountering the falling edge of POT.

② The deceleration point signal is valid when starting homing

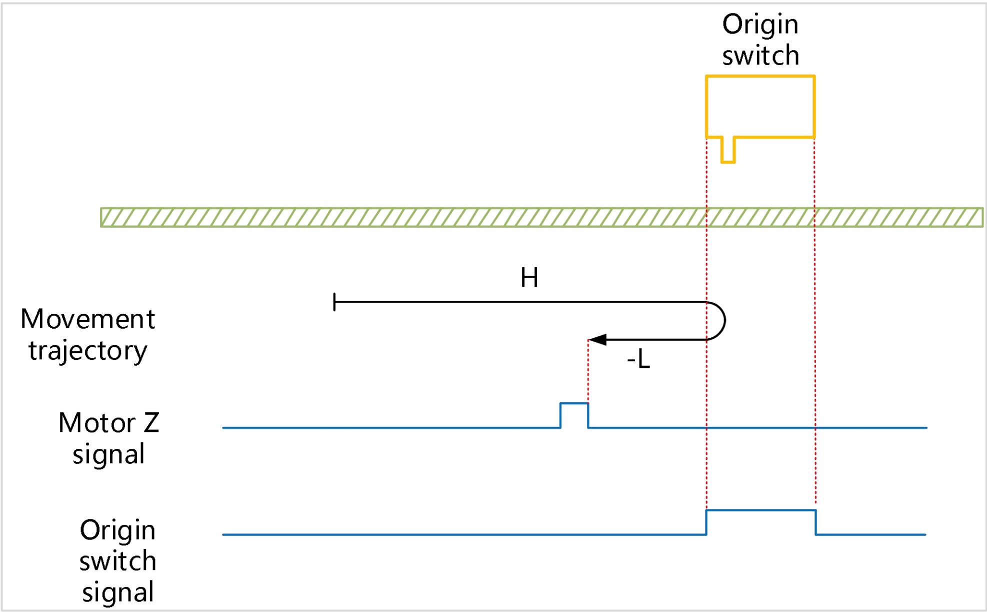


When homing starts (POT=1), the motor runs at low speed in the reverse direction and stops at the first Z signal after encountering the falling edge of POT.

(3) 6098H = 3

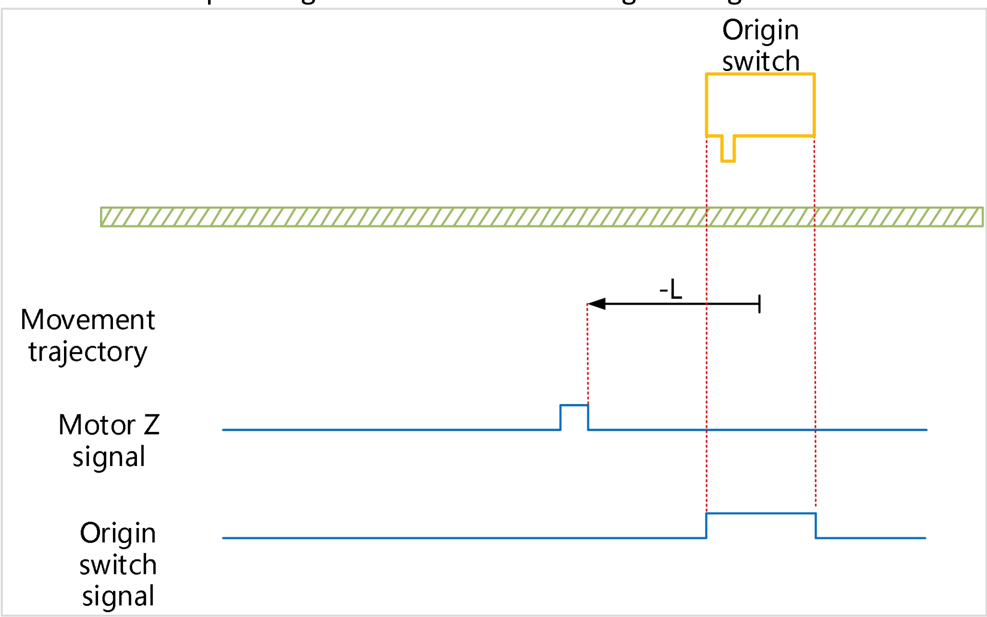
Mechanical origin: Motor Z signal
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0): the motor runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates, reverse direction, and run in reverse direction at low speed. It wil stop at the first Z signal.

② The deceleration point signal is valid when starting homing



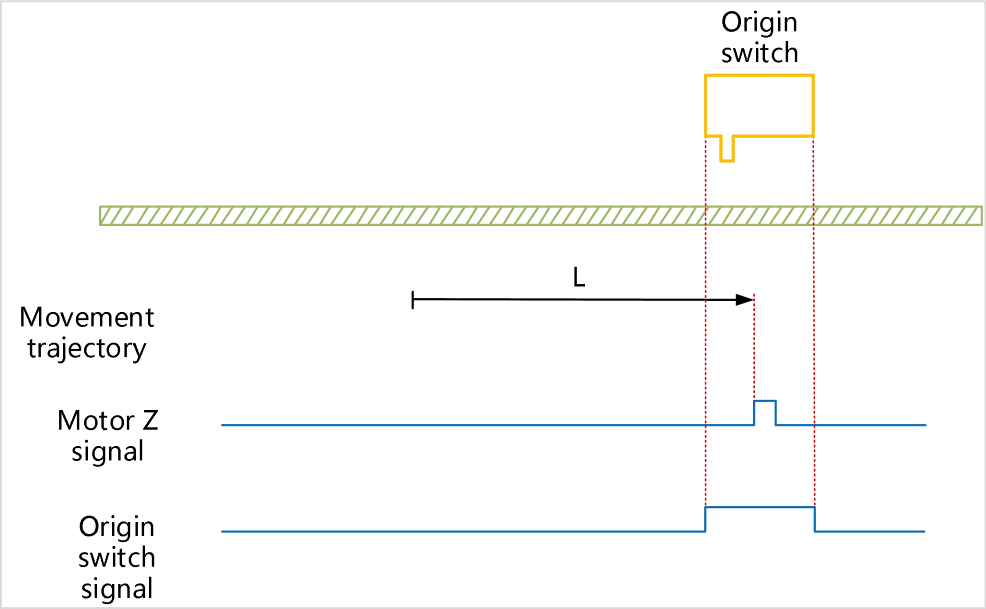
When homing starts (HW=1), the motor runs forward at low speed and stops at the first Z signal after encountering the falling edge of HW.

(4) 6098H = 4

Mechanical origin: Motor Z signal

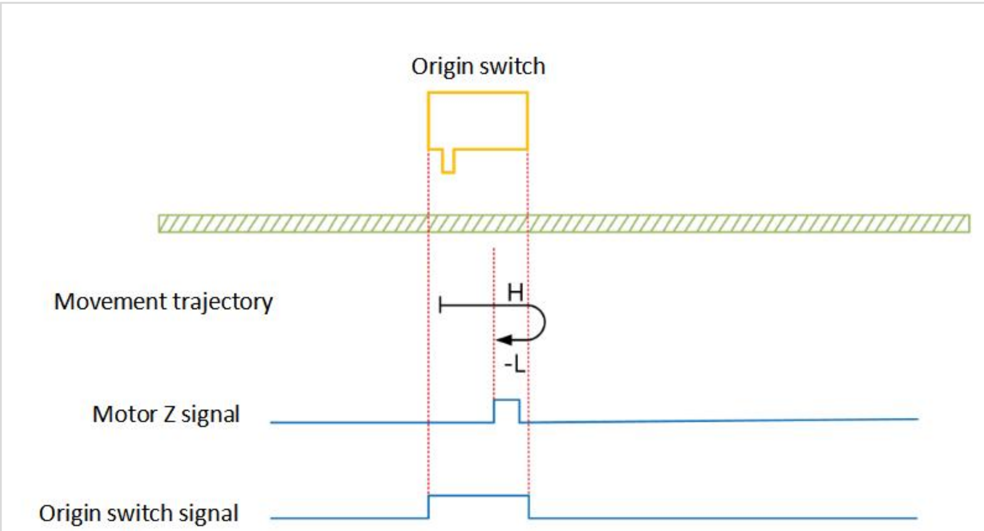
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0), the motor runs forward at low speed and stops at the first Z signal after encountering the rising edge of HW.

② The deceleration point signal is valid when starting homing



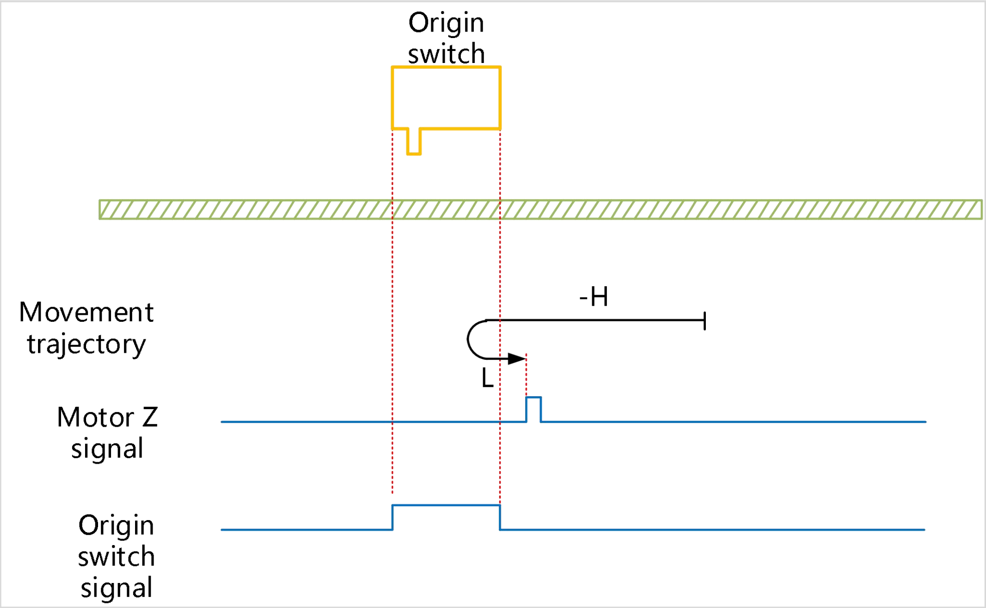
When homing starts (HW=1): the motor runs at high speed in the reverse direction. After encountering the falling edge of HW, it decelerates, reverse direction, and runs in low speed. It stops at the first Z signal after encountering the falling edge of HW.

(5) 6098H = 5

Mechanical origin: Motor Z signal

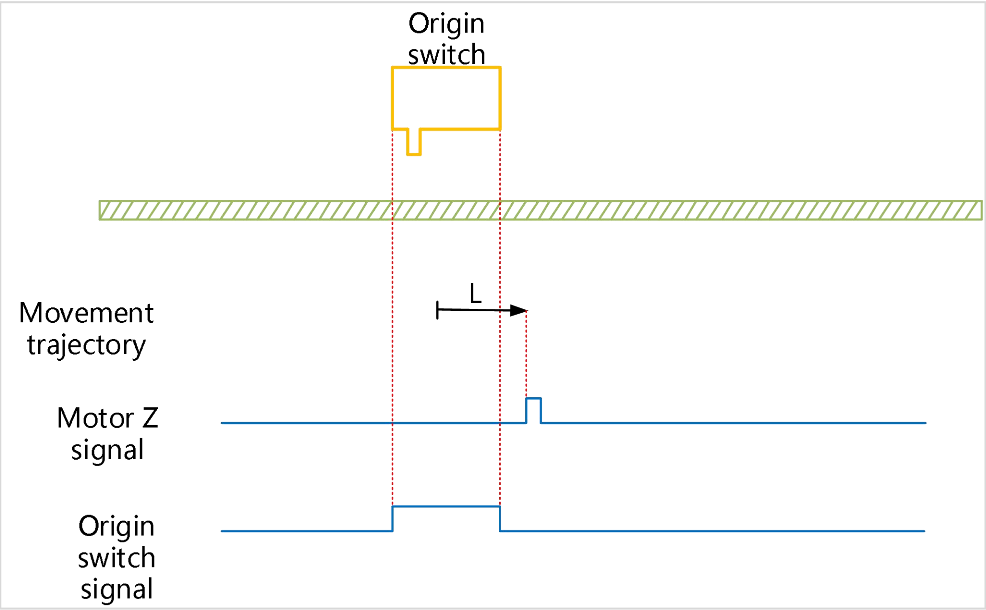
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of NOT, it decelerates, reverses direction, and runs forward at low speed. It will stop at the first Z signal after the falling edge of HW.

② The deceleration point signal is valid when starting homing



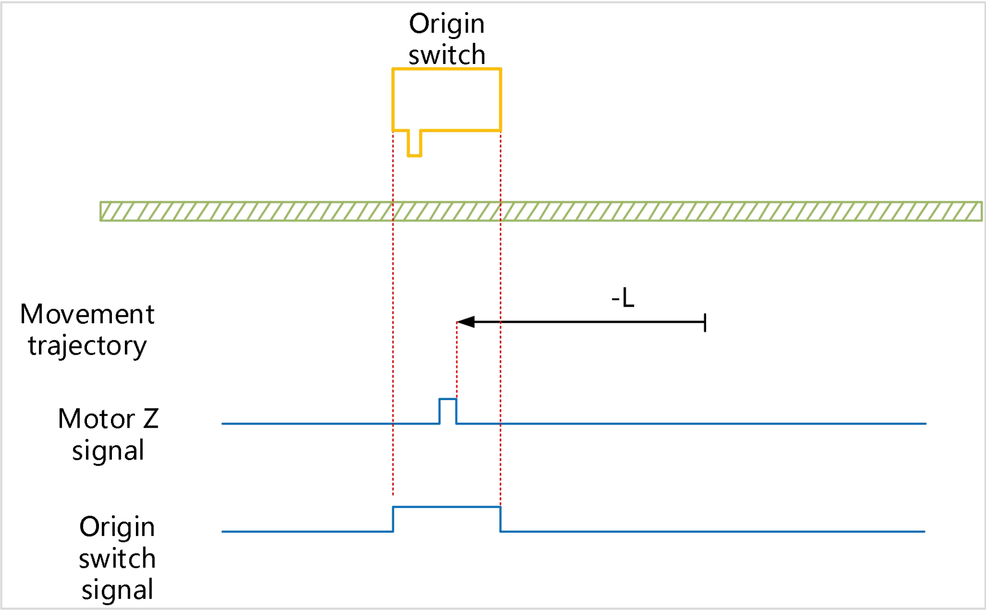
When homing starts (HW=1), the motor runs at low speed in the forward direction and stops at the first Z signal after encountering the falling edge of HW;

(6) 6098H = 6

Mechanical origin: Motor Z signal

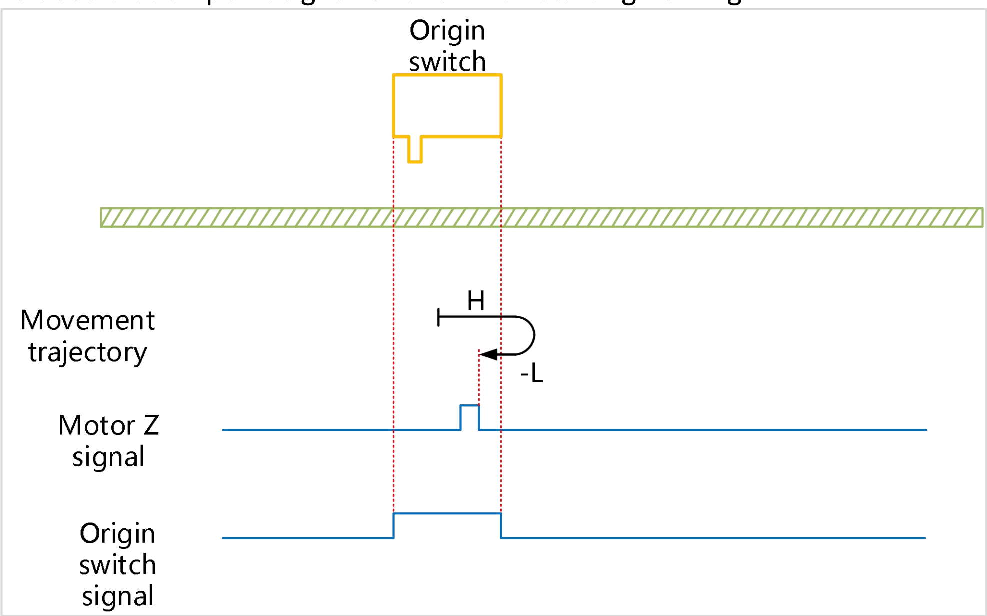
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0), the motor runs at low speed in the reverse direction and stops at the first Z signal after encountering the rising edge of HW;

② The deceleration point signal is valid when starting homing

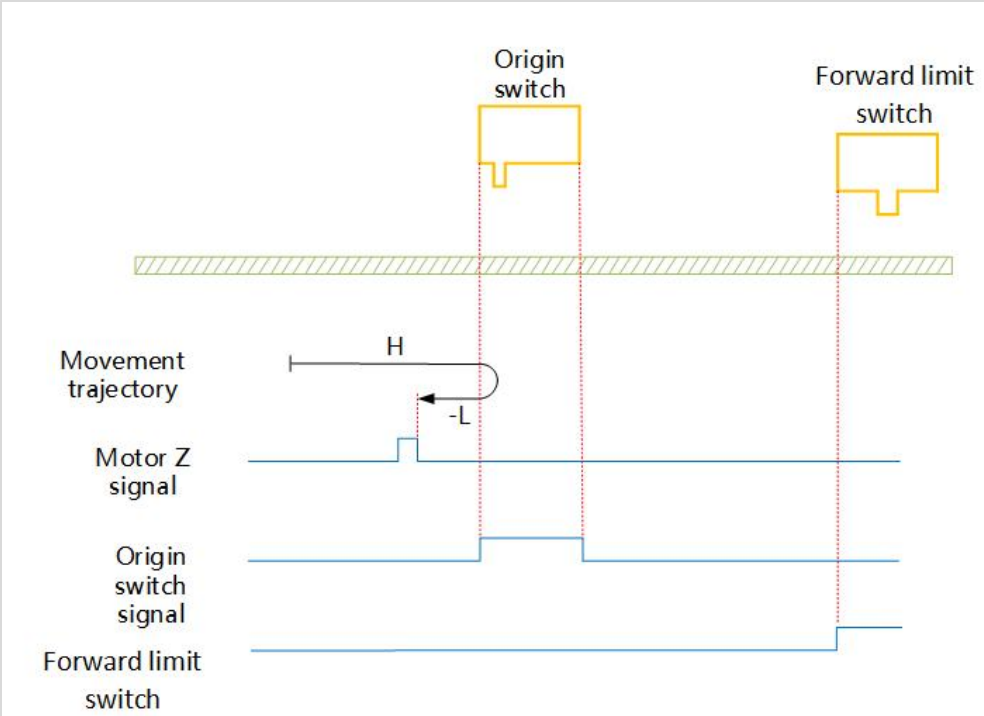


When homing starts (HW=1), the motor runs at high speed in the forward direction. After encountering the falling edge of NOT, it decelerates, reverses direction, and runs forward at low speed. It will stop at the first Z signal after encountering the raising edge of HW.

(7) 6098H = 7

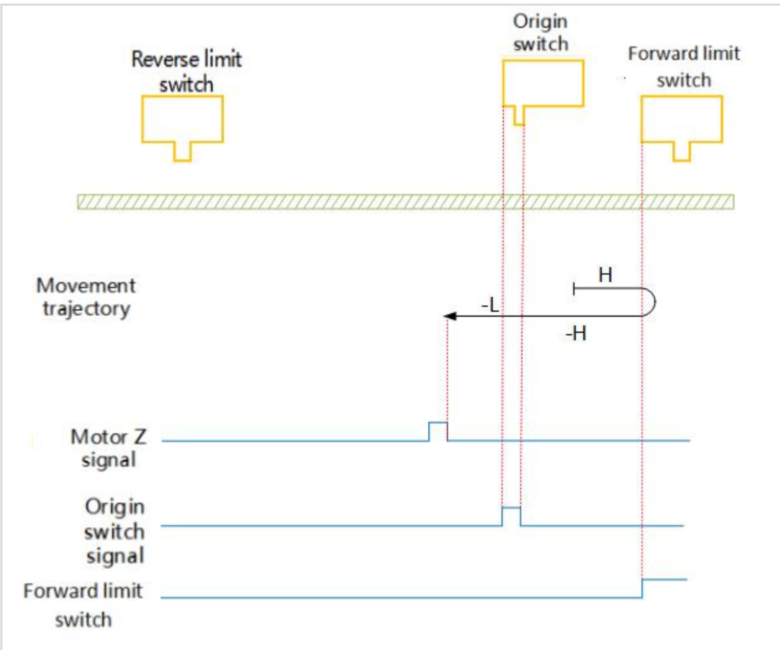
Mechanical origin: Motor Z signal
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



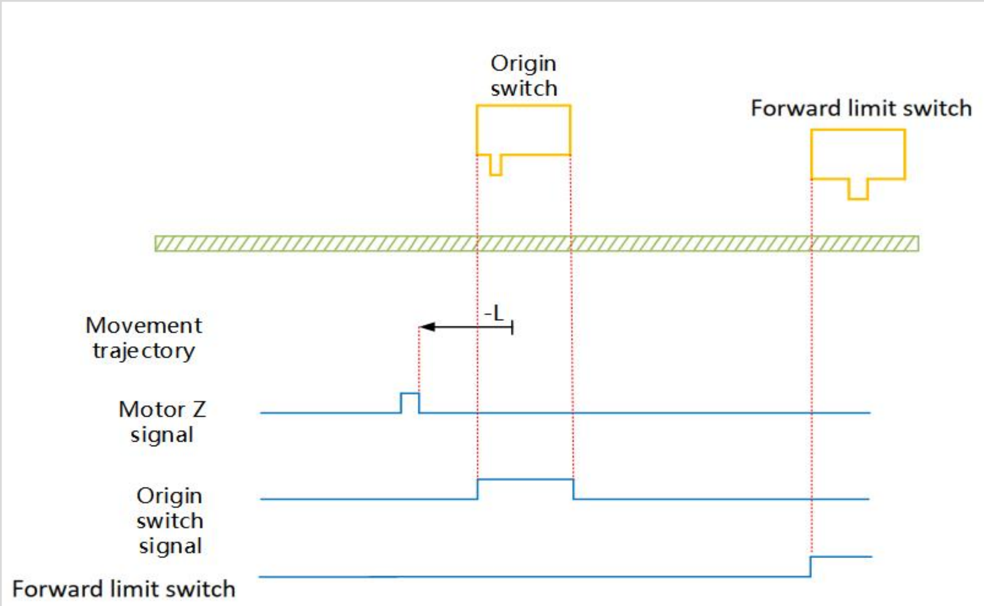
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates, reverse direction, and run in reverse direction at low speed. It will stop at the first Z signal after encountering the falling edge of HW.

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the rising edge of HW, it runs at low speed in the reverse direction. It will stop at the first Z signal after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing

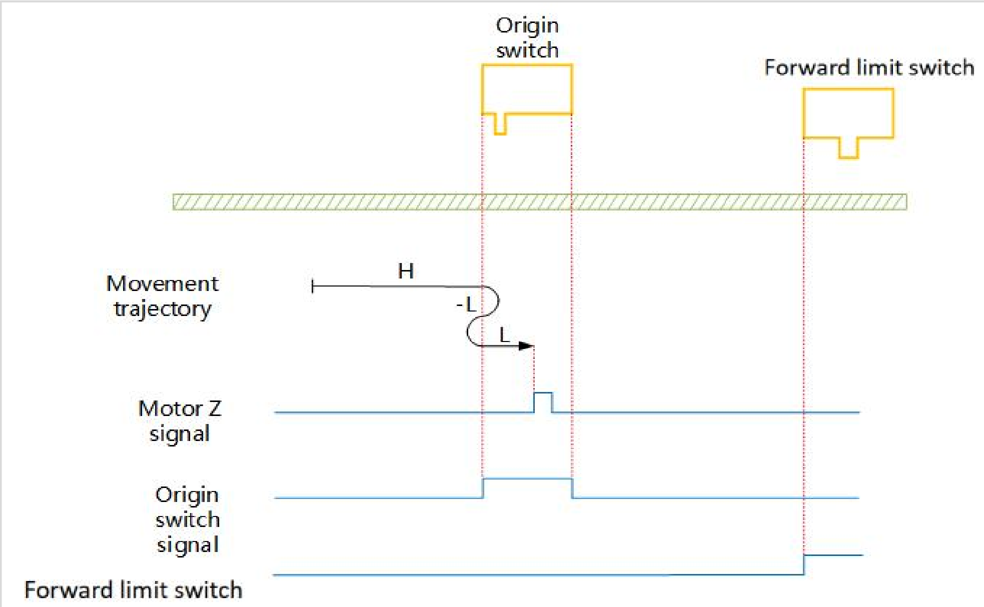


When homing starts (HW=1), the motor runs at low speed in the reverse direction. It stops at the first Z signal after encountering the falling edge of HW.

(8) 6098H = 8

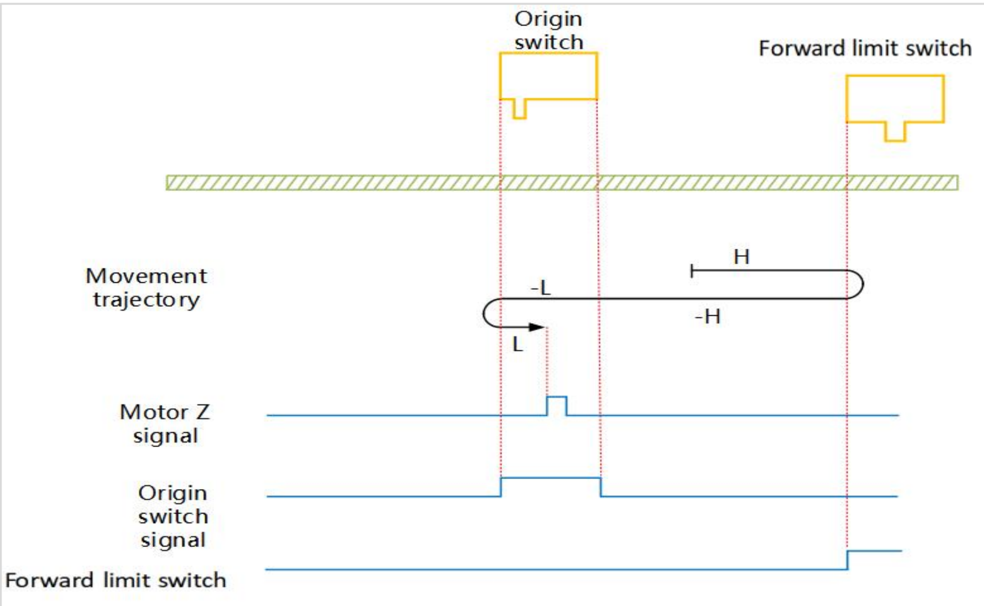
Mechanical origin: Motor Z signal
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting to homing, the forward limit switch is not encountered



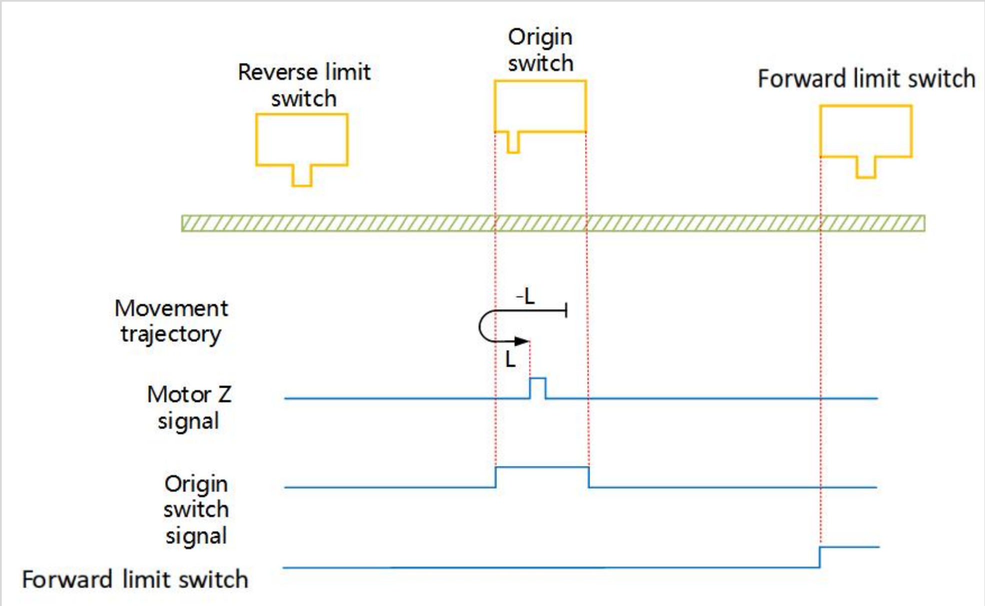
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the rising edge of HW, it runs at low speed in the reverse direction. It will stop at the first Z signal after encountering the raising edge of HW.

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates, and runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction. It will stop at the first Z signal after encountering the raising edge of HW.

③ The deceleration point signal is valid when starting homing



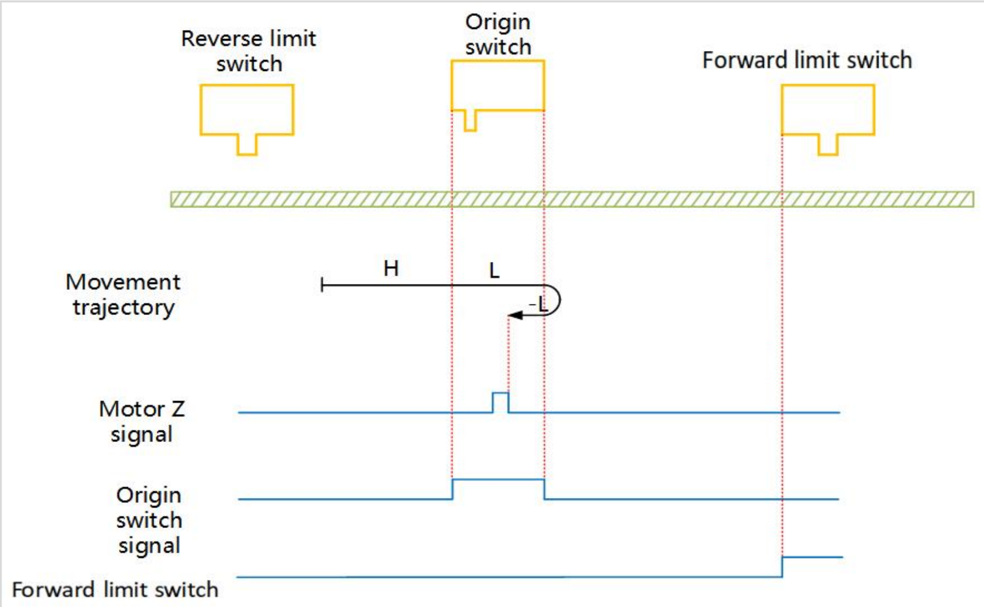
When homing starts (HW=1), the motor runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the forward direction. It will stop at the first Z signal after encountering the raising edge of HW.

(9) 6098H = 9

Mechanical origin: Motor Z signal

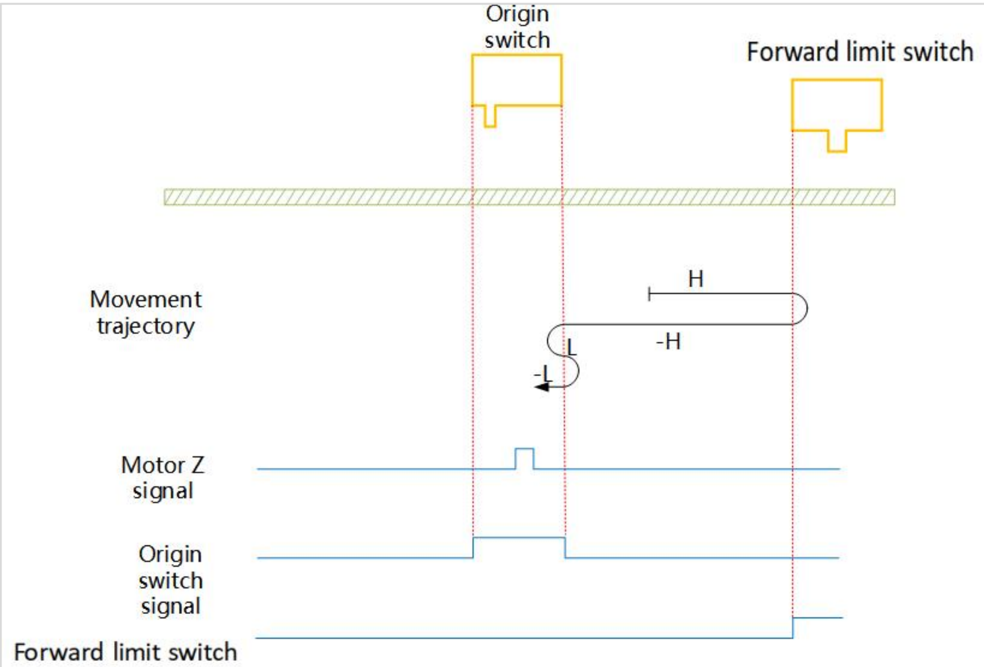
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



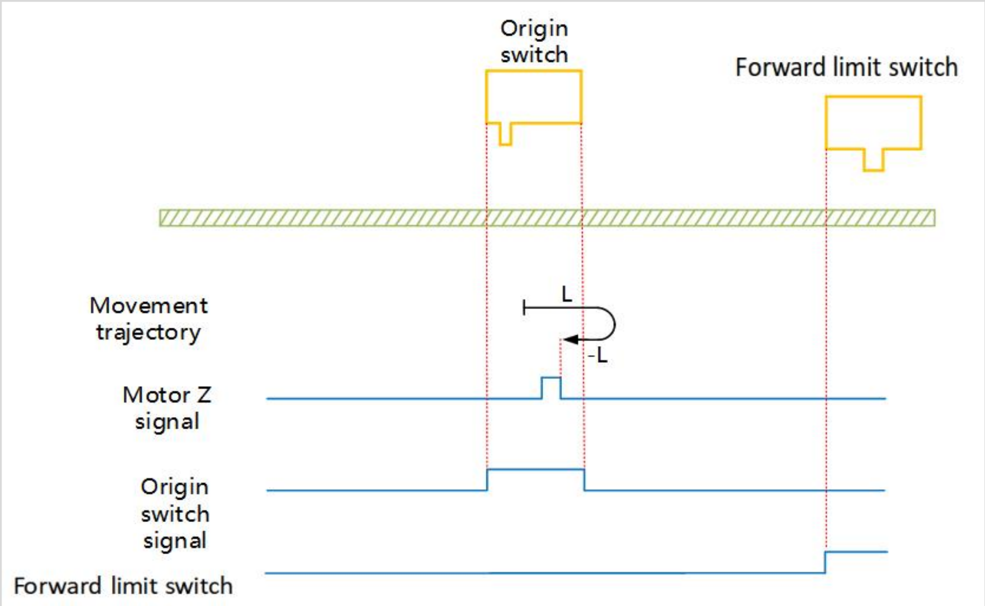
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerate and runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction. It will stop at the first Z signal after encountering the raising edge of HW.

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the rising edge of HW, it runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction. It will stop at the first Z signal after encountering the raising edge of HW.

③ The deceleration point signal is valid when starting homing



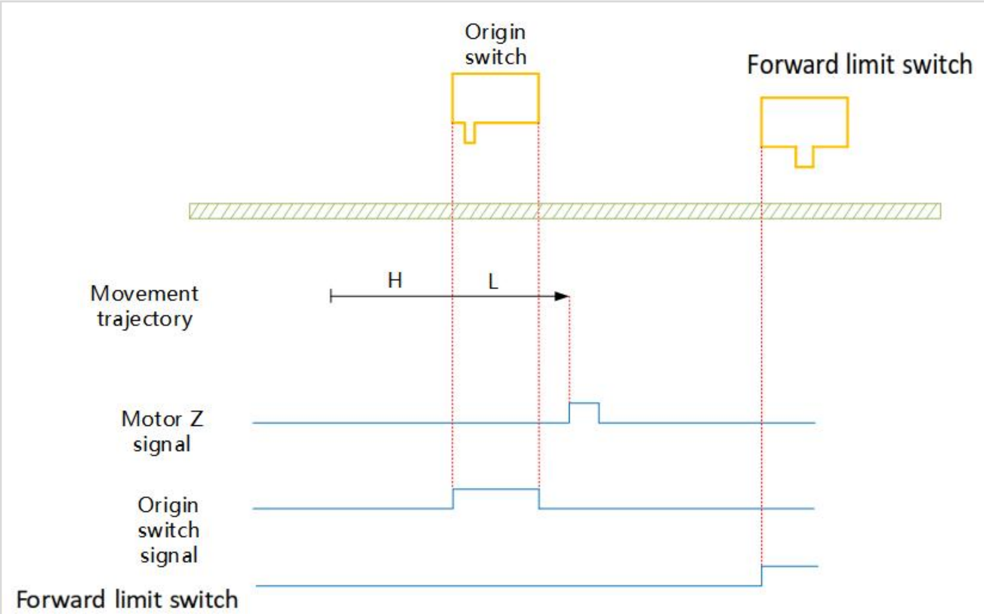
When homing starts (HW=1), the motor runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction. It stops at the first Z signal after encountering the raising edge of HW.

(10) 6098H=10

Mechanical origin: Motor Z signal

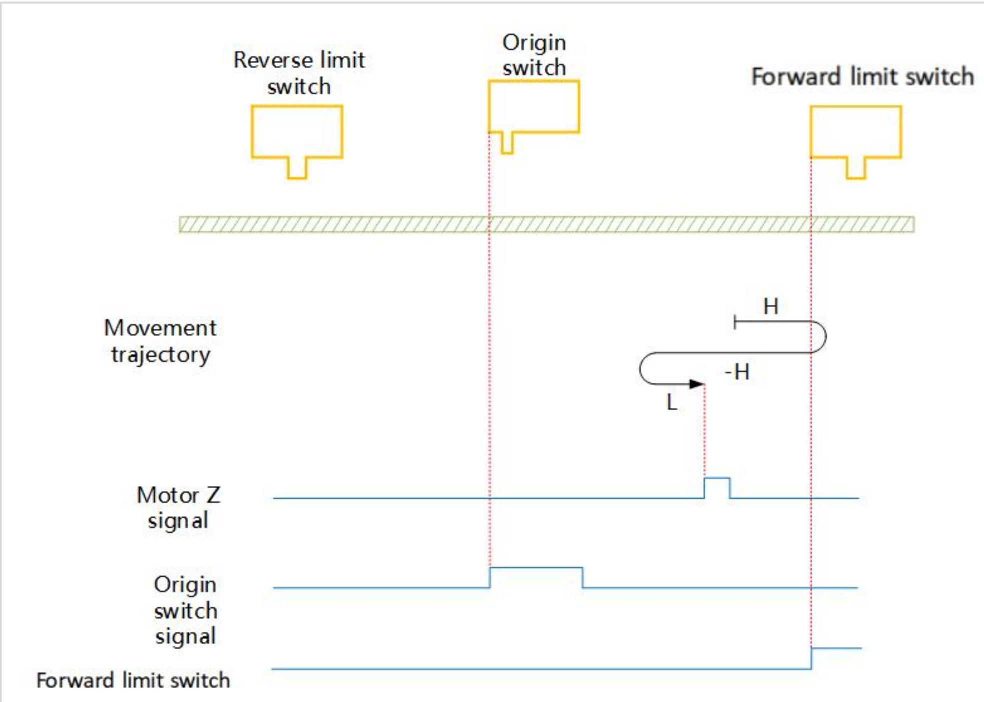
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



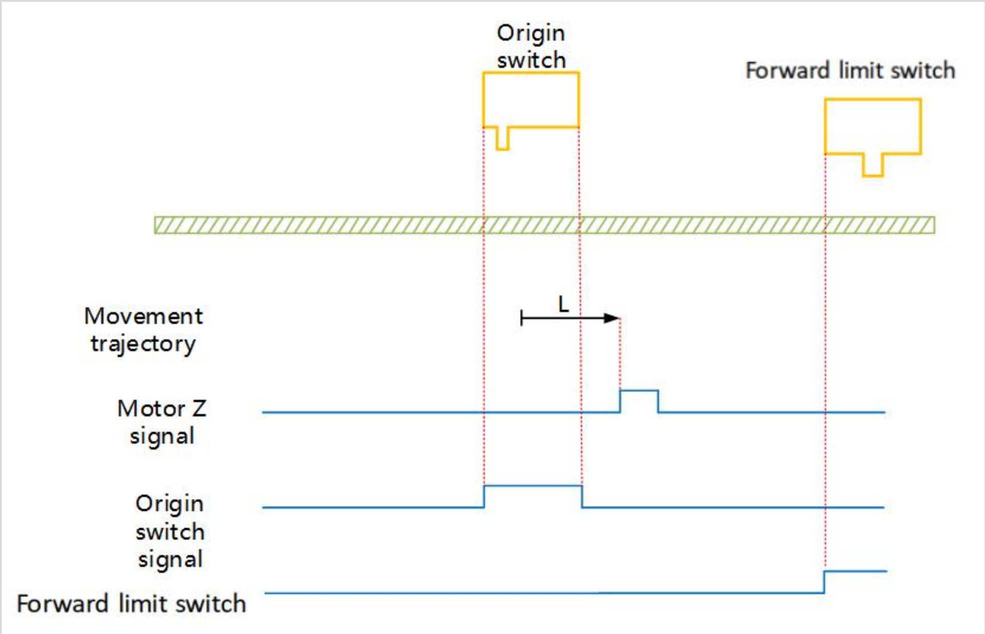
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerate and runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the forward direction and will stop at the first Z.

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates and reverse first, then runs at low speed in the forward direction. It will stop at the first Z signal after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing

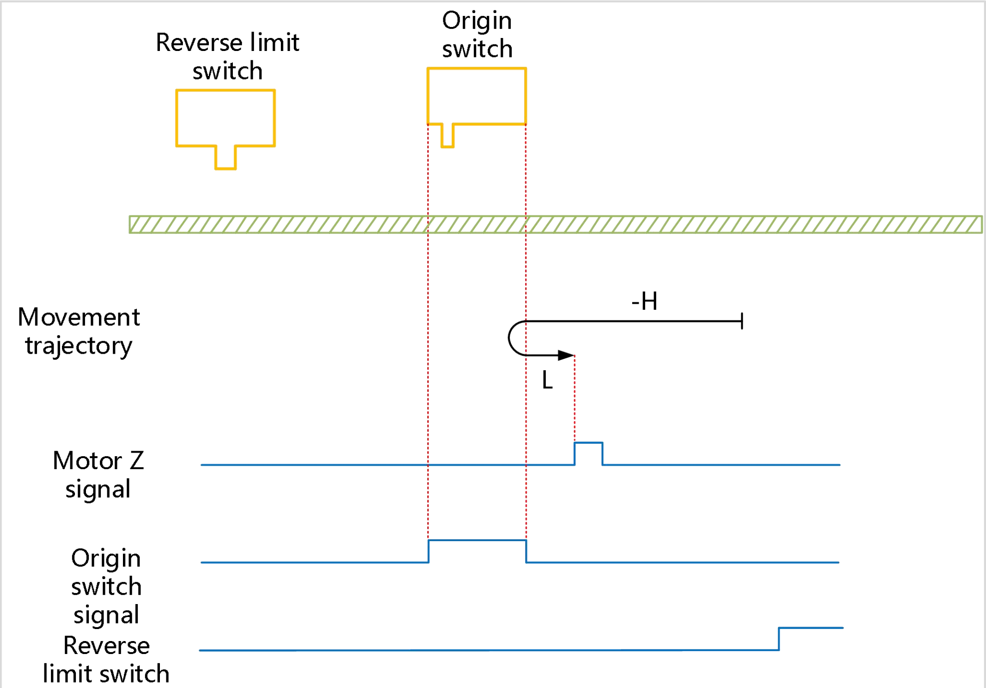


When homing starts (HW=1), the motor runs at low speed in the forward direction and stops at the first Z signal after encountering the falling edge of HW.

(11) 6098H=11

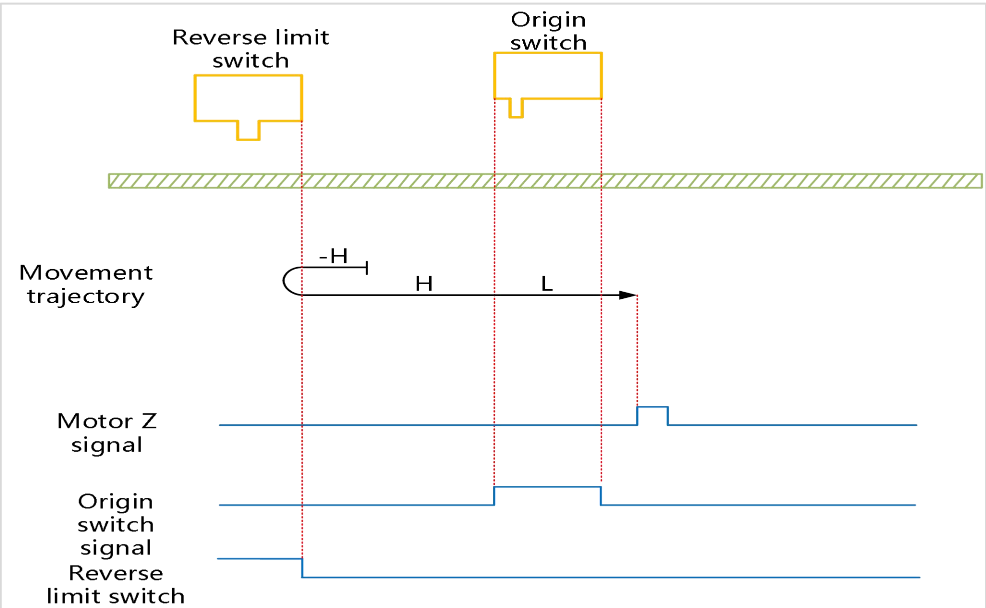
Mechanical origin: Motor Z signal
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates, reverse direction, and run at low speed in the forward direction. It will stop at the first Z signal after encountering the falling edge of HW.

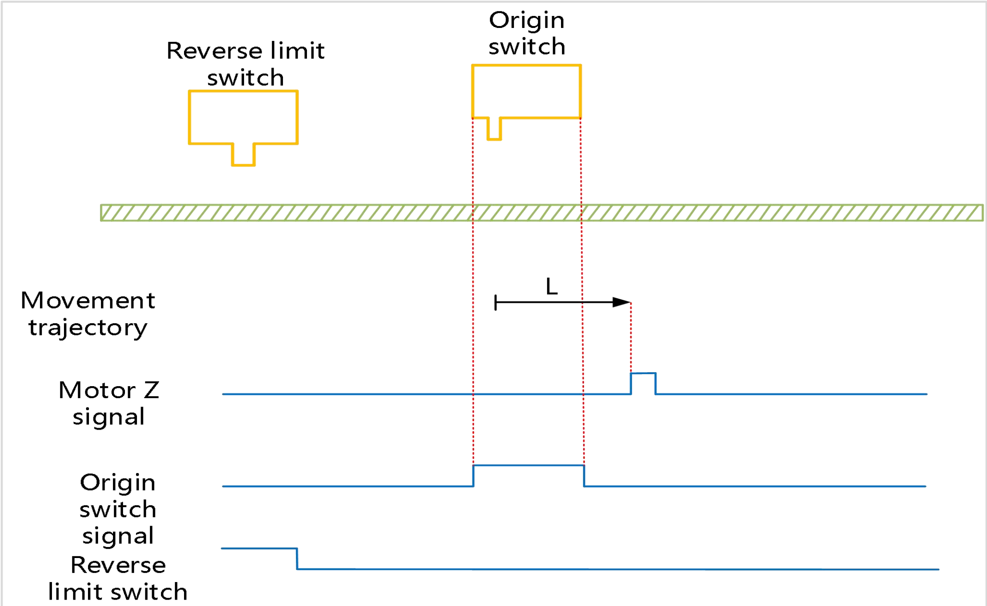
② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the limit switch, it runs at high speed in the forward direction. After encountering

the rising edge of HW, it decelerates and runs at low speed in the forward direction. It will stop at the first Z signal after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing

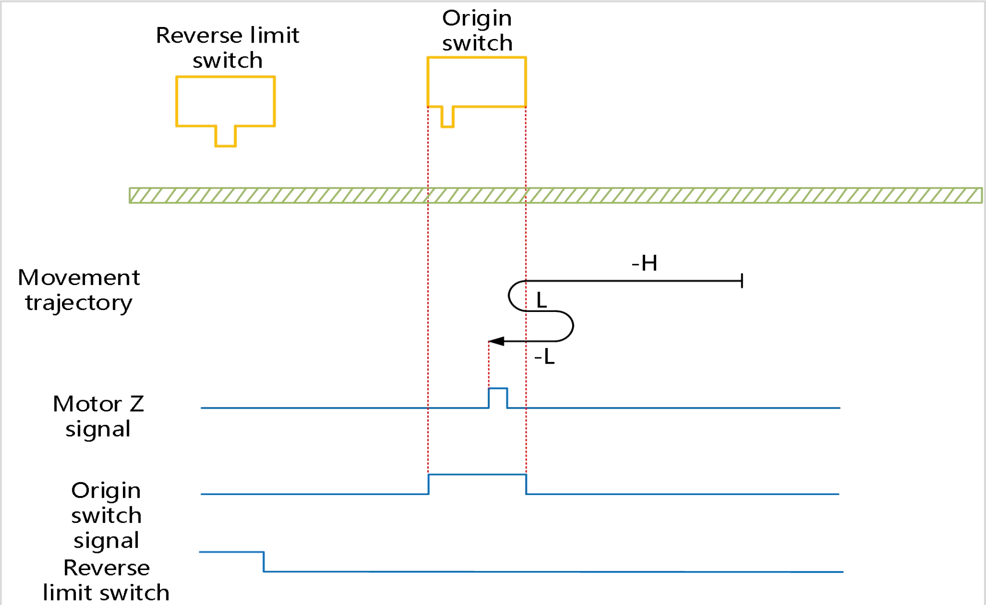


HW=1 when starting homing, it will start homing directly in forward direction at low velocity, and stop at the first Z signal after encountering the falling edge of HW;

(12) 6098H=12

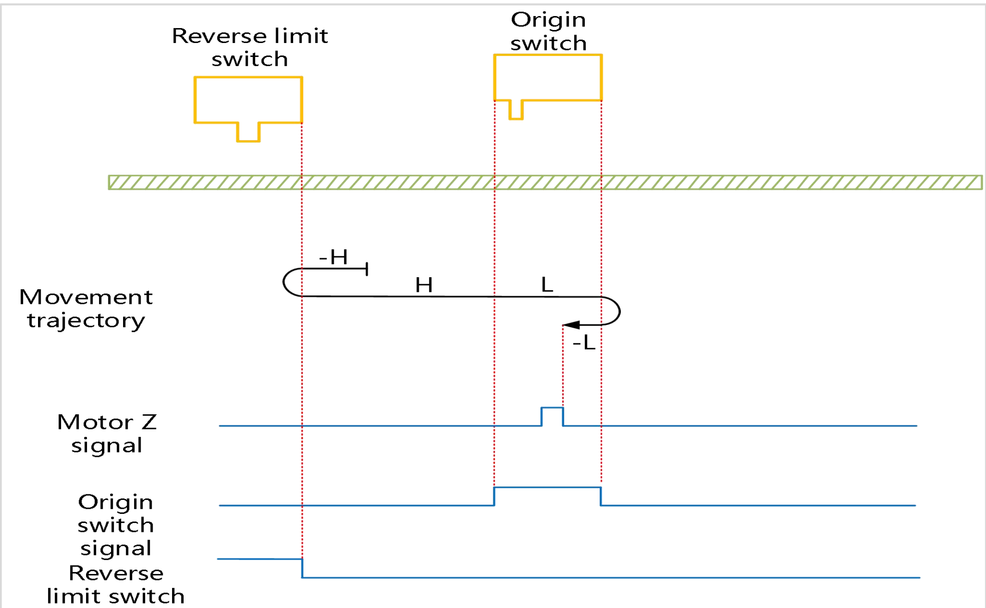
Mechanical origin: Motor Z signal
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered.



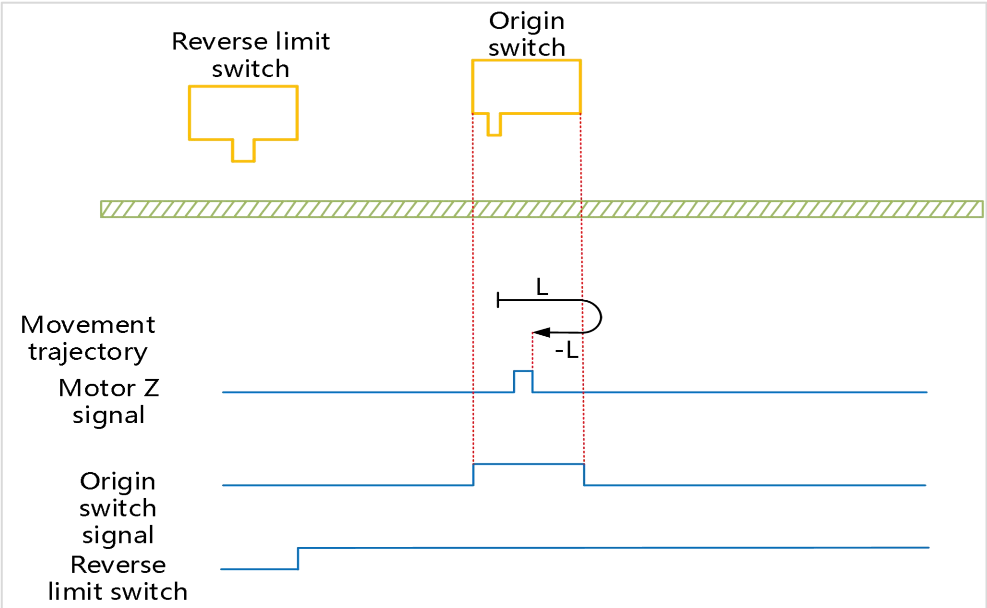
When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates and reverse first, then runs at low speed in the forward direction and will stop at the first Z signal.

② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates and runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction and will stop at the first Z signal.

③ The deceleration point signal is valid when starting homing

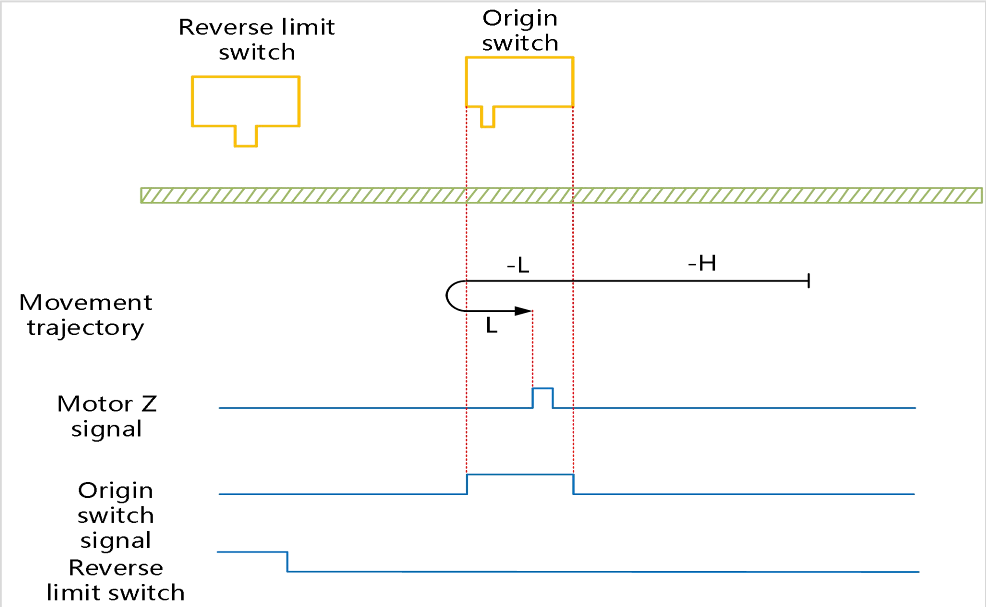


When homing starts (HW=1), the motor runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction.and stops at the first Z signal after encountering the raising edge of HW.

(13) 6098H=13

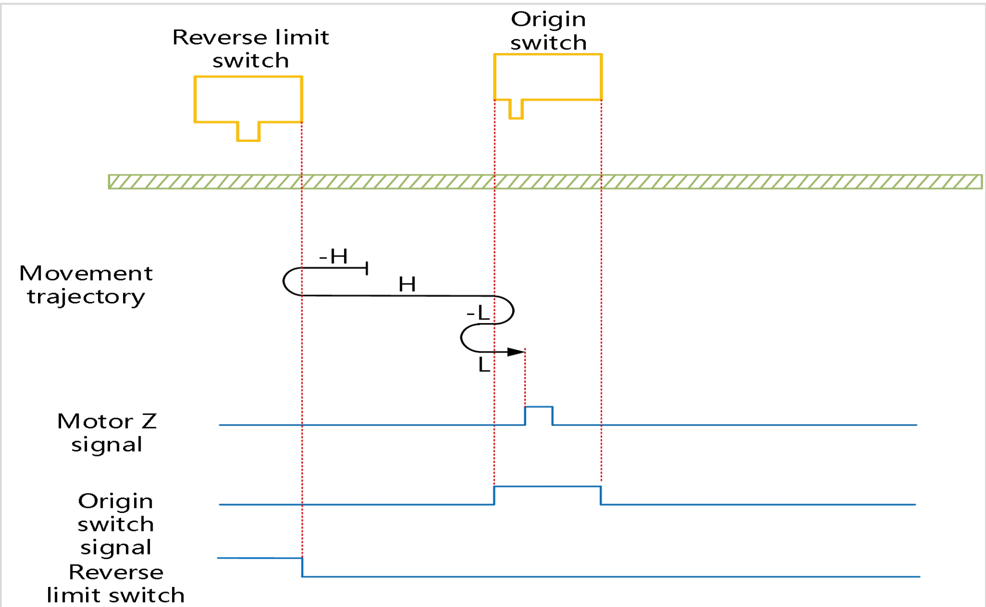
Mechanical origin: Motor Z signal
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



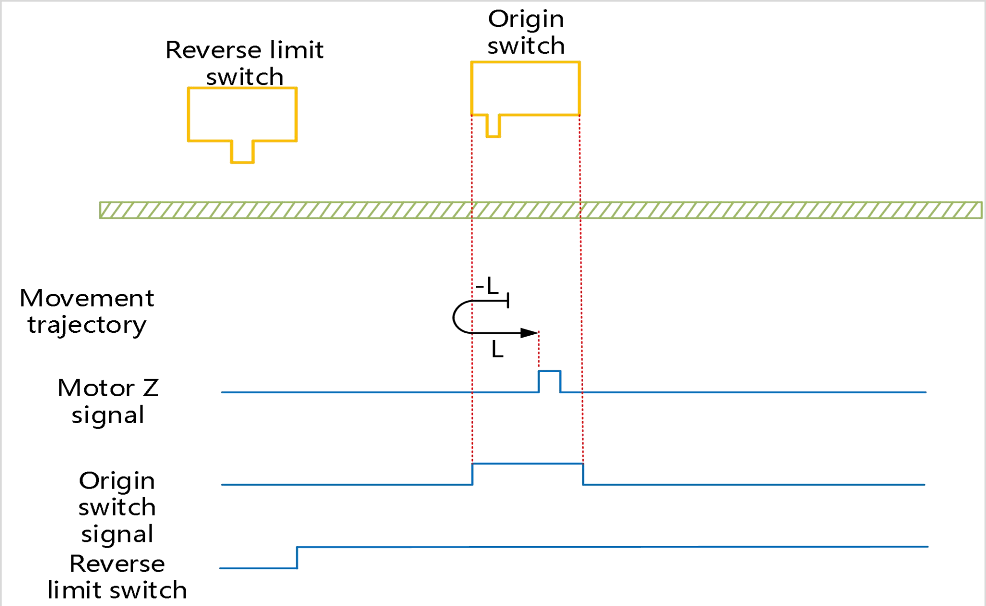
When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the raising edge of HW, it decelerates and runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction, and will stop at the first Z signal after encountering the raising edge of HW.

② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the limit switch, it runs at high speed in the forward direction. After encountering the raising edge of HW, it decelerates and reverse, runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction, and will stop at the first Z signal after encountering the raising edge of HW.

③ The deceleration point signal is valid when starting homing



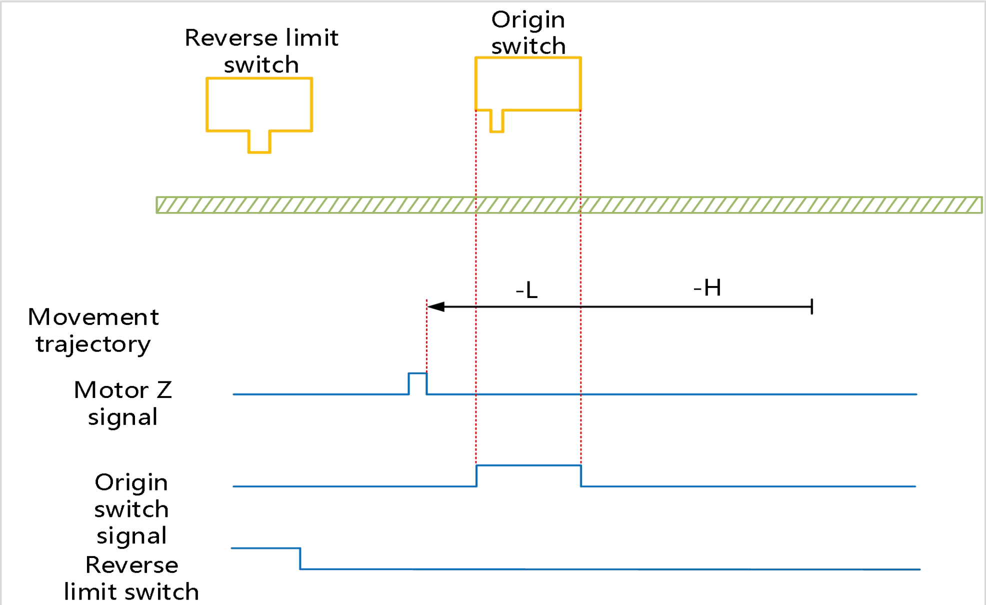
HW=1 when starting homing, start homing directly in reverse direction at low velocity. After encountering the falling edge of HW, change the running direction; stop at the first Z signal after encountering the rising edge of HW during running in forward direction at low velocity;

(14) 6098H=14

Mechanical origin: Motor Z signal

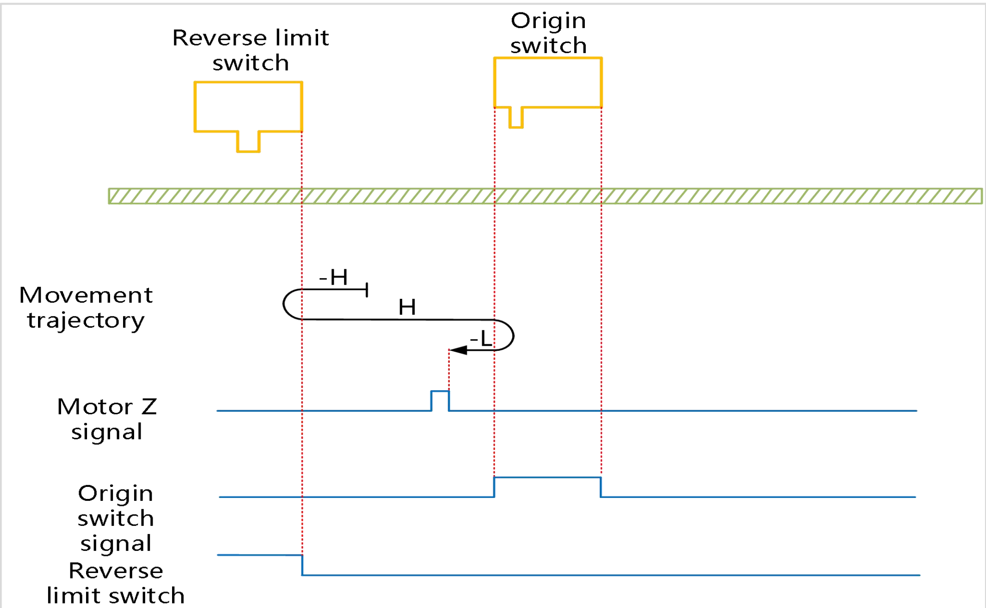
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates and runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction and will stop at the first Z signal.

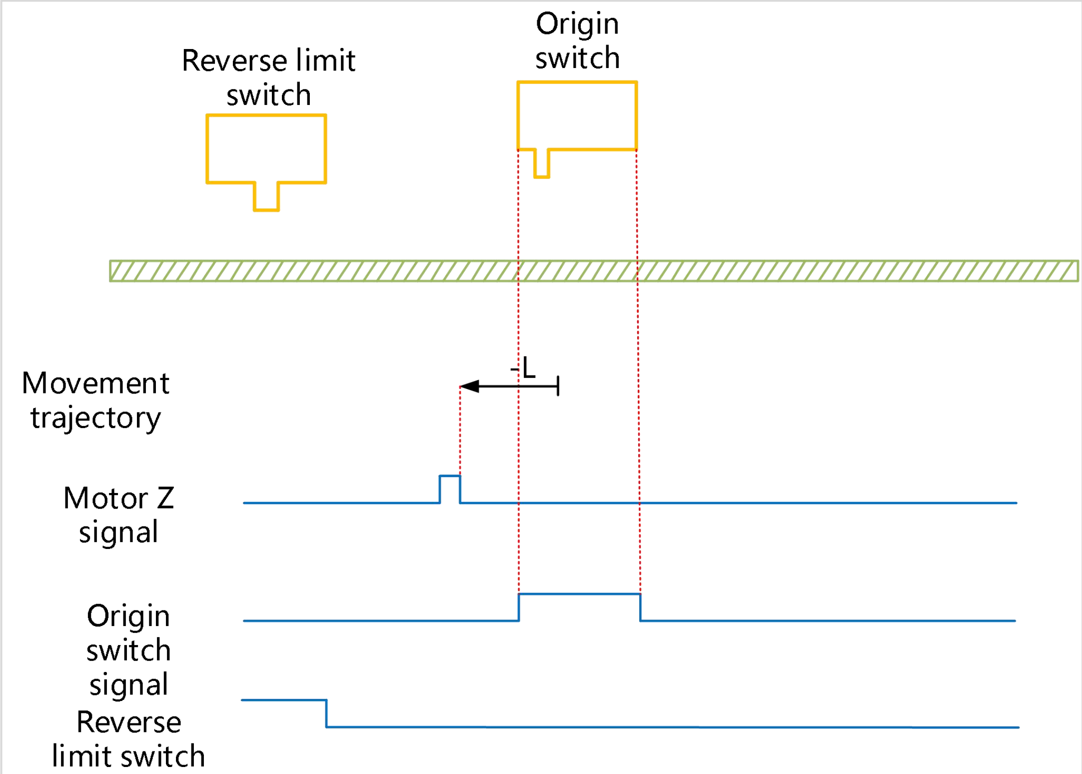
② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the limit switch, it runs at high speed in the forward direction. After encountering

the rising edge of HW, it decelerates and reverse. It will stop at the first Z signal after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing

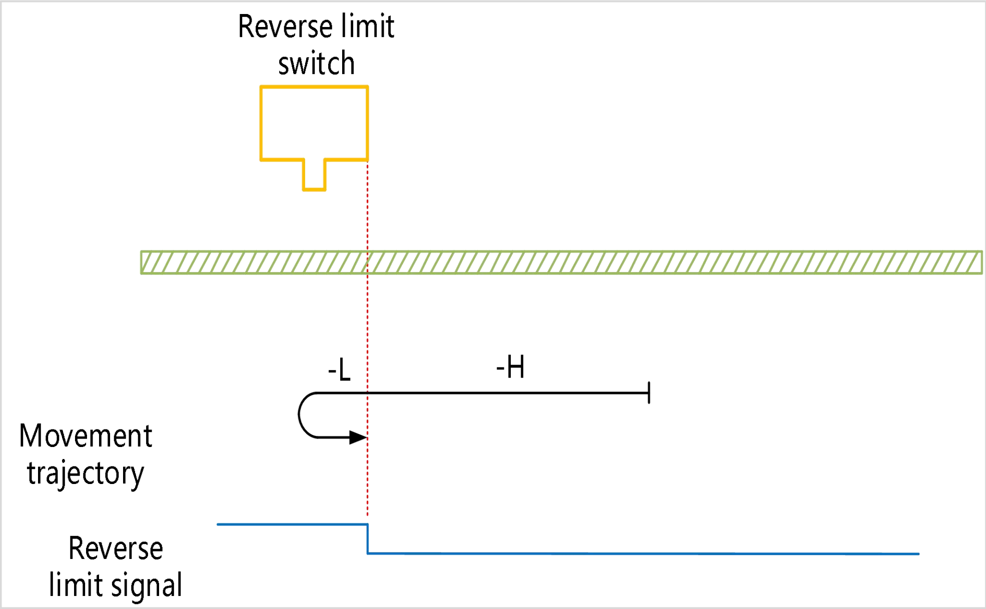


When homing starts (HW=1), the motor runs at low speed in the forward direction and stops at the first Z signal after encountering the falling edge of HW.

(15) 6098H=17

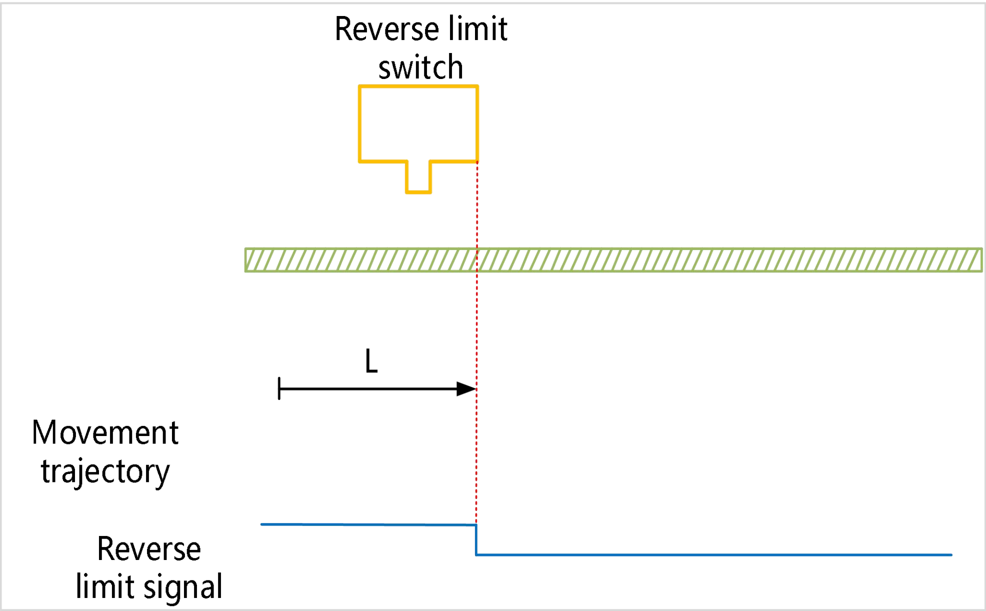
Mechanical origin: reverse overtravel switch (NOT)
Deceleration point: Reverse overtravel switch (NOT)

① The deceleration point signal is invalid when starting homing



When homing starts (NOT=1), the motor runs at high speed in the reverse direction. After encountering the raising edge of NOT, it decelerates, reverse direction, and runs in low speed in the forward direction. It will stop after encountering the falling edge of NOT.

② The deceleration point signal is valid when starting homing



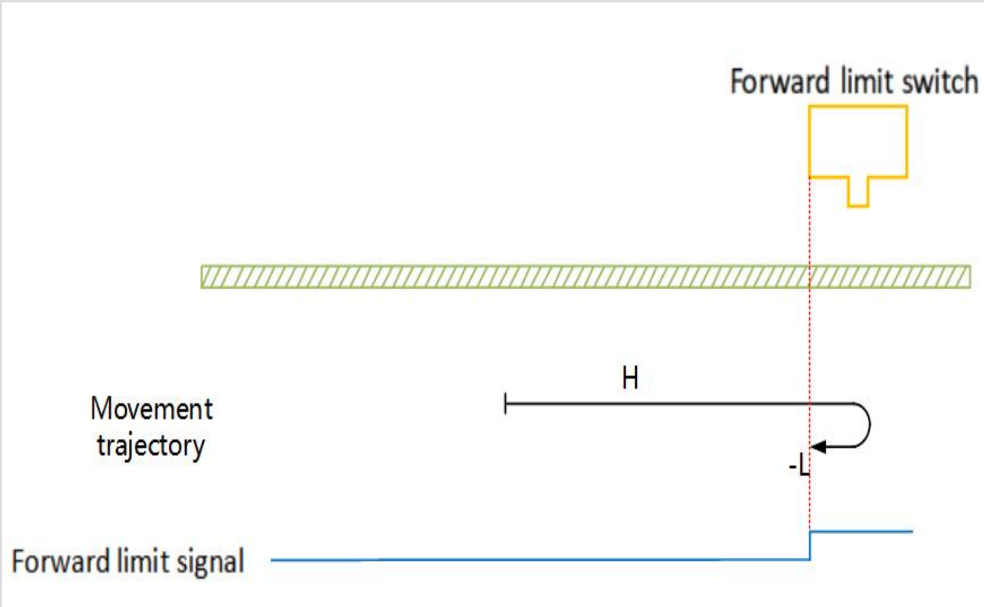
When homing starts (NOT=1), the motor runs at low speed in the forward direction and will stop after encountering the falling edge of NOT.

(16) 6098H=18

Mechanical origin: Forward overtravel switch (POT)

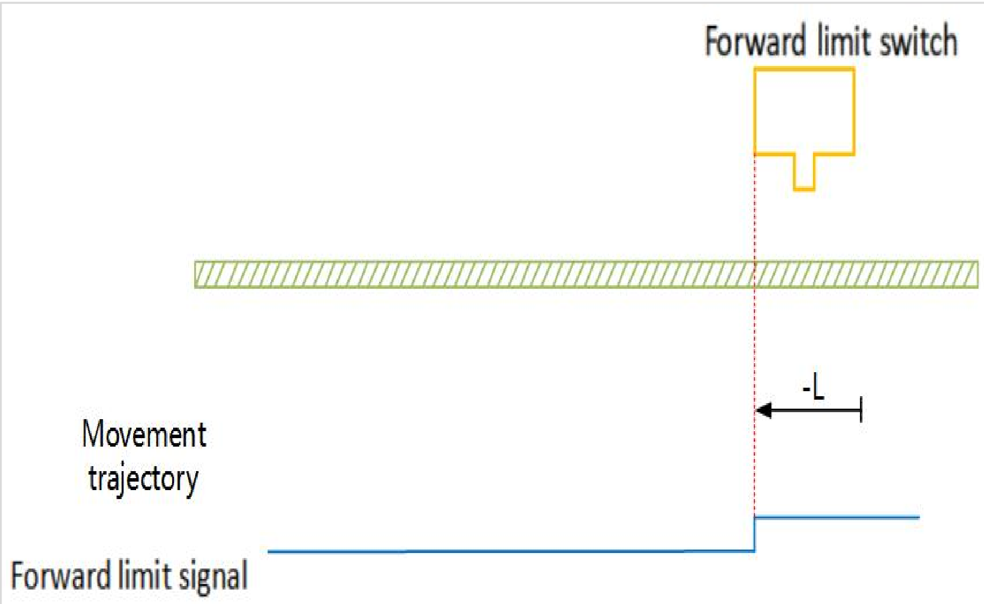
Deceleration point: Forward overtravel switch (POT)

① The deceleration point signal is invalid when starting homing



When homing starts (POT=0), the motor runs at high speed in the forward direction. After encountering the raising edge of POT, it decelerates, reverse direction, and runs in low speed in the reverse direction. It will stop after encountering the falling edge of POT.

② The deceleration point signal is valid when starting homing

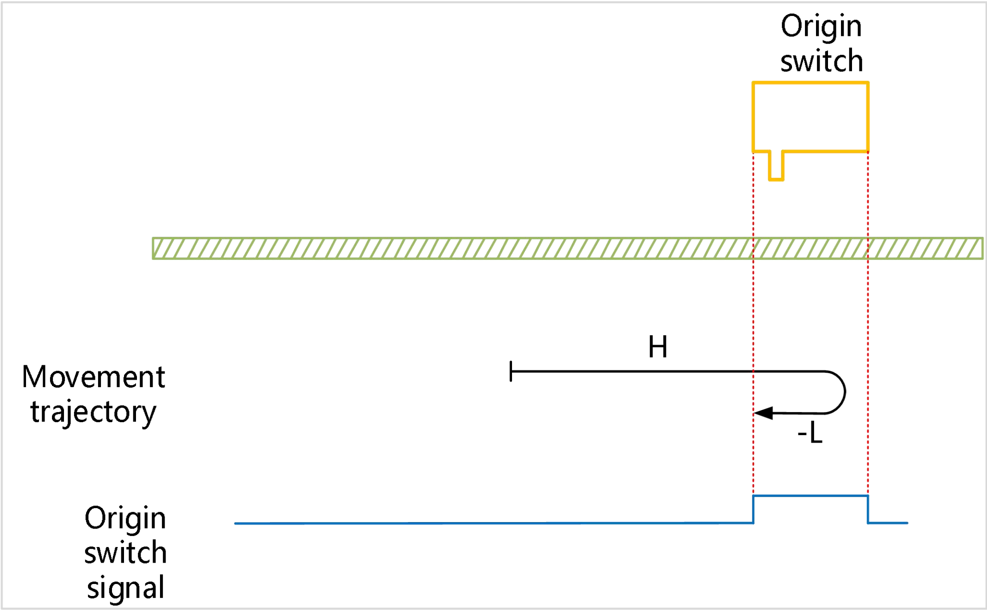


When homing starts (POT=1), the motor runs at low speed in the reverse direction and will stop after encountering the falling edge of POT.

(17) 6098H=19

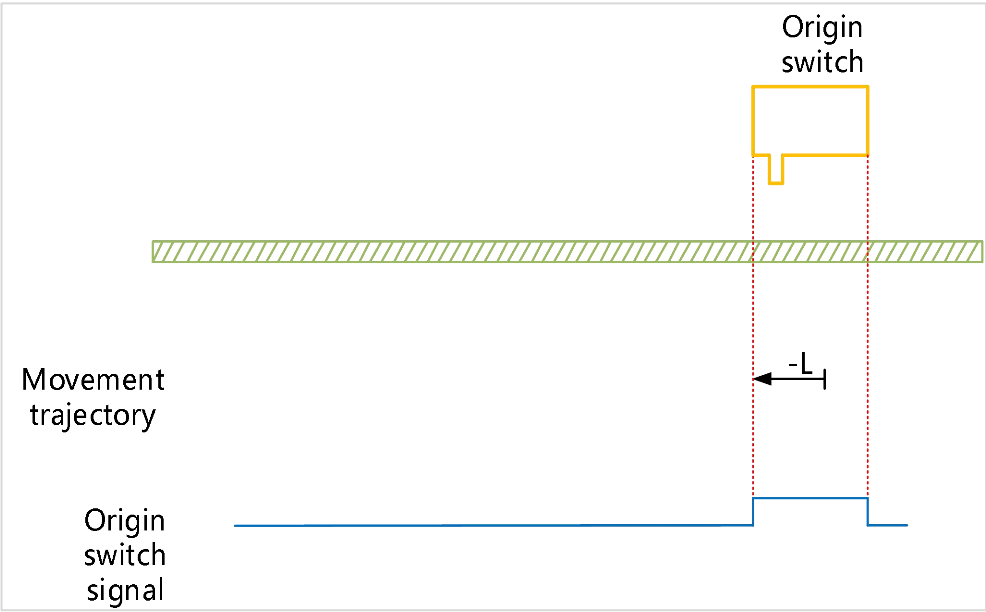
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates, reverse, and runs at low speed in the reverse direction. It will stop at the first Z signal after encountering the falling edge of HW
.

② The deceleration point signal is valid when starting homing

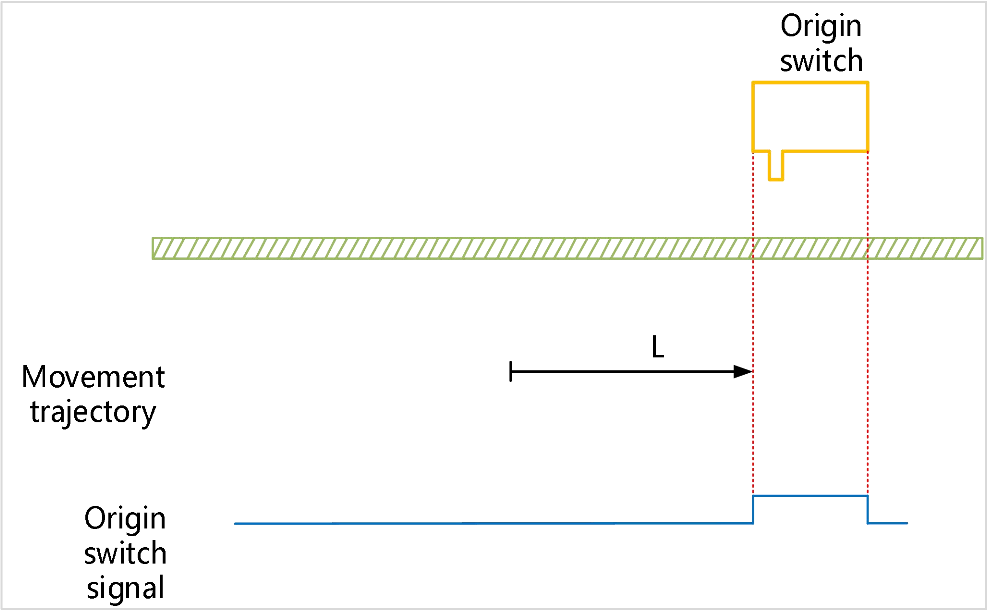


When homing starts (HW=1), the motor runs at low speed in the reverse direction and will stop after encountering the falling edge of HW.

(18) 6098H=20

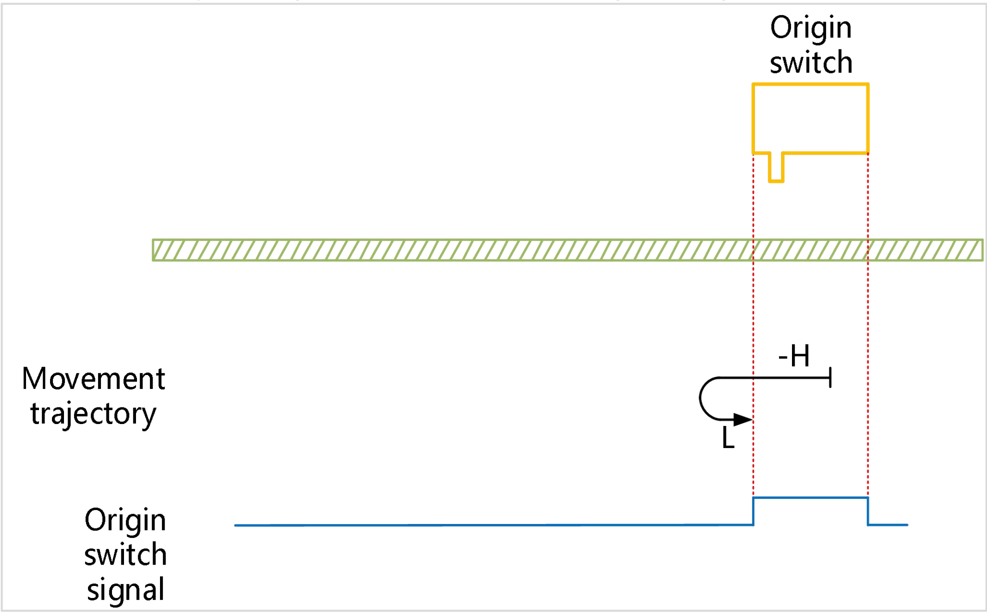
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0), the motor runs at low speed in the forward direction and will stop after encountering the raising edge of HW.

② The deceleration point signal is valid when starting homing

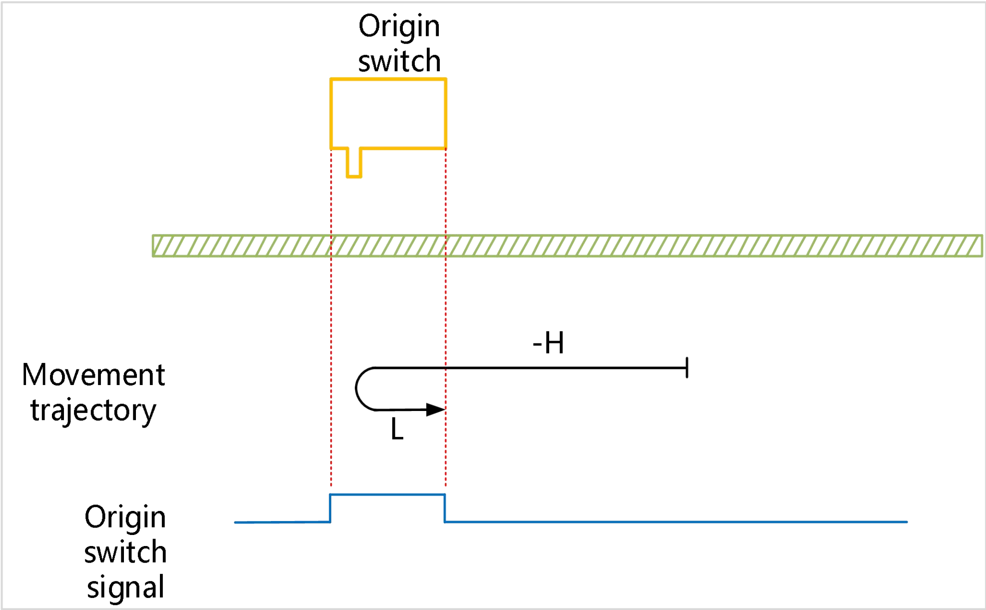


When homing starts (HW=1), the motor runs at high speed in the reverse direction. After encountering the falling edge of HW, it decelerates, reverses direction, and runs at low speed in the forward direction. It will stop after the raising edge of HW.

(19) 6098H=21

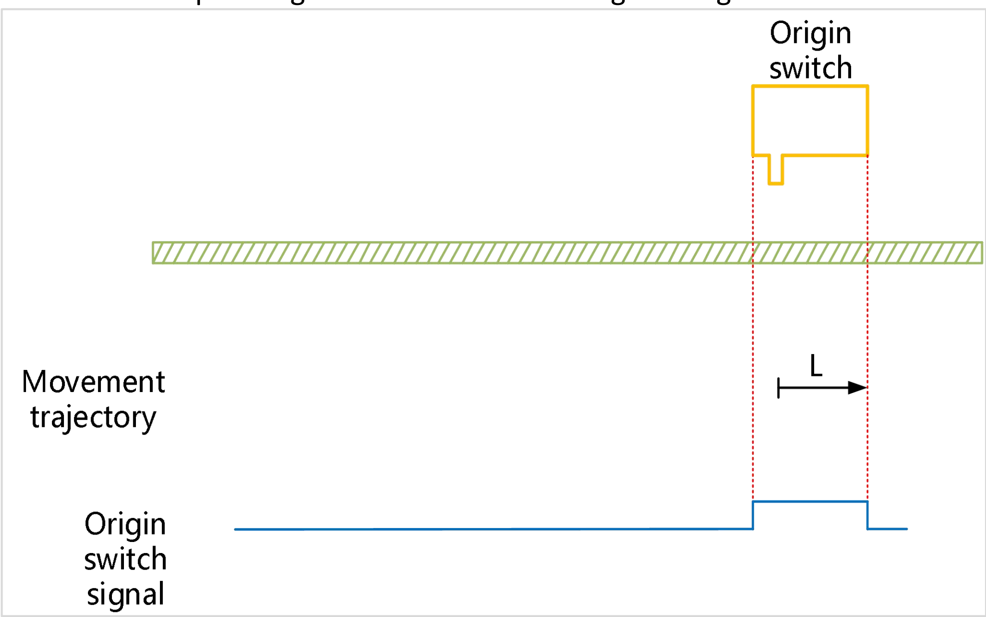
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates, reverse direction, and runs at low speed in the forward direction. It will stop after encountering the raising edge of HW.

② The deceleration point signal is valid when starting homing



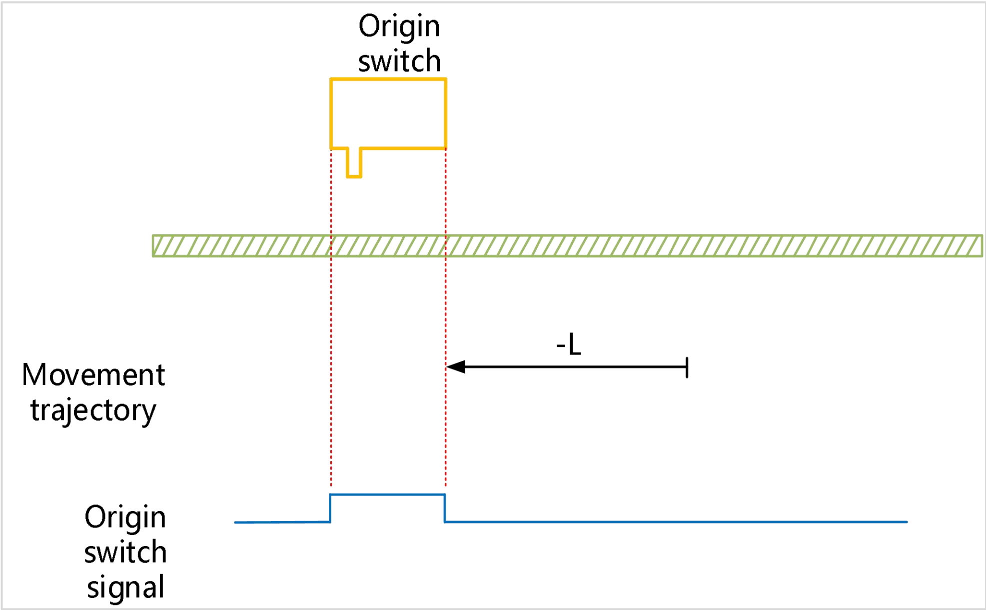
When homing starts (HW=1), the motor runs at low speed in the forward direction and will stop after encountering the falling edge of HW.

(20)6098H=22

Mechanical Origin: Origin Switch (HW)

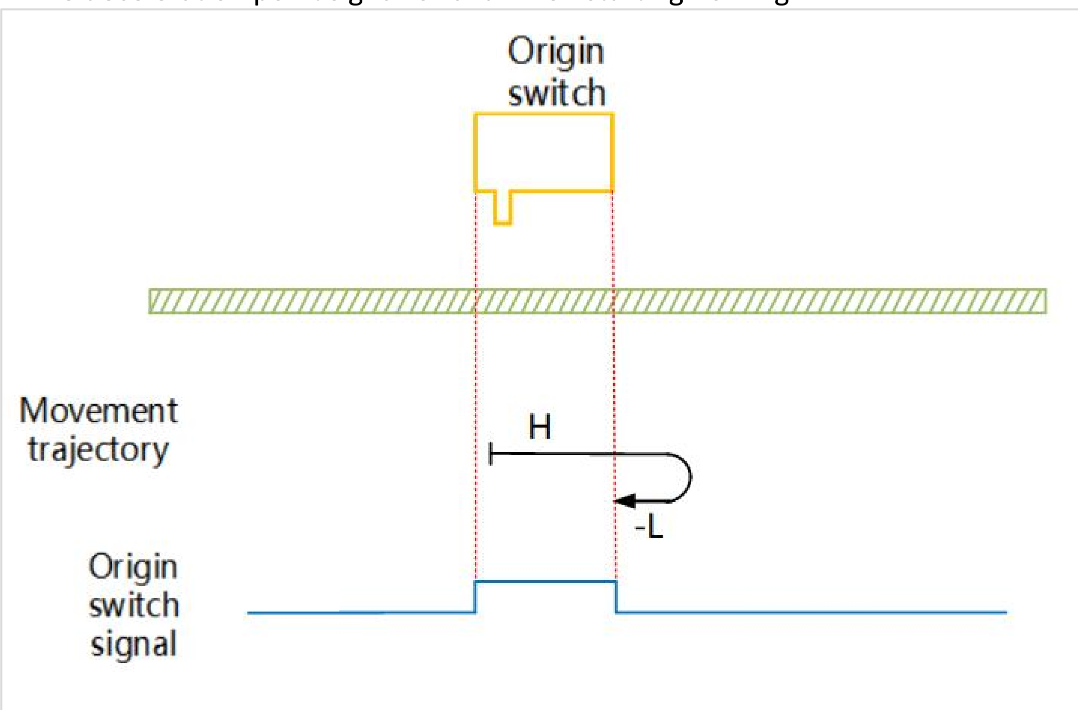
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing



When homing starts (HW=0), the motor runs at low speed in the reverse direction and will stop after encountering the raising edge of HW.

② The deceleration point signal is valid when starting homing

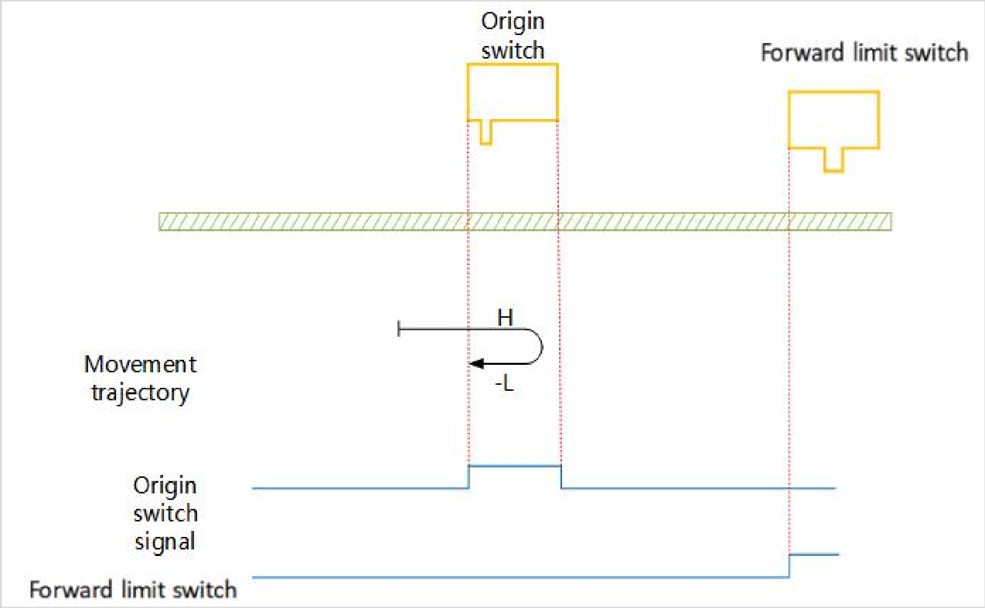


When homing starts (HW=1), the motor runs at high speed in the forward direction. After encountering the falling edge of HW, it decelerates, reverse, and runs at low speed in the reverse direction. It will stop after encountering the raising edge of HW.

(21)6098H=23

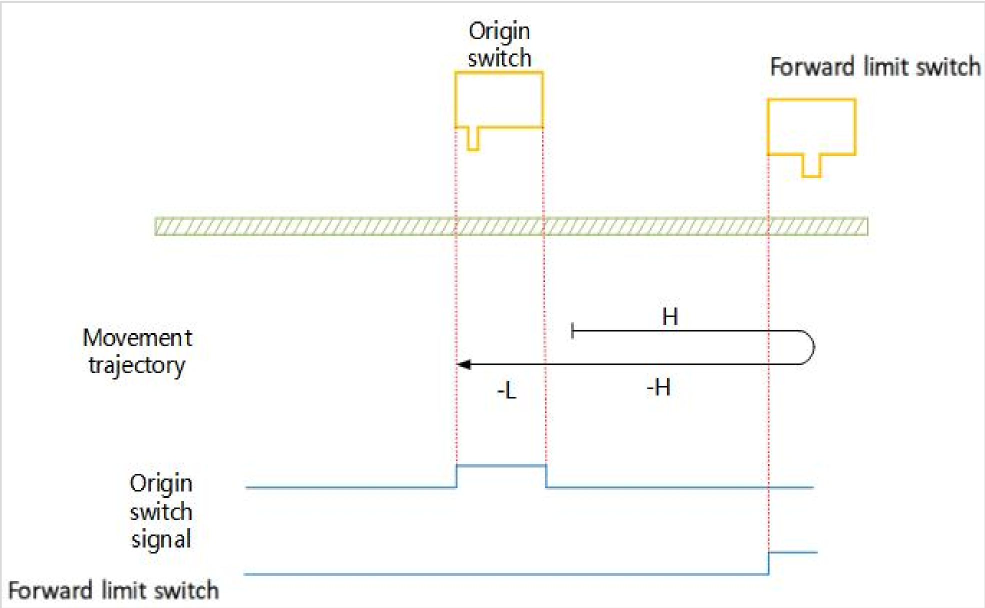
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



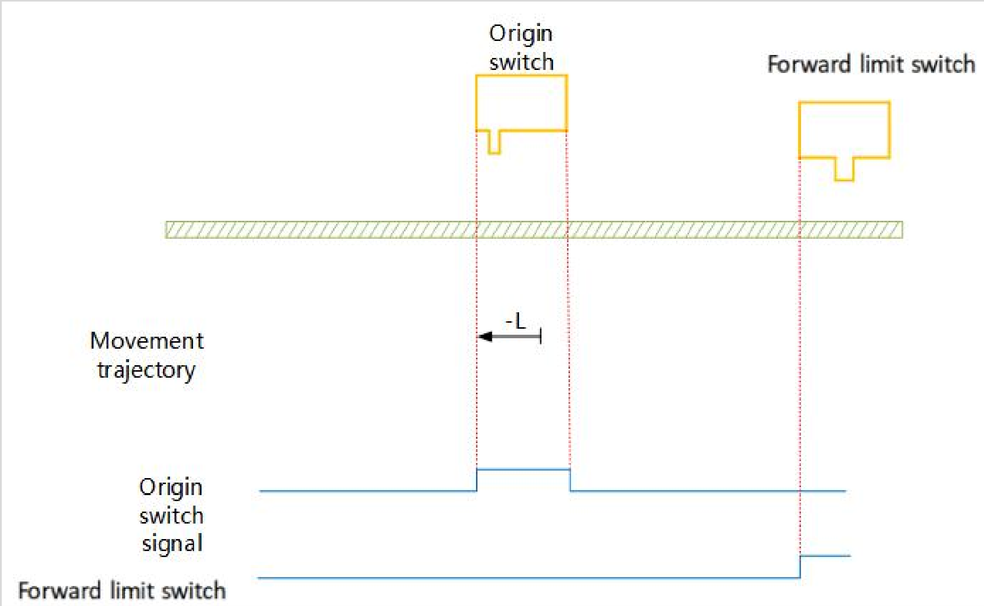
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates, reverse, and runs at low speed in the reverse direction. It will stop after encountering the falling edge of HW.

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the the limit switch, it runs at high speed in the reverse direction. After encountering the the the raising edge of HW, it runs at low speed in the reverse direction. It will stop after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing

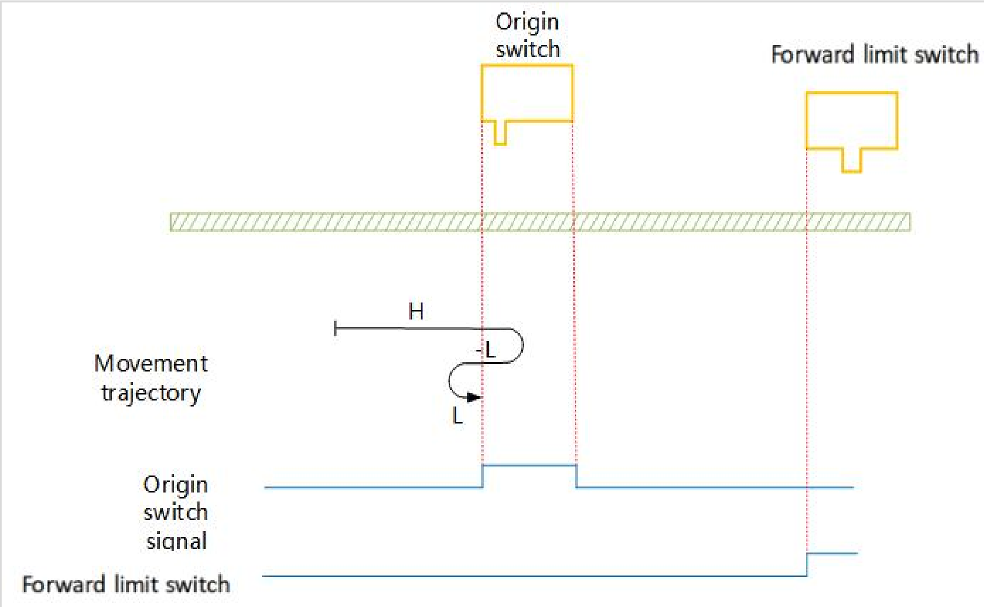


When homing starts (HW=1), the motor runs at low speed in the reverse direction and stops after encountering the falling edge of HW.

(22)6098H=24

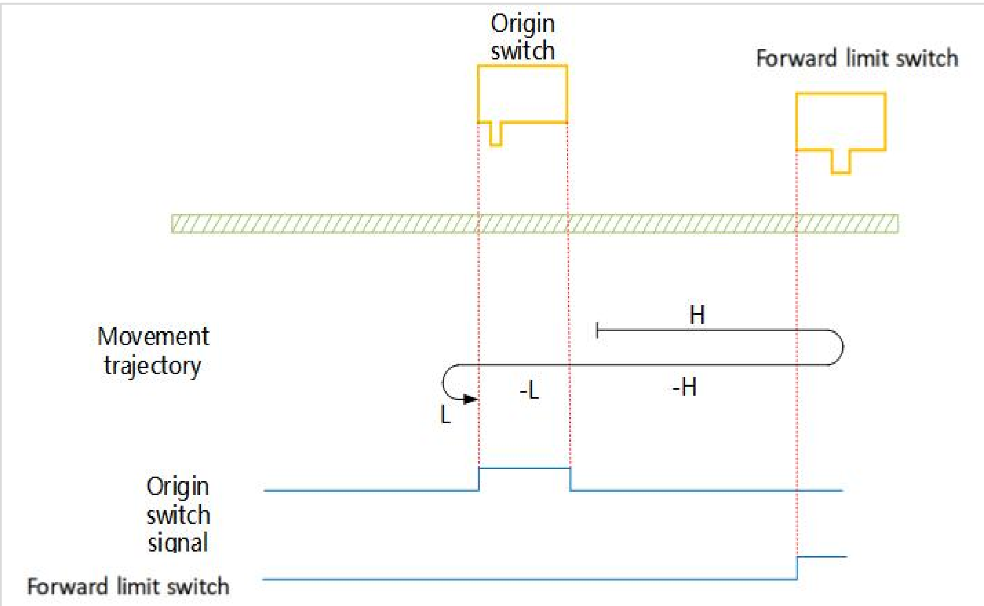
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting hoimng, the forward limit switch is not encountered



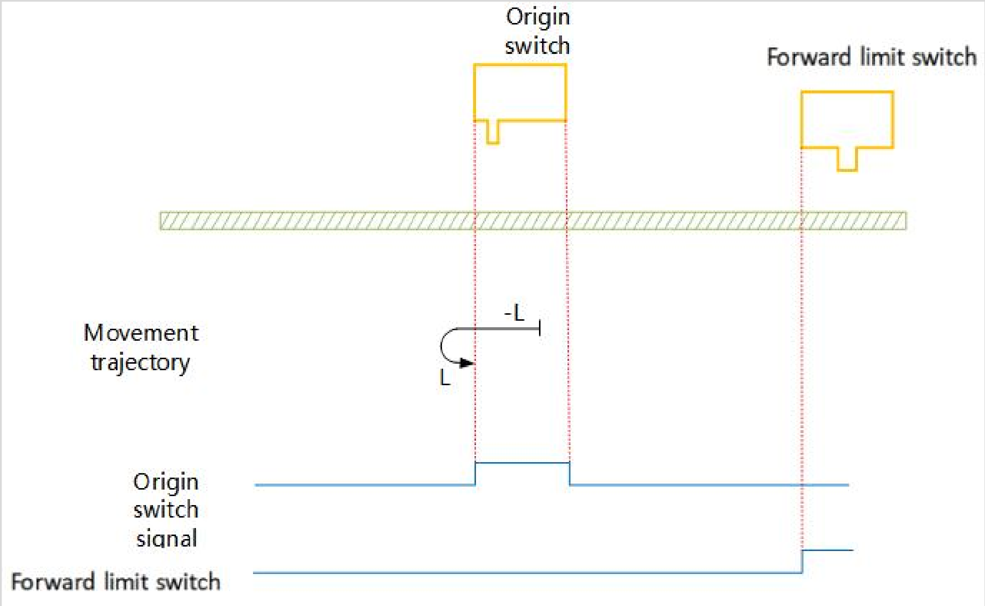
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates, reverse direction, and runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction. It will stop after encountering the raising edge of HW.

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the raising edge of HW, it decelerates and runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction. It will stop after encountering the raising edge of HW.

③ The deceleration point signal is valid when starting homing



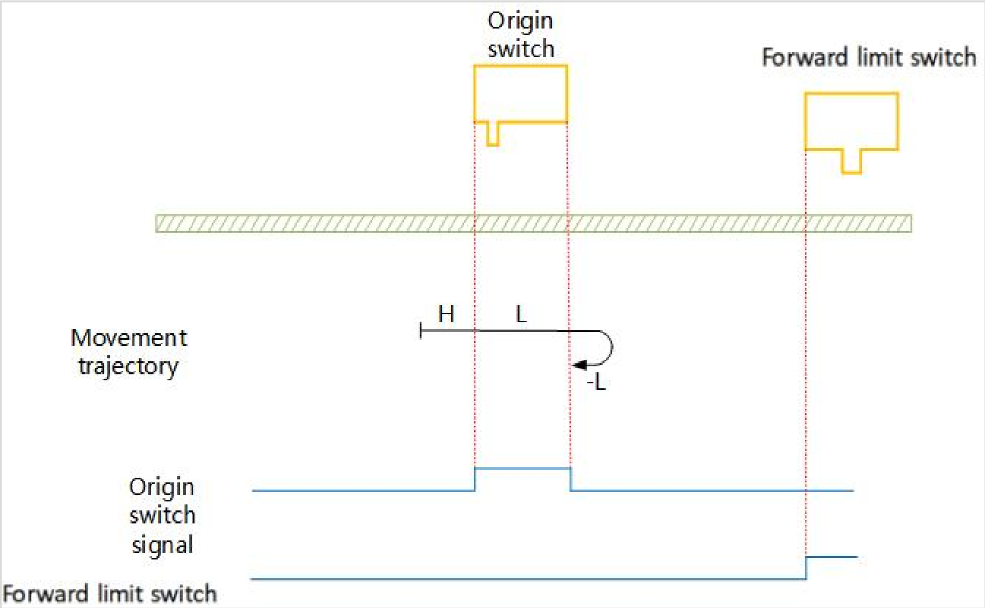
When homing starts (HW=1), the motor runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction and will stop after encountering the raising edge of HW.

(23)6098H=25

Mechanical Origin: Origin Switch (HW)

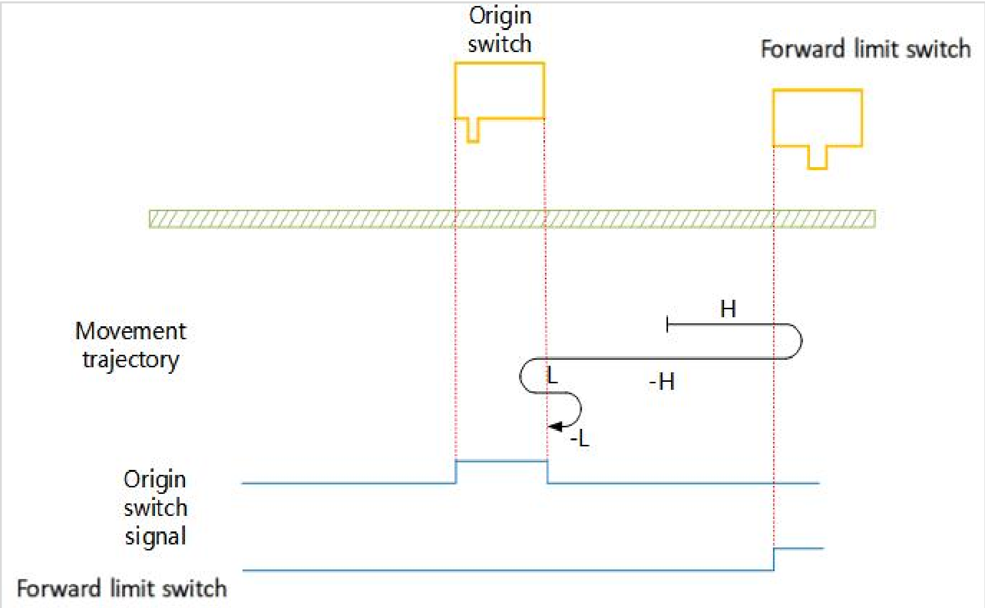
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the raising edge of HW, it decelerates and runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction. It will stop after encountering the raising edge of HW.

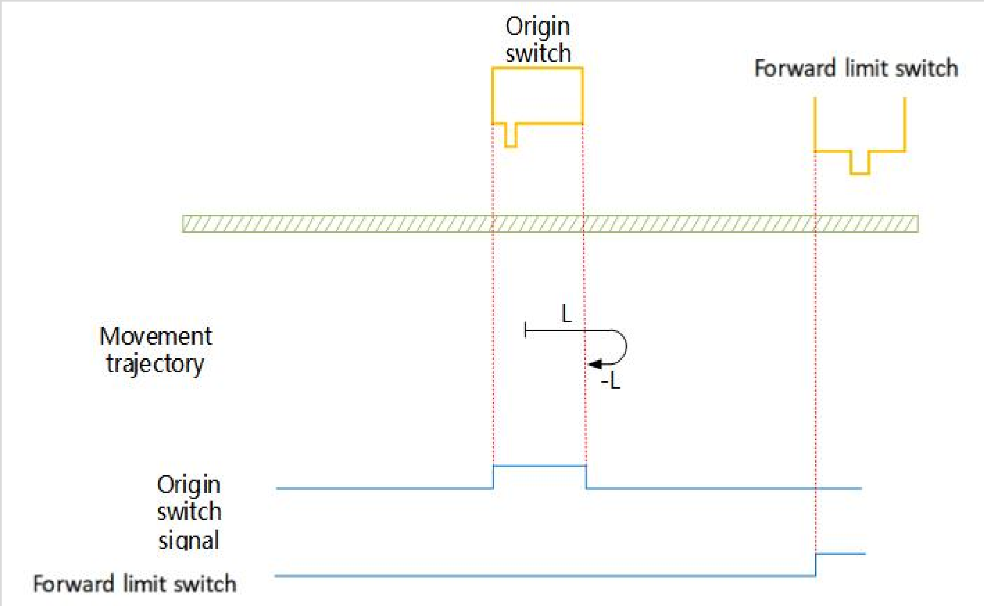
② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered.



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the raising edge of HW, it decelerates and reverse first, then runs at low speed in the forward direction.

After encountering the falling edge of HW, it runs at low speed in the reverse direction and will stop after encountering the raising edge of HW.

③ The deceleration point signal is valid when starting homing

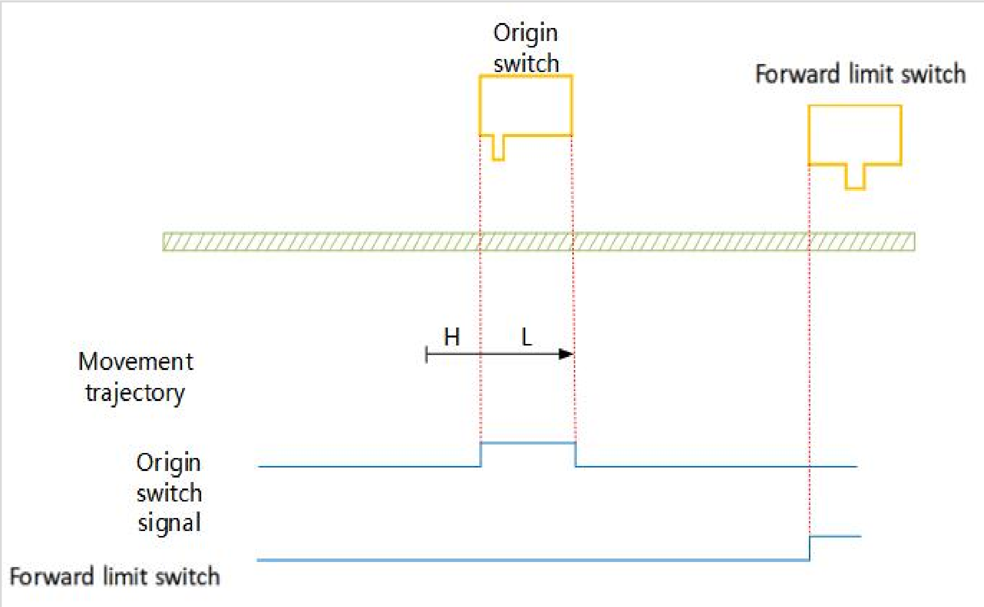


When homing starts (HW=1), the motor runs at high speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction and stops after encountering the raising edge of POT.

(24) 6098H=26

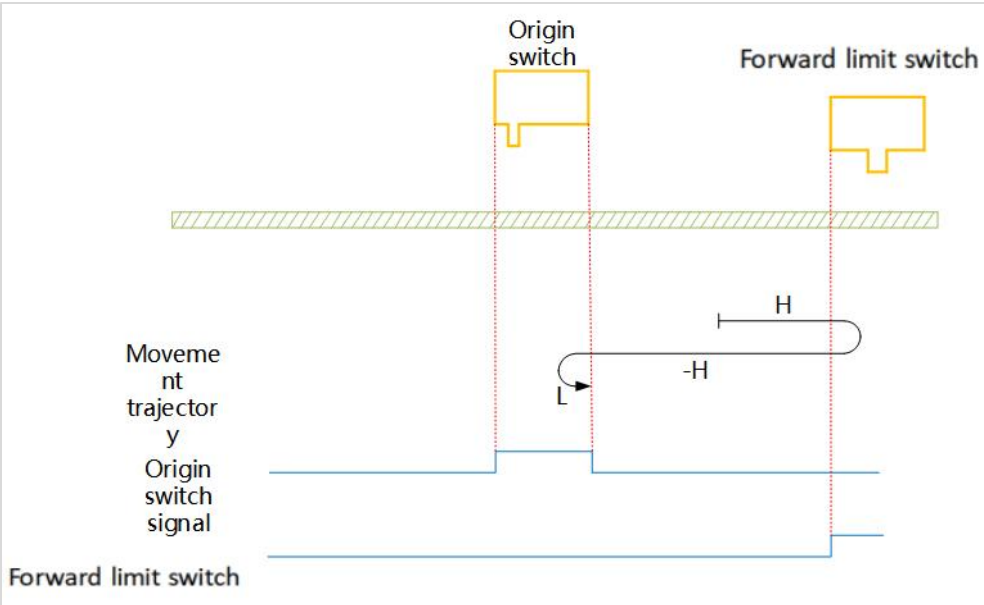
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the forward limit switch is not encountered



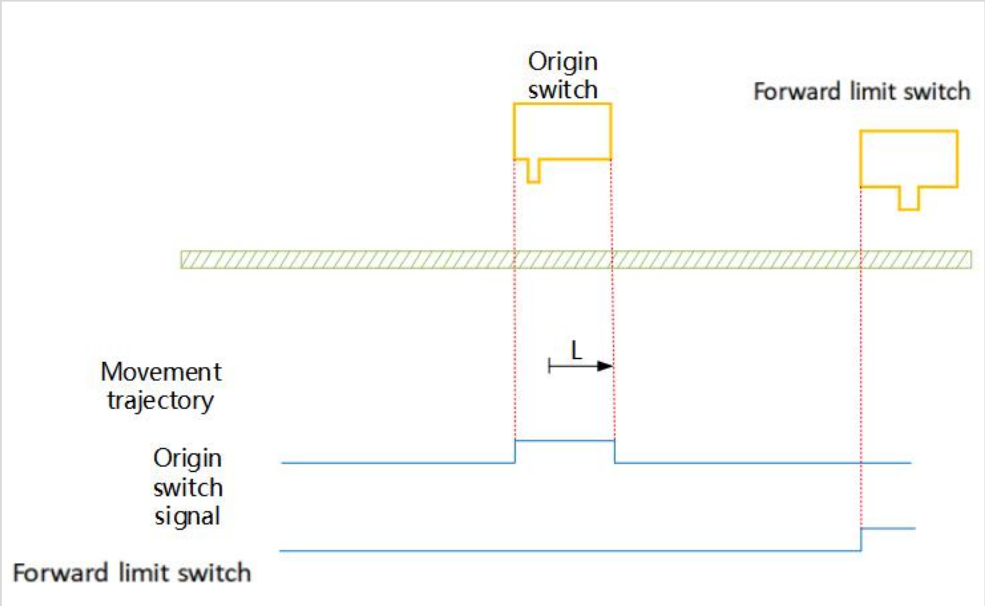
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the raising edge of HW, it decelerates and runs at low speed in the forward direction, it stops after encountering the falling edge of HW.

② The deceleration point signal is invalid when starting homing, the forward limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates and reverses first, then runs at low speed in the reverse direction. It stop after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing



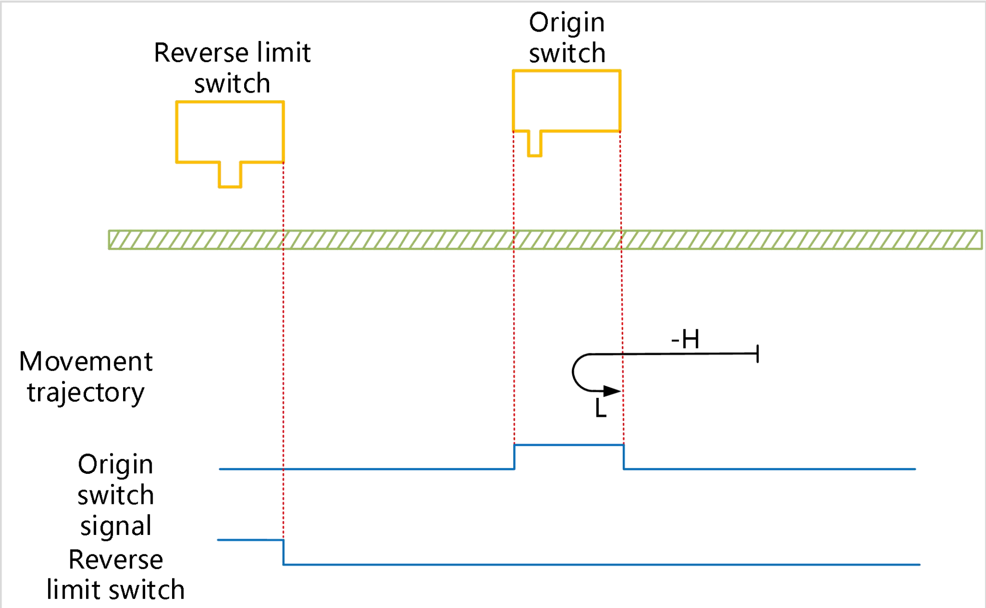
When homing starts (HW=1), the motor runs at low speed in the forward direction and stops after encountering the falling edge of HW.

(25) 6098H=27

Mechanical Origin: Origin Switch (HW)

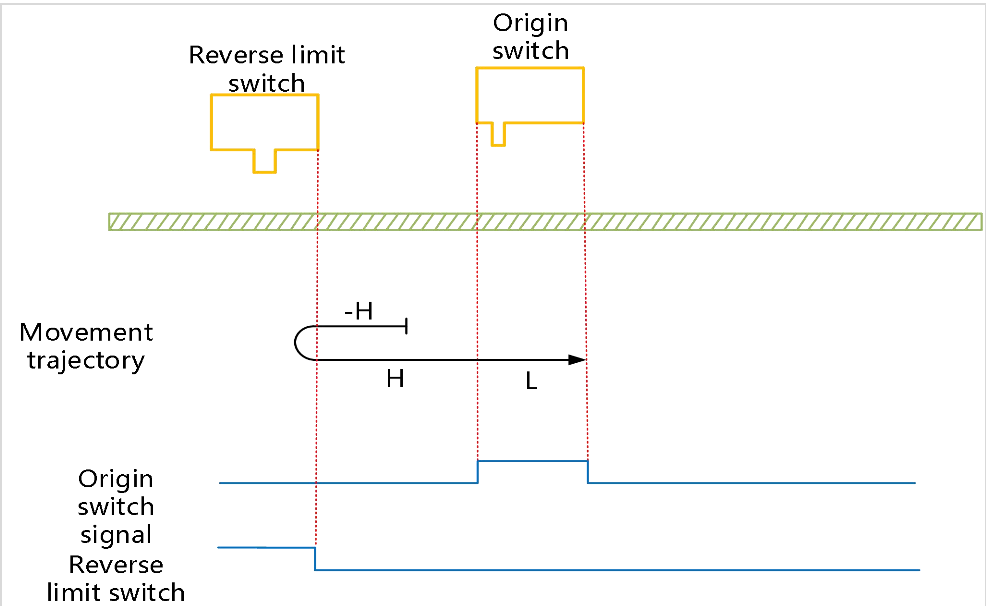
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates and reverses first,then runs at low speed in the reverse direction. It will stop after encountering the falling edge of HW.

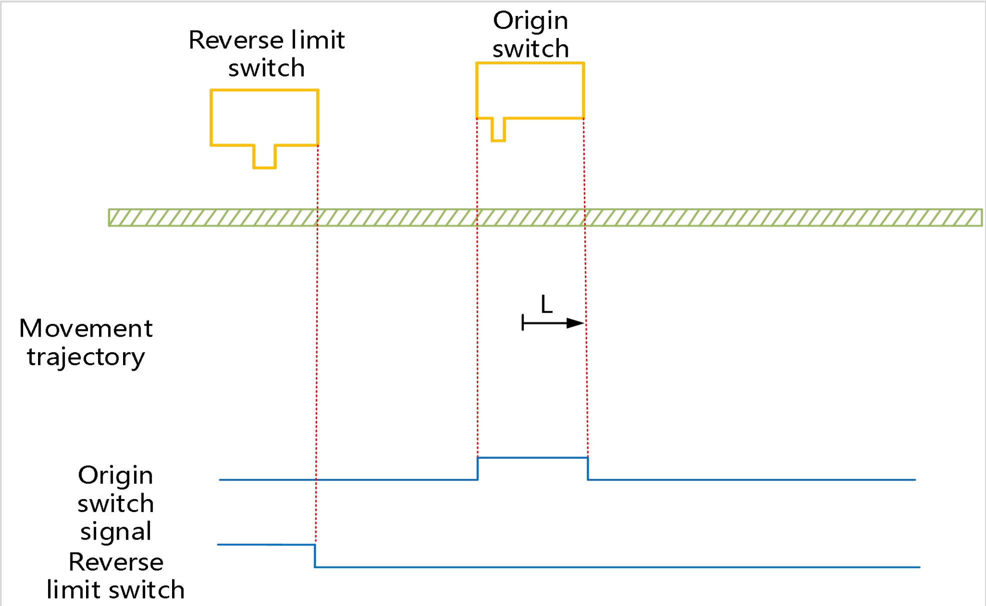
② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the limit switch, it runs at high speed in the forward direction. After encountering

the rising edge of HW, it decelerates and runs at low speed in the forward direction. It will stop after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing

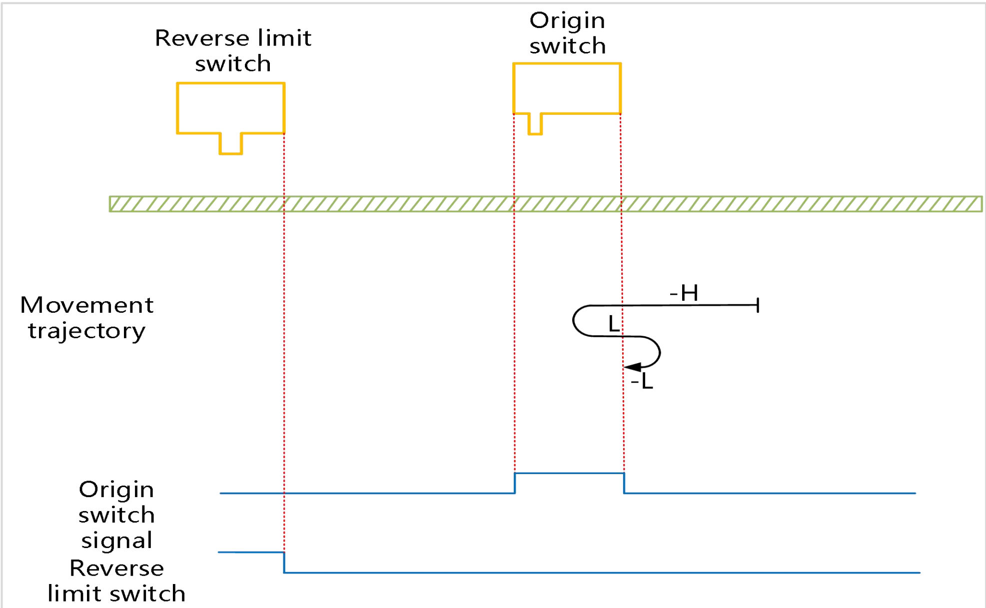


When homing starts (HW=1), the motor runs at low speed in the forward direction and stops after encountering the falling edge of HW.

(26) 6098H=28

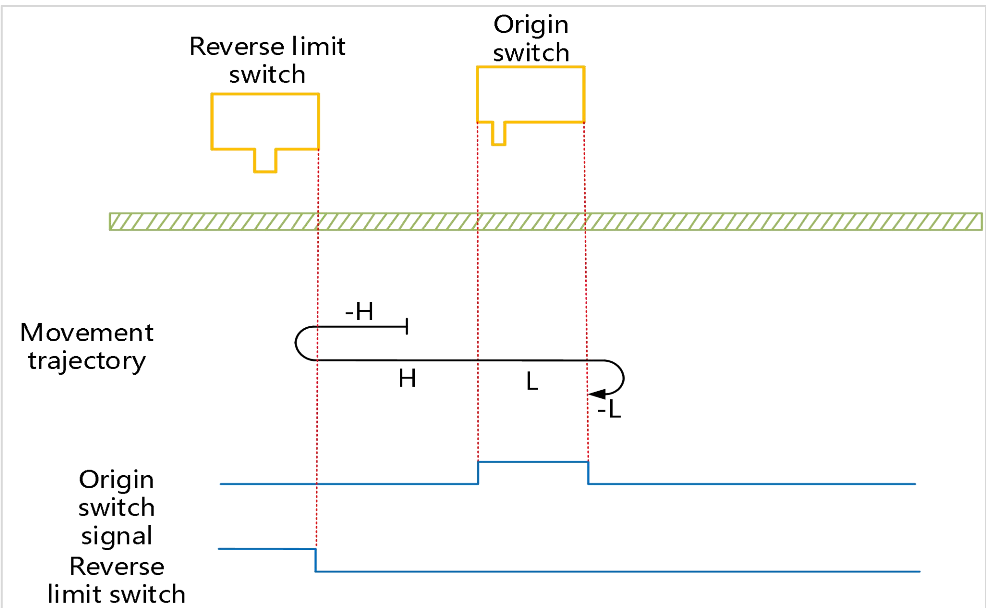
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



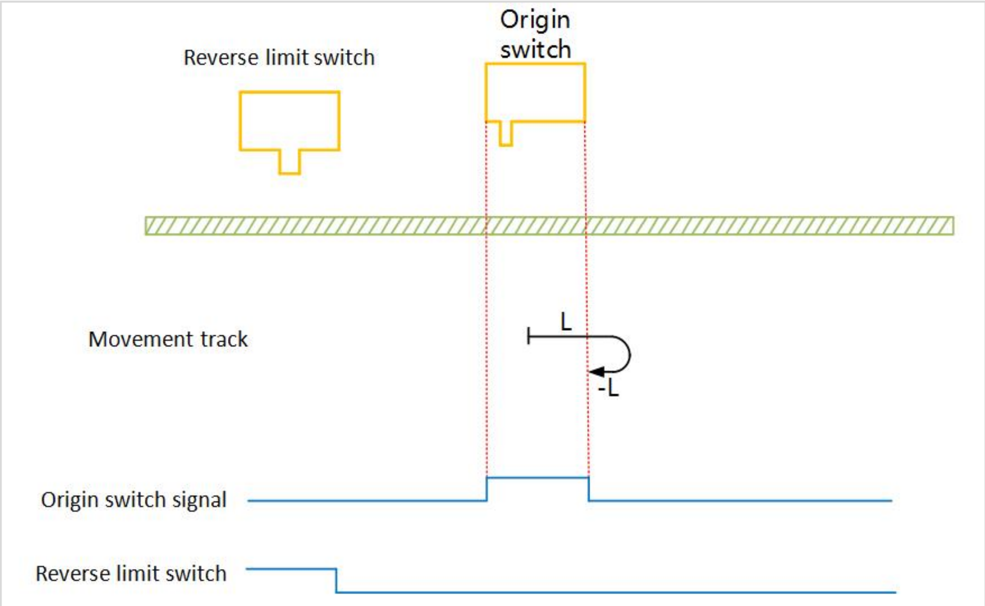
When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the rising edge of HW, it decelerates and reverses first, then runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction and stops after encountering the raising edge of HW.

② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the limit switch, it runs at high speed in the reverse direction. After encountering the rising edge of HW, it runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction. It will stop after encountering the raising edge of HW.

③ The deceleration point signal is valid when starting homing

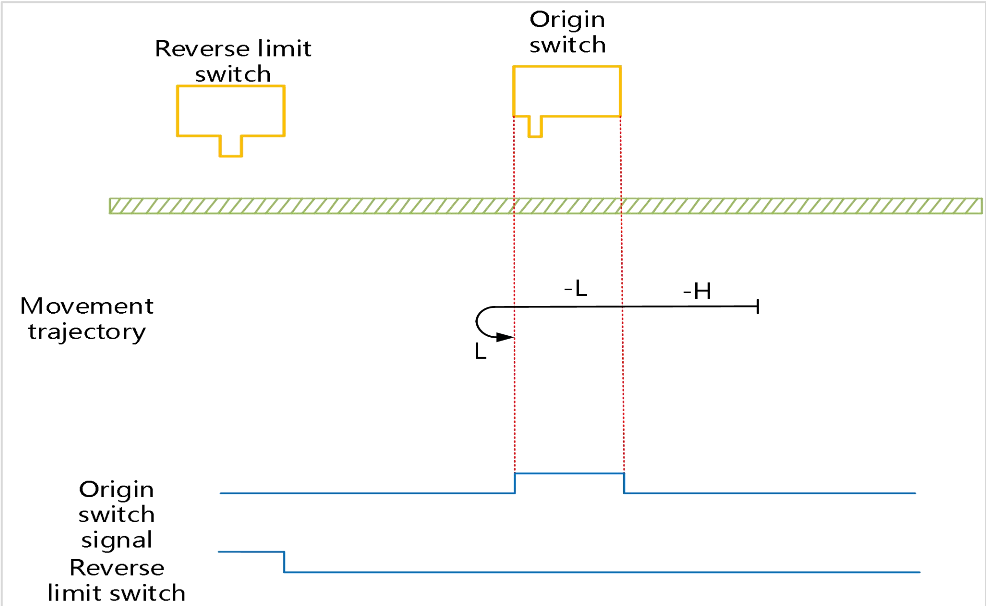


When homing starts (HW=1), the motor runs at low speed in the forward direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction and stops at the after encountering the raising edge of HW.

(27) 6098H=29

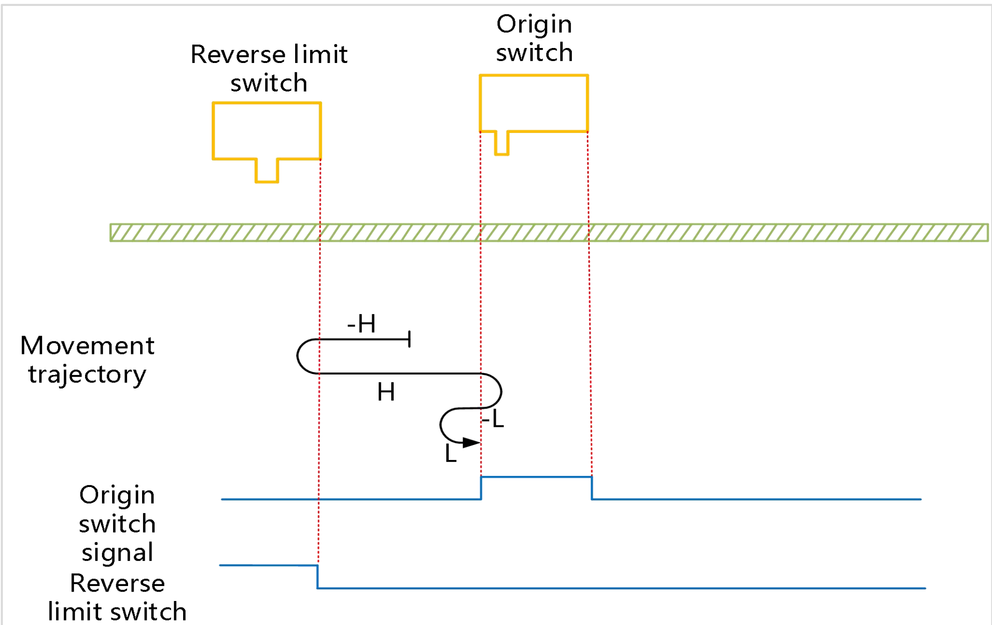
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered.



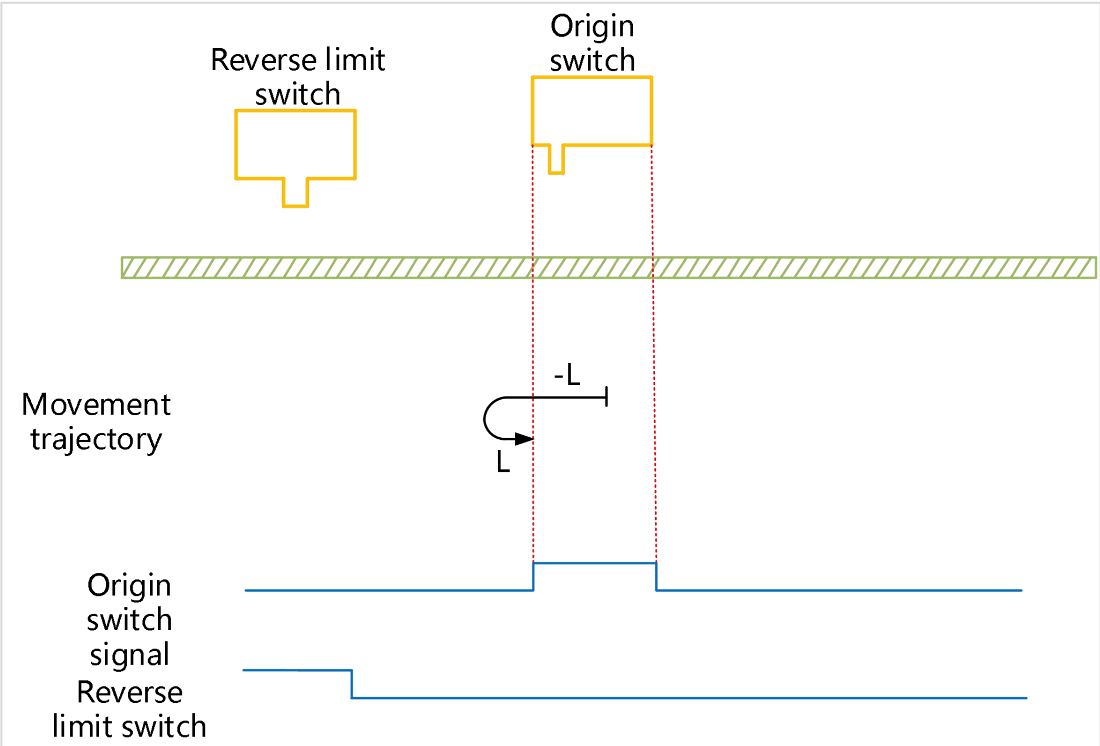
When homing starts (HW=0), the motor runs at high speed in the forward direction. After encountering the raising edge of HW,, it decelerates and runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the reverse direction. It will stop after encountering the raising edge of HW.

② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the limit switch, it runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates and runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction.It will stop at the after encountering the raising edge of HW.

③ The deceleration point signal is valid when starting homing

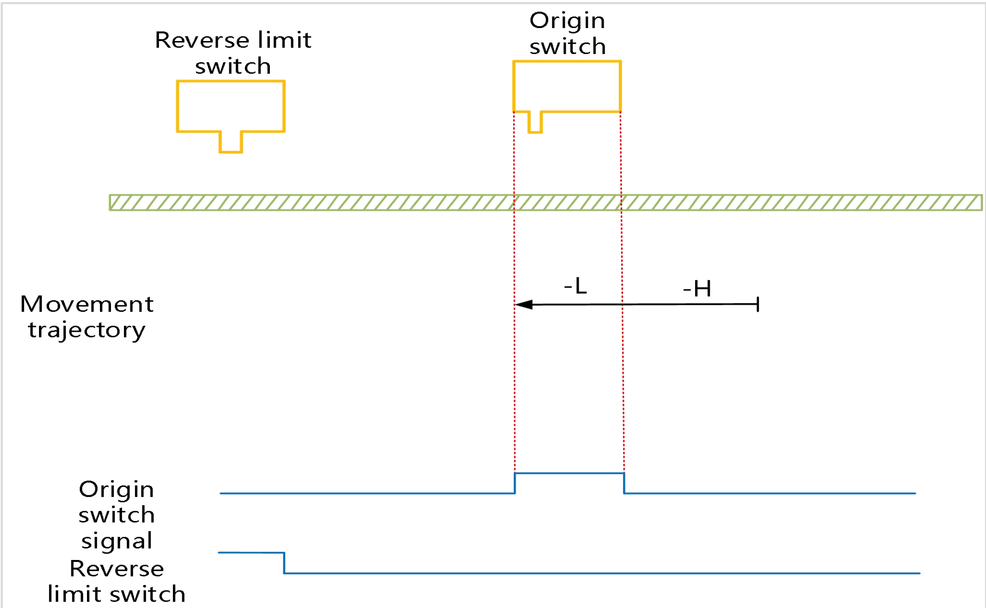


When homing starts (HW=1), the motor runs at low speed in the reverse direction. After encountering the falling edge of HW, it runs at low speed in the forward direction. It will stop after encountering the rising edge of HW.

(28) 6098H=30

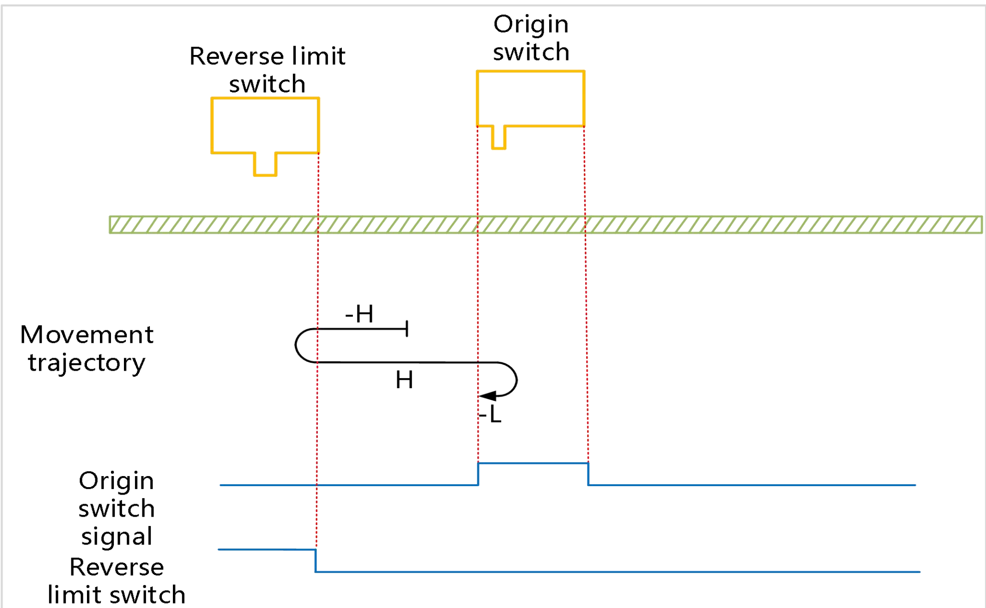
Mechanical Origin: Origin Switch (HW)
Deceleration point: Origin switch (HW)

① The deceleration point signal is invalid when starting homing, the reverse limit switch is not encountered



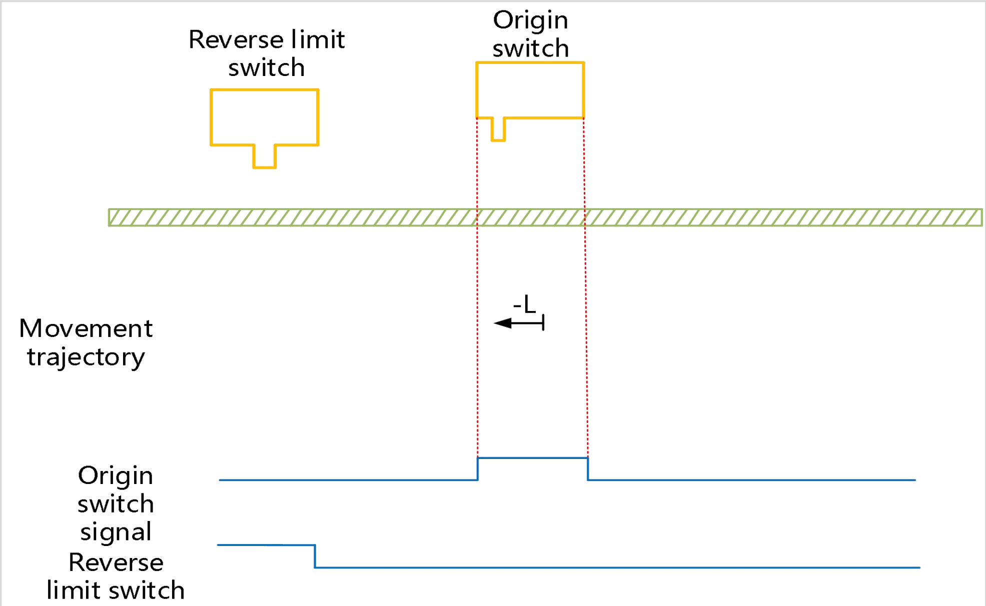
When homing starts (HW=0), the motor runs at low speed in the reverse direction. After encountering the rising edge of HW. It runs at low speed and stops after encountering the falling edge of HW.

② The deceleration point signal is invalid when starting homing, the reverse limit switch is encountered



When homing starts (HW=0), the motor runs at high speed in the reverse direction. After encountering the limit switch, it runs at high speed in the forward direction. After encountering the rising edge of HW, it decelerates and runs at low speed in the reverse direction. It will stop after encountering the falling edge of HW.

③ The deceleration point signal is valid when starting homing.



When homing starts (HW=1), the motor runs at low speed in the forward direction and stops after encountering the falling edge of HW.

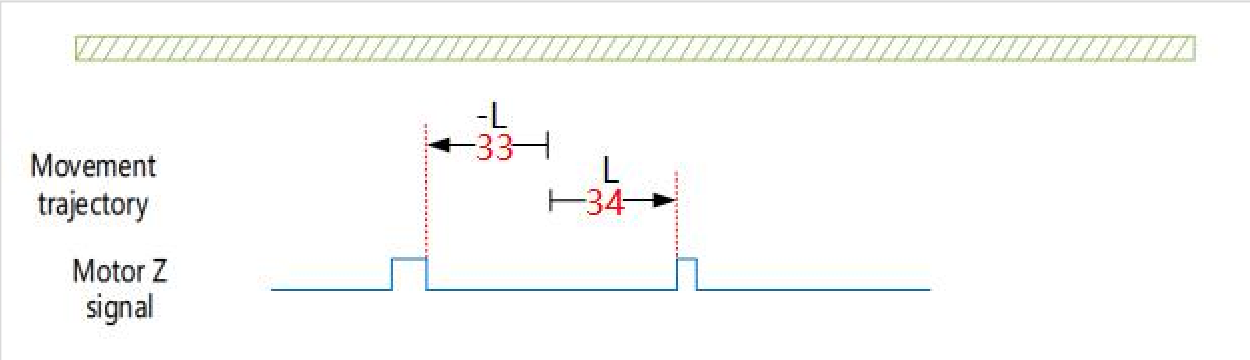
(29) 6098H=33 and 34

Mechanical origin: Z signal

Deceleration point: None

Homing mode 33: running in reverse direction at low velocity, stop at the first Z signal encountered

Homing mode 34: running in forward direction at low velocity, stop at the first Z signal encountered



(30) 6098h=35

Homing mode 35: Take the current position as the mechanical origin, and after triggering the origin to homing (6040 control word: 0xOF → 0x1F)

After returning to the origin, the position feedback 6064h is set to the origin offset 607Ch.

7.9 Accessibility function

7.9.1 Touch probe

The probe function refers to the function of the servo drive recording the current position information (instruction unit) and storing it in the specified register when the DI signal or motor Z signal specified by the external device changes. Please pay attention to the following when using it:

① In the case of the same probe, try to avoid using the rising edge and the falling edge at the same time;

② When using the Z signal, only the rising edge can be used, not the falling edge;

③ For single-trigger probes, if you need to trigger again, please clear 60B8h to 0 before setting the value. The VD5L bus servo drive supports 2 types of probe functions.

BIT	Touch Probe Function(60B8h)	Touch Probe Status Word (60B9h)
0	Probe 1 enable 0: Disable probe 1 1: Enable probe 1	Probe 1 enable 0: Disable probe 1 1: Enable probe 1
1	Probe 1 trigger mode. 0: Single trigger 1: Continuous trigger	Probe 1 rising edge latch. 0: Probe 1 rising edge latch not executed 1: Probe 1 rising edge latch executed
2	Probe 1 trigger signal selection. 0: DI5 set 18 trigger 1: Z signal trigger	Probe 1 falling edge latch. 0: Probe 1 falling edge latch not executed 1: Probe 1 falling edge latch executed
3	Reserved	Reserved
4	Probe 1 rising edge latch. 0: Do not use probe 1 rising edge latch 1: Use probe 1 rising edge latch	Reserved
5	Probe 1 falling edge latch. 0: Do not use probe 1 falling edge latch 1: Use probe 1 falling edge latch	Reserved
6	Reserved	Probe 1 trigger signal selection. 0: DI trigger 1: Z signal trigger
7	Reserved	Probe 1 triggers DI signal selection.

BIT	Touch Probe Function(60B8h)	Touch Probe Status Word (60B9h)
		0: DI is low level 1: DI is high level
8	Probe 2 enable 0: Disable probe 2 1: Enable probe 2	Probe 2 enable 0: Disable probe 2 1: Enable probe 2
9	Probe 2 trigger mode. 0: Single trigger 1: Continuous trigger	Probe 2 rising edge latch. 0: Probe 2 rising edge latch not executed 1: Probe 2 rising edge latch executed
10	Probe 2 trigger signal selection. 0: DI set 19 trigger 1: Z signal trigger	Probe 2 falling edge latch. 0: Probe 2 falling edge latch not executed 1: Probe 2 falling edge latch executed
11	Reserved	Reserved
12	Probe 2 rising edge latch. 0: Do not use probe 2 rising edge latch 1: Use probe 2 rising edge latch	Reserved
13	Probe 2 falling edge latch. 0: Do not use probe 2 falling edge latch 1: Use probe 2 falling edge latch	Reserved
14	Reserved	Probe 2 trigger signal selection. 0: DI trigger 1: Z signal trigger
15	Reserved	Probe 2 triggers DI signal selection. 0: DI is low level 1: DI is high level

1. Set the probe to trigger the DI signal: Probes 1 and 2 can be set to 18 and 19 respectively through different DI to enable trigger.

2. Set the probe function (60B8h) and probe status word (60B9h). The meaning of each-bit is shown in the following table. For example, if you use the rising and falling edges of probe 1 and probe 2, and DI single trigger, set 60B8h=3131h (12593 in decimal). When DI5 and DI6 signals are rising, probe 1 and probe 2 will latch at 60 BAh and 60BCh respectively; when DI5 and DI6 signals

are falling, probe 1 and probe 2 will latch at 60 BBh and 60BDh respectively. If you want to perform single trigger again, you need to set 60B8h=0, 60B8h=3131h.

Index(Hex)	Object dictionary	R/O	Unit	Bits	Setting range
60B8	Touch probe function	Read and write	-	16	0 to 65535
60B9	Touch probe status word	Read-only	-	16	0 to 65535
60BA	Probe 1 rising edge position	Read-only	Instruction unit	32	-2147483648 to 2147483647
60BB	Probe 1 falling edge position	Read-only	Instruction unit	32	-2147483648 to 2147483647
60BC	Probe 2 rising edge position	Read-only	Instruction unit	32	-2147483648 to 2147483647
60BD	Probe 2 falling edge position	Read-only	Instruction unit	32	-2147483648 to 2147483647

Chapter 8 Object dictionary

8.1 Overview of object dictionaries

8.1.1 Object dictionary area allocation

The object dictionary of CoE (CANopen over EtherCAT) specified in CIA 402 and the object dictionary of VD5 series are composed as follows:

Index	Content
0000h to 0FFFh	Data type region
1000h to 1FFFh	Communication sub-protocol area
2000h to 5FFFh	Vendor customized area
6000h to 9FFFh	Standard equipment sub-protocol area
A000h to FFFFh	Reserved

8.1.2 Explanation of related terms in object dictionary

★Index: The position of objects of the same class in the object dictionary, expressed in hexadecimal.

★Sub-index: Under the same index, there are multiple objects, and each object has an offset under the same index.

★Accessibility: See the following table for details:

Accessibility	Description
RW	Read and write
RO	Read-only
WR_PREOP	Write in preop mode

★Can it be mapped: See the following table for details:

Accessibility	Description
NO	Unmappable
RPDO	Can be used as RPDO
TPDO	Can be used as TPDO

★Set to take effect: See the following table for details:

Set conditions	Description
Shutdown setting	It can be set in the shutdown state
Operation setting	Can be set in any state

Set conditions	Description
Valid immediately	The set value will take effect immediately after the parameter is modified and downloaded
Power-on again	After the parameters are modified and downloaded, the servo drive needs to be powered down and then powered up, and the set value can take effect

★Data display range: The upper and lower limits of parameters.

★Default value: The factory setting value of the parameter.

★Data type: The type of data, as shown in the following table:

Data type	Description	Numerical range
SINT	Signed 8bit	-128 to 127
USINT	Unsigned 8bit	0 to 255
INT	Signed 16bit	-32768 to 32767
UINT	Unsigned 16bit	0 to 65535
DINT	Signed 32bit	-21247483648 to 21247483647
UDINT	Unsigned 32bit	0 to 4294967295
STRING	String Value	ASCII

★Related modes: See the following table for details:

Accessibility	Description
ALL	This parameter is related to all modes
CSP/CSV/HM	This parameter is only related to the corresponding mode
-	This parameter is independent of the control mode

8.2 Communication Sub-protocol Area (1000h to 1FFFh)

1000	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Device Type	RO	No	UDINT	-	-	-
Used to describe the CoE device subprotocol type.							

1001	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Error register	RO	No	USINT	-	0x00	-
Used to describe error records.							

1008	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Device name	RO	No	STRING	-	-	-
Used to describe the device name.							

1009	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Manufacturer hardware version	RO	No	STRING	-	-	-
Used to describe the manufacturer hardware version							

100A	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Manufacturer software version	RO	No	STRING	-	-	-
Used to describe the Manufacturer software version							

1018	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	ID Object	-	-	-	-	-	-
Used to describe device information.							
01h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Vendor ID	RO	No	UDINT	-	0x00000EFF	-
Serial number used to describe the drive.							

02h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Product Code	RO	No	UDINT	-	0x10003101	-
Used to describe the encoding inside the drive.							
03h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Revision Number	RO		UDINT	-	0x00000001	-
Upgrade record number used to describe the drive.							
04h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Serial Number	RO	No	UDINT	-	0x00001419	-
Used to describe a serial number.							

1600	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	RxPDO	-	-	-	-	-	-
Mapping object for setting RxPDO.							
01h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	First mapping object (RxPDO_SI1)	RW	RPDO	UDINT	-	0x60400010	-
Mapping object for setting RxPDO1.							
02h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Second mapping object (RxPDO_SI2)	RW	RPDO	UDINT	-	0x607A0020	-
Mapping object for setting RxPDO2.							
03h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Third mapping object (RxPDO_SI3)	RW	RPDO	UDINT	-	0x60B80010	-
Mapping object for setting RxPDO3.							
04h	Parameter	Accessibility	Data	Data	Data	Default	Correlation

	name		mapping	type	display range		mode
	Fourth mapping object (RxPDO_SI3)	RW	RPDO	UDINT	-	0x60600008	-
Mapping object for setting RxPDO4.							

1701	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	RxPDO	-	-	-	-	-	-
Mapping object for setting RxPDO.							
01h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	First mapping object (RxPDO_SI1)	RW	RPDO	UDINT	-	0x60400010	-
Mapping object for setting RxPDO1.							
02h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Second mapping object (RxPDO_SI2)	RW	RPDO	UDINT	-	0x607A0020	-
Mapping object for setting RxPDO2.							
03h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Third mapping object (RxPDO_SI3)	RW	RPDO	UDINT	-	0x60B80010	-
Mapping object for setting RxPDO3.							
04h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Fourth mapping object (RxPDO_SI4)	RW	RPDO	UDINT	-	0x60600008	-
Mapping object for setting RxPDO4.							

1702	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	RxPDO	-	-	-	-	-	-
Mapping object for setting RxPDO.							
01h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	First mapping object (RxPDO_SI1)	RW	RPDO	UDINT	-	0x60400010	-
Mapping object for setting RxPDO1.							
02h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Second mapping object (RxPDO_SI2)	RW	RPDO	UDINT	-	0x607A0020	-
Mapping object for setting RxPDO2.							
03h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Third mapping object (RxPDO_SI3)	RW	RPDO	UDINT	-	0x60FF0020	-
Mapping object for setting RxPDO3.							
04h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Fourth mapping object (RxPDO_SI4)	RW	RPDO	UDINT	-	0x60710008	-
Mapping object for setting RxPDO4.							
05h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Fifth mapping object (RxPDO_SI5)	RW	RPDO	UDINT	-	0x60600008	-
Mapping object for setting RxPDO5.							
06h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Sixth mapping object (RxPDO_SI6)	RW	RPDO	UDINT	-	0x60B80010	-
Mapping object for setting RxPDO6.							

07h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Seventh mapping object (RxPDO_SI7)	RW	RPDO	UDINT	-	0x607F0020	-
Mapping object for setting RxPDO7.							

1A00	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	TxPDO	-	-	-	-	-	-
Mapping object for setting TxPDO.							
01h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	First mapping object (TxPDO_SI1)	RW	TPDO	UDINT	-	0x60410010	-
Mapping object for setting TxPDO1.							
02h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Second mapping object (TxPDO_SI2)	RW	TPDO	UDINT	-	0x60640020	-
Mapping object for setting TxPDO2.							
03h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Third mapping object (TxPDO_SI3)	RW	TPDO	UDINT	-	0x60B90010	-
Mapping object for setting TxPDO3.							
04h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Fourth mapping object (TxPDO_SI4)	RW	TPDO	UDINT	-	0x60BA0020	-
Mapping object for setting TxPDO4.							
05h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Fifth mapping	RW	TPDO	UDINT	-	0x60BC0020	-

	object (TxPDO_SI5)						
Mapping object for setting TxPDO5.							
06h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Sixth mapping object (TxPDO_SI6)	RW	TPDO	UDINT	-	0x603F0010	-
Mapping object for setting TxPDO6.							
07h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Seventh mapping object (TxPDO_SI7)	RW	TPDO	UDINT	-	0x60610008	-
Mapping object for setting TxPDO7.							

1B01	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	TxPDO	-	-	-	-	-	-
Mapping object for setting TxPDO.							
01h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	First mapping object (TxPDO_SI1)	RW	TPDO	UDINT	-	0x603F0010	-
Mapping object for setting TxPDO1.							
02h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Second mapping object (TxPDO_SI2)	RW	TPDO	UDINT	-	0x60410010	-
Mapping object for setting TxPDO2.							
03h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Third mapping object (TxPDO_SI3)	RW	TPDO	UDINT	-	0x60640020	-
Mapping object for setting TxPDO3.							
04h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display**	**Default**	**Correlation mode**

					range		
	Fourth mapping object (TxPDO_SI4)	RW	TPDO	UDINT	-	0x60770010	-
Mapping object for setting TxPDO4.							
05h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Fifth mapping object (TxPDO_SI5)	RW	TPDO	UDINT	-	0x60F40020	-
Mapping object for setting TxPDO5.							
06h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Sixth mapping object (TxPDO_SI6)	RW	TPDO	UDINT	-	0x60610008	-
Mapping object for setting TxPDO6.							

1C12	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	RxPDO assign	-	-	-	-	-	-
Used to set up RPDO assignments.							
01h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Index of objects allocated by RPDO (RPDO Index)	RW	No	UINT	-	0x1701	-
The index used to set the allocation object of RPDO.							
1C13	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	TxPDO assign	-	-	-	-	-	-
Used to set TPDO assignments.							
01h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Index of objects assigned by TPDO (TPDO Index)	RW	No	UINT	-	0x1B01	-
The index of the allocation object used to set TPDO.							

1C32	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Synchronize management output parameter	-	-	-	-	-	-
Used to describe synchronization management output parameters.							
01h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Synchronization type	RW	No	UINT	-	0x0002	-
Used to set the synchronization type.							
02h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Cycle time	RO	No	UINT	-	0x0000	-
Reflects the period of DC SYNC0.							
04h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Synchronization Types support	RO	No	UINT	-	0x0004	-
Displays the type of distributed clock.							
05h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Minimum cycle time	RO	No	UDINT	-	0x0001E848	-
Displays the minimum synchronization period supported by the slave station in ns.							

1C33	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	SM input parameter	-	-	-	-	-	-
Used to describe synchronization management input parameters.							
01h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode
	Synchronization type	RO	No	UINT	-	0x0022	-
Used to set the synchronization type.							
02h	Parameter name	Accessibility	Data mapping	Data type	Data display range	Default	Correlation mode

	Cycle time	RO	No	UDINT	-	0x0000	-
Reflect the period of DC SYNC0.							
04h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Synchronization types support	RO	No	UINT	-	0x0004	-
Displays the type of distributed clock.							
05h	**Parameter name**	**Accessibility**	**Data mapping**	**Data type**	**Data display range**	**Default**	**Correlation mode**
	Minimum cycle time	RO	No	UDINT	-	0x0001E848	-
Displays the minimum synchronization period supported by the slave station in ns.							

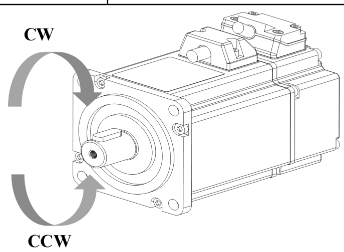
8.3 Vendor Customized Area (2000h to 2FFFh)

Group 2000h: Basic settings

P00-04 2000-04	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Rotatation direction RotationDir	Shutdown setting	Valid immediately	0	0 to 1	Basic settings	-

Set the positive direction of the motor rotation when viewed from the motor axis.

Setting value	Rotation direction	Remark
0	Take CW as the forward direction	Viewed from the motor axis, the motor rotates clockwise
1	Take CCW as the forward direction	Viewed from the motor axis, the motor rotates counterclockwise



P00-05 2000-05	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Servo OFF stop mode OffStopMode	Shutdown setting	Valid immediately	0	-2 to 2	Basic settings	-

Setting value	Brake resistance setting	Remark
-2	6084 ramp stop. Dynamic braking state maintained after stop[Note].	P00-05 is associated with object dictionary 605C. Set a reasonable stop mode according to mechanical status and operation requirements.
-1	Dynamic braking stop. Dynamic braking state maintained after stop[Note].	
0	Coast to stop. motor remains free after stop.	
1	6084 ramp stop. Free-running state maintained after stop. * 609A ramp deceleration stop is used in homing mode.	
2	Dynamic braking stop[Note]. Free-running state maintained after stop.	

✎**Note:** Only VD5E and VD5L-SA1D versions support the dynamic braking function. This setting is invalid for all other models.

P00-07 2000-07	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Fault stop mode FaultStopMode	Shutdown setting	Valid immediately	0	-4 to 4	Basic settings	-

Setting value	Brake resistance setting	Remark
-4	Emergency stop via torque control; dynamic braking remains active after stop.	P00-07 is associated with Object Dictionary index 605E. Class 1 and Class 2 faults force execution of the coast-to-stop mode, with the motor remaining in free-run state after stop.
-3	Profile stop (6085); dynamic braking remains active after stop.	
-2	Quick stop (6084); dynamic braking remains active after stop.	
-1	Dynamic braking stop; dynamic braking remains active after stop.	
0	Coast to stop; motor remains in free-run state after stop.	
1	Quick stop (6084); motor remains in free-run state after stop. * 609A ramp deceleration stop is used in homing mode.	
2	6084 ramp stop. Free-running state maintained after stop.	
3	Emergency torque deceleration stop. motor remains in free-run state after stop.	
4	Dynamic braking stop[Note]. Free-running state maintained after stop.	

✎**Note:** Only VD5E and VD5L-SA1D versions support the dynamic braking function. This setting is invalid for all other models.

P00-09 2000-09	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Braking resistor setting ExtResSel	Operation setting	Valid immediately	0	0 to 3	Basic settings	-

Used to set the mode of absorbing and releasing braking energy.

Setting value	Brake resistance setting	Remark
0	Use built-in braking resistor	Please refer to "7.1.5 Braking Resistance" to select the appropriate braking mode
1	Use external braking resistor and natural cooling	
2	Use external braking resistor and forced air cooling (not settable)	
3	No braking resistors are used, and all are absorbed by capacitance	

P00-10 2000-0A	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	External braking resistor resistance ExtResVal	Operation setting	Valid immediately	50	0 to 65535	Basic settings	Ω

Used to set the power of external braking resistor of servo drive. When the maximum braking energy calculated value is greater than the maximum braking energy absorbed by capacitor, and the braking power calculated value is greater than the built-in braking resistor power, use external braking resistor.
If the value of P00-10 is too large, Er.25 (too large braking resistor value) or Er.22 (main power supply is over-voltage) will occur.
When external braking resistor is connected, please disconnect the short tab between C and D and connect the external braking resistor between P + and C. Please refer to "2.1.2 Composition of servo drive" for specific operation.

P00-11 2000-0B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	External braking resistor power ExtResPwr	Operation setting	Valid immediately	100	0 to 65535	Basic settings	W

Used to set the power of the external braking resistor of the servo drive.
External braking resistor power "P00-11" is not allowed to be less than the calculated value of braking resistor power!

P00-16 2000-10	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Pulse per revolution Pulse In Pre Cyc	Shutdown setting	Valid immediately	0	0 to 100000000	Basic settings	Command pulse unit

Set the number of command pulses per rotation of the motor.
When this value is set to 0, [P00-17] electronic gear numerator and [P00-18] electronic gear denominator take effect.
✎**Note:** When P0-16 is set not equal to 0, the 6091 electronic gear ratio will not take effect.

P00-17 2000-11	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Electronic gear ratio 1 numerator Gear 1 Frac	Operation setting	Valid immediately	1	0 to 2^{31}	Basic settings	-

Set the numerator of the first electronic gear ratio for position command scaling, effective when [P00-16] Command pulses per motor rotation is set to 0.

Corresponds to object dictionary 6091 : 01.

P00-18 2000-12	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Electronic gear ratio 1 denominator Gear 1 Num	Operation setting	Valid immediately	1	0 to 2^{31}	Basic settings	-

Set the denominator of the first electronic gear ratio for position command scaling, effective when [P00-16] Command pulses per motor rotation is set to 0.

Corresponds to object dictionary 6091:02.

P00-23 2000-17	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	Z pulse output OZ polarity PulseOutPcPolarity	Operation setting	Power-on again	0	0 to 1	Basic settings	-

Used to set the logic level of Z pulse.

Setting value	Function
0	Z pulse is active at high level
1	Z pulse is active at low level

P00-24 2000-18	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	Z pulse output width PulseOutZWidth	Operation setting	Power on again	3	1 to 200	Basic settings	ms

Set the width of Z pulse output.

Setting value	Function
1	Pulse width 1ms
2	Pulse width 2ms
…	…
200	Pulse width 200ms

P00-29 2000-1D	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	The number of equivalent position units EquPositionUnitsPerTurn	Shutdown setting	Valid immediately	10000	0 to 131072	Basic settings	-

Equivalent position units when the motor rotates one circle. Used for position deviation display on oscilloscope and monitor.

P00-30 2000-1E	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Shield multi-turn absolute encoder battery fault EncBatErrMask	Operation setting	Power-on again	0	0 to 1	Basic settings	-

Used to set the battery fault alarm setting function of multi-turn absolute value encoder.

Setting value	Function	Remark
0	Unshielded	Detect battery undervoltage and battery low voltage faults of multi-turn absolute value encoder
1	Shield	Shield multi-turn absolute encoder battery under voltage and battery low-voltage fault. This would cause mechanical failure, please use with caution.

P00-31 2000-1F	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	Encoder read-write verification exception threshold setting EncCommWarmThreshold	Operation setting	Valid immediately	20	0 to 100	Basic settings	-

Encoder read-write verification exception is too frequent. Alarm threshold setting.
0: No alarm;
Others: When this setting value is exceeded, report A-93.

P00-32 2000-20	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	Communication tolerance setting ECAT Pdo TimeOut	Operation setting	Valid immediately	2	2 to 14	Basic settings	-

When the master station and the drive perform periodic data exchange, this parameter can be used to set the tolerance for PDO receiving event loss. When the accumulated errors exceed the set threshold, ER.09 is reported.

Group 2001h: Control parameters

P01-09 2001-09	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	Torque mode limit velocity source	Shutdown setting	Valid immediately	0	0 to 2	Protection and restriction	-

Used to set the maximum velocity limit value in torque mode.

Setting value	Function	Remarks
0	Internal velocity limit	P1-17 forward velocity limit P1-18 reverse velocity limit.
1	AI_2 analog input	Not supported yet!
2	Setting via EtherCAT	Set the maximum velocity limit through the corresponding EtherCAT communication

P01-10 2001-0A	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Maximum velocity threshold MaxvelocityTh	Operation setting	Valid immediately	3600	0 to 8000	Protection and restriction	rpm

Used to set the maximum velocity limit value. If the actual velocity of motor exceeds this value, Er.32 would occur (Exceed the maximum velocity of motor).

P01-11 2001-0B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Warning velocity threshold WarmvelocityTh	Operation setting	Valid immediately	3300	0 to 8000	Protection and restriction	rpm

Used to set the limit value of maximum velocity. If the actual velocity of motor exceeds this value, A-81 would occur (Exceed the maximum velocity of motor).

P01-12 2001-0C	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Forward velocity threshold PosvelocityTh	Operation setting	Valid immediately	3000	0 to 6000	Protection and restriction	rpm

Used to set the limit value of forward velocity.

P01-13 2001-0D	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	NegvelocityTh	Operation setting	Valid immediately	3000	0 to 6000	Protection and restriction	rpm

Used to set the limit value of reverse velocity

P01-14 2001-0E	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	Torque limit source ToqLimitSrc	Shutdown setting	Effective immediately	0	0 to 2	Protection and restriction	-

Used to set the torque limit source.

Setting value	Restricted source	Remarks
0	Internal	Internal torque limit.
1	Reserved	Reserved
2	EtherCAT	External torque limit, controlled by object dictionaries 6072, 60E0 and 60E1 through EtherCAT communication.

P01-15 2001-0F	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Forward torque limit PToqLim	Operation setting	Valid immediately	3000	0 to 3000	Protection and restriction	0.1%

When P01-14 is set to 0 (internal), the set value of this function code is used as the positive torque limit value.
If the value of P01-15 and P01-16 are set too small, the servo motor may be insufficient torque when performing acceleration and deceleration movements.

P01-16 2001-10	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Reverse torque limit NToqLim	Operation setting	Valid immediately	3000	0 to 3000	Protection and restriction	0.1%

When P01-14 is set to 0 (internal) , the setting value of this function code is used as reverse torque limit value

P01-17 2001-11	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Torque Mode PSpd Limit	Operation setting	Valid immediately	3000	0 to 6000	Protection and restriction	rmp

When P01-09 is set to 0 (internal), the setting value of this function code is used as the forward velocity limit in torque mode.

P01-18 2001-12	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Torque Mode NSpd Limit	Operation setting	Valid immediately	3000	0 to 6000	Protection and restriction	rmp

When P01-09 is set to 0 (internal), the setting value of this function code is used as the forward velocity limit in torque mode.

P01-19 2001-13	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Torque Limit Time ToqLimTime	Operation setting	Valid immediately	1000	0 to 65535	Protection and restriction	ms
When torque is limited by the setting value of P01-15 or P01-16, and exceeds the setting time, drive would report fault “abnormal torque saturation”. ✎**Note:** When the value of this function code is set to 0, the torque saturation timeout fault detection is not done, and this fault is ignored.							

P01-20 2001-14	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Software overcurrent detection SoftOverCurrentDt	Operation setting	Valid immediately	16	0 to 65536	Protection and restriction	-
Software overcurrent detection (set to 0 to diasbles software overcurrent alarm)							

P01-30 2001-1E	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Delay from brake output ON to instruction reception BK_ONtoCmdEnaDelay	Operation setting	Valid immediately	250	0 to 500	-	ms
Used to set the braking (BRK-OFF) output ON, until the servo drive allows the start of receiving the input instruction. When the brake output (BRK-OFF) is not allocated, this function code has no effect.							

P01-31 2001-1F	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	In the static state, delay from the brake output is OFF to the motor is not energized. BK_OFFtoPwmOFFDelay	Operation setting	Valid immediately	150	1 to 1000	-	ms
When the motor is in a static state, set the delay time from the brake (BRK-OFF) output is OFF to the servo drive is in the non-powered state. When the brake output (BRK-OFF) is not allocated, this function code has no effect.							

P01-32 2001-20	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Rotation status, when the brake output OFF, the velocity threshold. BK_OFFSpdTh	Operation setting	Valid immediately	30	0 to 3000	-	rpm
When the motor is rotating, the motor velocity threshold that is allowed when the brake (BRK-OFF) output is OFF. When the brake output (BRK-OFF) is not allocated, this function code has no effect.							

P01-33 2001-21	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Rotation status, Delay from servo enable OFF to brake output OFF BK_OFFSinceSofDelay	Operation setting	Valid immediately	500	1 to 2000	-	ms
When the motor rotates, the delay time from the servo enable (S-ON) OFF to the brake (BRK-OFF) output OFF is allowed. When the brake output (BRK-OFF) is not allocated, this function code has no effect.							

P01-35 2001-23	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Profile deceleration time 1 ProfileDec1	Operation setting	Valid immediately	167	0 to 65535	-	ms
Deceleration time from 1000 rpm to 0, converted to command units for 6084 ramp deceleration. 0: Uses 6084 ramp deceleration (fixed, not updated by 6084). Other values: 6084 ramp deceleration updates based on profile 1 deceleration time.							

P01-36 2001-24	Parameter name	Setting method	Valid time	Def ault	Set range	Application category	Unit
	Profile deceleration time 2 ProfileDec2	Operation setting	Valid immediately	0	0 to 65535	-	ms
Deceleration time from 1000 rpm to 0, converted to command units for 6085 ramp deceleration. 0: Uses 6085 ramp deceleration (fixed, not updated by 6085). Other values: 6085 ramp deceleration updates based on profile 2 deceleration time.							

P01-37 2001-25	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	JOG acceleration time SpdRefJOGAccTime	Operation setting	Effective immediately	500	1 to 5000	-	ms
The time for JOG instruction to accelerate from 0 to 1000rpm.							

P01-38 2001-26	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	JOG deceleration time SpdRefJOGDecTime	Operation setting	Effective immediately	500	1 to 5000	-	ms
The time for JOG instruction to decelerate from 1000rpm to 0.							

Group 2002h: Gain adjustment

P02-01 2002-01	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Position loop 1st gain PosLoop1stGain	Operation setting	Valid immediately	449	0 to 6200	Gain control	0.1Hz
It is used for setting the proportional gain of the first position loop to determine the responsiveness of the position control system.							

P02-02 2002-02	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	velocity loop 1st gain SpdLoop1stGain	Operation setting	valid immediately	250	0 to 35000	Gain control	0.1Hz
It is used for setting the proportional gain of the first position loop to determine the responsiveness of the position control system.							

P02-03 2002-03	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	velocity loop 1st integral time SpdLoop1stIntgTime	Operation setting	Valid immediately	230	10 to 65535	Gain control	0.1ms
Used to set the integral constant of the first velocity loop. The smaller the set value, the stronger the integral effect.							

P02-04 2002-04	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Position loop 2nd gain PosLoop2ndGain	Operation setting	Valid immediately	300	0 to 6200	Gain control	0.1Hz
Used to set the integral constant of the second velocity loop. The smaller the set value, the stronger the integral effect.							

P02-05 2002-05	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	velocity loop 2nd gain SpdLoop2ndGain	Operation setting	Valid immediately	160	0 to 35000	Gain control	0.1Hz
Used to set the integral constant of thes econd velocity loop. The smaller the set value, the stronger the integral effect.							

P02-06 2002-06	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	velocity loop 2nd integral time SpdLoop2ndIntg Time	Operation setting	Valid immediately	350	10 to 65535	Gain control	0.1ms

Used to set the integral constant of the second velocity loop. The smaller the set value, the stronger the integral effect.

P02-07 2002-07	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	velocity loop 2nd integral time SpdLoop2stIntgTime	Operation setting	Valid immediately	1	0 to 1	Gain control	-

Set the switching mode of the second gain.

Setting value	Function
0	The first gain is fixed. Use DI function 10 (GAIN-SEL, gain switching) to switch: DI logic invalid: PI control; DI logic valid: P control.
1	The first gain and the second gain are switched by the setting value of P02-08.

P02-08 2002-08	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Second Gain Fun Select	Operation setting	Valid immediately	0	0 to 10	Gain control	-

Set gain switching conditions

Setting value	Condition	Content
0	First gain fixed	Fixed as the first gain
1	Use DI port to switch	Use DI function 10(GAIn-SEL, gain switch) DI logic invalid: First gain (P02-01 to P02-03); DI logic valid: Second gain (P02-04 to P02-06).
2	Torque instruction large	In the previous first gain, when the absolute value of the torque instruction exceeds (level + hysteresis), it switches to the second gain; In the previous second gain, when the absolute value of the torqueinstruction is less than (level - hysteresis) and lasts for the delay time, it returns to the first gain.

	3	Actual torque large	In the previous first gain, when the absolute value of the actual torque exceeds (level + hysteresis), it switches to the second gain; In the previous second gain, when the absolute value of the actual torque is less than (level - hysteresis) and lasts for the delay time, it returns to the first gain.	
	4	velocity instruction large	In the previous first gain, when the absolute value of the velocity instruction exceeds (level + hysteresis), it switches to the second gain; In the previous second gain, when the absolute value of the velocity instruction is less than (level - hysteresis) and lasts for the delay time, it returns to the first gain.	
	5	Actual instruction large	In the previous first gain, when the absolute value of the actual velocity exceeds (level + hysteresis), it switches to the second gain; In the previous second gain, when the absolute value of the actual velocity is less than (level - hysteresis) and lasts for the delay time, it returns to the first gain.	
	6	Velocity instruction change ratio large	In the previous first gain, when the absolute value of the velocity instruction change rate exceeds (level + hysteresis), switch to the second gain; In the previous second gain, when the absolute value of the velocity instruction change rate is less than (level - hysteresis) and lasts for the delay time, return to the first gain.	
	7	Position offset large	In the previous first gain, when the absolute value of the position deviation exceeds (level + hysteresis), it switches to the second gain; In the previous second gain, when the absolute value of the position deviation is less than (level - hysteresis) and lasts for the delay time, it returns to the first gain.	
	8	Position instruction	In the previous first gain, if the position instruction is not 0, switch to the second gain; In the previous second gain, if the position instruction is 0 during the delay time, return to the first gain.	
	9	Position completed	In the previous first gain, if positioning is not completed, switch to the second gain; In the previous second gain, if the positioning incomplete state continues during the delay time, return to the first gain.	

10	Position instruction + Actual velocity	In the previous first gain, if the position instruction is not 0, switch to the second gain; In the previous second gain, if the position instruction is 0 during the delay time, keep the second gain; When the delay time is reached, if the absolute value of the current actual velocity does not reach (level), the velocity integral time constant is fixed at the second integral time constant, and the others return to the first gain. If the absolute value of the actual velocity does not reach (level-hysteresis), all return to the first gain.

P02-09 2002-09	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	SpdFeedForwardGain	Operation setting	Valid immediately	0	0 to 1000	Gain control	0.1%
It is used for setting the proportional gain of the second position loop to determine the responsiveness of the position control system.							

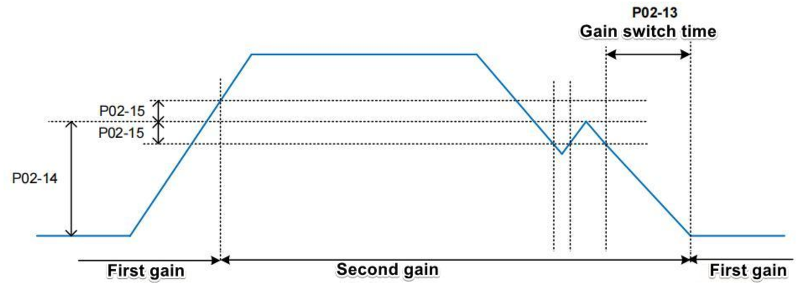
P02-10 2002-0A	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	SpdFeedForwardFilter	Operation setting	Valid immediately	3	0 to 500	Gain control	1ms
Used to set the time constant of the one power delay filter associated with the velocity feedforward input.							

P02-11 2002-0B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	ToqFeedForwardGain	Operation setting	Valid immediately	0	0 to 2000	Gain control	0.1%
Used to set the torque feedforward gain.							

P02-12 2002-0C	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	ToqFeedForwardFilter	Operation setting	Valid immediately	50	0 to 10000	Gain control	0.01ms
Used to set the time constant of the first-order delay filter associated with the torque feedforward input.							

P02-13 2002-0D	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	SecondGainSwTime	Operation setting	Valid immediately	20	0 to 10000	Gain control	0.1ms

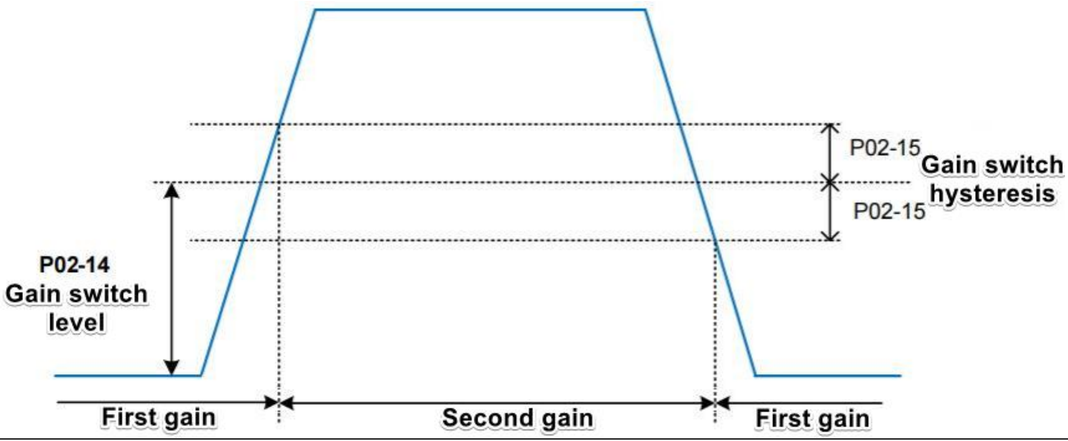
When switching from the second gain back to the first gain, the switching condition needs to be maintained for a period of time.



✎**Note:** This parameter is only valid when the second gain is switched back to the first gain.

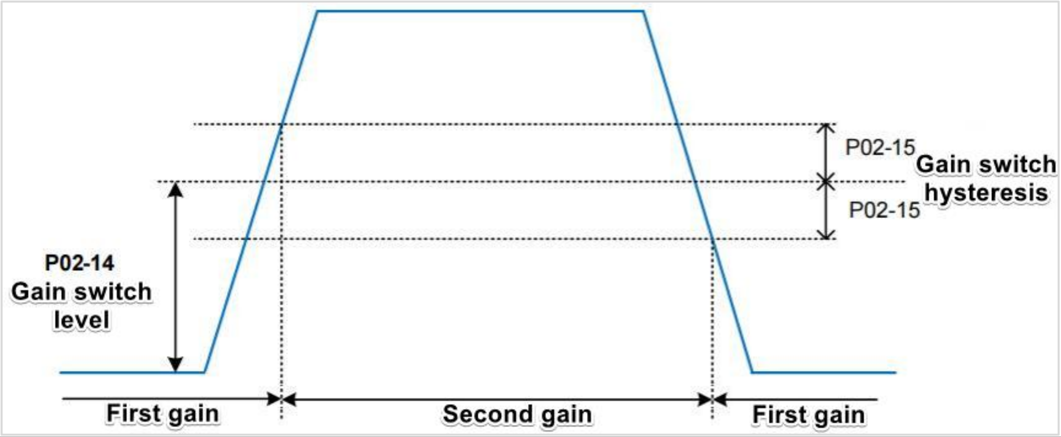
P02-14 2002-0E	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	SecondGain SwLevel	Operation setting	Valid immediately	50	0 to 20000	Gain control	Dependent on switch condition

Used to set the time constant of the primary delay filter associated with the torque feedforward input.



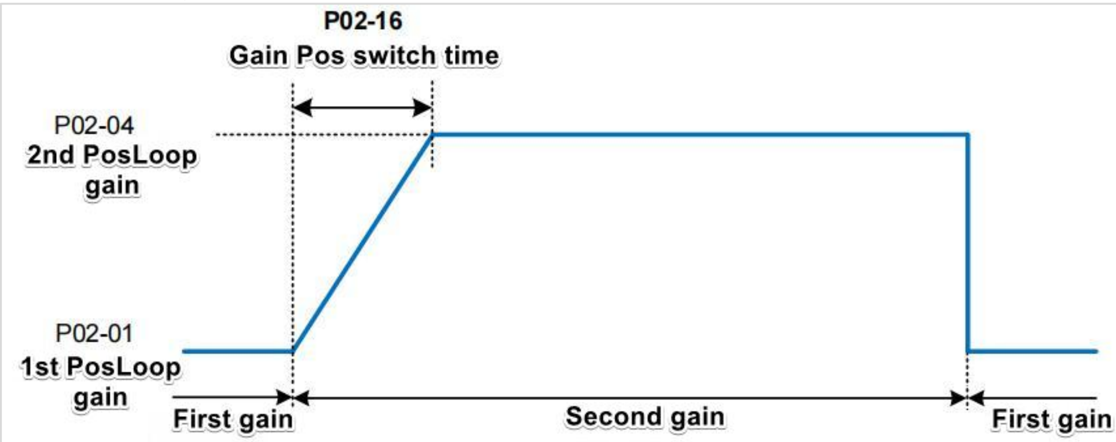
P02-15 2002-0F	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	SecondGain Hysteresis	Operation setting	Valid immediately	20	0 to 20000	Gain control	Dependent on switch condition

Used to set the time constant of the primary delay filter associated with the torque feedforward input.



P02-16 2002-10	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Second Gain Pos Switch Time	Operation setting	Valid immediately	30	0 to 10000	Gain control	1ms

Set the time when the first position loop 2002-01 (P02-01) switches to the second position loop 2002-04 (P02-04) in position control mode..



If 2002-04≤2002-01, this parameter is invalid and the second gain is switched immediately.

P02-20 2002-14	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Ctrl Enable	Stop setting	Valid immediately	0	0 to 1	Gain control	-

Set 1 to enable the model tracking control function.

P02-21 2002-15	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Ctrl Gain	Operation setting	Valid immediately	1000	200 to 20000	Gain control	0.1%
Used to set the torque feedforward gain.							

P02-22 2002-16	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Ctrl Gain Compensation	Stop setting	Valid immediately	1000	500 to 2000	Gain control	0.1%
Gain compensation affects the damping ratio of the model loop, and the damping ratio increases as the gain compensation increases.							

P02-23 2002-17	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Ctrl Positive dir Offset	Operation setting	Valid immediately	1000	0 to 10000	Gain control	0.1%
Used to set the torque feedforward gain.							

P02-24 2002-18	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Ctrl Negative dir Offset	Operation setting	Valid immediately	1000	0 to 10000	Gain control	0.1%
Used to set the torque feedforward gain.							

P02-25 2002-19	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Ctrl velocity Forward Compensation	Operation setting	Valid immediately	1000	0 to 10000	Gain control	0.1%
Used to set the torque feedforward gain.							

P02-26 2002-1A	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Second Model Ctrl Gain	Stop setting	Valid immediately	1000	200 to 20000	Gain control	0.1%
Increasing the model tracking control gain can improve the position response performance of the model loop, but too high a gain may cause overshoot.							

P02-27 2002-1B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Second Model Ctrl Gain Compensation	Operation setting	Valid immediately	1000	500 to 2000	Gain control	0.1%
Gain compensation affects the damping ratio of the model loop, and the damping ratio increases as the gain compensation increases.							

P02-28 2002-1C	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Tracking Vibration Suppression 1 Frequency A	Operation setting	Valid immediately	500	10 to 2500	Gain control	0.1%

P02-29 2002-1D	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Model Tracking Vibration Suppression 1 Frequency B	Stop setting	Valid immediately	700	10 to 2500	Gain control	0.1Hz

P02-40 2002-28	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Gravity compensation Gravity Comp Value	Operation setting	Valid immediately	0	-1000 to 1000	Gain control	0.1%

P02-41 2002-29	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Positive friction compensation Positive Friction Value	Operation setting	Valid immediately	0	-1000 to 1000	Gain control	0.1%

P02-42 2002-2A	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Negative friction compensation Negative Friction Value	Operation setting	Valid immediately	0	-1000 to 1000	Gain control	0.1%

P02-43 2002-2B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Friction compensation start threshold Friction Start Th	Operation setting	Valid immediately	100	0 to 65535	Gain control	0.1 rpm

P02-47 2002-2F	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Quadrant protrusion suppression enable QPS Enable	Operation setting	Valid immediately	0	0 to 1	Gain control	-

P02-48 2002-30	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Quadrant protrusion suppression time QPS Time	Operation setting	Valid immediately	0	0 to 1000	Gain control	0.1 ms

P02-49 2002-31	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Quadrant protrusion suppression level QPS Level	Operation setting	Valid immediately	0	1 to 500	Gain control	-

P02-50 2002-32	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Quadrant protrusion suppression sensitive QPS Sensitive	Operation setting	Valid immediately	10	1 to 65535	Gain control	-

Group 2003h: Self-adjusting parameters

P03-01 2003-01	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Load inertia ratio LoadInerRatio	Operation setting	Valid immediately	300	100 to 10000	Automatic parameter tuning	0.01
Used to set the load inertia ratio, 1.00 to 100.00 times.							

P03-02 2003-02	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Load rigidity selection RigiditySel	Operation setting	Valid immediately	14*	0 to 31	Automatic parameter tuning	-
Set the rigidity of the servo system. The larger the setting value, the faster the response, but too high rigidity will cause vibration. *: The factory default value may be different for different models.							

P03-03 2003-03	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Self-adjusting mode selection SelfAdjustMode	Operation setting	Valid immediately	0	0 to 2	Automatic parameter tuning	-

Used for setting different gain adjustment modes, the related gain parameters can be set manually or automatically according to the rigidity grade table.

Setting value	Function	Description
0	Self-adjusting mode.	Position loop gain, velocity loop gain, velocity loop integral time constant, torque filter parameter settings are automatically adjusted according to the rigidity grade setting.
1	Manual setting	The user manually sets the position loop gain, velocity loop gain, velocity loop integral time constant and torque filter parameter settings.
2	Online automatic parameter self-adjusting mode	Not yet realized.

P03-04 2003-04	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Online inertia identification sensitivity InerIdOncable	Operation setting	Valid immediately	0	0 to 2	Automatic parameter tuning	-
Not yet realized.							

P03-05 2003-05	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Number of cycles of inertia identification InerIdCircle	Shutdown setting	Valid immediately	2	1 to 20	Automatic parameter tuning	Circle
Used to set the load inertia identification process and set the number of rotations of the motor.							

P03-06 2003-06	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Maximum velocity of inertia identification InerIdMaxSpd	Shutdown setting	Valid immediately	1000	300 to 2000	Automatic parameter tuning	rpm
Used to set the maximum allowable motor velocity instruction in offline inertia identification mode. The faster the velocity during inertia identification, the more accurate the identification result will be. It is recommended to keep the default value.							

P03-07 2003-07	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Parameter identification rotation direction InerIdRollMode	Shutdown setting	Valid immediately	0	0 to 2	Automatic parameter tuning	-

Used to set parameters identification rotation direction.

Setting value	Rotation direction
0	Forward and reverse reciprocating rotation
1	Forward one-way rotation
2	Reverse one-way rotation

P03-08 2003-08	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Parameter identification waiting time InerIdWaitTime	Shutdown setting	Valid immediately	1000	300 to 10000	Automatic parameter tuning	ms
During offline inertia identification, the time interval between two consecutive velocity instructions							

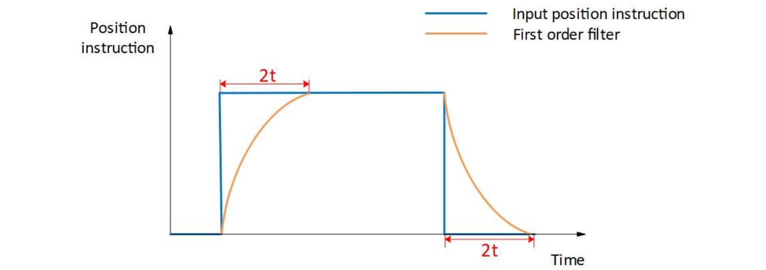
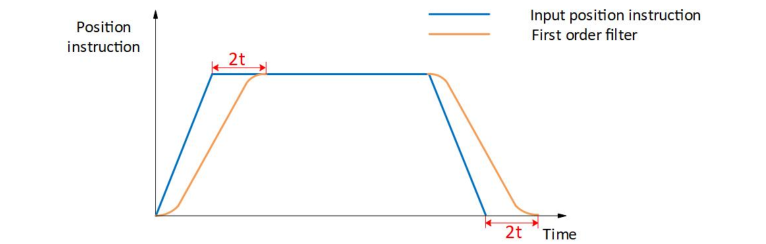
Group 2004h: Vibration suppression

P04-01 2004-01	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Pulse instruction filtering method PulseFilterType	Shutdown setting	Valid immediately	0	0 to 1	Position mode	-

Setting value	Filtering method
0	First-order low-pass filtering method
1	Mean filtering method
2	First-order low-pass filter method+ average value filter mode method

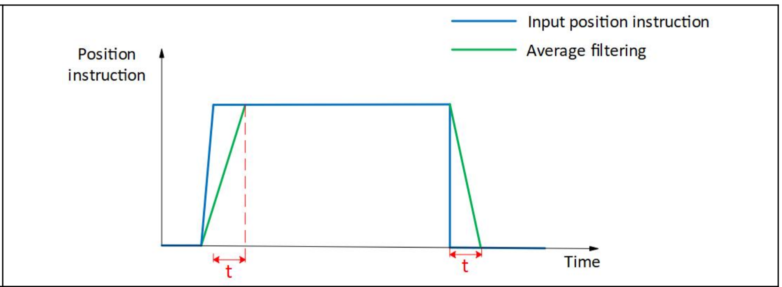
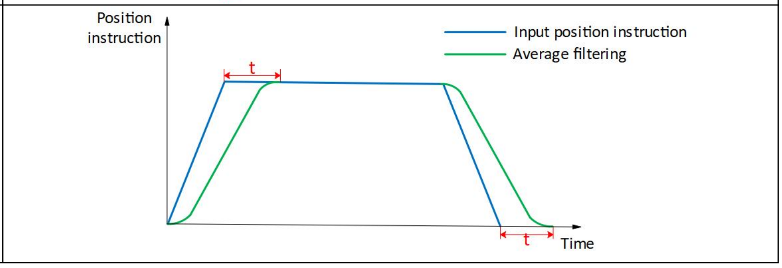
P04-02 2004-02	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Position instruction first-order low-pass Filtering time constant LowpassFilterTime	Shutdown setting	Valid immediately	0	0 to 1000	Position mode	ms

It is used to set the filtering time constant of the first-order low-pass filtering mode.

The position instruction is rectangular waves	
The position instruction is trapezoidal wave	

P04-03 2004-03	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	The position instruction average filter time constant AveragingFilterTime	Shutdown setting	Valid immediately	0	0 to 128	Position mode	ms

Used to set average filtering time constant.

The position instruction is rectangular waves	
The position instruction is trapezoidal wave	

P04-04 2004-04	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Torque filter time constant TorFiltertTime	Operation setting	Valid immediately	95	7 to 2500	Vibration suppression	0.01ms

Used to set torque filtering time constant. When the function code P03-03(Self-adjustment mode selection) is set to 0, the parameter is automatically set by servo.

P04-05 2004-05	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	1st notch filter frequency NotchFilter1_Freq	Operation setting	Valid immediately	300	250 to 5000	Vibration suppression	Hz

Used to set the center frequency of the 1st notch filter. When the function code is set to 5000, the function of the notch filter is invalid.

P04-06 2004-06	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	1st notch filter depth NotchFilter1_Deep	Operation setting	Valid immediately	100	0 to 100	Vibration suppression	-
Used to set the notch filter depth grade (the ratio of input and output at the center frequency of the notch filter).The larger the setting of this function code, the shallower the notch filter depth, resulting in weaker suppression of mechanical vibrations, but setting it too high may cause system instability							

P04-07 2004-07	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	1st notch filter width NotchFilter1_Band	Operation setting	Valid immediately	4	0 to 12	Vibration suppression	-
Used to set the notch filter width grade (the ratio of input and output at the center frequency of the notch filter)							

P04-08 2004-08	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	2nd notch filter frequency NotchFilter2_Freq	Operation setting	Valid immediately	500	250 to 5000	Vibration suppression	Hz
Used to set the center frequency of the 2nd notch filter. When the function code is set to 5000, the function of the notch filter is invalid.							

P04-09 2004-09	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	2nd notch filter depth NotchFilter2_Deep	Operation setting	Valid immediately	100	0 to 100	Vibration suppression	-

P04-10 2004-0A	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	2nd notch filter width NotchFilter2_Band	Operation setting	Valid immediately	4	0 to 12	Vibration suppression	-

P04-18 2004-12	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	velocity feedback filter time SpdFdbFilterTime	Operation setting	Effective immediately	10	1 to 1000	Vibration suppression	0.01ms

Group 2005h: Signal input and output

P05-16 2005-10	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Rotation detection velocity threshold RotateSpdDtTh	Operation setting	Valid immediately	20	0 to 1000	velocity mode	rpm
Set the velocity threshold that triggers the motor rotation signal. The motor rotation signal (TGON) is used to confirm that the motor has rotated.							

P05-19 2005-13	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Zero velocity output signal threshold SpdZeroOutTh	Operation setting	Valid immediately	10	0 to 6000	velocity mode	rpm
Used to set the velocity threshold that triggers the motor rotation signal. Motor output zero velocity signal (ZSP) means that the actual velocity of the motor is close to stationary.							

P05-20 2005-14	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Torque reaches threshold TorArriveThreshold	Operation setting	Valid immediately	100	0 to 300	Torque mode	%
[P05-20] needs to be used together with [P05-21] When the actual torque reaches the value of [P05-20] + [P05-21], the torque arrival DO becomes valid; When the actual torque drops below the value of [P05-20]- [P05-21], the torque arrival DO becomes invalid.							

P05-21 2001-15	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Torque reaches hysteresis TorArriveHysteresis	Operation setting	Valid immediately	10	0 to 20	Torque mode	%
[P05-21] needs to be used together with [P05-20]							

P05-25 2005-19	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Touch probe DI conduct On compensation time TouchProbeDIOnCompTime	Operation setting	Valid immediately	500	-10000 to 10000	-	ns
Setting range: -10000 to 10000Time range: -100us ~ 100us*High-precision probe compensation is only supported by VD5E/VD5L 101 (U02-05) hardware version.							

P05-26 2005-1A	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Touch probe DI Off compensation time TouchProbeDIOffCompTime	Operation setting	Valid immediately	3780	-10000 to 10000	-	ns
Setting range: -10000 to 10000Time range: -100us ~ 100us*High-precision probe compensation is only supported by VD5E/VD5L 101 (U02-05) hardware version.							

Group 2006h: DIDO configuration

P06-02 2006-02	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_1 channel function selection Di1FunSel	Operation setting	Power-on again	0	0 to 32	DI/DO	-

Set DI functions corresponding to hardware DI_1. Refer to the following table for the functions corresponding to the set value:

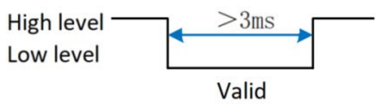
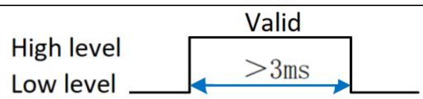
Setting value	DI channel function
0	OFF (Not used)
1	SON (Servo enabled)
2	A-CLR (Fault and warning clear)
3	POT (Forward drive prohibition)
4	NOT (Reverse drive prohibition)
6	CL (Deviation counter cleared)

Setting value	DI channel function
8	E-STOP (Emergency stop)
10	GAIN-SEL (Gain switch)
18	Probe 1
19	Probe 2
26	HOMEORG (Origin signal)
Remaining	None

When P06-02 is set to a value outside the table, the function of ID port is not be used.
The same DI channel function could not be allocated to multiple DI ports, otherwise servo drive will occur A-89 (duplicate DI port configuration)

P06-03 2006-03	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_1 channel logic selection Di1LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

DI port input logic validity function selection

Setting value	Content	Specification
0	Normally open input. Active low level (switch on);	
1	Normally closed input. Active high level (switch off);	

P06-04 2006-04	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_1 input source selection Di1SrcSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

Select the enabled DI_1 port type

Setting value	Port category
0	Hardware DI_1 input terminal
1	Virtual VDI_1 input terminal

P06-05 2006-05	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_2 channel function selection Di2FunSel	Operation setting	Power-on again	2	0 to 32	DI/DO	-

P06-06 2006-06	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_2 channel logic selection Di2LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-07 2006-07	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_2 input source selection Di2SrcSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-08 2006-08	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_3 channel function selection Di3FunSel	Operation setting	Power-on again	3	0 to 32	DI/DO	-

P06-09 2006-09	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_3 channel logic selection Di3LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-10 2006-0A	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_3 input source selection Di3SrcSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-11 2006-0B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_4 channel function selection Di4FunSel	Operation setting	Power-on again	4	0 to32	DI/DO	-

P06-12 2006-0C	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_4 channel logic selection Di4LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-13 2006-0D	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_4 input source selection Di4SrcSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-13 2006-0E	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_5 input source selection Di5SrcSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-14 2006-0E	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_5 channel function selection Di5FunSel	Operation setting	Power-on again	0	0 to 32	DI/DO	-

P06-15 2006-0F	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_5 channel logic selection Di5LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-16 2006-10	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_5 input source selection Di5SrcSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-17 2006-11	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_6 channel function selection Di6FunSel	Operation setting	Power-on again	0	0 to 32	DI/DO	-

P06-18 2006-12	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_6 channel logic selection Di6LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-19 2006-13	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DI_6 input source selection Di6SrcSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
P06-26 2006-1A	DO_1 channel function selection Do1FunSel	Operation setting	Valid immediately	132	128 to 148	DI/DO	-

Used to set DO functions corresponding to hardware DO_1. Refer to the following table for the functions corresponding to the set value:

Setting value	DI channel function
128	OFF (Not used)
129	RDY (Servo ready)
130	ALM (Fault signal)
131	WARN (Warning signal)
132	TGON (Rotation detection)
133	ZSP (Zero velocity signal)
134	P-COIN (Positioning completed)
137	V-NEAR (velocity approach)
138	T-COIN (Torque arrival)

Setting value	DI channel function
139	T-LIMIT (Torque limit)
140	V-LIMIT (velocity limited)
141	BRK-OFF (Brake output)[Note]
142	SRV-ST (Servo on state output)
145	COM_VDO1 (Communication VDO1 output)
146	COM_VDO2 (Communication VDO2 output)
147	COM_VDO3 (Communication VDO3 output)
Others	None

✎**Note:** To use the BRK-OFF (brake output) function code, power must be turned on again to take effect.

If P06-26 is set to a value other than that in the preceding table, the DO port function is not required

The same DO channel function could not be allocated to multiple DO ports, otherwise servo drive will occur A-90 (duplicate DO port configuration)

P06-27 2006-1B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DO_1 channel logic selection Do1LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

DO port input logic validity function selection.

Setting value	Content
0	Output transistor is on when the output is valid, and output transistoris off when the output is invalid.
1	Output transistor is off when the output is valid, and output transistor is on when the output is invalid.

P06-28 2006-1C	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DO_2 channel function selection Do2FunSel	Operation setting	Valid immediately	130	128 to 148	DI/DO	-

P06-29 2006-1D	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DO_2 channel logic selection Do2LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P06-30 2006-1E	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DO_3 channel function selection Do3FunSel	Operation setting	Valid immediately	129	128 to 148	DI/DO	-

P06-31 2006-1F	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	DO_3 channel logic selection Do3LogSel	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

<table>
<tr><th rowspan="2">P06-34
2006-20</th><th>Parameter name</th><th>Setting method</th><th>Valid time</th><th>Default</th><th>Set range</th><th>Application category</th><th>Unit</th></tr>
<tr><td>ECAT forces DO to output state
CompDoOutputStatu</td><td>Operation setting</td><td>Valid immediately</td><td>0</td><td>0 to 1</td><td>Auxiliary function</td><td>-</td></tr>
<tr><td colspan="8">When the master station changes from online to offline, the DO output state changes (when the DO forced output enable of 60FE-02h is not turned on, it is not affected by this function code)
0: Keep the current state;
1: Initialize state.</td></tr>
</table>

Group 200Ah: Auxiliary function

P10-01 200A-01	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	JOG velocity SpdRefJOG	Operation setting	Valid immediately	100	0 to 3000	Auxiliary function	rpm
Used to set JOG velocity							

P10-02 200A-02	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Factory value resetting RstFuncFac	Shutdown setting	Valid immediately	0	0 to 65535	Auxiliary function	-

Used to restore function code parameters to factory values.

Setting value	Operational meaning
0	No operation
1	Restore factory setting value

P10-03 200A-03	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Fault clearing ServoErrClear	Operation setting	Valid immediately	0	0 to 1	Auxiliary function	-

Fault reset operation selection

Setting value	Function	Remark
0	No operation	-
1	Fault clearing	For clearable faults, after the cause of fault is removed, and write 1 to the function code, the drive will stop the fault display and enter the Rdy (or RUN) state again.

✎**Note:** If the servo S-ON is valid, when the fault is removed and cleared, the servo will directly enter the Run state. When performing fault clearing actions, be sure to stop sending control instructions such as pulses to ensure personal safety.

P10-04 200A-04	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Motor overload protection time factor MotOLProtect_Coef	Operation setting	Valid immediately	100	1 to 800	Auxiliary function	%

This function code represents the heat dissipation capacity of the motor surface.
The larger the value, the stronger the heat dissipation capacity of the motor, and the less likely it is to report motor overload warnings and faults under the same load conditions.

P10-05 200A-05	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Motor type MotoTypeSel	Operation setting	Power-on again	0	0-65535	Auxiliary function	-

The motor type is used together with P10-7 to manually set the motor code. When P10-7 is set to 1, the motorcode uses the P10-5 setting value. When P10-7 is set to 0, query U0-53 to obtain the current motor type.
✎**Note:** The motor must be connected first, and then the drive is powered on. Otherwise, the servo drive will report Er.27 (encoder disconnection fault).

P10-06 200A-06	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Multi-turn absolute encoder reset AbsEncRst	Shutdown setting	Valid immediately	0	0 to 1	Auxiliary function	-

Used to clear the rotation number of multi-turn absolute encoder (U0-56), current position (U0-56) or clear the encoder fault alarms

Setting value	Function
0	No operation
1	Clear multi-turn data, encoder current position and encoder fault alarms

✎**Note:** After resetting (P10-06 is set to 1), the absolute position of the encoder will change suddenly, and the mechanical homing operation is required.

P10-07 200A-07	Parameter name	Setting method	Effective time	Default	Set range	Application category	Unit
	Manual setting motor code ManualSetMotoCode	Operation setting	Power-on again	0	0 to 1	Auxiliary function	-

Used to modify the Motor Code of the servo drive. When it is set to 0, Motor Code is read from motor. When it is set to 1, Motor code is read from P10-5 motor model.
✎**Note:** Do not modify it casually, otherwise, it will cause motor damage.

P10-11 200A-0B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	ManualSetMotoCode	Operation setting	Valid immediately	0	0 to 1	Auxiliary function	-

Used to turn on and off the motor stall overtemperature detection function..

Setting value	VDI_1 input level
0	Enable motor stall overtemperature detection. When the motor stalls, the drive reports [ER.45] motor stall overtemperature protection;
1	Shielded motor stall overtemperature detection. (After stall detection, the torque is automatically reduced to 70.7% of the rated value)

✎**Note:** After executing the shielded motor stall overtemperature detection operation (P10-11 is set to 1), the motor may burn out when it stalls and overheats!

200Ch Group: Communication parameter

P13-01 200D-01	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Bus communication data write to EEPROM CommDataWrEep	Operation setting	Valid immediately	1	0 to 1	Auxiliary function	-

When P06-04 is set to 1, DI_1 channel logic is controlled by this function code.

Setting value	Function
0	The bus communication data set by the upper computer is not written to EEPROM and is not stored after power-off.
1	The bus communication data set by the upper computer is written to EEPROM and is stored after power-off.

Group 200Dh communication input and output terminal

P13-01 200D-01	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Virtual VDI_1 input value CommVdi_1	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

When P06-04 is set to 1, DI_1 channel logic is controlled by this function code.

Setting value	VDI_1 input level
0	Low level
1	High level

P13-02 200D-02	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Virtual VDI_2 input value CommVdi_2	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

When P06-07 is set to 1, DI_2 channel logic is controlled by this function code.

P13-03 200D-03	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Virtual VDI_3 input value CommVdi_3	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

When P06-10 is set to 1, DI_3 channel logic is control by this function code.

P13-04 200D-04	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Virtual VDI_4 input value CommVdi_4	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

When P06-13 is set to 1, DI_4 channel logic is control by this function code.

P13-05 200D-05	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Virtual VDI_5 input value CommVdi_5	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

When P06-16 is set to 1, DI_5 channel logic is control by this function code.

P13-06 200D-06	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Virtual VDI_6 input value CommVdi_4	Operation setting	Valid immediately	0	0 to 1	DI/DO	-
When P06-19 is set to 1, DI_6 channel logic is control by this function code.							

P13-11 200D-0B	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Communication VDO_1 output value CommVdo_1	Operation setting	Valid immediately	0	0 to 1	DI/DO	-
Used to set the input level logic when the DO function selected by VDO_1 is active.							

Setting value	VDO_1 input level
0	Low level
1	High level

P13-12 200D-0C	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Communication VDO_2 output value CommVdo_2	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

P13-13 200D-0D	Parameter name	Setting method	Valid time	Default	Set range	Application category	Unit
	Communication VDO_3 output value CommVdo_3	Operation setting	Valid immediately	0	0 to 1	DI/DO	-

Group 201Eh universal monitoring

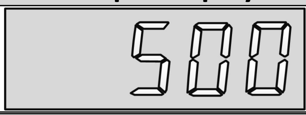
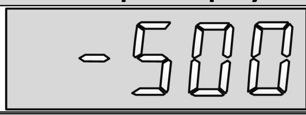
U0-01 201E-01	Monitoring name	Range	Category	Panel display	Unit	Data type
	Servo status SrvStatus	0 to 8	Universal	Decimal	-	16-bit

Display the status of servo drive.

Display value	Status	Display value	Status
0	Power-on	5	Servo operation
1	Initialization	6	Quick shutdown
2	Failure-free (nF)	7	**Fault** shutdown
3	Servo ready (Ry)	8	Fault
4	Wait for servo enabled		

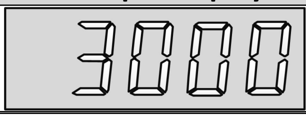
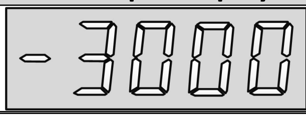
U0-02 201E-02	Monitoring name	Range	Category	Panel display	Unit	Data type
	Servo motor velocity velocityDis	-5000 to 5000	Universal	Decimal	rpm	16-bit

Display the actual velocity of servo drive. The accuracy is 1 rpm. The display of servo drive panel is as below.

500rpm display	-500rpm display
	

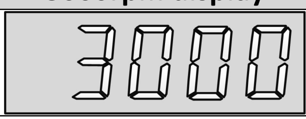
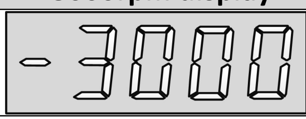
U0-03 201E-03	Monitoring name	Range	Category	Panel display	Unit	Data type
	Input velocity instruction SpdCmd	-6000 to 6000	Universal	Decimal	rpm	16-bit

Display servo input velocity instruction. The accuracy is 1 rpm. The display of servo drive panel is as below.

3000rpm display	-3000rpm display
	

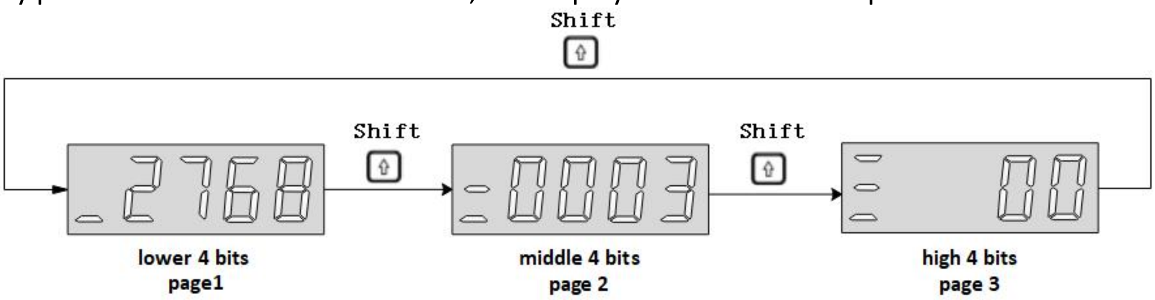
U0-04 201E-04	Monitoring name	Range	Category	Panel display	Unit	Data type
	Corresponding velocity of position instruction PosCmdToSpd	-5000 to 5000	Universal	Decimal	rpm	16-bit

Display the current velocity instruction value of servo drive in position mode. The accuracy is 1 rpm. The display of servo drive panel is as below.

3000rpm display	-3000rpm display
	

U0-05 201E-05	Monitoring name	Range	Category	Panel display	Unit	Data type
	Pulse deviation PulsErr	-2^{31} to 2^{31}	Universal	Decimal	Equivalent pulse deviation	32-bit

Display pulse deviation. If U0-05 is 32768, the display of the servo drive panel is:



U0-07 201E-0F	Monitoring name	Range	Category	Panel display	Unit	Data type
	Encoder communication error count Encoder Err Cnt	0 to 65536	Universal	Decimal		16-bit

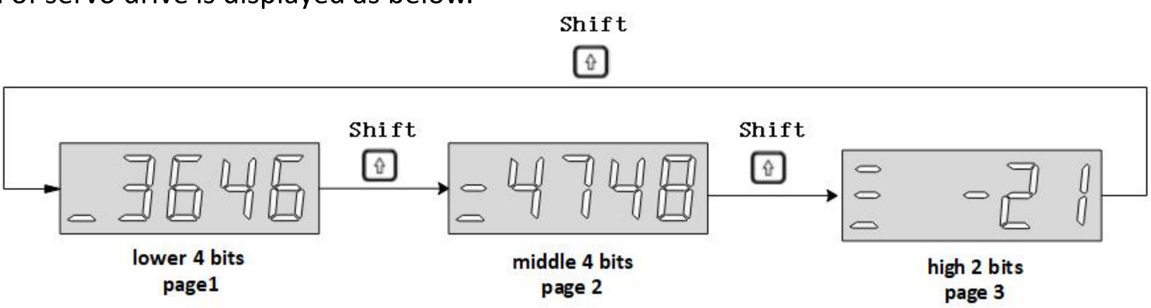
Displays the number of drive and encoder communication errors from power on to the current drive

U0-08 201E-08	Monitoring name	Range	Category	Panel display	Unit	Data type
	Packet loss counter Sync0SubSm_Cnt	0 to 65536	Universal	Decimal		16-bit

Display the error value between SYNC0 and SM
(Theoretically, one SYNC0 signal corresponds to one SM count.)

U0-09 201E-09	Monitoring name	Range	Category	Panel display	Unit	Data type
	Input instruction pulse number PulsTotal	-2^{31} to 2^{31}	Universal	Decimal	Instruction unit	32-bit

Display instruction pulse number that input the servo drive. If U0-09 is set to -2147483646, the panel of servo drive is displayed as below.

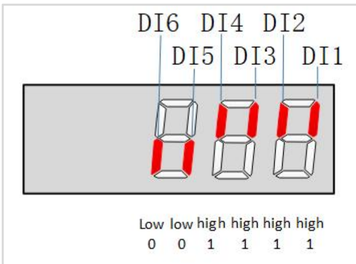


U0-13 201E-0D	Monitoring name	Range	Category	Panel display	Unit	Data type
	Encoder cumulative position (Low 32-bit) EncTotal_LowWord	-2^{31} to 2^{31}	Universal	Decimal	Encoder unit	32-bit

U0-15 201E-0F	Monitoring name	Range	Category	Panel display	Unit	Data type
	Encoder cumulative position (High 32-bit) EncTotal_HighWord	-2^{31} to 2^{31}	Universal	Decimal	Encoder unit	32-bit
Display the cumulative data of encoder position. It is used with U0-13 cooperatively.						

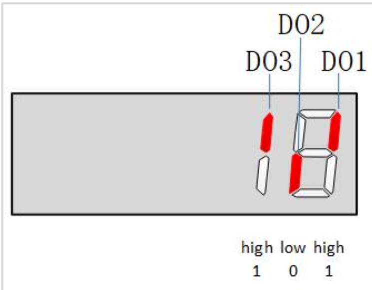
U0-17 201E-11	Monitoring name	Range	Category	Panel display	Unit	Data type
	DI input signal status DiData1	00000000to 11111111	Universal	Binary	Encoder unit	16-bit

Display the current level status of the 6 DI terminals.
Display method: On the servo drive panel, the upper part of the digital tube lights up to indicate a high level (represented by '1'); the lower part lights up to indicate a low level (represented by '0'). For example, with DI1 to DI4 terminals at high level and DI5~DI6 terminals at low level: the corresponding binary code is '001111'. On the Wecon servo upper computer debugging platform U0-17, the current binary value is displayed as 0b0000 1111. The servo drive panel displays as follows:



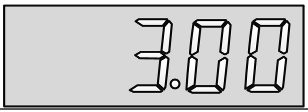
U0-19 201E-13	Monitoring name	Range	Category	Panel display	Unit	Data type
	DO output signal status DoData1	00000000to 00001111	Universal	Binary	Encoder unit	16-bit

Displays the current level status of the3 DO terminals.
Display method: On the servo drive panel, the upper part of the digital tube lights up to indicate a high level (represented by '1'); the lower part lights up to indicate a low level (represented by '0'). For example, with DI1, DI3 terminals at high level and DI2 terminal at low level: the corresponding binary code is '101'. On the Wecon servo upper computer debugging platform U0-17, the current binary value is displayed as 0b0000 0101. The servo drive panel displays as follows:



U0-20 201E-14	Monitoring name	Range	Category	Panel display	Unit	Data type
	Real-time load inertia ratio InerRatioReal	-	Universal	Decimal	%	16-bit

Displays the current load inertia ratio. If the load inertia ratio is 3 times (300%) , the panel of servo drive is displayed as below.

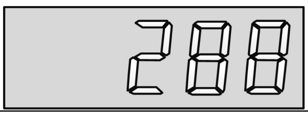


U0-23 201E-17	Monitoring name	Range	Category	Panel display	Unit	Data type
	Vibration frequency DisVibFreq	-	Universal	Decimal	Hz	16-bit

U0-24 201E-18	Monitoring name	Range	Category	Panel display	Unit	Data type
	Vibration amplitude DisVibMag	-	Universal	Decimal	rpm	16-bit

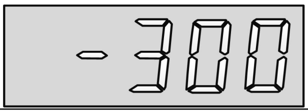
U0-25 201E-19	Monitoring name	Range	Category	Panel display	Unit	Data type
	Forward torque limit value PToqLimitDis	0 to 300	Universal	Decimal	%	16-bit

Display the set value of P01-15 (forward torque limit) of servo drive. If U0-25 is 288%, the panel of servo drive is displayed as below.



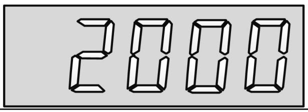
U0-26 201E-1A	Monitoring name	Range	Category	Panel display	Unit	Data type
	Reverse torque limit value NToqLimitDis	-300 to 0	Universal	Decimal	%	16-bit

Display the set value of P01-16 (reverse torque limit) of servo drive. If U0-26 is 300%, the panel of servo drive is displayed as below.



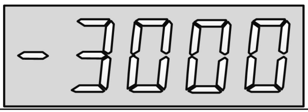
U0-27 201E-1B	Monitoring name	Range	Category	Panel display	Unit	Data type
	Forward velocity limit value PSpdLimitDis	0 to 5000	Universal	Decimal	rpm	16-bit

Display the set value of P01-12 (forward velocity threshold) of servo drive. If P01-12 is set to 2000, the panel of servo drive is displayed as below.



U0-28 201E-1C	Monitoring name	Range	Category	Panel display	Unit	Data type
	Reverse velocity limit value NSpdLimitDis	-5000 to 0	Universal	Decimal	rpm	16-bit

Display the set value of P01-13 (reverse velocity threshold) of servo drive. If P01-13 is set to 3000, the panel of servo drive is displayed as below.



U0-29 201E-1D	Monitoring name	Range	Category	Panel display	Unit	Data type
	Mechanical angle MachineAngle	0 to 359	Universal	Decimal	°	16-bit

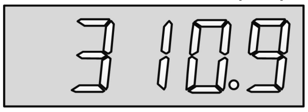
Display current mechanical angle of motor. 0 corresponds to a mechanical angle of 0 degree.

U0-30 201E-1E	Monitoring name	Range	Category	Panel display	Unit	Data type
	Electrical angle ElecAngle	0 to 359	Universal	Decimal	°	16-bit

Display current electrical angle of motor. The accuracy is 1°. When the motor rotates, the electrical angle range is 360°.
When the motor is 4 poles, every time the motor is rotated one turn, it undergoes a change process of 0° to 359° for four times.

U0-31 201E-1F	Monitoring name	Range	Category	Panel display	Unit	Data type
	Bus voltage DcBusVoltDisp	-	Universal	Decimal	V	16-bit

Display the DC bus voltage of the main circuit input voltage of servo drive after rectification.
If the bus voltage is 310.9, the panel of servo drive is displayed as below.



U0-32 201E-20	Monitoring name	Range	Category	Panel display	Unit	Data type
	Radiator temperature Temperature_IPM	-	Universal	Decimal	°C	16-bit

U0-33 201E-21	Monitoring name	Range	Category	Panel display	Unit	Data type
	Instantaneous output power OutputPowerInst	-	Universal	Decimal	W	16-bit

U0-34 201E-22	Monitoring name	Range	Category	Panel display	Unit	Data type
	Average output power OutputPowerAverage	-	Universal	Decimal	W	16-bit

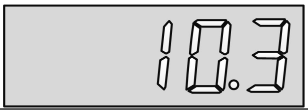
U0-35 201E-23	Monitoring name	Range	Category	Panel display	Unit	Data type
	Total operation time (hour) HourTotalRun	-	Universal	Decimal	h	16-bit

U0-37 201E-25	Monitoring name	Range	Category	Panel display	Unit	Data type
	Total operation time (minute) MinTotalRun	-	Universal	Decimal	min	16-bit

U0-38 201E-26	Monitoring name	Range	Category	Panel display	Unit	Data type
	Total operation time (second) SecTotalRun	-	Universal	Decimal	s	16-bit

	Monitoring name	Range	Category	Panel display	Unit	Data type
U0-39 201E-27	Load torque percentage ToqOutRate	-	Universal	Decimal	%	16-bit

Display current load torque percentage. If the current load torque percentage is 10.3%, the panel of servo drive is displayed as below.



	Monitoring name	Range	Category	Panel display	Unit	Data type
U0-40 201E-28	Current operation time (hour) HourCurrentRun	-	Universal	Decimal	h	16-bit

	Monitoring name	Range	Category	Panel display	Unit	Data type
U0-42 201E-2A	Current operation time (minute) MinCurrentRun	-	Universal	Decimal	min	16-bit

	Monitoring name	Range	Category	Panel display	Unit	Data type
U0-43 201E-2B	Current operation time (second) SecCurrentRun	-	General	Decimal	s	16-bit

	Monitoring name	Range	Category	Panel display	Unit	Data type
U0-44 201E-2C	Instantaneous braking resistor power DisPwrInst	-	General	Decimal	W	16-bit

	Monitoring name	Range	Category	Panel display	Unit	Data type
U0-46 201E-2E	Average braking resistor power DisPwrAvg	-	General	Decimal	W	16-bit

	Monitoring name	Range	Category	Panel display	Unit	Data type
U0-48 201E-30	Power-on times PwrUpCount	-	General	Decimal	Times	16-bit

U0-49 201E-31	Monitoring name	Range	Category	Panel display	Unit	Data type
	MotorOverLoadCount	-	General	Decimal	0.01%	16-bit

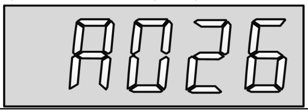
U0-50 201E-32	Monitoring name	Range	Category	Panel display	Unit	Data type
	Motor cumulative number of circles (Low 32-bit) MotoTotal_LowWord	0 to $(2^{32}-1)$	Universal	Decimal	Circle	32-bit
Displays the cumulative number of revolutions of the motor.It is used with U0-51 cooperatively.						

U0-51 201E-33	Monitoring name	Range	Category	Panel display	Unit	Data type
	Motor cumulative number of circles (High 32-bit) MotoTotal_HighWord	0 to $(2^{32}-1)$	Universal	Decimal	Circle	32-bit

U0-52 201E-34	Monitoring name	Range	Category	Panel display	Unit	Data type
	Encoder bit EncoderBit	17 to 23	Universal	Decimal	Bit	16-bit

U0-53 201E-35	Monitoring name	Range	Category	Panel display	Unit	Data type
	Motor model code MotoModel	-	Universal	Hexadecimal	-	16-bit

Displays the Motor Code of the current servo drive connected motor. Taking WD80M-07530S-A1F (A026) as an example, the description panel is displayed as below:



U0-54 201E-36	Monitoring name	Range	Category	Panel display	Unit	Data type
	Absolute encoder position in 1 lap AbsEncIn1Cycle	0 to $(2^{32}-1)$	Universal	Decimal	Encoder unit	32-Bit
Display the single turn position feedback value of absolute encoder						

U0-55 201E-37	Monitoring name	Range	Category	Panel display	Unit	Data type
	Absolute encoder number of circles AbsEncMultiTurn	0 to 65535	Universal	Decimal	Circle	32-Bit
Circle numbers of multi-turn absolute encoder						

U0-58 201E-3A	Monitoring name	Range	Category	Panel display	Unit	Data type
	Dynamic brake relay switching times Bk Relay CtrlCnt	0 to (2^{32}-1)	Universal	Decimal	-	32-bit

Record the number of times the dynamic brake relay is switched on and off.
✎**Note:** This function is currently only used on VD5E.

U0-59 201E-3B	Monitoring name	Range	Category	Panel display	Unit	Data type
	Current position of the multi-turn absolute encoder (High 32-bit) EncTotal_CmdUnit	---	Universal	Decimal	V	16-bit

Display the historical maximum bus voltage and record it after exceeding the default value of 360V.

U0-60 201E-3C	Monitoring name	Range	Category	Panel display	Unit	Data type
	Current position of the multi-turn absolute encoder (High 32-bit) EncTotal_CmdUnit	--	Universal	Decimal	W	16-bit

Display the historical maximum of average power and record it after exceeding the default value of 750W.

U0-61 201E-3D	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port0 Frame error counter EscP0InvalidFrame_Cnt	--	Universal	Decimal	W	16-bit

U0-62 201E-3E	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port1 Frame error counter EscP1InvalidFrame_Cnt	--	Universal	Decimal	W	16-bit

U0-63 201E-3F	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port0 Rx Error counter EscP0RxErr_Cnt	--	Universal	Decimal	W	16-bit

U0-64 201E-40	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port1 Rx Error counter EscP1RxErr_Cnt	--	Universal	Decimal	W	16-bit

U0-65 201E-41	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port0 Frame error counter EscP1FwRxErr_Cnt	--	Universal	Decimal	W	16-bit

U0-66 201E-42	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port1 Forward error count EscP1FwRxErr_Cnt	--	Universal	Decimal	W	16-bit

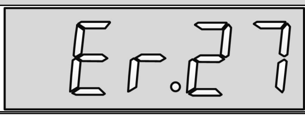
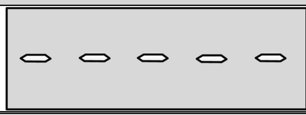
U0-67 201E-43	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port1 Count EscP0LostlinkCnt	--	Universal	Decimal	W	16-bit

U0-68 201E-44	Monitoring name	Range	Category	Panel display	Unit	Data type
	EtherCat Port1 Count EscP1LostlinkCnt	--	Universal	Decimal	W	16-bit

201Fh Group: Warning monitoring

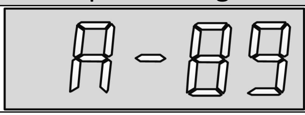
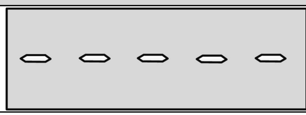
U1-01 201F-01	Monitoring name	Range	Category	Panel display	Unit	Data type
	Current error code NowErrorCode	-	Warning	-	-	16-bit

If there is fault in servo drive, it would display the corresponding fault. If not, the panel displays "---". Taking the failure of "encoder disconnection" as an example, the panel of servo drive is displayed as below.

Servo drive has an fault "encoder disconnection"	Servo drive has no fault
	

U1-02 201F-02	Monitoring name	Range	Category	Panel display	Unit	Data type
	Current warning code NowWarmCode	-	Warning	-	-	16-bit

If there is warning in servo drive, it would display the corresponding warning. If not, the panel displays "---". Taking the warning of "duplicate DI port configuration" as an example, the panel is displayed as below.

Servo drive has an warning "duplicate DI port configuration"	Servo drive has no warning
	

U1-03 201F-03	Monitoring name	Range	Category	Panel display	Unit	Data type
	U phase current when faults occur IuWarmOccur	-	Warning	Decimal	A	16-bit

U1-04 201F-04	Monitoring name	Range	Category	Panel display	Unit	Data type
	V phase current when faults occurmalfunction IvWarmOccur	-	Warning	Decimal	A	16-bit

U1-05 201F-05	Monitoring name	Range	Category	Panel display	Unit	Data type
	Bus voltage when faults occur UdcWarmOccur	-	Warning	Decimal	V	16-bit

U1-06 201F-06	Monitoring name	Range	Category	Panel display	Unit	Data type
	IGBT temperature when faults occur T_IPMWarmOccur	-	Warning	Decimal	°C	16-bit

U1-07 201F-07	Monitoring name	Range	Category	Panel display	Unit	Data type
	Torque component when faults occur IqWarmOccur	-	Warning	Decimal	%	16-bit

U1-08 201F-08	Monitoring name	Range	Category	Panel display	Unit	Data type
	Excitation component when faults occur IdWarmOccur	-	Warning	Decimal	%	16-bit

U1-09 201F-09	Monitoring name	Range	Category	Panel display	Unit	Data type
	Position deviation when faults occur PosErrWarmOccur	-	Warning	Decimal	Encoder unit	32-bit

U1-10 201F-0A	Monitoring name	Range	Category	Panel display	Unit	Data type
	Velocity value when faults occur SpdWarmOccur	-	Warning	Decimal	rpm	16-bit

U1-11 201F-0B	Monitoring name	Range	Category	Panel display	Unit	Data type
	Time when the fault occurred Time TimeWarmOccur	-	Warning	Decimal	s	16-bit

U1-12 201F-0C	Monitoring name	Range	Category	Panel display	Unit	Data type
	Number of faults during current operation ErrCntCurRun	-	Warning	Decimal	-	16-bit

U1-13 201F-0D	Monitoring name	Range	Category	Panel display	Unit	Data type
	Number of warnings during current operation WarmCntCurRun	-	Warning	Decimal	-	16-bit

U1-14 201F-0E	Monitoring name	Range	Category	Panel display	Unit	Data type
	Total number of historical faults ErrorTotalCnt	-	Warning	Decimal	-	16-bit

U1-15 201F-0F	Monitoring name	Range	Category	Panel display	Unit	Data type
	Total number of historical warnings WarmTotalCnt	-	Warning	Decimal	-	16-bit

U1-16 201F-10	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 1st fault code ErrCodeLast1st	-	Warning	-	-	16-bit
Display the 1st fault code of the most recent of servo drive						

U1-17 201F-11	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 2nd fault code ErrCodeLast2nd	-	Warning	-	-	16-bit

U1-18 201F-12	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 3rd fault code ErrCodeLast 3rd	-	Warning	-	-	16-bit

U1-19 201F-13	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 4th fault code ErrCodeLast 4th	-	Warning	-	-	16-bit

U1-20 201F-14	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 5th fault code ErrCodeLast 5th	-	Warning	-	-	16-bit

U1-21 201F-15	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 1st warning code WarmCodeLast1st	-	Warning	-	-	16-bit
Display the 1st warning code of the most recent of servo drive						

U1-22 201F-16	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 2nd warning code WarmCodeLast 2nd	-	Warning	-	-	16-bit

U1-23 201F-17	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 3rd warning code WarmCodeLast 3rd	-	Warning	-	-	16-bit

U1-24 201F-18	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 4th warning code WarmCodeLast 4th	-	Warning	-	-	16-bit

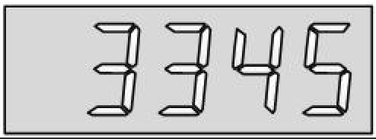
U1-25 201F-18	Monitoring name	Range	Category	Panel display	Unit	Data type
	Latest 5th warning code WarmCodeLast 5th	-	Warning	-	-	16-bit

U1-26 201F-1A	Monitoring name	Range	Category	Panel display	Unit	Data type
	VD5E Board test result VD5E.BoardTestStatee	-	-	-	-	32-bit

2020h Group: Device monitoring

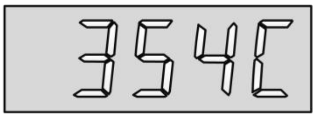
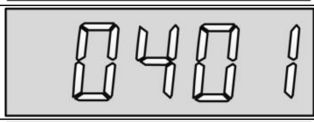
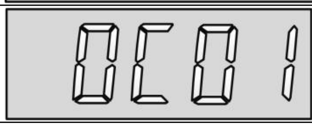
U2-01 2020-01	Monitoring name	Range	Category	Panel display	Unit	Data type
	Product series ProductSer	-	Device	Hexadecimal	-	16-bit

Display the product series code of servo drive.
Taking the VD5L servo drive with the code **0x354C** as an example. The panel is displayed as below:



U2-02 2020-02	Monitoring name	Range	Category	Panel display	Unit	Data type
	Model Model1	-	Device	Hexadecimal	-	16-bit

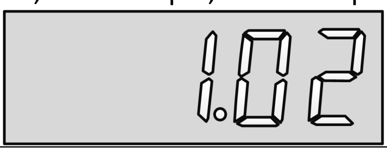
Display the servo drive model.

U2-01 display	U2-02 display	Model
 354C	 0201	VD5L-003SA1P
	 0301	VD5L-010SA1P
	 0401	VD5L-014SA1P
	 0C01	VD5L-015SA1P

U2-03 2020-03	Monitoring name	Range	Category	Panel display	Unit	Data type
	Model Model2	-	Device	Hexadecimal	-	16-bit

U2-04 2020-04	Monitoring name	Range	Category	Panel display	Unit	Data type
	Firmware version FirewareVer	-	Device	Decimal	-	16-bit

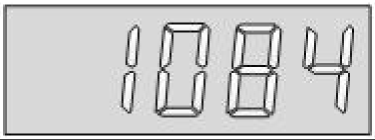
Display the firmware version.
Display format: X.YY, 2 decimal places, For example, 1.02. The panel is displayed as below.



U2-05	Monitoring name	Range	Category	Panel display	Unit	Data type

2020-05	Cm Hardware version CM FireWare	-	Device	Decimal	-	16-bit

Displays the servo cm firmware version number.
Display format: X.YY, 2 decimal places, such as 1084 represents January 8, 2024, the servo drive panel displays as follows:

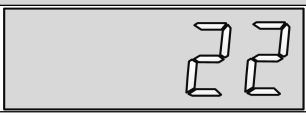


U2-06 2020-06	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**
	Firmware time (year) ExFactoryYear	-	Device	Decimal	Year	16-bit

U2-07 2020-07	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**
	Firmware time (month) ExFactoryMonth	-	Device	Decimal	Month	16-bit

U2-08 2020-08	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**
	Firmware Date (Day) ExFactoryDay	-	Device	Decimal	Day	16-bit

Display the production date of display firmware.
Taking the “VD5L-014SA1P firmware production date is January 10, 2022” as an example, the drive panel is displayed as below:

U2-06	**U2-07**	**U2-08**
		

U2-09 2020-09	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**
	Device serial number 1 DeviceSerNum1	-	Device	Decimal	-	16-bit

U2-10 2020-0A	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**
	Device serial number 2 DeviceSerNum2	-	Device	Decimal	-	16-bit

U2-11 2020-0B	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**
	Device serial number 3 DeviceSerNum3	-	Device	Decimal	-	16-bit

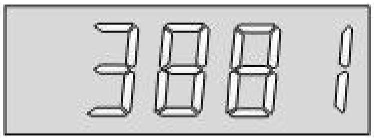
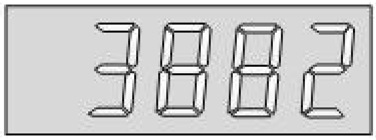
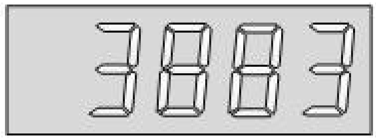
U2-12 2020-0C	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**
	EtherCAT XML Version number	-	Device	Decimal	-	16-bit

U2-13 2020-0D	**Monitoring name**	**Range**	**Category**	**Panel display**	**Unit**	**Data type**

	Device serial number 5 DeviceSerNum5	-	Device	Decimal	-	16-bit

U2-14 2020-0E	Monitoring name	Range	Category	Panel display	Unit	Data type
	PCB hardware version identification number PCB HardWare	-	Device	Decimal	-	16-bit

Used to display the servo hardware PCB version number. Currently supported PCB versions are 3881/3882/3883. Servo drive panel display:

U2-14	U2-14	U2-14
		

U2-15 2020-0F	Monitoring name	Range	Category	Panel display	Unit	Data type
	Device serial number 7 DeviceSerNum7	-	Device	Decimal	-	16-bit

U2-16 2020-10	Monitoring name	Range	Category	Panel display	Unit	Data type
	Device serial number 8 DeviceSerNum8	-	Device	Decimal	-	16-bit

8.4 Standard equipment sub-protocol area (6000h to 6FFFh)

603F	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Error code	RO	TPDO	-	0 to 65535	0	ALL	16-bit	-

When the drive malfunctions and alarms, 603Frepresents the corresponding internal fault alarm code for the servo.
When the drive has an encoder disconnection fault, the value for 603F is 27.

6040	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Control word	RW	RPDO	Operation setting Shutdown effective	0 to 65535	0	ALL	16-bit	-

Used to set control instructions. It is meaningless to assign each bit of a control word separately, and it must be combined with other bits to form a certain control instruction.
bit0 to bit3 have the same meaning in each control mode of servo drive, and instructions must be sent in sequence before the servo drive can be switched according to CiA402 state machine.

Bit	Name	Description
0	Servo operation can be started	0: Invalid
		1: Valid
1	Turn on the main circuit	0: Invalid
		1: Valid
2	Quick shutdown	0: Invalid
		1: Valid
3	Servo operation	0: Invalid
		1: Valid
4 to 6	Operation mode	It is related to the operation mode of servo drive
7	Fault reset	Used to clear reset faults: The rising edge of-bit7 is valid; bit7 is kept at 1, and other control instructions are invalid.
8	Pause	Please refer to the object dictionary 605D for the pause method in each mode.
9	Reserved	Undefined
10	Reserved	Undefined
11-15	Manufacturer customizaed	Manufacture customizaed

6041	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Status word	RO	TPDO	-	0 to 65535	0	ALL	16-bit	-

Used to display servo drive status.

Bit	Name	Description
0	Servo ready	0: Invalid 1: Valid
1	Servo operation enable	0: Invalid 1: Valid
2	Servo operation	0: Invalid 1: Valid
3	Fault	0: Invalid 1: Valid
4	Electrical connection of main circuit	0: Invalid 1: Valid
5	Quick shutdown	0: Invalid 1: Valid
6	Servo is not operational	0: Invalid 1: Valid
7	Warning	0: Invalid 1: Valid
8	-	-
9	Remote control	0: Invalid 1: Valid
10	Target reached	0: Invalid 1: Valid

Bit0 to bit9 have the same meaning in all control modes of servo drive. After the control word 6040h sends instructions in sequence, the servo feedback the determined status.

Setting value (binary nu1mber)	Description
xxxx xxxx x0xx 0000	Servo is not ready
xxxx xxxx x1xx 0000	Startup failure
xxxx xxxx x01x 0001	Servo ready
xxxx xxxx x01x 0011	Start up
xxxx xxxx x01x 0111	Servo enable
xxxx xxxx x00x 0111	Malfunction shutdown valid
xxxx xxxx x0xx 1111	Fault response valid
xxxx xxxx x0xx 1000	Fault

605A	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Quick stop option code	RW	NO	-	0 to 7	2	ALL	16-bit	-

Used to set the quick stop mode.

Setting value	Name
0	The drive enters the OFF state and coasts to a stop. The motor shaft remains in a free state.
1	After deceleration stop with 6084 (CSP&PP), the motor shaft remains in a free state. After deceleration stop with 609A (HM), the motor shaft remains in a free state. After deceleration stop with 6084 (CSV&PV), the motor shaft remains in a free state. After deceleration stop with 6084 (CST&PT), the motor shaft remains in a free state.
2	After deceleration stop with 6085 (CSP&PP), the motor shaft remains in a free state. After deceleration stop with 6085 (HM), the motor shaft remains in a free state. After deceleration stop with 6085 (CSV&PV), the motor shaft remains in a free state. After deceleration stop with 6085 (CST&PT), the motor shaft remains in a free state.
3	After deceleration stop with emergency torque, the motor shaft remains in a free state.
4	Not supported
5	After deceleration stop with 6084 (CSP&PP), the motor shaft remains locked. After deceleration stop with 609A (HM), the motor shaft remains locked. After deceleration stop with 6084 (CSV&PV), the motor shaft remains locked. After deceleration stop with 6084 (CST&PT), the motor shaft remains locked.
6	After deceleration stop with 6085 (CSP&PP), the motor shaft remains locked. After deceleration stop with 6085 (HM), the motor shaft remains locked. After deceleration stop with 6085 (CSV&PV), the motor shaft remains locked. After deceleration stop with 6085 (CST&PT), the motor shaft remains locked.
7	After deceleration stop with emergency torque, the motor shaft remains in a position-locked state.

605B	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Shutdown option code	RW	NO	-	0 to 1	0	ALL	16-bit	-

Used to set the quick stop mode.

Setting value	Name
0	The drive enters the OFF state and stops freely. The motor shaft remains in a free state.
1	After stopping at 6084 deceleration, the motor shaft remains in a free state.

605C	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Disable operation option code	RW	NO	-	-2 to 12	0	ALL	16-bit	-

Used to set the quick stop mode.

Setting value	Name
-2	Quick stop (6084); dynamic braking remains active after stop.
-1	Dynamic braking stop; dynamiDynamic braking stop[Note]. Free-running state maintained after stop.emains active after stop.
0	The drive enters the OFF state and stops freely. The motor shaft remains in a free state.
1	After stopping at 6084 deceleration, the motor shaft remains in a free state.
2	Dynamic braking stop[Note]. Free-running state maintained after stop.

✎**Note:** Only VD5E and VD5L-SA1D versions support the dynamic braking function. This setting is invalid for all other models.

605D	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Halt option code	RW	NO	-	1 to3	1	ALL	16-bit	-

Used to set the quick stop mode.

Setting value	Name
1	After deceleration stop with 6084 (CSP&PP), the motor shaft remains locked. After deceleration stop with 609A (HM), the motor shaft remains locked. After deceleration stop with 6084 (CSV&PV), the motor shaft remains locked. After deceleration stop with 6087 (CST&PT), the motor shaft remains locked. In other modes, the drive stops freely. The motor shaft remains locked.
2	After deceleration stop with 6085 (CSP & PP), the motor shaft remains locked. After deceleration stop with 6085 (HM), the motor shaft remains locked. After deceleration stop with 6085 (CSV & PV), the motor shaft remains locked. After deceleration stop with 6087 (CST & PT), the motor shaft remains locked. In other modes, the drive stops freely. The motor shaft remains locked.
3	After deceleration stop with emergency torque (CSP & PP), the motor shaft remains locked. After deceleration stop with emergency torque (HM), the motor shaft remains locked. After deceleration stop with emergency torque (CSV & PV), the motor shaft remains locked. After deceleration stop with 6087 (CST & PT), the motor shaft remains locked. In other modes, the drive stops freely. The motor shaft remains locked.
other	Reserved, not supported yet.

605E	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Fault reaction option code	RW	NO	-	-4 to 4	0	ALL	16-bit	-

Used to set the quick stop mode.

Setting value	Brake resistance setting
-4	*Emergency stop via torque control; dynamic braking remains active after stop.
-3	Profile stop (6085); dynamic braking remains active after stop.
-2	Quick stop (6084); dynamic braking remains active after stop.
-1	*Dynamic braking stop; dynamic braking remains active after stop.
0	Coast to stop; motor remains in free-run state after stop.
1	Quick stop (6084); motor remains in free-run state after stop. * 609A ramp deceleration stop is used in homing mode.
2	6084 ramp stop. Free-running state maintained after stop.
3	Emergency torque deceleration stop. motor remains in free-run state after stop.
4	*Dynamic braking stop[Note]. Free-running state maintained after stop.

✎**Note:** Only VD5E and VD5L-SA1D versions support the dynamic braking function. This setting is invalid for all other models.

6060	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Modes of operation	RW	RPDO	Operation setting, stop to take effect	0 to 10	0	ALL	8-bit	-

Used to set the operation mode of servo drive.

Setting value	Name	Remarks
1	Profile position control mode	-
3	Profile velocity control mode	-
4	Profile torque control mode	Please refer to "7.7 Profile Torque Mode" for details-
6	Homing mode	Please refer to "7.8 Homing Mode" for details
7	Interpolation mode	-
8	Cyclic Synchronous Position mode	Please refer to "7.4 Cyclic Synchronous Position mode (CSP)" for details
9	Cyclic synchronous velocity mode	Please refer to "7.5 Cyclic Synchronous Velocity mode (CSV)" for details
10	Cyclic synchronous torque mode	Please refer to "7.6 Cyclic Synchronous Torque mode (CSt)" for details

6061	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Modes of operation display	RO	TPDO	-	0 to 10	0	ALL	8-bit	-

Used to display the current operation mode of servo drive.

Setting value	Name	Remarks
1	Profile position control mode	-
3	Profile velocity control mode	-
4	Profile torque control mode	Please refer to "7.7 Profile Torque Mode" for details-
6	Homing mode	Please refer to "7.8 Homing Mode" for details
7	Interpolation mode	-
8	Cyclic Synchronous position mode	Please refer to "7.4 Cyclic Synchronous Position mode (CSP)" for details
9	Cyclic synchronous velocity mode	Please refer to "7.5 Cyclic Synchronous Velocity mode (CSV)" for details
10	Cyclic synchronous torque mode	Please refer to "7.6 Cyclic Synchronous Torque mode (CSt)" for details

6062	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Position demand value	RO	TPDO	-	-	0	CSP HM PP	32-bit	Instruction unit

Used to reflect the position instruction (instruction unit) that has been input by the servo in the enabled state.

6063	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Position actual value	RO	TPDO	-	-	0	ALL	32-bit	Encoder unit

Used to reflect the absolute position of motor.

6064	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Position actual value	RO	TPDO	-	-	0	ALL	32-bit	Instruction unit
Used to reflect real-time absolute position. "Position Feedback 6064h" * "Gear Ratio 6091h" = "Position Feedback 6063h"									

6065	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Following error window	RW	RPDO	Operation setting, effective immediately	0 to (2^{32}-1)	17-bit encoder: 524288 23-bit encoder: 25165824	CSP HM PP	32-bit	Instruction unit
Used to set the position deviation excess threshold. When the position deviation exceeds the set value of 6065h, Er.36 (excessive position deviation) will occur in servo.									

6066	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Following error time out	RW	RPDO	Operation setting, effective immediately	0 to (2^{32}-1)	0	CSP HM PP	32-bit	ms
Used to set the position deviation excess threshold. When the position deviation exceeds the set value of 6065h, Er.36 (excessive position deviation) will occur in servo.									

6067	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Position window	RW	RPDO	Operation setting Shutdown immediately	0 to (2^{32}-1)	1000	CSP HM PP	32-bit	Instruction unit
Used to set the threshold value for position arrival. When the position deviation is within the set value of ±6067h, the position is determined to have arrived. In position mode, bit10=1 for status word 6041									

6068	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Position window time	RW	RPDO	Operation setting, effective immediately	0 to 65535	100	PP IP CSP	16-bit	ms
Used to set the position window time of the servo drive under the position mode.									

606C	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Velocity actual value	RO	TPDO	Operation setting, effective immediately	-2^{31} to $(2^{31}-1)$	-	ALL	32-bit	Instruction unit/s
Used to display the actual rotating velocity of the servo drive.									

606D	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Velocity window	RW	RPDO	Operation setting, effective immediately	0 to 65535	30	PV	16-bit	Instruction unit/s
Used to set the velocity arrival threshold of servo drive under the velocity mode.									

606E	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Velocity window time	RW	RPDO	Operation setting, effective immediately	0 to 65535	100	PV	16-bit	ms
Used to set the velocity window time of servo drive under the velocity mode.									

6071	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Target torque	RW	RPDO	Operation setting, effective immediately	-3000 to 3000	0	PT CST	16-bit	0.1%
Used to set the servo target torque in profile torque mode and cycle synchronous torque mode. 100.0% corresponds to 1 times the rated torque of the motor.									

6072	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default value	Correlation mode	Data type	Unit
	Max. torque	RW	RPDO	Operation setting, effective immediately	0 to 3000	3000	ALL	16-bit	0.1%

6074	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Torque demand	RO	TPDO	-	-3000 to 3000	0	ALL	16-bit	0.1%
It is used to reflect the torque instruction (instruction unit) that has been input when the servo is enabled. 100.0% corresponds to 1 times the rated torque of the motor.									

6077	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Torque actual value	RO	TPDO	-	-3000 to 3000	0	PT CST	16-bit	0.1%
Used to display the actual torque value of servo drive under the torque mode.									

607A	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Target position	RW	RPDO	Operation setting, stop take effect	(-2^{31}) to $(2^{31}-1)$	0	CSP HM PP	32-bit	Instruction unit
Used to set the servo target position of the servo drive in the cyclic synchronous position mode (CSP).									

607C	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Home offset	RW	RPDO	Operation setting, stop to take effect	(-2^{31}) to $(2^{31}-1)$	0	HM	32-bit	Instruction unit
Used to set the physical position of the mechanical homing mode from the motor origin in homing mode. This object dictionary only takes effect when the servo is powered on, the homing operation is completed, and the status word 6041 is bit15=1.									

607F	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Max profile velocity	RW	RPDO	Operation setting, stop to take effect	0 to (2^{32}-1)	13107200	ALL	32-bit	Instruction unit/s

Set the maximum operating velocity of user.
The set value takes effect when the velocity instruction of slave station changes.

6081	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Profile velocity	RW	RPDO	Operation setting, stop to take effect	0 to (2^{32}-1)	218453	PP	32-bit	User-set velocity unit

Set the constant operating velocity of the shift instruction under the profile position mode.
The set value takes effect after the salve station receives the shift instruction.

6083	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Profile acceleration	RW	RPDO	Operation setting, stop to take effect	0 to (2^{32}-1)	13107200	PP PV	32-bit	Instruction unit/s^2

Set the acceleration under the profile position mode and profile velocity mode.
Under the profile position mode, the set value takes effect after the position instruction is triggered. The minimum value of the cyclic position instruction increment of each position loop is 1.
Under the profile velocity mode, the operation takes effect.
If the parameter value is set to be 0, it will be converted to 1 compulsorily.

6084	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Profile deceleration	RW	RPDO	Operation setting, stop to take effect	0 to (2^{32}-1)	13107200	PP PV CSP CSV	32-bit	Instruction unit/s^2
Set the deceleration under the profile position mode and profile velocity mode. Under the profile position mode, the set value takes effect after the position instruction is triggered. Under the profile velocity mode, the operation takes effect. Under PP CSV PV mode, the quick-stop option code (605A) is equal to 1 or 5, the deceleration of slope shutdown takes effect when the quick-stop instruction is valid; Under PP CSV PV mode, the halt option code (605D) is equal to 1, the deceleration of slope shutdown takes effect when halt instruction is valid. Under PP CSV PV mode, when the pause mode selection (605D) is equal to 1, the deceleration during ramp stop when the pause instruction is valid; Under PP CSV PV mode, when the fault stop selection (605E) is equal to 1, the deceleration during ramp stop when the fault stop instruction is valid.									

6085	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Quick stop deceleration	RW	RPDO	Operation setting, stop to take effect	0 to (2^{32}-1)	100	PP PV HM CSP CSV	32-bit	Instruction unit/s^2
Under PP CSV PV HM mode, the quick-stop option code (605A) is equal to 2 or 6, the deceleration of slope shutdown takes effect when the quick-stop instruction is valid. Under PP CSV PV HM mode, the halt option code (605D) is equal to 2, the deceleration of slope shutdown takes effect when the halt instruction is valid. Under PP CSV PV mode, when the fault stop selection (605E) is equal to 2 and the fault stop instruction is valid, the deceleration of the ramp stop.									

6086	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Motion profile type	RW	RPDO	Operation setting, stop to take effect	-$2^{15}$to (2^{15}-1)	0	--	16-bit	-
Set the curve type of the motor position instruction or velocity instruction. 0: Linear (Currently only supports mode 0.)									

6087	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Torque slope	RW	RPDO	Operation setting, stop to take effect	0 to $(2^{32}-1)$	1000	PT CST	32-bit	0.1%/s
Set the torque instruction acceleration under the profile torque mode, which means the torque instruction increment per second.									

6091	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Gear Ratio	-	-	-	-	-	CSP HM PP PV CSV	-	-
Set range of electronic gear ratio: "0.001* encoder resolution/10000, 4000* encoder resolution/10000" Beyond this set range, Er.35 (electronic gear ratio overrun) will occur in servo drive.									
01h	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Motor shaft revolutions	RW	RPDO	Operation setting, stop to take effect	1 to $(2^{32}-1)$	1	-	32-bit	-
Used to set the motor resolution.									
02h	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Driving shaft revolutions	RW	RPDO	Operation setting, stop to take effect	1 to $(2^{32}-1)$	1	-	32-bit	-
Used to set the load shaft resolution.									

6098	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Homing method	RW	RPDO	Operation setting, stop to take effect	1 to 35	1	HM	8-bit	-

Used to select homing method.

method	Deceleration point	Origin	method	Deceleration point	Origin
1	Reverse overtravel switch	Motor Z signal	19	Origin switch	Origin switch
2	Forward overtravel switch	Motor Z signal	20	Origin switch	Origin switch
3	Origin switch	Motor Z signal	21	Origin switch	Origin switch
4	Origin switch	Motor Z signal	22	Origin switch	Origin switch
5	Origin switch	Motor Z signal	23	Origin switch	Origin switch
6	Origin switch	Motor Z signal	24	Origin switch	Origin switch
7	Origin switch	Motor Z signal	25	Origin switch	Origin switch
8	Origin switch	Motor Z signal	26	Origin switch	Origin switch
9	Origin switch	Motor Z signal	27	Origin switch	Origin switch
10	Origin switch	Motor Z signal	28	Origin switch	Origin switch
11	Origin switch	Motor Z signal	29	Origin switch	Origin switch
12	Origin switch	Motor Z signal	30	Origin switch	Origin switch
13	Origin switch	Motor Z signal	33	None	Motor Z signal
14	Origin switch	Motor Z signal	34	None	Motor Z signal
17	Reverse overtravel switch	Reverse overtravel switch	35	-	Current position
18	Forward overtravel switch	Forward overtravel switch			

6099	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Homing speeds	-	-	-	-	-	HM	--	-
Used to set two velocity values in homing mode									
01	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Speed during search for switch	RW	RPDO	Operation setting, stop to take effect	0 to (2^{32}-1)	432537	HM	32-bit	Instruction unit/s
Used to set the velocity of searching deceleration point signal. It is recommended to set the velocity to a higher value to prevent Er.44 (back-to-original timeout fault) caused by too long homing time									
02	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Speed during search for zero	RW	RPDO	Operation setting, stop to take effect	10 to (2^{32}-1)	218453	HM	32-bit	Instruction unit/s
Used to set the velocity of searching origin signal.It is recommended to be set to a lower value to prevent overshoot caused by high-velocity stop.									

609A	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Home acceleration	RW	RPDO	Operation setting, stop to take effect	0 to (2^{32}-1)	655360	HM	32-bit	Instruction unit/s^2
Used to set the acceleration in homing mode. When the homing operation is started, the set value takes effect. Home acceleration refers to the increment of position instruction (instruction unit) per second. ✎**Note:** PDO is not supported.									

60B0	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Position offset	RW	RPDO	Operation setting, stop to take effect	(-2^{31}) to $(2^{31}-1)$	0	CSP	32-bit	Instruction unit
Used to set the EtherCAT external velocity feedforward signal under the cyclic synchronization position mode.Used to set the servo torque instruction offset amount under the cyclic synchronization velocity mode; after offset, servo target torque=60FFh+60B1h.									

60B1	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Velocity offset	RW	RPDO	Operation setting, stop to take effect	(-2^{31}) to $(2^{31}-1)$	0	CSV	32-bit	Instruction unit
Used to set the EtherCAT external velocity feedforward signal under the cyclic synchronization position mode. Used to set the servo torque instruction offset amount under the cyclic synchronization velocity mode; after offset, servo target torque=60FFh+60B1h.									

60B2	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Torque offset	RW	RPDO	Operation setting, stop to take effect	-3000 to 3000	0	CSP	16-bit	0.1%
Used to set the servo torque instruction offset amount under the cyclic synchronization torque mode; after offset, servo target torque=6071h+60B2h.									

60B8	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Touch probe function	RW	RPDO	Operation setting, stop to take effect	0 to 65535	0	-	16-bit	-
Used to set the function of probe 1 and probe 2.									

60B9	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Touch probe status	RO	TPDO	-	0 to 65535	0	-	16-bit	-
Used to read the status of probe 1 and probe 2.									

60BA	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Touch probe 1 positive edge	RO	TPDO	-	(-2^{31}) to $(2^{31}-1)$	0	-	32-bit	Instruction unit

60BB	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Touch probe 1 negative edge	RO	TPDO	-	(-2^{31}) to $(2^{31}-1)$	0	-	32-bit	Instruction unit

60BC	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Touch probe 2 positive edge	RO	TPDO	-	(-2^{31}) to $(2^{31}-1)$	0	-	32-bit	Instruction unit
Used to display the rising edge and position value of probe 2 signal (instruction unit).									

60BD	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Touch probe 2 negative edge	RO	TPDO	-	(-2^{31}) to $(2^{31}-1)$	0	-	32-bit	Instruction unit
Used to display the falling edge and position value of probe 2 signal (instruction unit).									

60C5	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Max acceleration	RW	RPDO	Operation setting, take effect immediately	0 to (2^{32}-1)	0	-	32-bit	Instruction unit/s^2
Set the maximum allowable acceleration during the acceleration phase in both contour position mode and contour velocity mode.									

60C6	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Max deceleration	RW	RPDO	Operation setting, take effect immediately	0 to (2^{32}-1)	0	-	32-bit	Instruction unit/s^2
Set the maximum allowable deceleration during the acceleration phase in both contour position mode and contour velocity mode.									

60D5	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Probe 1 rising edge count	RO	TPDO	-	0 to 65535	0	Probe	16-bit	-
Records the total number of rising edge signals currently captured by Probe 1.									

60D6	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Probe 1 fallng edge count	RO	TPDO	-	0 to 65535	0	Probe	16-bit	-
Records the total number of falling edge signals currently captured by Probe 1.									

60D7	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Probe 2 rising edge count	RO	TPDO	-	0 to 65535	0	Probe	16-bit	-
Records the total number of rising edge signals currently captured by Probe 2.									

60D8	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Probe 2 falling edge count	RO	TPDO	-	0 to 65535	0	Probe	16-bit	-

Records the total number of falling edge signals currently captured by Probe 2.

60E0	Parameter name	Accessibility	Data mapping	Setting in force	Data display range	Default value	Correlation mode	Data type	Unit
	Positive torque limit value	RW	RPDO	Operation setting, effective immediately	0 to 3000	3000	ALL	16-bit	0.1%
Set the negative maximum torque limit of the servo. ✎**Note:** It takes effect when the parameter P1-14=2.									

60E1	Parameter name	Accessibility	Data mapping	Setting in force	Data display range	Default value	Correlation mode	Data type	Unit
	Negative torque limit value	RW	RPDO	Operation setting, effective immediately	0 to 3000	3000	ALL	16-bit	0.1%
Set the negative maximum torque limit of the servo. ✎**Note:** It takes effect when the parameter P1-14=2.									

60F4	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Following error actual value	RO	TPDO	-	-	-	PP HM CSP	32-bit	Instruction unit
Display position offset (instruction unit).									

60FC	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Position demand value	RO	TPDO	-	-	-	PP HM CSP	32-bit	Encoder unit

Used to display the position instruction value (encoder unit).
When the servo is enabled, if there is no warning, the relationship between the position demand value (encoder unit) and position demand value (instruction unit) is shown as follows:
Position demand value 60FCh (encoder unit)= position demand value 6062h (instruction unit)* gear ratio (6091h).

60FD	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Digital inputs	RO	TPDO	-	-	-	ALL	32-bit	--

Used to reflect the current DI terminal logic of drive:
0 -logic invalid;
1- logic valid.
DI signals represented by each-bit are as follows:

Bit	Name	Description
0	Reverse overun switch	0: Invalid
		1: Valid
1	Forward overun switch	0: Invalid
		1: Valid
2	Homing Switch	0: Invalid
		1: Valid
3-15	N/A	0: Invalid
		1: Valid
16	DI1	0: Invalid
		1: Valid
17	DI2	0: Invalid
		1: Valid
18	DI3	0: Invalid
		1: Valid
19	DI4	0: Invalid
		1: Valid
22	NA	0: Invalid
		1: Valid
25-31	NA	0: Invalid
		1: Valid

60FE	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Digital outputs	RW	RPDO	Operation setting Effective immediately	0 to 65535	0	ALL	32-bit	--

60EF-01		
bit	name	description
0-15	reserve	-
16	DO_1	0：Forced output OFF
		1: Forced output ON
17	DO_2	0：Forced output OFF
		1: Forced output ON
18	DO_3	0：Forced output OFF
		1: Forced output ON
19-31	reserve	-

60EF-02		
bit	name	description
0-15	reserve	-
16	DO_1	0：Forced output OFF
		1: Forced output ON
17	DO_2	0：Forced output OFF
		1: Forced output ON
18	DO_3	0：Forced output OFF
		1: Forced output ON
19-31	reserve	-

60FF	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Target velocity	RW	RPDO	-	(-2^{31}) to $(2^{31}-1)$	0	PV CSV	32-bit	Instruction unit

Used to set the user velocity instruction under the profile velocity mode and cyclic synchronization velocity mode.

6502	Parameter name	Accessibility	Data mapping	Set to take effect	Data display range	Default	Correlation mode	Data type	Unit
	Supported drive modes	RO	TPDO	-	-	-	-	32-bit	-

Used to select homing method.

Bit	Description	Supoort or not 0-Not support 1-Support
0	Profile position mode (PP)	1
1	NA	0
2	Profile velocity mode (PV)	1
3	Profile torque mode (PT)	1
4	NA	0
5	Homing mode (HM)	1
6	Interpolation mode	0
7	Cycle Synchronous position mode (CSP)	1
8	Cycle Synchronous velocity mode (CSV)	1
9	Cycle Synchronous torque mode (CST)	1
10-31	Factory customized	Reserved

Chapter 9 Adjustments

9.1 Overview

The servo drive needs to make the motor work without delay as much as possible in accordance with the instructions issued by the host controller. In order to make the motor run based on instruction as much as possible and maximize the mechanical performance, it is necessary to adjust the gain. The flow of gain adjustment is as shown in Figure 9-1.

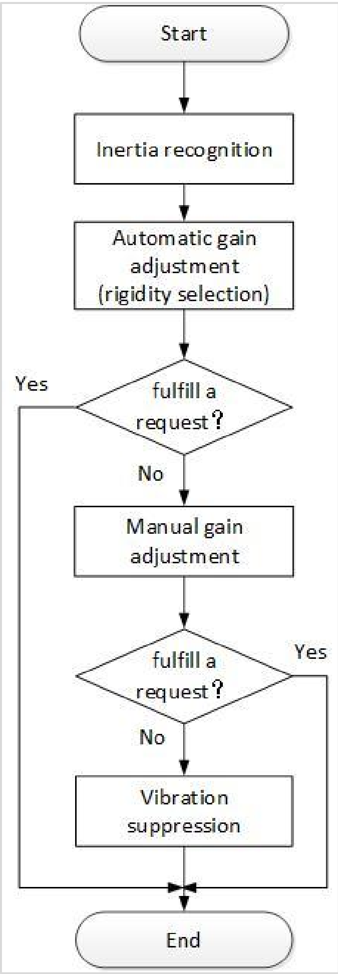


Figure 9-1 Gain adjustment process

The servo gain is composed of multiple sets of parameters such as position loop, velocity loop, filter, load inertia ratio, etc., and they affect each other. In the process of setting the servo gain, the balance between the setting values of each parameter must be considered.

Notice
Before adjusting the gain, it is recommended to carry out jogging test run first! Ensure that the servo motor can operate normally!

The gain adjustment process description is shown in Table 9-1.

Table 9-1 Gain adjustment process description

Gain adjustment process			Function	Detailed chapter
1	Inertia identification		Automatic load inertia ratio identification is carried out by using the upper computer debugging platform software matched with the drive.	9.2
2	Automatic gain adjustment		On the premise of setting the inertia ratio correctly, the drive automatically adjusts a set of matching gain parameters.	9.3.1
3	Manual gain adjustment	Basic gain	On the basis of automatic gain adjustment, if the expected effect is not achieved, manually fine-tune the gain to optimize the effect.	9.3.2
		Feedforward gain	The feedforward function is enabled to improve the followability.	9.3.3
4	Vibration suppression	Mechanical resonance	The notch filter function is enabled to suppress mechanical resonance.	9.4.1

9.2 Inertia identification

Load inertia ratio "2003-01" refers to:

$$\text{Load inertia ratio} = \frac{\text{Total moment of inertia of mechanical load}}{\text{Moment of inertia of the motor}}$$

Load inertia ratio is an important parameter of servo system. Correct setting of load inertia ratio is helpful to complete debugging quickly.

Notice

Before performing online load inertia identification, the following conditions should be met:

1. The maximum velocity of the motor should be greater than 300rpm;
2. The actual load inertia ratio is between 0.00 and 100.00.
3. The load torque is relatively stable, and the load cannot change drastically during the measurement process;
4. The backlash of the load transmission mechanism is within a certain range;

The motor's movable stroke should meet following two requirements:

1. There is a movable stroke of more than 1 circle in both forward and reverse directions between the mechanical limit switches. Before performing oncable inertia identification, please make sure that the limit switch has been installed on the machine, and the motor has a movable stroke of more than 1 circle respectively in the forward and reverse directions to prevent overtravel during the inertia identification process, which may cause accidents.
2. Meet the requirements of inertia identification turns [2003-05]; make sure that the motor's movable stroke at the stop position is greater than the set value of the number of inertia identification circles [2003-05], otherwise the maximum velocity of inertia identification [2003-06] should be appropriately reduced.

During the automatic load inertia identification process, if vibration occurs, the load inertia identification should be stopped immediately.

Related function codes are shown in Table 9-2.

Table 9-2 Details of inertia identification related parameters

Function code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2003-01	Load inertia ratio	Operation Setting	Valid immediately	300	100 to 10000	Set load inertia ratio, 0.00to100.00 times	0.01
2003-05	Inertia identification circles	Shutdown Setting	Valid immediately	2	1 to 20	Offcable load inertia identification process, motor rotation number setting	circle
2003-06	Maximum velocity of inertia identification	Shutdown Setting	Valid immediately	1000	300 to 2000	Set the allowable maximum motor velocity instruction in offcable inertia identification mode. The faster the velocity during inertia identification is, the more accurate the identification result will be. Generally, keep the default value.	rpm

Function code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2003-07	Parameter identification of rotation direction	Shutdown Setting	Valid immediately	0	0 to 2	0: Forward and reverse reciprocating rotation 1: Forward one-way rotation 2: Reverse one-way rotation	-

9.3 Gain adjustment

In order to optimize the responsiveness of the servo drive, the gain set in the servo drive needs to be adjusted. Servo gain needs to set multiple parameter combinations, which will affect each other. Therefore, the adjustment of servo gain must consider the relationship between each parameter.
Under normal circumstances, high-rigidity machinery can improve the response performance by increasing the servo gain. But for machines with lower rigidity, when the servo gain is increased, vibration may occur, which will affect the increase in gain.Therefore, selecting appropriate servo gain parameters can achieve higher response and stable performance.
The servo supports automatic gain adjustment and manual gain adjustment. It is recommended to use automatic gain adjustment first.

9.3.1 Automatic gain adjustment

Automatic gain adjustment means that through the rigidity level selection function [2003-02], the servo drive will automatically generate a set of matching gain parameters to meet the requirements of rapidity and stability.
The rigidity of the servo refers to the ability of the motor rotor to resist load inertia, that is, the self-locking ability of the motor rotor. The stronger the servo rigidity is, the greater the corresponding position loop gain and velocity loop gain can achieve, and the faster the response velocity of the system will be.

Notice
Before adjusting the rigidity grade, set the appropriate load inertia ratio correctly[2003-01].

The value range of rigidity grade is between 0 to 31. The value range of the rigidity grade is between 0 and 31. Grade 0 corresponds to the weakest rigidity and minimum gain, and grade 31 corresponds to the strongest rigidity and maximum gain. According to different load types,Table 9-3 Empirical values can be used for reference.

Table 9-3 Experience reference of rigidity grade

Rigidity grade	Load mechanism type
Grade 4 to 8	Some large machinery
Grade 8 to 15	Low rigidity applications such as belts
Grade 15 to 20	High rigidity applications such as ball screw and direct connection

When the function code [2003-03] is set to 0, the gain parameters are stored in the first gain by modifying the rigidity grade.

When debugging with the upper computer debugging software, automatic rigidity level measurement can be carried out, which is used to select a set of appropriate rigidity grades as operating parameters. The operation steps are as follows:

Step 1 Confirm that the servo is in the ready state, the panel displays “ry”, and the communication cable is connected;

Step 2 Open the servo drive debugging software, enter the trial run interface, set the corresponding parameters, and click "Servo on";

Step 3 Click the “forward" or “reverse" button to confirm the travel range of the servo operation;

Step 4 After the "Start Identification" of inertia identification lights up, click "Start Identification" to start inertia identification to measure the load inertia.

Step 5 After the inertia identification test is completed, click "Save inertia value";

Step 6 Click "Next" at the bottom right to go to the parameter adjustment interface, click "Parameter Measurement" to start parameter measurement.

Step 7 After the parameter measurement is completed, the servo drive debugging software will pop up a confirmation window for parameter writing and saving.

Notice

- There may be a short mechanical whistling sound during the test. Generally, the servo will automatically stop the test. If it does not stop automatically or in other abnormal situations, you can click the "Servo Off" button on the interface to turn off the servo, or power off the machine!
- For the detailed operation of the upper computer debugging software, please refer to "Wecon SCTool Software User Manual".

Table 9-4 Self-tuning mode selection parameter details

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2003-03	Self-tuning mode selection	Operation setting	Valid immediately	0	0 to 2	0: Rigidity grade self-adjusting mode. Position loop gain, velocity loop gain, velocity loop integral time constant, torque filter parameter settings are automatically adjusted according to the rigidity grade setting. 1: Manual setting. Users need to manually set the position loop gain, velocity loop gain, velocity loop integral time constant, and torque filter parameter setting 2: On automatic	-

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
						parameter self-adjusting mode (Not implemented yet)	

9.3.2 Manual gain adjustment

When the servo automatic gain adjustment fails to achieve the desired result, you can manually fine-tune the gain to achieve better results.

The servo system consists of three control loops, from the outside to the inside are the position loop, the velocity loop and the current loop. The basic control block diagram is shown as below.

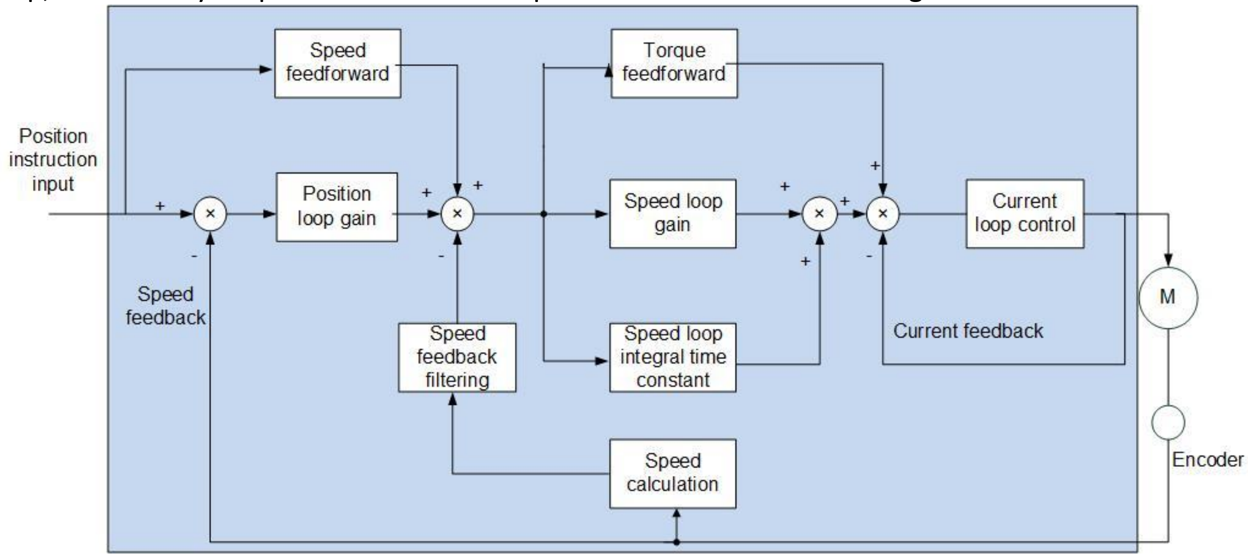


Figure 9-2 Basic block diagram of servo loop gain

The more the inner loop is, the higher the responsiveness is required. Failure to comply with this principle may lead to system instability!

The default current loop gain of the servo drive has ensured sufficient responsiveness, generally no adjustment is required, only the position loop gain, velocity loop gain and other auxiliary gains need to be adjusted.

(1) velocity loop gain

The velocity loop gain determines the highest frequency of the changing velocity instruction that the velocity loop can follow.

In the case of no vibration or noise in the mechanical system, the larger the velocity loop gain setting value is, the better the response of servo system and the better the velocity followability can achieve. When noise occurs in the system, reduce the velocity loop gain. Related function codes are shown in Table 9-5.

Table 9-5 Details of velocity loop gain parameters

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2002-02	1st velocity loop gain	Operation setting	Valid immediately	250	0 to 35000	Set the velocity loop proportional gain to determine the responsiveness of the velocity loop.	0.1Hz

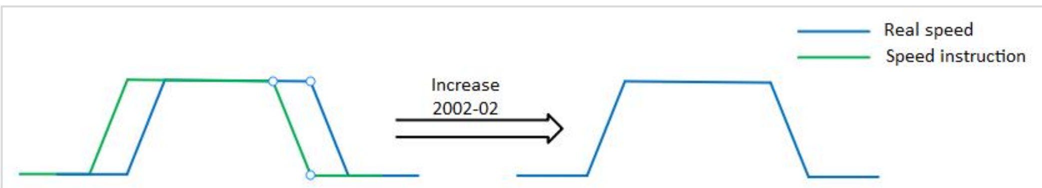


Figure 9-3 Effect schematic diagram of velocity loop gain

(2) velocity loop integral time constant

The velocity loop integral time constant is used to eliminate the velocity loop deviation. Decreasing the integral time constant of the velocity loop can increase the velocity of the velocity following. If the set value is too small, is will easily cause velocity overshoot or vibration. When the setting value of time constant is too large, the integral action will be weakened, resulting in a deviation of the velocity loop. Related function codes are shown in Table 9-6.

Table 9-6 Details of velocity loop integral time constant parameters

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2002-03	velocity loop 1st integral time	Operation setting	Valid immediately	230	10 to 65535	Set the velocity loop integral constant. The smaller the set value is, the stronger the integral effect will be.	0.1ms

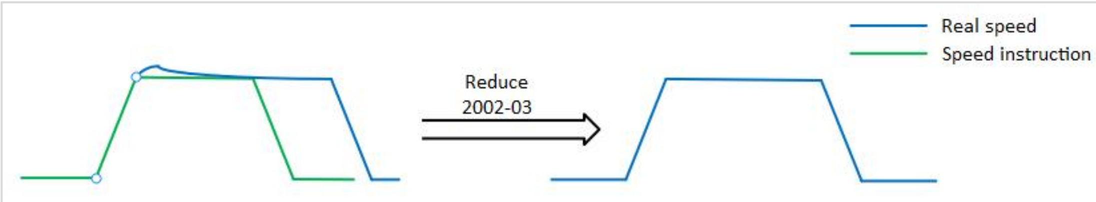


Figure 9-4 Sketch for the effect of integrating time constant of velocity loop

(3) Position loop gain

Determine the highest frequency of the position instruction that the position loop can follow the change. Increasing this parameter can velocity up the positioning time and improve the ability of the motor to resist external disturbances when the motor is stationary. However, if the setting value is too large, the system may be unstable and disrupted. Related function codes are shown in Table 9-7.

Table 9-7 Details of position loop gain parameters

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2002-01	1st position loop gain	OperationSetting	Valid immediately	449	0 to 6200	Set the position loop proportional gain to determine the responsiveness of the position control system.	0.1Hz

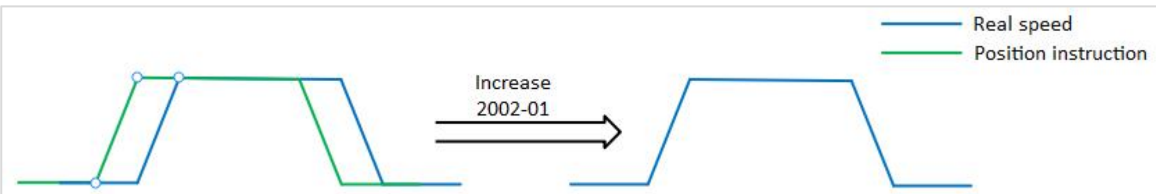


Figure 9-5 Gain effect schematic diagram of position loop

(4) Torque instruction filter time

Selecting an appropriate torque filter time constant could suppress mechanical resonance. The larger the value of this parameter, the stronger the suppression ability. If the setting value is too large, it will decrease the current loop response frequency and cause needle movement. Related function codes are shown in Table 9-8.

Table 9-8 Details of torque filter time constant parameters

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2004-04	Torque filtering time constant	Operation Setting	Valid immediately	95	7 to 2500	This parameter is automatically set when "Self-tuning Mode Selection" is selected as 0.	0.01ms

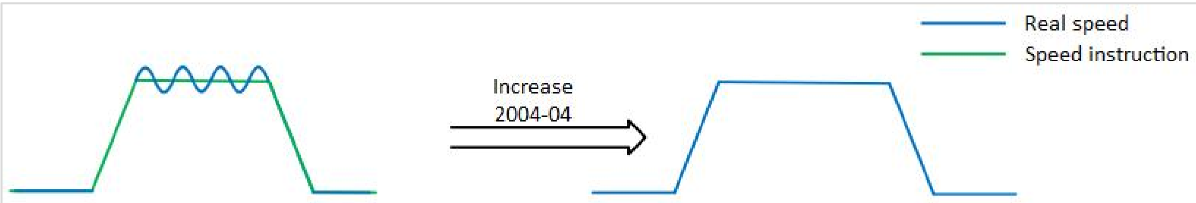


Figure 9-6 Time Constant Effect Schematic Diagram of Torque Filtering

9.3.3 Feedforward gain

velocity feedforward could be used in position control mode and full closed-loop function. It could improve the response to the velocity instruction and reduce the position deviation with fixed velocity. velocity feedforward parameters are shown inTable 9-9. See Table 9-10 for details of torque feedforward parameters.

Figure 9-7 Effect schematic of velocity feedforward parameters

Table 9-9 velocity feedforward parameters

Index code	Name	Adjustment description
2002-09	velocity feedforward gain	When the velocity feedforward filter is set to 3 (3ms), gradually increase the velocity feedforward gain, and the velocity feedforward will take effect. The position deviation during operation at a constant velocity becomes smaller according to the value of the velocity feedforward gain as shown in the following formula. Position deviation (pulse instruction) = instruction velocity[instruction unit/s]÷position loop gain [1/s]×(100-velocity feedforward gain [%])/100
2002-0A	velocity feedforward filtering time constant	

Torque feedforward can improve torque instruction response and reduce position deviation during fixed acceleration and deceleration.

Table 9-10 Torque feedforward parameters

Index code	Name	Adjustment description
2002-0B	Torque feedforward gain	Increase the torque feedforward gain, because the position deviation during certain acceleration and deceleration can be close to 0, so under the ideal condition that the torque does not act when the external disturbance occurs, when driving under the trapezoidal velocity model, the position deviation can be made in the entire action range close to 0. In fact, there must be external disturbance torque, so the position deviation cannot be 0. In addition, like the velocity feedforward, the larger the constant of the torque feedforward filter is, the smaller the action will be, with greater positional deviation of the acceleration change point.
2002-0C	Torque feedforward filter time constant	

9.3.4 Model tracking control function

Model tracking control is applicable to the position control mode, which adds a model loop outside the three loops. In the model loop, new control quantities such as position instructions, velocity feedforward and torque feedforward are generated based on the user's response requirements for the system and the ideal motor control model. Applying these control variables to the actual control loop can significantly improve the response performance and positioning performance of position control. The design block diagram is as follows.

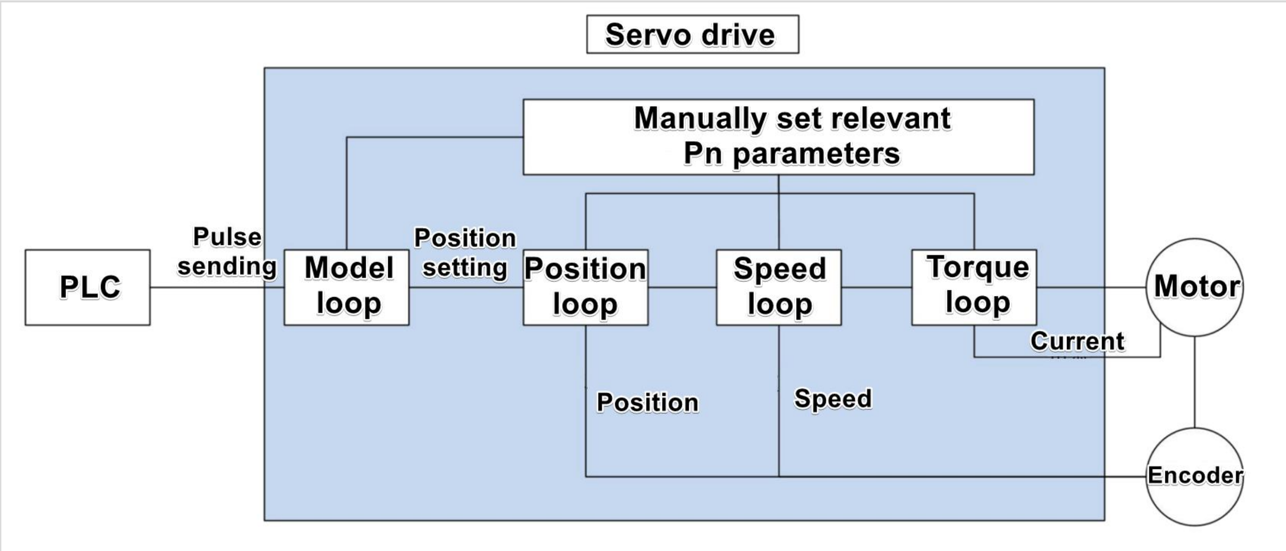


Figure 9-8 Model tracking control design block diagram

Use methods and conditions of model tracking control:

① Correctly set the inertia ratio P3-1 of the system, which can be obtained by monitoring the real-time load inertia ratio U0-20;

② Set the load rigidity level P3-2, set suitable values, do not need to set high rigidity levels (recommended values under rigid loads 17 to 21);

③ Setting P2-20=1, turn on the function of model tracking control;

④ Adjust the tracking control gain of P2-21 model from small to large, which can be gradually increased according to the step amount of 1000 until the responsiveness of the system meets the actual demand. The responsiveness of the system is mainly determined by this parameter;

⑤ After the responsiveness meets the requirements, appropriate adjustments can be made to improve the load rigidity level P3-2.

✎**Note:** Model tracing control is only available in position mode and not available in other modes.

Index code	Name	Setting method	Effective time	Default	Range	Definition	Unit
2002-14	Model tracking control enabled	Stop setting	Effective immediately	0	0 to 1	Set 1 to enable model tracking control features	-
2002-15	Model tracking control gain	Stop setting	Effective immediately	1000	200 to 20000	Increasing the model tracking control gain can improve the position	0.1/s
2002-16	Model tracking control gain compensation	Stop setting	Effective immediately	1000	500 to 2000	response performance of the model loop. High gain may cause overshoot behavior. Gain compensation affects the damping ratio of the model loop, and the damping ratio becomes larger with the increase of gain compensation.	0.10%
2002-17	Model tracking control forward direction offset	Operation setting	Effective immediately	1000	0 to 10000	Magnitude of torque feedforward in forward and reverse directions under model tracking control	0.10%
2002-18	Model tracking control reverse direction offset	Operation setting	Effective immediately	1000	0 to 10000		0.10%
2002-19	Model tracking control velocity feedforward compensation	Operation setting	Effective immediately	1000	0 to 10000	Velocity feedforward magnitude under model tracking control	0.10%

Please refer to the following table for examples of steps for adjusting servo gain.

Step	Content
1	Please try to set the correct load inertia ratio parameter P3-1.
2	If the automatic adjustment mode is adopted (P3-3 is set to 0), please set the basic rigidity level parameter P3-2; If you manually adjust the mode(P3-3set1), please set the gain related to the position loop and velocity loop P2-1 to P2-3 and torque filtering time constant P4-4. The setting principle is mainly non-vibration and overshoot.
3	Turn on the model tracking function P2-20 and set it to 1.
4	In the range where overshoot and vibration do not occur, improve the model tracking gain P2-21.
5	If the rigidity level of step 2 is relatively low, the rigidity level P3-2 can be appropriately increased.

6	When overshoot occurs, or when the responses of forward and reverse are different, fine-tuning is performed by model tracking control forward direction offset P2-23, model tracking control reverse direction offset P2-24, and model tracking control velocity feedforward compensation P2-25.

9.3.5 Gain switching

Gain switching function:

① It can be switched to a lower gain when the motor is stationary (servo enabled) to suppress vibration;

② It can be switched to higher gain when the motor is stationary to shorten the positioning time;

③ It can be switched to higher gain in the running state of the motor to obtain better instruction tracking performance;

④ Different gain settings can be switched through external signals according to load equipment conditions, etc.

(1) Gain switching parameter setting

① When P02-07=0

Fixed to the first gain (i.e. using P02-01 to P02-03), by DI function 10 (GAIN-SEL, gain switching) can be achieved P/PI(proportion / proportional-integral) control switching.

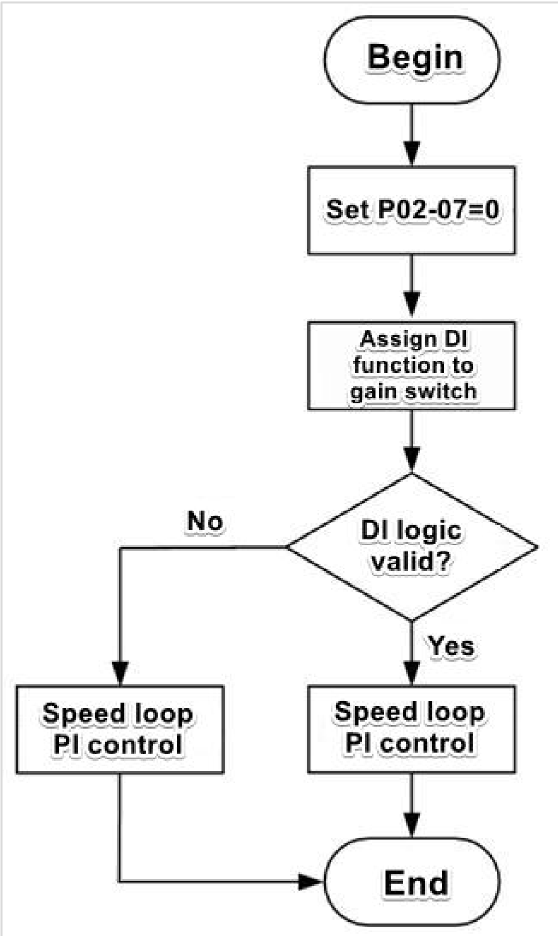


Figure 9-9 P02-07=0 Gain switch flowchart

② When P02-07=1

Achieve the first gain (P02-01toP02-03) and second gain (P02-04toP02-06), the switching condition can be set by parameter P02-08.

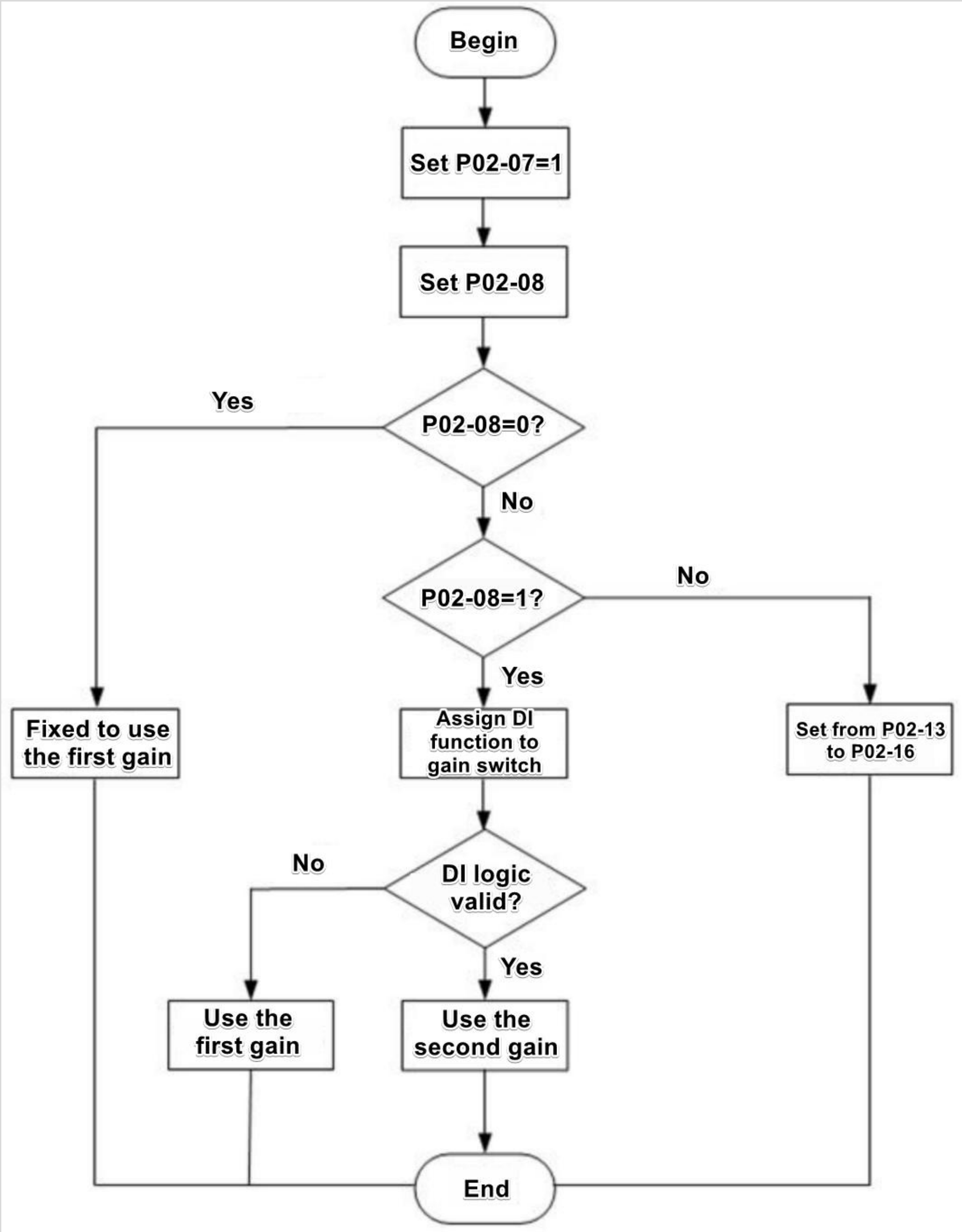
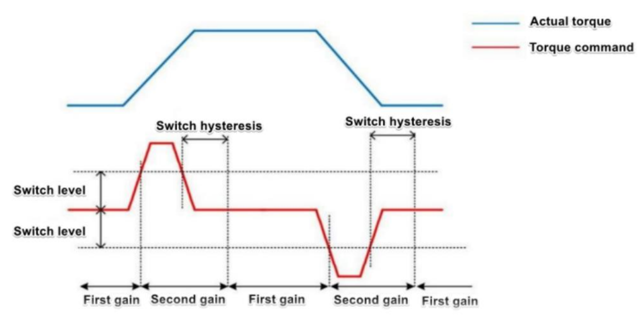
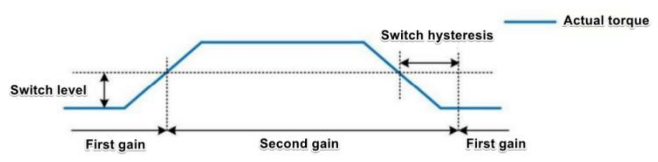
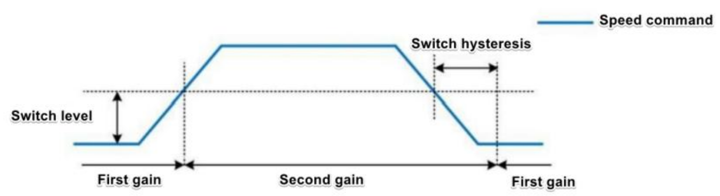
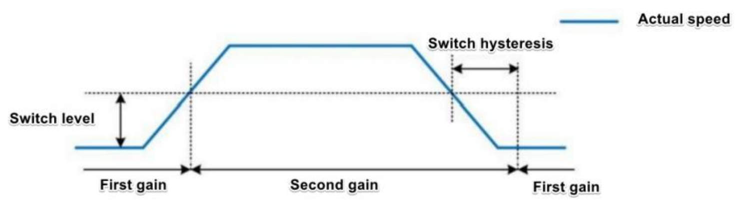
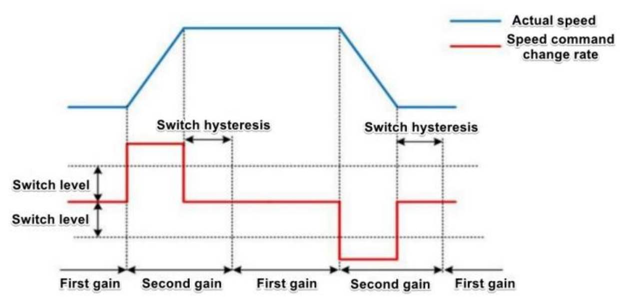
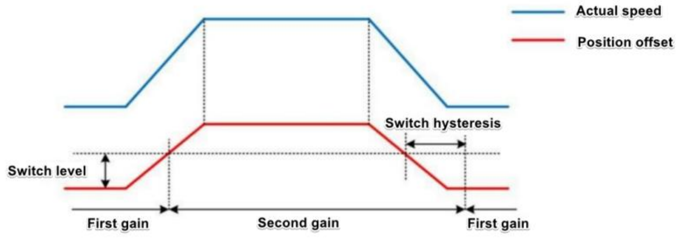
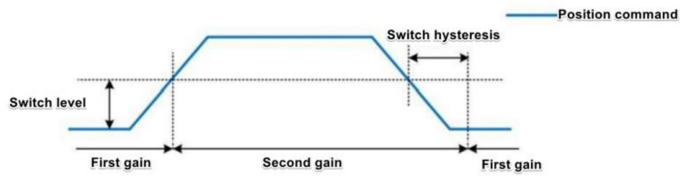
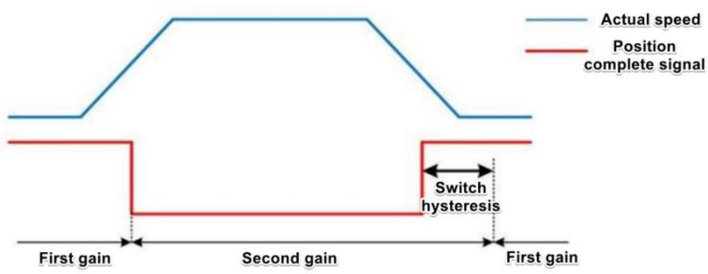


Figure 9-10 When P02-07=1, gain switching flowchar

P02-08	Content	Schematic diagram
0	Fixedly used first gain	-
1	Switching with DI	-
2	When torque instruction is larger	
3	When actual torque is larger	
4	When velocity torque is larger	
5	When actual velocity is larger	
6	When velocity instruction change rate is larger.	

7	When position deviation is larger	

P02-08	Content	Schematic diagram
8	There is a position instruction	
9	Positioning completed	
10	With position instruction+actual velocity	The description is made with reference to figure 7-10. In the previous first gain, if the position Instruction is not 0, switching to the second gain; In the previous second gain, if the status in which the position instruction is 0 continues during the delay time, maintaining the second gain; When the delay time reaches, if the absolute value of the current actual velocity is less than (level), the velocity integration time constant is fixed at the second integration time constant, and the rest are returned to the first gain. If the absolute value of the actual velocity is less than (level-lag), all are returned to the first gain.

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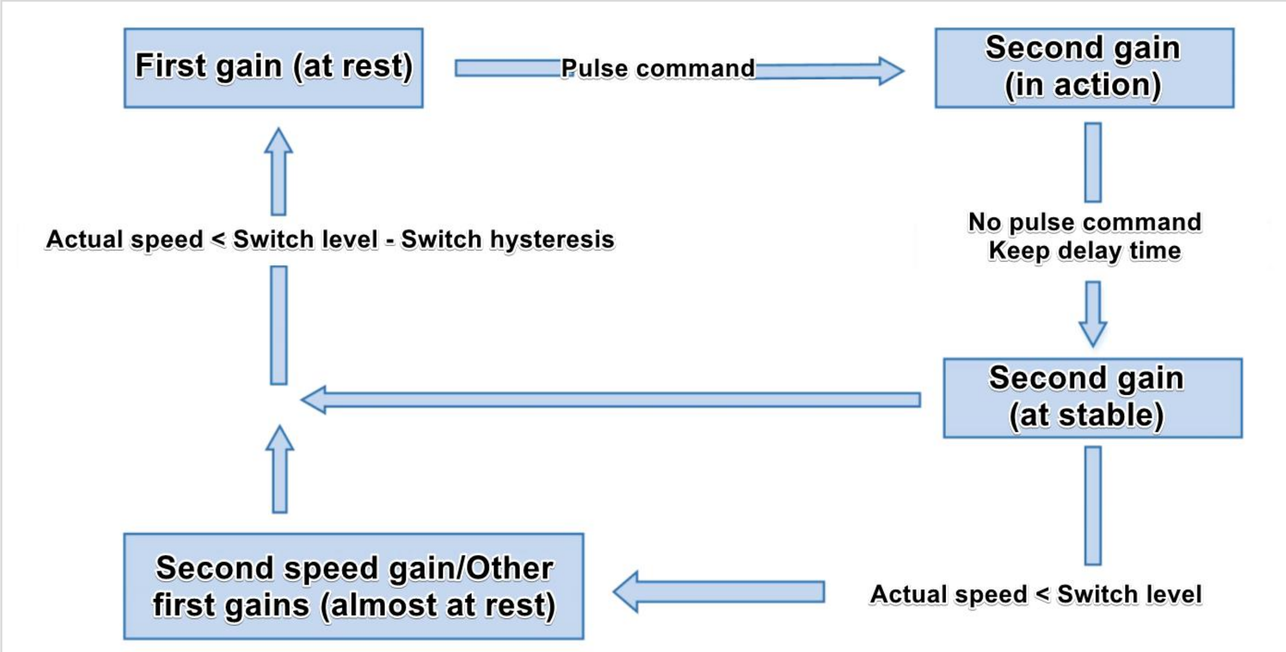


Figure 9-11 P02-08=10 position instruction+actual velocity gain description

(2) Relevant parameter description

2002-07	Parameter name	Setting method	Effective time	Default	Range	Application category	Unit
	2nd gain switching mode	Operation setting	Effective immediately	1	0 to 1	Gain control	

The switching mode of the second gain is set.

Setting value	Function
0	First gain fixed. Using DI function 10(GAIN-SEL, gain switching) to switch: DI logic invalid: PI control; DI logic valid: P control.
1	The first gain and the second gain are switched by the set value of P02-08.

2002-08	Parameter name	Setting method	Effective time	Default	Range	Application category	Unit
	Gain switching condition selection	Operation setting	Effective immediately	0	0 to 10	Gain control	

Set the conditions for gain switching.

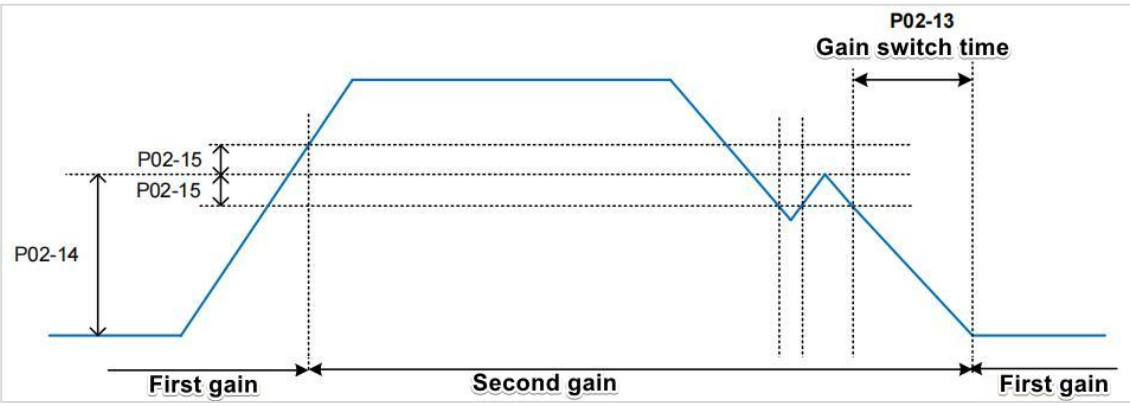
Setting value	Gain switching condition	Details
0	First gain fixed	Fixed as a first gain
1	Switch by DI terminal	Using DI function 10(GAIN-SEL, gain switching). DI logic invalid: First gain (P02-01 to P02-03); DI logic valid: Second gain (P02-04 to P02-06).
2	When torque instruction is larger	In the previous first gain, when the absolute value of the torque instruction exceeds (level+hysteresis), switching to second gain; In the previous second gain, when a status in which the absolute value of the torque instruction is less than (level-hysteresis) continues during the delay time, the second gain is returned to the first gain.
3	When actual torque is larger	In the previous first gain, when the absolute value of the actual torque exceeds (level+hysteresis), switching to the second gain; In the second gain of the previous time, when a

		state in which the absolute value of the actual torque is less than (level-hysteresis) continues during the delay time, the second gain is returned to the first gain.
4	When velocity torque is larger	In the previous first gain, when the absolute value of the velocity instruction exceeds (level+hysteresis), switching to the second gain; When the status where the absolute value of the velocity instruction is less than (level-hysteresis) in the previous second gain continues during the delay time, the gain returns to the first gain.
5	When actual velocity is larger	In the previous first gain, when the absolute value of the actual velocity exceeds (level+hysteresis), switching to the second gain; In the second gain of the previous time, when a status in which the absolute value of the actual velocity is less than (level-hysteresis) continues during the delay time, the first gain is returned to the first gain.
6	When velocity instruction change rate is larger.	In the previous first gain, when the absolute value of the velocity instruction change rate exceeds (level+hysteresis), switching to the second gain; In the previous second gain, when a status in which the absolute value of the velocity instruction change rate is less than (level-hysteresis) continues during the delay time, the gain is returned to the first gain.
7	When position deviation is larger	In the previous first gain, when the absolute value of the position deviation exceeds (level+hysteresis), switching to the second gain; In the previous second gain, when a status in which the absolute value of the position deviation is less than (level-hysteresis) continues during the delay time, the gain is returned to the first gain. Ⅱ.
8	There is a position instruction	In the previous first gain, if the position Instruction is not 0, switching to the second gain; If the status where the position instruction is 0 continues during the delay time in the previous second gain, the gain returns to the first gain.

	9	Positioning completed	In the previous first gain, if the positioning does not complete, switching to the second gain; In the second gain of the previous time, if the positioning incomplete status persists during the delay time, the first gain is returned.
	10	With position instruction+actual velocity	In the previous first gain, if the position Instruction is not 0, switching to the second gain; In the previous second gain, if the status in which the position instruction is 0 continues during the delay time, maintaining the second gain; When the delay time reaches, if the absolute value of the current actual velocity is less than (level), the velocity integration time constant is fixed at the second integration time constant, and the rest are returned to the first gain. If the absolute value of the actual velocity is less than (level-lag), all are returned to the first gain.

2002-0D	Parameter name	Setting method	Effective time	Default	Range	Application category	Unit
	Gain switching delay time	Operation setting	Effective immediately	20	0 to 10000	Gain control	0.1ms

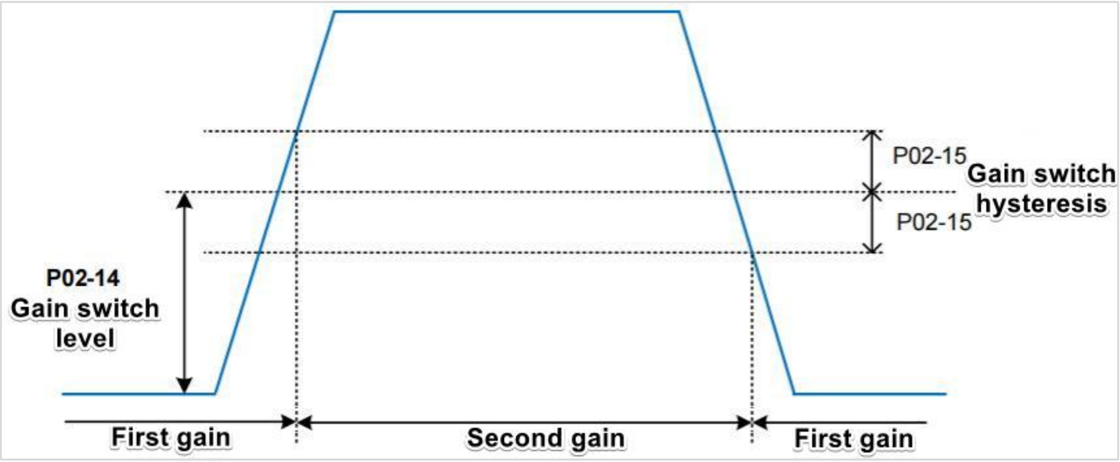
When the second gain is set to switch back to the first gain, the time switching condition needs to last.



✎**Note:** This parameter is valid only when the second gain is switched back to the first gain.

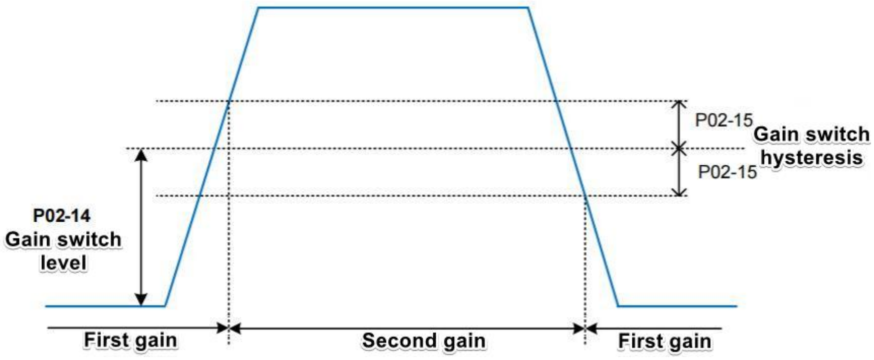
2002-0E	Parameter name	Setting method	Effective time	Default	Range	Application category	Unit
	Gain switching level	Operation setting	Effective immediately	50	0 to 20000	Gain control	According to the switching condition

Set the level of the gain condition. The actual switching action is affected by two conditions: level and hysteresis.



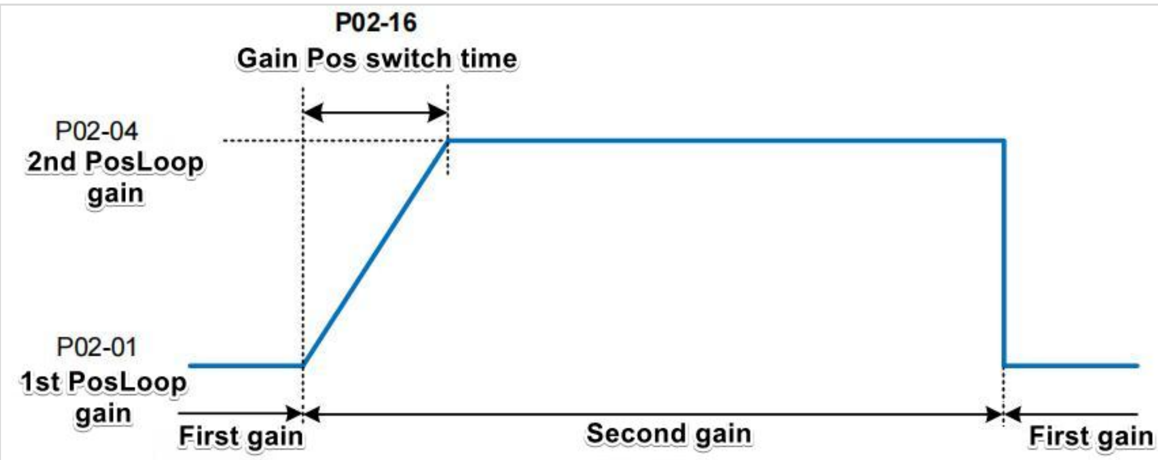
2002-0F	Parameter name	Setting method	Effective time	Default	Range	Application category	Unit
	Gain switching hysteresis	Operation setting	Effective immediately	20	0 to 20000	Gain control	According to the switching condition

Set the hysteresis that satisfies the gain switching condition.



2002-10	Parameter name	Setting method	Effective time	Default	Range	Application category	Unit
	Position gain switching time	Operation setting	Effective immediately	30	0 to 10000	Gain control	0.1ms

The time is set at which the first position loop (P02-01) is switched to the second position loop (P02-04) in the position control mode.



If P02-04≤P02-01, this parameter is invalid and immediately switches to the second gain.

9.4 Mechanical resonance suppression

9.4.1 Mechanical resonance suppression methods

When the mechanical rigidity is low, vibration and noise may occur due to resonance caused by shaft twisting, and it may not be possible to increase the gain setting. In this case, by using a notch filter to reduce the gain at a specific frequency, the servo gain can continue to increase after the resonance is validly suppressed. There are 2 methods to suppress mechanical resonance.

(1) Torque instruction filter

By setting the filter time constant, the torque instruction is attenuated in the high frequency range above the cutoff frequency, so as to achieve the expectation of suppressing mechanical resonance. The cut-off frequency of the torque instruction filter could be calculated by the following formula:

$$\text{Filter cutoff frequency} fc(Hz) = \frac{1}{2\pi * \text{Set parameter value} * 0.001}$$

(2) Notch filter

The notch filter can achieve the expectation of suppressing mechanical resonance by reducing the gain at a specific frequency. When setting the notch filter correctly, the vibration can be validly suppressed. You can try to increase the servo gain. The principle of notch filter is shown in Figure Figure 9-13.

9.4.2 Notch filter

VD5L Ethernet servo drive have 2 sets of notch filters, each of which has 3 parameters: notch frequency, width grade and depth grade.

(1) Width grade of notch filter

The notch width grade is used to express the ratio of the notch width to the center frequency of the notch:

$$\text{Notch filter width grade} = \frac{f_H - f_L}{f_T} \qquad (9\text{-}1)$$

In formula (9-1), f_T It is the center frequency of notch filter, that is, the mechanical resonance frequency; $f_H - f_L$ is the width of notch filter, which represents the frequency bandwidth with an amplitude attenuation rate of -3dB relative to the center frequency of notch filter.

(2) Depth grade of notch filter

The depth grade of notch filter represents the ratio relationship between input and output at center frequency.

When the depth level of notch filter is 0, the input is completely suppressed at the center frequency; When the notch filter depth level is 100, the input is completely passable at the center frequency. Therefore, the smaller the the notch filter depth grade is set, the deeper the the notch filter depth will be, and the stronger the suppression of mechanical resonance can achieve, but it may lead to system instability, so attention should be paid when using it. Specific relationships are shown in Figure 9-12.

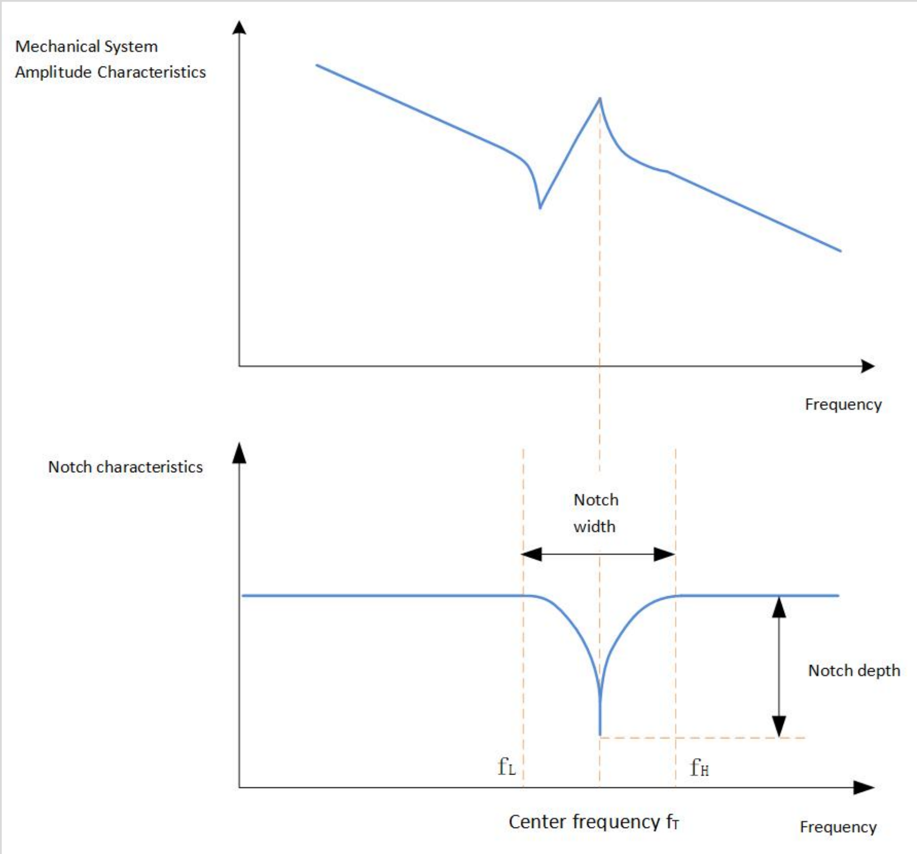


Figure 9-12 Notch characteristics, notch width and notch depth

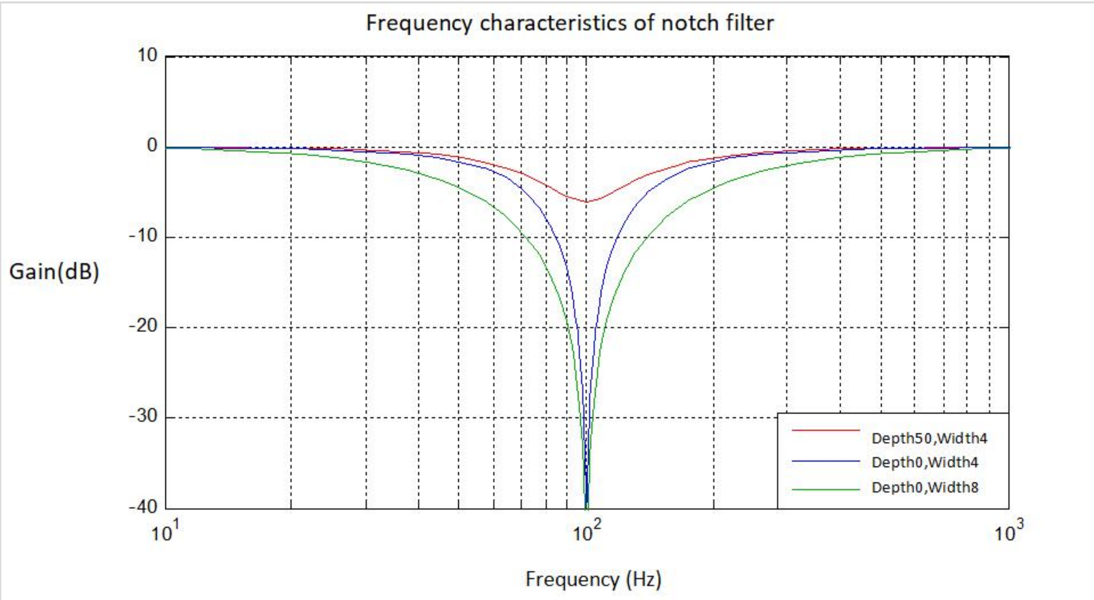


Figure 9-13 Frequency characteristics of notch filter

Table 9-11 Details of notch filter function code parameters

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2004-05	1st notch filter frequency	Operation Setting	Valid immediately	300	250 to 5000	Set the center frequency of the 1st notch filter. When the set value is 5000, the function of the notch filter is invalid.	Hz
2004-06	1st notch filter depth	Operation Setting	Valid immediately	100	0 to 100	0: all truncated 100: All passed	-
2004-07	1st notch filter width	Operation Setting	Valid immediately	4	0 to 12	0: 0.5 times the bandwidth 4: 1 times the bandwidth 8: 2 times the bandwidth 12: 4 times the bandwidth	-
2004-08	2nd notch filter frequency	Operation Setting	Valid immediately	500	250 to 5000	Set the center frequency of the 2nd notch filter. When the set value is 5000, the function of the notch filter is invalid.	Hz

Index code	Name	Setting method	Valid time	Default	Range	Definition	Unit
2004-09	2nd notch filter depth	Operation Setting	Valid immediately	100	0 to 100	0: all truncated 100: All passed	-
2004-0A	2nd notch filter width	Operation Setting	Valid immediately	4	0 to 12	0: 0.5 times the bandwidth 4: 1 times the bandwidth 8: 2 times the bandwidth 12: 4 times the bandwidth	-

Chapter 10 Malfunctions

10.1 Faults and warnings handling at startup

Boot process	Fault phenomenon	Reason	Confirmation method
Power supply (L1, L3)	① Digital tube is not bright ② Not display "ry"	① The power terminal is disconnected	☆Rewiring
		② Servo drive failure	☆Contact technician for repair
	Panel display "Er.xx"	Refer to"10.2 Faults and warnings handling during operation" to find the cause and troubleshoot	
	After troubleshooting, the servo drive panel should display"ry"		

10.2 Faults and warnings handling during operation

10.2.1 Overview

The faults and warnings of Wecon VD5L series servo drives are graded according to their severity, which can be divided into four grades: Category 1, Category 2, Category 3, Category 4.
Severity level: Category 1> Category 2> Category 3 > Category 4. The specific types are as follows:
Category 1: Non-clearable faults;
Category 2: Clearable faults;
Category 3: Clearable faults;
Category 4: Clearable warning.
Among them, "Clearable" means that the panel stops the fault display state by giving a "Clear signal". The specific operations are as follows:
① Set the parameters 200A-03=1 (fault clearing) or use DI function 02 (A-CLR, fault and warning clearing) and set it to logic valid, which can stop the fault display on the panel.
② The clearing method of category 2 and category 3 clearable faults: first turn off the servo enable signal (set S-ON to OFF), then set P10-03=1 or use DI function 2.
③ The clearing method of category 4 of clearable warnings: set 200A-03=1 or use DI function 2.

Notice
For some faults and warnings, please change the settings to eliminate the causes before they can be cleared, but clearing does not mean that the changes take effect. For the changes that need the device to be re-powered to take effect, the device must be re-powered; for the changes that need to stop the device to take effect, the servo must be disabled. After the changes take effect, the servo drive is running normally.

Associated function code:

Function code	Name	Setting method	Valid time	Default	Range	Definition
200A-03=1	Fault clearing	Operation setting	Valid immediately	0	0 to 1	0: No operation 1: For clearable faults, after the cause of fault is removed, and write 1 to the function code, the drive will stop the fault display and enter the Rdy (or RUN) state again. ✎**Note:** If the servo S-ON is valid, when the fault is removed and cleared, the servo will directly enter the Run state. When performing fault clearing actions, be sure to stop sending control instructions such as pulses to ensure personal safety.

Associated function number:

Number	Name	Function name	Function
2	A-CLR	Fault and warning clear	Invalid, does not reset faults and warnings. Valid, reset faults and warnings

Wecon VD5L series bus servo drives have a fault recording function, which could record the latest 5 faults and the latest 5 warning names and the status parameters of servo drive when the fault or warning occurs. After the fault or warning is cleared, the fault record will still save the fault and warning.

The current fault code could be viewed through the monitoring parameter U1-01, and the current warning code could be viewed through U1-02. The monitoring U1-16 to U1-25 could display the latest 5 fault codes and warning codes. Please refer to "201Fh Group: warning monitoring".

10.2.2 Fault and warning code table

Category	Fault/warning name	Fault code	Can it be cleared
Category 1	Parameter damage	Er.01	No
Category 1	Parameter storage error	Er.02	No
Category 1	ADC reference source error	Er.03	No
Category 1	AD current sampling conversion error	Er.04	No
Category 1	Abnormal FPGA communicatio n	Er.05	No
Category 1	Wrong FPGA program version	Er.06	No
Category 1	Clock abnormality	Er.07	No
Category 1	Software overcurrent	Er.19	Yes
Category 1	Overcurrent	Er.20	No
Category 1	The braking resistor is turned on abnormally	Er.24	No
Category 1	Encoder is disconnected	Er.27	No
Category 1	Wrong motor model	Er.26	No
Category 1	Encoder Z pulse is lost	Er.28	No
Category 1	Encoder UVW signal error	Er.30	No
Category 1	Exceeding motor maximum velocity	Er.32	No

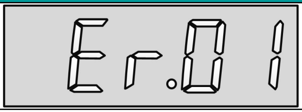
Category	Fault/warning name	Fault code	Can it be cleared
Category 3	Synchronization period error is too large	Er.14	Yes
Category 3	Main power supply is undervoltage	Er.21	Yes
Category 3	Braking resistor is not connected	Er.23	Yes
Category 3	Wrong motor model	Er.25	Yes
Category 3	Power module is over temperature	Er.33	Yes
Category 3	Motor overload protection	Er.34	Yes
Category 3	Electronic gear ratio exceeds limit	Er.35	Yes
Category 3	Position deviation is too large	Er.36	Yes
Category 3	Abnormal torque saturation	Er.37	Yes
Category 3	Main circuit electrical phase loss	Er.38	Yes
Category 3	Emergency stop	Er.39	Yes
Category 3	Encoder battery failure	Er.40	Yes
Category 3	Motor (encoder) over temperature	Er.41	Yes
Category 3	Encoder write failure	Er.42	Yes
Category 3	Drive overload fault	Er.43	Yes

Category	Fault/warning name	Fault code	Can it be cleared	Category	Fault/warning name	Fault code	Can it be cleared
Category 1	ADC conversion is not completed	Er.60	No	Category 3	Back to original timeout fault	Er.44	Yes
Category 1	Internal software fault	Er.61	No	Category 3	Drive stall over-temperature protection	Er.45	Yes
Category 1	Internal software fault	Er.62	No	Category 4	Over velocity alarm	A-81	Yes
Category 1	Internal software fault	Er.63	No	Category 4	Overload	A-82	Yes
Category 1	Internal software fault	Er.64	No	Category 4	Braking resistor is over temperature or overload	A-83	Yes
Category 1	Internal software fault	Er.65	No	Category 4	Parameter modification that needs to be powered on again	A-84	Yes
Category 2	Main power supply overvlotage	Er.11	Yes	Category 4	Main circuit instantaneous power failure	A-88	Yes
Category 2	Main power supply overvlotage	Er.22	Yes	Category 4	Duplicate DI port configuration	A-89	Yes
Category 2	Power cable disconnection	Er.31	Yes	Category 4	Duplicate DO port configuration	A-90	Yes
Category 3	Abnormal network status switching	Er.09	Yes	Category 4	Parameter modification is too frequent	A-91	Yes
Category 3	Loss of synchronizatio n	Er.10	Yes	Category 4	Encoder battery voltage low warning	A-92	Yes
Category 3	Network initialization failed	Er.12	Yes	Category 4	Encoder read and write check is abnormal and frequency is too high	A-93	Yes
Category 3	Synchronizatio n period setting error	Er.13	Yes				

10.2.3 Troubleshooting

Er.01 Parameter damage

(1) Fault phenomenon

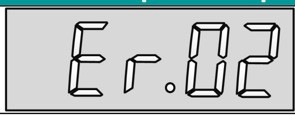
Servo drive panel display	Fault name
	Parameter damage

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
EEPROM could not be read and written	Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.	■Contact the manufacturer's technician personnel for maintenance.

Er.02 Parameter storage error

(1) Fault phenomenon

Servo drive panel display	Fault name
	Parameter storage error

Reason: The total number of function codes or content transmission changes. It usually occur after firmware upgrade.

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Firmware upgraded	●Check whether the program has been upgraded.	■Repower the servo drive.
Parameter read and write exceptions	●After a parameter is changed, power it on again and check whether the parameter is saved	■If the parameters are not saved and the problem persists after multiple power-on, contact the manufacturer's technical personnel for repair.
	●Restore factory setting [200A-02=1] and power on again..If the servo drive still alarms after multiple operations, it is faulty.	■Contact the manufacturer's technician personnel for maintenance.

Er.03 ADC reference source error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.03	ADC reference source error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The internal analog reference source of the drive is not accurate	Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.	■If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.04 AD current sampling conversion error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.04	AD current sampling conversion error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Current sampling timeout	Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.	■If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance.
Current sensor error		

Er.05 Abnormal FPGA communication

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.05	Abnormal FPGA communication

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Abnormal FPGA communication	Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.	■If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.06 Wrong FPGA program version

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.06	FPGA program version is not right

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The FPGA program version does not match firmware version	● Check whether the servo drive monitoring quantities 2020-04 (firmware version) and 2020-05 (hardware version) conform to the corresponding relationship.	■ Contact the manufacturer's technician to upgrade FPGA (hardware version).
Servo drive fault	● Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.	■ If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.07 Clock abnormality

(1) Fault phenomenon

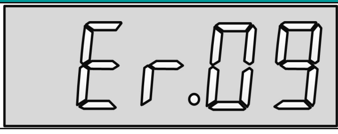
Servo drive panel display	Fault name
Er.07	Clock abnormality

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
External interference	●Check whether there are strong magnetic fields nearby	■Eliminate the interference of strong magnetic field nearby.
	●Check whether there are sources of interference such as power supply inverter equipment nearby	■Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.
Servo drive fault	●Restore factory setting [200A-02=1] and power on again.If the servo drive still alarms after multiple operations, it is faulty.	■If servo still have alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.09 Abnormal network status switching

(1) Fault phenomenon

Servo drive panel display	Fault name
	Abnormal network status switching

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Master station operation error	● Check whether the master station switches the network status when the servo drive is enabled.	■ Correct the upper computer network switching program.
Communication cable connection error	● Check whether the communication cable is properly connected.	■ Correctly connect the communication cable.

Er.10 Loss of synchronization

(1) Fault phenomenon

Servo drive panel display	Fault name
	Loss of synchronization

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Communication is disturbed	●Check whether the servo drive network port is damaged. (Displayed by the first digital tube from the left of the servo drive panel)	■If damaged, contact the manufacturer's technician for repair.
	●Check whether the communication cable is damaged.	■If damaged, replace a reliable communication cable, it is recommended to use twisted-pair shielded cable with shielding function.
	●Check whether the servo drive is well grounded.	■The servo drive is well grounded.
Communication wiring error	●Check whether the communication connection follows the sequence of CN5 port in and CN6 port out to connect each slave station.	■Correctly connect the communication cable.

Reason	Troubleshooting methods	Handling
Master station configuration error	●Cross-verification, using normal PLC for comparative test.	■If it is determined that the configuration of the master station is wrong, correct the relevant procedures of the master station configuration.
The upper computer is shut down or stuck	●Check whether the upper computer is shut down or stuck.	■Restart the upper computer.
Upper computer synchronization clock is not in effect	●Measure the synchronization period by oscilloscope.	■If the synchronization period is 0, first check whether the communication cable connection mode is correct, and then restart the network. ■If the synchronization period is not 0, contact the manufacturer's technician.
Servo drive fault	●None of the above methods can solve the fault.	■If damaged, contact the manufacturer's technician for repair.

Er.11 Unburned XML configuration file

(1) Fault phenomenon

Servo drive panel display	Fault name
	Unburned XML configuration file

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Unburned device configuration file (XML file)	● After the upper computer scans the slave station, check whether the slave station ID is empty.	Contact the manufacturer's technician to burn the device file.
Servo drive fault	●After burning the configuration file, the fault still not be solved.	■ Contact the manufacturer's technician personnel for maintenance.

Er.12 Network initialization failed

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.12	Network initialization failed

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Unburned device configuration file (XML file)	●After the upper computer scans the slave station, check whether the slave station ID is empty.	Contact the manufacturer's technician to burn the device file.
Servo drive fault	●After burning the configuration file, the fault still not be solved.	■ Contact the manufacturer's technician personnel for maintenance.

Er.13 Synchronization period setting error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.13	Synchronization period setting error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The synchronization period is not an integer multiple of 125us or 250us	●Check the setting value of synchronization period.	■ Modify the synchronization period to an integer multiple of 125us or 250us.

Er.14 Synchronization period error is too large

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.14	Synchronization period error is too large

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Device profile mismatch	●Check whether this fault occurs every time,if so, the device profile does not match.	■ Contact the manufacturer technician to update the device configuration file (XML file) inside the servo drive to the latest version.
The synchronization period error of the controller is large	●Check whether this fault is accidental.	■Check the upper computer.

Er.101 EtherCat Synchronization error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.101	EtherCat Synchronization error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Synchronization cycle is not an integer multiple of 125µs or 250µs.	● Confirm the synchronization cycle setting in the controller ● Measure the actual; synchronization cycle of the controller.	■ Set the synchronization cycle to an integer multiple of 125µs or 250µs. ■ Contact the manufacturer's technical support.
Large synchronization cycle error in the controller.		

Er.102 EtherCAT PD watchdog error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.102	EtherCAT PD watchdog error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Incorrect master station configuration	● Check the watchdog configuration.	■ Ensure the watchdog configured correctly. ■ Contact the manufacturer's technical support.

Er.103 EtherCAT SM check error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.103	EtherCAT SM check error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Incorrect master station configuration	● Check the configuration of the SM2 channel.	■ Ensure the SM channel configuration is correct.
Incorrect or mismatched slave XML file.	● Check if the indexes of the TxPDO/RxPDO mapping objects exceed the limits in the dictionary.	■ The indexes of the TxPDO/RxPDO mapping object dictionary are correct.

Er.104 EtherCAT state transition error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.104	EtherCAT state transition error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The mode/state transition does not exist or is not allowed.	● Check the mode transition configuration in the master station.	■ Modify the mode transition configuration in the master station.

Er.19 Software overcurrent

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.19	Software overcurrent

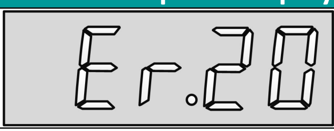
(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Motor power cable UVW phase sequence is wrong	●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.	■According to the drive side UVW, connect the motor side UVW correctly.
Motor power cable short circuit	●Check whether power cable UVW is short-circuited to PE	■Replace the power cable.
Poor connection of motor power cable terminal	●Check whether the motor power cable connection port is connected reliably	■Tighten the fixing screws at the connection port of the motor power wire.
Abnormal braking resistance	●Internal brake resistance wiring error: check whether C, D are connected to the shorting cap and the contact is normal	■Ensure reliable connection between C and D shorting cap or short wiring.
	●External braking resistor wiring error: Check whether the external resistor is connected reliably between P+ and C.	■The external braking resistor is reliably connecting between P + and C.
	●Short-circuit of the built-in brake resistance: Check whether the built-in brake resistance is short-circuit.	■Remove the shorting cap between C and D, and connect the external braking resistors with equal resistance between P + and C. ■Contact the manufacturer's technician to replace the internal braking resistor.
	●The resistance value of the	■Select the appropriate external

Reason	Troubleshooting methods	Handling
	external braking resistor is too small: Test the resistance value of the external braking resistor actually selected and compare it with the recommended braking resistor to confirm whether the resistance value of the actual resistor is too small	braking resistor.
Encoder wiring error; loose plug	●Check whether the cable port (CN1) of the encoder is properly connected	■Tighten the fixing screws for CN2 port.
	●Check whether the servo drive CN1 port jack is deformed	■Replace the cable or cable port if deformed.
	●Check whether both ends of the rectangular connector are reliably connected	■Ensure reliable connection at both ends of rectangular connection port; ■Replace with an encoder cable with higher connection reliability.
Improper parameter setting	●Check whether the load inertia ratio (2003-01) and load rigidity level (2003-02) settings are reasonable.	■Set 2003-01 (load inertia ratio) to a reasonable value and adjust the 2003-02 (load rigidity level) setting appropriately.
	●Check whether the gain parameters are set properly, resulting in overshoot	■Reasonably adjust the gain parameters.
Frequent acceleration and deceleration	●Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.	■Appropriately extend the acceleration and deceleration time.
Internal servo drive fault	●Cross-verification. Use the normal motor, encoder cable to connect to the servo drive, only connect the encoder cable. If the servo drive still alarm, it is failure.	■Contact the manufacturer's technician personnel for maintenance.

Er.20 Overcurrent

(1) Fault phenomenon

Servo drive panel display	Fault name
	Overcurrent

(2) Troubleshooting methods

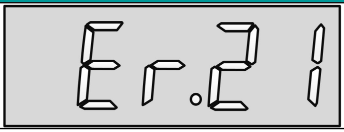
Reason	Troubleshooting methods	Handling
Motor power cable UVW phase sequence is	●Check whether the phase sequence of the motor power	■According to the drive side UVW, connect the motor side UVW

Reason	Troubleshooting methods	Handling
wrong	cable on the servo drive side and motor side corresponds to each other.	correctly.
Motor power cable short circuit	●Check whether power cable UVW is short-circuited to PE	■Replace the power cable.
Poor connection of motor power cable terminal	●Check whether the motor power cable connection port is connected reliably	■Tighten the fixing screws at the connection port of the motor power wire.
Abnormal braking resistance	●Internal brake resistance wiring error: check whether C, D are connected to the shorting cap and the contact is normal	■Ensure reliable connection between C and D shorting cap or short wiring.
	●External braking resistor wiring error: Check whether the external resistor is connected reliably between P+ and C.	■The external braking resistor is reliably connecting between P + and C.
	●Short-circuit of the built-in brake resistance: Check whether the built-in brake resistance is short-circuit.	■Remove the shorting cap between C and D, and connect the external braking resistors with equal resistance between P + and C. ■Contact the manufacturer's technician to replace the internal braking resistor.
	●The resistance value of the external braking resistor is too small: Test the resistance value of the external braking resistor actually selected and compare it with the recommended braking resistor to confirm whether the resistance value of the actual resistor is too small	■Select the appropriate external braking resistor.
Encoder wiring error; loose plug	●Check whether the cable port (CN1) of the encoder is properly connected	■Tighten the fixing screws for CN1 port.
	●Check whether the servo drive CN1 port jack is deformed	■Replace the cable or cable port if deformed.
	●Check whether both ends of the rectangular connector are reliably connected	■Ensure reliable connection at both ends of rectangular connection port; ■Replace with an encoder cable with higher connection reliability.
Improper parameter setting	●Check whether 2003-02 (load rigidity level) is set properly	■Appropriately increase the setting value of 2003-02 (load rigidity level).
	●Check whether the gain parameters are set properly, resulting in overshoot	■Reasonably adjust the gain parameters.

Reason	Troubleshooting methods	Handling
Frequent acceleration and deceleration	●Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.	■Appropriately extend the acceleration and deceleration time.
Internal servo drive fault	●Cross-verification. Use the normal motor, encoder cable to connect to the servo drive, only connect the encoder cable. If the servo drive still alarm, it is failure.	■Contact the manufacturer's technician personnel for maintenance.

Er.21 Main power supply undervoltage

(1) Fault phenomenon

Servo drive panel display	Fault name
	Main power supply is undervoltage

Reason: DC bus voltage is lower than the fault value.

○220V drive: The normal value of DC bus voltage is 310V, and the fault value of DC bus voltage is 200V;

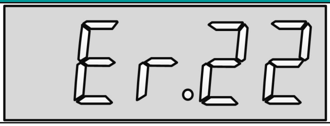
○380V drive: The normal value of DC bus voltage is 540V, and the fault value of DC bus voltage is 420V.

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Power-off when VD5L drive is enabled	●Check whether the servo drive is power off when logic is valid and the S-ON function is enabled in the 2006 group “DIDO Function configuration parameter”.	■It is servo internal software logic, and the alarm will be automatically released after the indicator light of servo drive panel is off.
The power supply is unstable or off	●Observe whether the monitoring quantity 201E-1f (bus voltage) is in the following range: 220V drive: 201E-1F less than 200V; 380V drive: 201E-1F less than 420V.	■Run servo after the power supply is stable; ■Increase power capacity.
The voltage drops during operation of the servo drive	●Check whether the servo drive shares the same power supply with other high loads	■Turn off other loads of the same main circuit power supply; ■Servo drive uses a separate power supply
Phase loss	●Check if the main circuit wiring is correct type A: Single-phase 220V input connected to L1, L2.	■Correctly connect the main circuit wiring.

Er.22 Main power supply overvoltage

(1) Fault phenomenon

Servo drive panel display	Fault name
	Main power supply overvoltage

Reason: DC bus voltage is higher than the fault value.

- 220V drive: The normal value of DC bus voltage is 310V, and the fault value of DC bus voltage is 390V;
- 380V drive: The normal value of DC bus voltage is 540V, and the fault value of DC bus voltage is 670V.

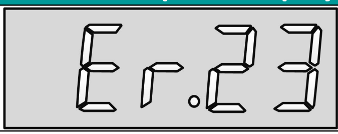
(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The input voltage is too high	●Check that the drive input power specifications meet the specifications: 220V drive: valid value: 198V to 242V; 380V drive: valid values: 342V to 418V.	■Change or adjust the power supply.
The power supply is not stable or struck by lightning	●Check whether the input power supply of the servo drive meets the specifications and monitor whether it has been struck by lightning.	■Run servo after the power supply is stable; ■Connect the surge suppressor, please contact the technical personnel of the manufacturer for the specific connection method.
Abnormal braking resistance	●Internal braking resistor wiring error: Check whether C, D are connected to the shorting cap and the connection is normal	■Reliable connection between C and D shorting cap or short wiring.
	●External braking resistor wiring error: Check whether the external resistor is connected reliably between P+ and C.	■The external braking resistor is reliably connected between P + and C.
	●Short-circuit of the built-in braking resistor: Check whether the built-in braking resistor suffers from short-circuit.	■Remove the shorting cap between C and D, and reliably connect the external braking resistors with equal resistance between P + and C. ■Contact the manufacturer's technician to replace the internal braking resistor.
	●The resistance value of the external braking resistor is too large: Check the resistance value of the external braking resistor actually selected and compare it with the recommended braking	■Select the appropriate external braking resistor.

Reason	Troubleshooting methods	Handling
	resistor to confirm whether the resistance value of the actual resistor is too large.	
The motor is in a state of rapid acceleration and deceleration motion	●Monitor the servo drive monitoring quantity 201E-1F (bus voltage) to confirm whether the voltage exceeds the fault value when the motor is in the deceleration section.	■Ensure that the input voltage is within the specification range and increase the acceleration and deceleration time.
Internal servo drive fault	●The servo drive is still faulty after power on again	■Servo drive may be damaged, contact the manufacturer's technician for repair.

Er.23 Braking resistor is not connected

(1) Fault phenomenon

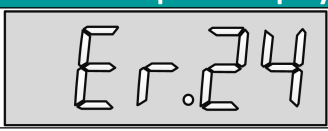
Servo drive panel display	Fault name
	Braking resistor is not connected

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Internal braking resistor wiring error	●Check whether C, D are connected to the shorting cap and the connection is normal	■When internal braking resistors are used, ensure the shorting caps or short wires are reliably connected between C and D.
External braking resistor wiring error	●Check whether the external resistor is connected reliably between P+ and C.	■When external braking resistors are used, ensure the external resistors are reliably strung between P + and C.
Internal braking resistor damaged	●The servo drive is powered off. Detect whether the resistance between P+ and D is 50Ω	■Contact the manufacturer's technician to replace the internal braking resistor. ■Use the external braking resistor and change the relevant parameters in servo drive 2000 group "basic settings".

Er.24 Braking resistor turns on abnormally

(1) Fault phenomenon

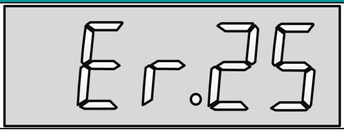
Servo drive panel display	Fault name
	Braking resistor turns on abnormally

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Internal hardware of servo drive damaged	●The servo drive is still faulty after power on again	■ Contact the manufacturer's technician for maintenance.

Er.25 Braking resistor resistance is too large

(1) Fault phenomenon

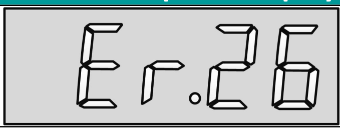
Servo drive panel display	Fault name
	Braking resistor resistance is too large

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The resistance value of the external braking resistor is large	●Check the resistance value of the external braking resistor actually selected and compare it with the recommended braking resistor to confirm whether the resistance value of the actual resistor is too large.	■Use an appropriate external braking resistor.
Improper parameter setting	●Check whether the value of servo drive 2000-0A (external brake resistance) is set too high	■Reasonably set the parameter value of 2000-0A (external braking resistance value).

Er.26 Wrong motor model

(1) Fault phenomenon

Servo drive panel display	Fault name
	Wrong motor model

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The motor is not supported by the servo drive	●Check whether the servo drive model supports the motor	■ Contact the manufacturer's technician to obtain the appropriate servo drive model and motor model.
Wrong motor model	●Check whether the Motor Code is consistent with the motor nameplate	■Contact technician to record the motor Motor Code

Er.27 Encoder disconnection

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.27	Encoder disconnected

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Poor contact on CN1 port	●Check whether the cable port (CN1) of the encoder is properly connected	■Tighten the fixing screws for CN1 port.
	●Check whether the servo drive CN1 port jack is deformed	■Replace the cable or cable port if deformed.
Poor contact on adapter port (Rectangular connection cable)	●Check whether both ends of the rectangular connector are reliably connected	■Ensure reliable connection at both ends of rectangular connection port; ■Replace with an encoder cable with higher connection reliability.
Wrong encoder cable wiring	●Check whether the both ends of the encoder cable are correctly connected	■Adjust the wiring according to the corresponding relationship of pins; ■Preferably use the standard encoder cable of the manufacturer.

Er.28 Encoder Z pulse lost

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.28	Encoder Z pulse lost

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Wrong motor model	●Check whether the servo drive model supports the motor	■Contact the manufacturer's technician to obtain the appropriate servo drive model and motor model.
External interference	●Check whether there are strong magnetic fields nearby	■Eliminate the interference of strong magnetic field nearby.
	●Check whether there are sources of interference such as power supply inverter equipment nearby	■Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.
Encoder fault	●Manually rotate the motor shaft counterclockwise or clockwise to	■If the value of U0-30 (electric angle) changes abruptly or does

Reason	Troubleshooting methods	Handling
	observe whether the monitoring quantity U0-30 (electrical angle) changes regularly	not change, there may be a problem with the encoder itself. Please replace the motor or encoder.

Er.30 Encoder UVW signal error

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.30	Encoder UVW signal error

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
External interference	●Check that the motor and servo drive are well grounded	■Ensure the motor and servo drive are well grounded.
Encoder cable fault	●Cross-verification. Use the normal motor, encoder cable to connect to the servo drive.	■Replace with an encoder cable with higher connection reliability.
Servo drive fault	●The servo drive is still faulty after power on again	■ Contact the manufacturer's technician for maintenance.

Er.31 Power cable disconnection

(1) Fault phenomenon

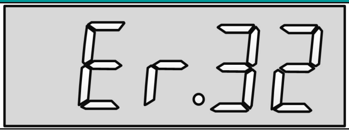
Servo drive panel display	Fault name
Er.31	Power cable disconnection

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Poor contact of motor power wiring port	●Check whether the motor power wiring port is connected reliably	■Tighten the fixing screws at the wiring port of the motor power wire.
Power cable disconnection	●Check whether both ends of the power cable are disconnected	■Replace the power cable and repower
Poor contact on adapter port (rectangular connection cable)	●Check whether both ends of the rectangular connector are reliably connected	■Ensure reliable connection at both ends of rectangular connection port; ■Replace with a power cable with higher connection reliability.

Er.32 Exceeding motor maximum velocity

(1) Fault phenomenon

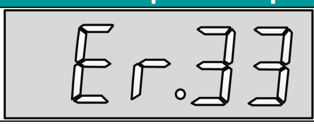
Servo drive panel display	Fault name
	Exceeding motor maximum velocity

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Motor power cable UVW phase sequence error	●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.	■According to the drive side UVW, the motor side UVW is connected correctly.
2001-0A parameter setting is incorrect.	●Check that the parameter value of 2001-0A (maximum velocity threshold) is less than the maximum velocity required for the actual operation of the motor ●Check whether the motor rotating velocity corresponding to the input instruction exceeds 2001-0A (maximum velocity threshold)	■ Reset 2001-0A (maximum velocity threshold) according to mechanical requirements.
Motor velocity overshoot	●Check whether the gain parameters are set properly, resulting in overshoot	■ Reasonably adjust the gain parameters.
Servo drive fault	●The servo drive is still faulty after power on again	■ Servo drive may be damaged, replace servo drive.

Er.33 Power module over temperature

(1) Fault phenomenon

Servo drive panel display	Fault name
	Power module over temperature

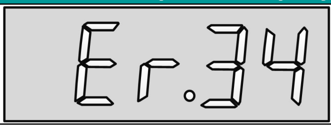
(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Ambient temperature is too high	●Measure the ambient temperature.	■Reduce the ambient temperature of the servo drive.
Servo drive fan failure	●Check whether the servo drive fan is blocked or damaged	■Contact the manufacturer's technician to repair or replace the fan.
The servo drive is mounted in an unreasonable orientation or the	●Check whether the servo drive installation is reasonable	■Contact the manufacturer's technician to obtain the servo drive installation standard.

Reason	Troubleshooting methods	Handling
spacing between the servo drives is unreasonable		
Servo drive fault	●Fault is still reported when restarting after ten minutes of power cutoff	■Servo drive may be damaged, contact the manufacturer's technician for repair.

Er.34 Motor overload protection

(1) Fault phenomenon

Servo drive panel display	Fault name
	Motor overload protection

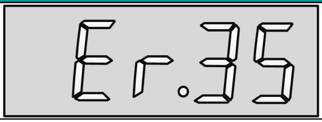
(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Motor power cable, encoder cable wiring error	●Check whether the motor power cable and encoder cable wiring are correct.	■Connect according to the correct connection method; ■Preferably use the motor power cables and encoder cables standard by manufacturers.
The load is too large	●Check overload characteristics of motor or servo drive	■Reduce the load; ■Contact the manufacturer's technician to obtain the drive and motor model with appropriate capacity.
Frequent acceleration and deceleration	●Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.	■Appropriately extend the acceleration and deceleration time.
Motor model and servo drive do not match	●Check the monitoring quantity 201E-35 (motor model code).	■Contact the manufacturer's technician to obtain the matching motor model.
Unreasonable parameters	●Use Wecon SCTools to obtain the actual torque waveform and observe whether overshoot is obvious	■Set the appropriate loop gain parameters.
	●Observe whether the motor vibrates during operation	■Set the appropriate rigidity level.
	●Check whether 200A-04 (motor overload protection time coefficient) parameter is reasonable	■Increase 200A-04 (motor overload protection time coefficient) under the premise that the motor will not burn out.
The motor is locked	●Check whether the brake output function is enabled by mistake, resulting in the motor locking.	■Disable the brake output function.

Reason	Troubleshooting methods	Handling
Servo drive fault	●The servo drive is still faulty after power on again	■Servo drive may be damaged, contact the manufacturer's technician for repair.

Er.35 Electronic gear ratio exceeds limit

(1) Fault phenomenon

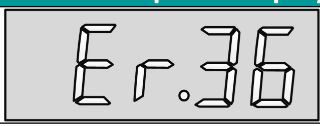
Servo drive panel display	Fault name
	Electronic gear ratio exceeds limit

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The electronic gear ratio setting is greater than the settable range	Check whether the ratio of object dictionaries 6091: 01 to 6091: 02 is within the following range: ●The upper limit of 17bit absolute value encoder can be set to 52428; ●The upper limit of 23bit absolute value encoder can be set to 3355443.	■ After modifying the corresponding function code according to the settable range, set 200A-03 (fault clearing) to 1
The electronic gear ratio setting is less than the settable range	Check whether the ratio of object dictionaries 6091: 01 to 6091: 02 is within the following range: ●The lower limit of 17bit absolute value encoder can be set to 0.01; ●The lower limit of 23bit absolute value encoder can be set to 0.83.	

Er.36 Position deviation is too large

(1) Fault phenomenon

Servo drive panel display	Fault name
	Position deviation is too large

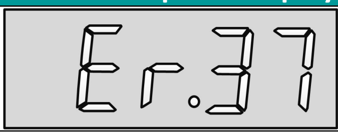
(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Cable problem	●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.	■According to the drive side UVW, connect the motor side UVW correctly.
	●Check whether both ends of power cable are disconnected	■Replace the power cable and repower
Improper parameter setting	●Check whether 2003-02 (load rigidity level) is set properly	■Appropriately increase the setting value of 2003-02 (load

Reason	Troubleshooting methods	Handling
		rigidity level).
	●Check whether the gain parameters are set properly; if not, it may result in overshoot	■Reasonably adjust the gain parameters.
	●Check whether 6065 (position deviation threshold) is set properly	■Appropriately increase the setting value of 6065 (excessive position deviation threshold)
	●Use Wecon SCTools to obtain the equivalent velocity of the position instruction and check whether the velocity is greater than the motor rotating velocity limit	■Increase the setting values of 2001-0C (forward velocity threshold) and 2001-0D (reverse velocity threshold) according to mechanical requirements.
Motor is locked	●Check whether motor is locked due to mechanical jamming	■Solve the problem of mechanicam jamming.
Brake is not opened	●Check whether the brake device is opened normally, and check whether the output voltage of the brake is 24V	■Check the logic of brake power supply or brake output signal.
Position instruction equivalent velocity changes too quickly	●Check whether the position instruction equivalent velocity changes too quickly	■Properly increase the acceleration and deceleration time and reduce the change rate of the rotating velocity.

Er.37 Abnormal torque saturation

(1) Fault phenomenon

Servo drive panel display	Fault name
	Abnormal torque saturation

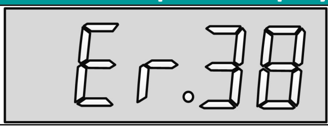
(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Motor power cable UVW phase sequence error	●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.	■According to the drive side UVW, connect the motor side UVW correctly.
Improper parameter setting	●Check whether 2001-13 (torque saturation timeout) is set properly	■Appropriately increase the setting value of 2001-13 (torque saturation timeout time).
	Check whether 2001-0F (forward torque limit) and 2001-10 (reverse torque limit) are set reasonably	■Appropriately increase the setting values of 2001-0F (positive torque limit) and 2001-10 (reverse torque limit).
	●Check whether the gain	■Reasonably adjust the gain

Reason	Troubleshooting methods	Handling
	parameters are set properly	parameters.
	●Check whether the acceleration and deceleration time are set properly	■Appropriately increase the acceleration and deceleration time.
The load is too large	●Check whether the load is too large	■Reduce the load.
Motor is locked	●Check whether the motor is locked due to mechanical jamming of the load.	■Solve the problem of mechanical jamming.
Limit switches are mounted beyond the travel	●Check whether the limit switch is installed beyond the travel	■Adjust the installation position of the limit switch.
The brake is not opened	●Check whether the brake device is opened normally, and check whether the output voltage of the brake is 24V	■Check the logic of brake power supply or brake output signal.

Er.38 Main circuit electrical phase loss

(1) Fault phenomenon

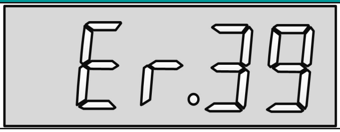
Servo drive panel display	Fault name
	Main circuit electrical phase loss

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Cable problem	●Check whether the motor power wiring port is connected reliably	■Tighten the fixing screws at the wiring port of the motor power wire.
	●Check whether both ends of the power cable are disconnected	■Replace the power cable and repower
Three-phase specification drives run on single-phase power supplies	●Check whether the three-phase drive has a single-phase power supply	■Re-connect the three-phase power supply according to the power supply specifications.
The power supply is unstable or off	●Check that the drive input power specifications meet the specifications: 220V drive: valid value : 198V to 242V;; 380V drive: valid values : 342V to 418V.	■Run servo after the power supply is stable.
Servo drive fault	●The servo drive is still faulty after power on again	■Servo drive may be damaged, contact the manufacturer's technician for repair.

Er.39 Emergency stop

(1) Fault phenomenon

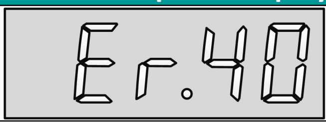
Servo drive panel display	Fault name
	Emergency stop

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Servo drive receives emergency stop instructions	●Check whether emergency stop protection is triggered manually	■Repower the servo drive.
	●Check whether the servo drive has mistakenly triggered the emergency stop signal. Check whether function 08 (E-STOP) is configured in "DI "port function selection" of the 2006 group "DIDO configuration" function code group and whether the DI port wiring is normal.	■Reasonably wire the DI port.

Er.40 Encoder battery failure

(1) Fault phenomenon

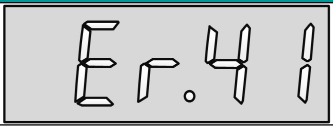
Servo drive panel display	Fault name
	Encoder battery failure

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Multi-turn absolute encoder is not connected to the battery when the servo drive is power off	●Check if the encoder is connected to the battery during the power off of the servo	■Set 200A-03 (fault clearing) to 1.
The voltage of multi-turn absolute encoder battery is low	●Measure battery voltage	■Contact the manufacturer's technician to replace the new encoder battery.

Er.41 Motor (encoder) over temperature

(1) Fault phenomenon

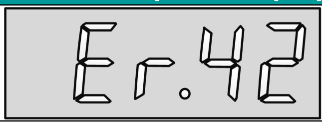
Servo drive panel display	Fault name
	Motor (encoder) over temperature

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The motor is overloaded	●Check whether the motor is overloaded	■Reduce the load, or stop the motor. After the motor temperature returns to normal, use the [P10-3] to clear the fault.

Er.42 Encoder write fault

(1) Fault phenomenon

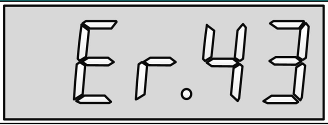
Servo drive panel display	Fault name
	Encoder write fault

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Poor contact on CN1 port	●Check whether the cable port (CN1) of the encoder is properly connected	■Tighten the fixing screws for CN1 port.
	●Check whether the servo drive CN1 port jack is deformed	■Replace the cable or cable port if deformed.
Poor contact on adapter port (rectangular connection cable)	●Check whether both ends of the rectangular connector are reliably connected	■Ensure reliable connection at both ends of rectangular connection port; ■Replace with an encoder cable with higher connection reliability.
External interference	●Check whether there are strong magnetic fields nearby	■Eliminate the interference of strong magnetic field nearby.
	●Check whether there are sources of interference such as power supply inverter equipment nearby	■Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.
Servo drive fault	●The servo drive is still faulty after power on again	■Servo drive may be damaged, contact the manufacturer's technician for repair.

Er.43 Drive overload fault

(1) Fault phenomenon

Servo drive panel	Fault name
	Drive overload fault

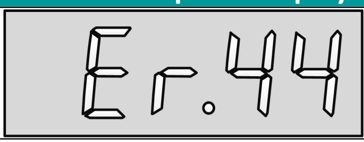
(2) Troubleshooting methods

Reason	Troubleshooting	Handling
The average output power of U0-34 exceeds the limit power (110% overload) for more than 20 minutes.	■ Whether the average output power of U0-34 often exceeds the limit (110% overload) Check whether the drive meets the requirements.	■ It can be observed whether the U0-34 is often greater than the servo limit power (110% overload) when servo is running. When ER.43 alarm is found in the process of machine adjustment, please check whether the servo power is suitable. It is recommended to replace the drive model with higher power.
Servo drive fault	■ The servo drive is still fault after power on again	■ Servo drive may be damaged. Please contact the manufacturer's technician for repair.

Servo drive model	Rated power /W	Limited power/W (110% overload)
VD5L-003SA1P	100	110
VD5L-010SA1P	400	440
VD5L-014SA1P	750	825
VD5L-015SA1P	750	825

Er.44 Homing timeout fault

(1) Fault phenomenon

Servo drive panel display	Fault name
	Homing timeout fault

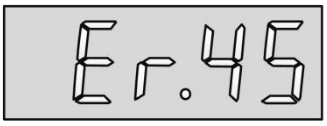
(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Fault of homing switch	Check whether homing is always in a high-velocity search instead of a low-velocity search. Check whether homing high-velocity search has been in the reverse low-velocity search process.	■First confirm whether the DI function 26 is set in group 2006, and then check the connection of the DI terminal. When manually changing the logic of the DI terminal, check whether the servo drive receives the corresponding DI level signal through 201E-11. If not, it means that the DI wiring is wrong, please wire correctly.

Reason	Troubleshooting methods	Handling
		■Manually make DI terminal logic change, if received level signal, indicating the homing operation is wrong, please operate correctly.
The velocity of searching the home switch signal at high velocity is too small	●Check whether the 6099: 01h setting value is too small.	■Increase the 6099: 01h setting value.
Hardware switch setting is unreasonable	●Confirm whether the limit switch signals on both sides are valid at the same time. ●Confirm whether a limit switch signal and the deceleration point signal or origin signal are valid at the same time	■Set the hardware switch position reasonably.

Er.45 Drive stall over-temperature protection

(1) Fault phenomenon

Servo drive panel display	Fault name
	Drive stall over-temperature protection

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Controlled by parameter P10-11 motor stall and over-temperature function. When P10-11=0, the motor is stalled, the actual velocity of the motor is less than 10rpm, the torque instruction exceeds the rated torque of the motor, and the duration reaches the motor overheating protection time at the corresponding torque, ER.45 fault will be reported and the machine will be shut down immediately.	Check the waveform of the oscilloscope. The actual velocity of the motor is less than 10rpm, and the torque instruction exceeds the rated torque of the motor. Observe whether the mechanical structure is jammed.	A temporary solution. P10-11=1 When the motor is stalled, the torque will become 70% of the rated torque. (Not recommended) **Note:** The shielded drive stall and over-temperature protection function is likely to cause motor and mechanical failure. Please use it carefully!

Er.60 ADC conversion is not completed

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.60	ADC conversion is not completed

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
External interference	●Check whether there are strong magnetic fields nearby	■Eliminate the interference of strong magnetic field nearby.
	●Check whether there are sources of interference such as power supply inverter equipment nearby	■Try to separate the strong and weak currents in the wiring, ensure that the motor and the servo drive are well grounded, and keep away from the power cables.
Servo drive fault	●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.	■If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.61 Internal software fault

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.61	Internal software fault

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Servo drive fault	●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.	■If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.62 Internal software fault

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.62	Internal software fault

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Servo drive fault	●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.	■If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.63 Internal software fault

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.63	Internal software fault

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Servo drive fault	●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.	■If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.64 Internal software fault

(1) Fault phenomenon

Servo drive panel display	Fault name
Er.64	Internal software fault

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Servo drive fault	●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.	■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.

Er.65 Internal software fault

(1) Fault phenomenon

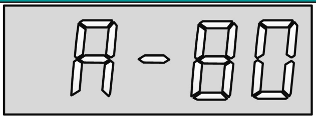
Servo drive panel display	Fault name
Er.65	Internal software fault

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Servo drive fault	●Restore factory setting [200A-02=1] and power on again. If the servo drive still alarms after multiple operations, it is faulty.	■ If servo still give alarm after powering on several times, contact the manufacturer's technicians for maintenance.

A-80 Power limit alarm

(1) Fault phenomenon

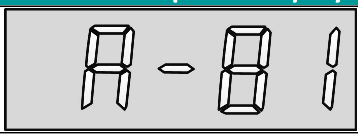
Servo drive panel	Alarm name
	Drive overpower alarming

(2) Troubleshooting methods

Reason	Troubleshooting	Handling
When the average output power of U0-34 exceeds the limit power of the drive (110% overload) for more than 5 seconds, there is drive overpower alarming.	■ Check whether the average output power of U0-34 exceeds the limit (110% overload) for more than 5 seconds.	■ Check whether the power of U0-34 exceeds 110% of the rated power of the drive. When A80 alarm is reported in the adjustment process, please check whether the servo power is suitable.

A-81 Overvelocity alarm

(1) Fault phenomenon

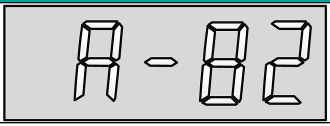
Servo drive panel display	Warning name
	Overvelocity alarm

(2)Troubleshooting methods

Reason	Troubleshooting methods	Handling
Motor power cable UVW phase sequence error	●Check whether the phase sequence of the motor power cable on the servo drive side and motor side corresponds to each other.	■According to the drive side UVW, connect the motor side UVW correctly.
2001-0B parameter setting is not proper	●Check whether the value of 2001-0B (warning velocity threshold) is less than the max velocity required for the operation of motor	■Reset 2001-0B (warning velocity threshold) according to mechanical requirements.
Input velocity instruction is too high	●Check whether the motor velocity corresponding to the input instruction exceeds 2001-0B (warning velocity threshold)	■Reduce the input velocity instruction while ensuring mechanical requirements; ■Reasonably increase 2001-0B (warning velocity threshold).

A-82 Overload

(1) Fault phenomenon

Servo drive panel display	Warning name
	Overload

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Motor power cable, encoder cable wiring error	●Check whether the motor power cable and encoder cable wiring are correct.	■Complete wiring according to the correct wiring method; ■Preferably use the standard motor power cables and encoder cables provided by manufacturers.
The load is too large	●Perform inertia identification and check the inertia ratio.	■Reduce the load; ■Contact the manufacturer's technician to obtain the drive and motor model with appropriate capacity.
Frequent acceleration and deceleration	●Check whether frequent acceleration and deceleration are performed and whether the acceleration and deceleration time is too short.	■Appropriately extend the acceleration and deceleration time.
Motor model and servo drive do not match	●Check the monitoring quantity 201E-35 (motor model code).	■Contact the manufacturer's technician to obtain the matching motor model.
Unreasonable parameters	●Use Wecon SCTools to obtain the actual torque waveform and observe whether overshoot is obvious	■Set the appropriate loop gain parameters.
	●Observe whether the motor vibrates during operation	■Set the appropriate rigidity level.

A-83 Braking resistor is overtemperature or overloaded

(1) Fault phenomenon

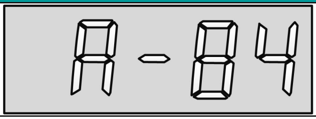
Servo drive panel display	Warning name
A-83	Braking resistor is overtemperature or overloaded

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Improper wiring of internal braking resistor	●Check whether C, D are connected to the shorting cap and the contact is normal	■When internal braking resistors are used, ensure the shorting caps or short wires are reliably connected between C and D.
Improper wiring of external braking resistor	●Remove the external braking resistor and measure whether the resistance value is "∞"(Infinity).	■Replace with a new external braking resistor, after ensuring that the resistance value of the resistor is consistent with the nominal value, connect it in series between P+ and C.
The resistance value of the external braking resistor is too large	●Test the actual external braking resistor resistance and compare it with the recommended braking resistor to make sure the actual resistance is not too large.	■Use an appropriate external braking resistor.
Improper parameter setting	When using an external braking resistor, check the following parameters. Whether the value of 2000-09 (brake setting) is reasonable Whether the value of 2000-10 (resistance value of external braking resistor) is reasonable.	■Reasonably set the parameter value of 2000-09 (brake setting setting): 2000-09=1 (external braking resistor is used, natural cooling) 2000-09=3 (no braking resistor is used, and all are absorbed by capacitance) ■The parameter value of 2000-0A (external braking resistor) should be the same as the actual external braking resistance.

A-84 Parameter modification that needs device to be powered on again

(1) Fault phenomenon

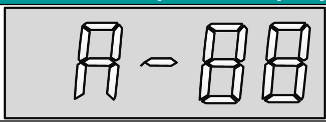
Servo drive panel display	Warning name
	Parameter modification that needs device to be powered on again

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Modified the valid timing parameter to "power on again".	●Check whether the servo drive has modified the valid timing parameter to "power on again".	■Power on again.

A-88 Main circuit instantaneous power failure

(1) Fault phenomenon

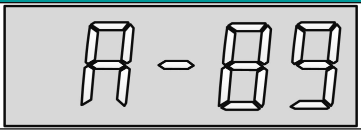
Servo drive panel display	Warning name
	Main circuit instantaneous power failure

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Power failure	●Check that the drive input power specifications meet the specifications: 220V drive: valid value : 198V to 242V;; 380V drive: valid values : 342V to 418V.	■If the mains input has no voltage or is unstable, wait for the power supply to stabilize before use.
Servo drive fault	When the mains power is confirmed to be normal, the servo drive is still faulty after power on again	■Servo drive may be damaged, please contact the manufacturer's technician.

A-89 Duplicate DI port configuration

(1) Fault phenomenon

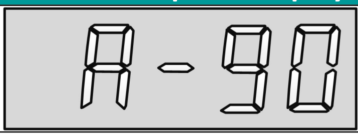
Servo drive panel display	Fault name
	Duplicate DI port configuration

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The same non-zero DI function is assigned to multiple DI ports	Check whether the "DI port function selection" of the "DIDO configuration" function code group of the 2006 group is configured with the same DI function	■ Set different DI functions for different DI port, and repower the servo; ■Configure the function of unnecessary DI port to 0 (off), and repower servo; ■Restore parameters to factory settings through setting 200A-02=1, and power it on again.

A-90 Duplicate DO port configuration

(1) Fault phenomenon

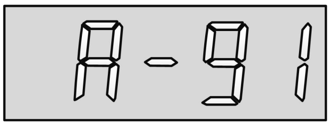
Servo drive panel display	Fault name
	Duplicate DO port configuration

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
The same non-zero DO function is assigned to multiple DO ports	Check whether the “DO port function selection" of the "DIDO Configuration" function code group of the 2006 group is configured with the same DO function.	■Set different DO functions for different DO port; ■Configure the function of unnecessary DO port to 128 (off); ■Restore parameters to factory settings through setting 200A-02=1, and power it on again.

A-91 Parameter modification is too frequent.

(1) Fault

Servo drive panel	Fault name
	Parameter modification is too frequent (Allowable modification frequency of the function code): 150 times/ 4 hours ✎**Note:** The 32-bit function code corresponds to 2 modification operations.

(2) Troubleshooting

Reason	Troubleshooting	Handling
Parameter modification is too frequent	●Check whether the host computer modifies the writing parameters frequently; (Allowable modification frequency of the function code): 150 times/ 4 hours ✎**Note:** The 32-bit function code corresponds to 2 modification operations. **Notes:** ① When the servo detects that the frequency of writing to the internal EEPROM is too high, and the operating frequency exceeds the EEPROM write lifespan, the driver will report an A91 warning indicating that parameter modification is too frequent. Within 5 minutes of this A91 warning appearing, the modified function code data will still be saved to the EEPROM. After 5 minutes, the modification of function code parameters will automatically switch to no longer saving to the EEPROM. ② This protection is automatically exited upon power-up, and whether to save parameters to the EEPROM is determined by the setting of function code [P12-4].	(1) During the adjustment, A91 alarming (150 times/4 hours) caused by frequently manual modification of function codes can be cleared through P10-03. In other cases, please check the PLC program; (2) If A91 alarming appears in the normal working mode of the machine, please check whether the PLC program frequently modifies the function code.

A-92 Low encoder battery voltage warning

(1) Fault phenomenon

Servo drive panel display	Fault name
A-92	Low encoder battery voltage warning

(2) Troubleshooting methods

Reason	Troubleshooting methods	Handling
Encoder battery voltage is less than 3.1V	●Measure encoder battery voltage	■Contact the manufacturer's technician to replace the new encoder battery.

A-93 Encoder read-write verification exception is too frequent.

(1) Fault phenomenon

Servo drive panel	Fault name
A-93	Encoder read-write verification exception is too frequent.

(2) Troubleshooting methods

Reason	Troubleshooting	Handling
External interference	■ Check for strong magnetic fields nearby	■ Eliminate the interference of strong magnetic field nearby.
	■ Check whether there are sources of interference such as power supply inverter equipment nearby	■ Try to separate the strong and weak currents in the wiring. Make sure the motor and drive are well grounded and keep away from the power cables.
	■ Increase P0-31 encoder read-write verification exception threshold setting	■ Eliminate the A93 alarming by increasing the exception threshold is regarded as a temporary solution. The disadvantage is that the motor may run in an unstable state.
Encoder fault	■Manually rotate the motor axis counterclockwise or clockwise to observe whether the monitoring value 201E-1E (electrical angle) changes regularly	■ If the value of 201E-1E (electric angle) changes abruptly or does not change, there may be a problem with the encoder itself. Please replace the motor or encoder.
Servo drive fault	■ Cross-verification: Use the normal motor and encoder cables to connect to the servo drive. If the servo drive still alarms, it is a servo drive fault.	■ Servo drive may be damaged, please contact the manufacturer's technician.

Chapter 11 Appendix

11.1 Object dictionary list

Group 1000

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
1000	Device type	RO	No	0x00020192	-	-	UDINT
1001	Error record	RO	No	0x00	-	-	USINT
1008	Device name	RO	No	-	-	-	STRING
1009	Manufacturer's hardware equipment	RO	No	-	-	-	STRING
100A	Manufacturer software version	RO	No	-	-	-	STRING
1018: 01	Vendor ID	RO	No	0x00000EFF	-	-	UDINT
1018: 02	Product code	RO	No	0x10003101	-	-	UDINT
1018: 03	Revision number	RO	No	0x00000001	-	-	UDINT
1018: 04	Serial number	RO	No	0x00001419	-	-	UDINT
1600: 01	First mapping object	RW	RPDO	0x60400010	-	-	UDINT
1600: 02	Second mapping object	RW	RPDO	0x607A0020	-	-	UDINT
1600: 03	Third mapping object	RW	RPDO	0x60B80010	-	-	UDINT
1600: 04	Fourth mapping object	RW	RPDO	0X60600008			UDINT
1701: 01	First mapping object	RW	RPDO	0x60400010	-	-	UDINT
1701: 02	Second mapping object	RW	RPDO	0x607A0020	-	-	UDINT
1701: 03	Third mapping object	RW	RPDO	0x60B80010	-	-	UDINT
1701: 04	Fourth mapping object	RW	RPDO	0x60600008	-	-	UDINT
1702: 01	First mapping object	RW	RPDO	0x60400010	-	-	UDINT
1702: 02	Second mapping object	RW	RPDO	0x607A0020	-	-	UDINT

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
1702: 03	Third mapping object	RW	RPDO	0x60FF0020	-	-	UDINT

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
1702: 04	Fourth mapping object	RW	RPDO	0x60710010	-	-	UDINT
1702: 05	Fifth mapping object	RW	RPDO	0x60600008	-	-	UDINT
1702: 06	Sixth mapping object	RW	RPDO	0x60B80010	-	-	UDINT
1702: 07	Seventh mapping object	RW	RPDO	0x607F0020	-	-	UDINT
1A00: 01	First mapping object	RW	TPDO	0x60410010	-	-	UDINT
1A00: 02	Second mapping object	RW	TPDO	0x60640020	-	-	UDINT
1A00: 03	Third mapping object	RW	TPDO	0x60B90010	-	-	UDINT
1A00: 04	Fourth mapping object	RW	TPDO	0x60BA0020	-	-	UDINT
1A00: 05	Fifth mapping object	RW	TPDO	0x60BC0020	-	-	UDINT
1A00: 06	Sixth mapping object	RW	TPDO	0x603F0010	-	-	UDINT
1A00: 07	Seventh mapping object	RW	TPDO	0x60610008	-	-	UDINT
1B01: 01	First mapping object	RO	TPDO	0x603F0010	-	-	UDINT
1B01: 02	Second mapping object	RO	TPDO	0x60410010	-	-	UDINT
1B01: 03	Third mapping object	RO	TPDO	0x60640020	-	-	UDINT
1B01: 04	Fourth mapping object	RO	TPDO	0x60770010	-	-	UDINT
1B01: 05	Fifth mapping object	RO	TPDO	0x60F40020	-	-	UDINT
1B01: 06	Sixth mapping object	RO	TPDO	0x60610008	-	-	UDINT
1C12: 01	Index of objects allocated by RPDO	RW	No	0x1701	-	-	UINT

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
1C13: 01	Index of objects assigned by TPDO	RW	No	0x0001	-	-	UINT
1C32: 01	Synchronization type	RW	No	0x0002	-	-	UINT
1C32: 04	Synchronization types supported	RO	No	0x0005	-	-	UDINT
1C32: 05	Minimum cycle time	RO	No	0x0001E848	-	-	UINT
1C33: 01	Synchronization type	RW	No	0x0002	-	-	UINT
1C33: 04	Synchronization types supported	RO	No	0x0005	-	-	UDINT
1C33: 05	Minimum cycle time	RO	No	0x0001E848	-	-	UINT

Group 2000

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2000	04	P00-04	Rotation direction	Shutdown setting	Valid immediately	0	0 to 1	-	16-bit
2000	05	P00-05	Servo OFF shutdown mode	Shutdown setting	Valid immediately	0	-2 to 2	-	16-bit
2000	07	P00-07	Fault Shutdown mode	Operation setting	Valid immediately	0	-4 to 4	-	16-bit
2000	09	P00-09	Brake resistor setting	Shutdown setting	Valid immediately	0	0 to 3	-	16-bit
2000	0A	P00-10	External brake resistor value	Shutdown setting	Valid immediately	50	0 to 65535	Ω	16-bit
2000	0B	P00-11	External braking resistor power	Operation setting	Valid immediately	100	0 to 65535	W	16-bit
2000	10	P00-16	Pulses per revolution	Shutdown setting	Valid immediately	0	0 to 100000000	Instruction pulse unit	16-bit
2000	11	P00-17	Electronic gear ratio 1 numerator	Operation setting	Valid immediately	1	1 to 2^{31}	-	32-bit 1
2000	12	P00-18	Electronic gear ratio 1 denominator	Operation setting	Valid immediately	1	1 to 2^{31}	-	32-bit 1
2000	17	P00-23	Z pulse output OZ polarity	Operation setting	Power-on again	0	0 to 1	-	16-bit
2000	18	P00-24	Z pulse output width	Operation setting	Power-on again	3	1 to 200	ms	16-bit
2000	1D	P00-29	Number of equivalent position units	Shutdown setting	Valid immediately	10000	0 to 131072	-	32-bit

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2000	1E	P00-30	Shield multi-turn absolute encoder battery fault	Operation setting	Power-on again	0	0 to 1	-	16-bit
2000	1F	P00-31	Encoder R/W check	Operation setting	Valid immediately	20	0 to 100	-	16-bit
2000	20	P00-32	Communication tolerance setting	Operation setting	Valid immediately	2	2 to 14	-	16-bit

Group 2001

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2001	09	P01-09	Torque Mode velocity Source	Shutdown setting	Valid immediately	0	0 to 2	-	16-bit
2001	0A	P01-10	MaxvelocityLimit	Operation setting	Valid immediately	3600	0 to 8000	rpm	16-bit
2001	0B	P01-11	WarmvelocityTh	Operation setting	Valid immediately	3300	0 to 5000	rpm	16-bit
2001	0C	P01-12	PosvelocityTh	Operation setting	Valid immediately	3000	0 to 8000	rpm	16-bit
2001	0D	P01-13	NegvelocityTh	Operation setting	Valid immediately	3000	0 to 6000	rpm	16-bit
2001	0E	P01-14	ToqLimitSrc	Shutdown setting	Valid immediately	0	0 to 2	-	16-bit
2001	0F	P01-15	PToqLim	Operation setting	Valid immediately	3000	0 to 3000	0.1 %	16-bit
2001	10	P01-16	NToqLim	Operation setting	Valid immediately	3000	0 to 3000	0.1 %	16-bit
2001	11	P01-17	Torque mode PSpd limit	Operation setting	Valid immediately	3000	0 to 6000	rpm	16-bit
2001	12	P01-18	Torque mode NSpd limit	Operation setting	Valid immediately	3000	0 to 6000	rpm	16-bit
2001	13	P01-19	ToqLimTime	Operation setting	Valid immediately	1000	0 to 65535	ms	16-bit
2001	14	P01-20	SoftOverCurrentDt	Operation setting	Valid immediately	16	0 to 65535	-	16-bit
2001	1E	P01-30	BK_ONtoCmdEnaDelay	Operation setting	Valid immediately	250	0 to 500	ms	16-bit
2001	1F	P01-31	BK_OFFtoPwmOFFDelay	Operation setting	Valid immediately	150	1 to 1000	ms	16-bit
2001	20	P01-32	BK_OFFSpdTh	Operation setting	Valid immediately	30	0 to 3000	rpm	16-bit
2001	21	P01-33	BK_OFFSinceSoffDelay	Operation setting	Valid immediately	500	1 to 2000	ms	16-bit
2001	22	P01-35	Profile Dec 1	Operation setting	Valid immediately	167	0 to 65535	ms	16-bit
2001	23	P01-36	Profile Dec 2	Operation setting	Valid immediately	0	0 to 65535	ms	16-bit
2001	24	P01-37	SpdRefJOGAccTime	Operation setting	Valid immediately	500	1 to 5000	ms	16-bit
2001	25	P01-38	SpdRefJOGDecTime	Operation setting	Valid immediately	500	1 to 5000	ms	16-bit

Group 2002

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2002	01	P02-01	PosLoop1stGain	Operation setting	Valid immediately	449	0 to 6200	0.1Hz	16-bit
2002	02	P02-02	SpdLoop1stGain	Operation setting	Valid immediately	250	0 to 35000	0.1Hz	16-bit
2002	03	P02-03	SpdLoop1stIntgTime	Operation setting	Valid immediately	230	10 to 65535	0.1ms	16-bit
2002	04	P02-04	PosLoop2stGain	Operation setting	Valid immediately	300	0 to 6200	0.1Hz	16-bit
2002	05	P02-05	SpdLoop2stGain	Operation setting	Valid immediately	160	0 to 35000	0.1Hz	16-bit
2002	06	P02-06	SpdLoop2stIntgTime	Operation setting	Valid immediately	350	10 to 65535	0.1ms	16-bit
2002	07	P02-07	Second gain switch mode	Operation setting	Valid immediately	1	0 to 1	-	16-bit
2002	08	P02-08	Second gain fun select	Operation setting	Valid immediately	0	0 to 10	-	16-bit
2002	09	P02-09	SpdFeedForwardGain	Operation setting	Valid immediately	0	0 to 1000	0.1%	16-bit
2002	0A	P02-10	SpdFeedForwardFilter	Operation setting	Valid immediately	3	0 to 500	1ms	16-bit
2002	0B	P02-11	ToqFeedForwardGain	Operation setting	Valid immediately	0	0 to 2000	0.1%	16-bit
2002	0C	P02-12	ToqFeedForwardFilter	Operation setting	Valid immediately	50	0 to 10000	0.01 ms	16-bit
2002	0D	P02-13	SecondGainSwTime	Operation setting	Valid immediately	20	0 to 10000	0.1ms	16-bit
2002	0E	P02-14	SecondGainSwLevel	Operation setting	Valid immediately	50	0 to 20000	-	16-bit
2002	0F	P02-15	SecondGainHysteresis	Operation setting	Valid immediately	20	0 to 20000	-	16-bit
2002	10	P02-16	SecondGainPosSwTime	Operation setting	Valid immediately	30	0 to 10000	0.1ms	16-bit
2002	14	P02-20	Model Ctrl Enable	Shutdown setting	Valid immediately	0	0 to 1	-	16-bit
2002	15	P02-21	Model Ctrl Gain	Shutdown setting	Valid immediately	1000	200 to 20000	0.1/s	16-bit
2002	16	P02-22	Model Ctrl Gain Compensation	Shutdown setting	Valid immediately	1000	500 to 2000	0.1%	16-bit
2002	17	P02-23	Model Ctrl Positive dir Offset	Operation setting	Valid immediately	1000	0 to 10000	0.1%	16-bit
2002	18	P02-24	Model Ctrl Negative dir Offset	Operation setting	Valid immediately	1000	0 to 10000	0.1%	16-bit

2002	19	P02-25	Model Ctrl Speed Forward Compensation	Operation setting	Valid immediately	1000	0 to 10000	0.1%	16-bit
2002	1A	P02-26	Model Ctrl 2 Gain	Shutdown setting	Valid immediately	1000	200 to 20000	0.1/s	16-bit
2002	1B	P02-27	Model Ctrl Gain Compensation	Shutdown setting	Valid immediately	1000	500 to 2000	0.1%	16-bit
2002	1C	P02-28	Model CtrlSps FrqA	Shutdown setting	Valid immediately	500	10 to 2500	0.1Hz	16-bit
2002	1D	P02-29	Model CtrlSps FrqB	Shutdown setting	Valid immediately	700	10 to 2500	0.1Hz	16-bit
2002	28	P02-40	Gravity Comp Value	Operation setting	Valid immediately	0	-1000 to 1000	0.1%	16-bit
2002	29	P02-41	Positive Friction Value	Operation setting	Valid immediately	0	-1000 to 1000	0.1%	16-bit
2002	2A	P02-42	Negative Friction Value	Operation setting	Valid immediately	0	-1000 to 1000	0.1%	16-bit
2002	2B	P02-43	Friction Start Th	Operation setting	Valid immediately	100	0 to 65535	0.1% rpm	16-bit
2002	2F	P02-47	QPS Enable	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2002	30	P02-48	QPS Time	Operation setting	Valid immediately	0	0 to 1000	0.1ms	16-bit
2002	31	P02-49	QPS Level	Operation setting	Valid immediately	100	1 to 500	-	16-bit
2002	32	P02-50	QPS Sensitive	Operation setting	Valid immediately	10	1 to 65535	–	16 位

Group 2003

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2003	01	P03-01	Load InerRatio	Operation setting	Valid immediately	300	100 to 10000	0.01	16-bit
2003	02	P03-02	RigiditySel	Operation setting	Valid immediately	14	0 to 31	-	16-bit
2003	03	P03-03	SelfAdjustMode	Operation setting	Valid immediately	0	0 to 2	-	16-bit
2003	04	P03-04	InerIdOncable	Operation setting	Valid immediately	0	0 to 2	-	16-bit
2003	05	P03-05	InerIdCircle	Shutdown setting	Valid immediately	2	1 to 20	Circle	16-bit
2003	06	P03-06	InerIdMaxSpd	Shutdown setting	Valid immediately	1000	300 to 2000	rpm	16-bit
2003	07	P03-07	InerIdRollMode	Shutdown setting	Valid immediately	0	0 to 2	-	16-bit
2003	08	P03-08	InerIdWaitTime	Shutdown setting	Valid immediately	1000	300 to 10000	ms	16-bit

Group 2004

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2004	01	P04-01	PulseFilterType	Shutdown setting	Valid immediately	0	0 to 2	-	16-bit
2004	02	P04-02	LowpassFilterTime	Shutdown setting	Valid immediately	0	0 to 1000	ms	16-bit
2004	03	P04-03	AveragingFilterTime	Shutdown setting	Valid immediately	0	0 to 128	ms	16-bit
2004	04	P04-04	TogFilterTime	Operation setting	Valid immediately	95	7 to 2500	0.01 ms	16-bit
2004	05	P04-05	NotchFilter1_Freq	Operation setting	Valid immediately	300	250 to 5000	Hz	16-bit
2004	06	P04-06	NotchFilter1_Deep	Operation setting	valid immediately	100	0 to 100	-	16-bit
2004	07	P04-07	NotchFilter1_Band	Operation setting	Valid immediately	4	0 to 12	-	16-bit
2004	08	P04-08	NotchFilter2_Freq	Operation setting	Valid immediately	500	250 to 5000	Hz	16-bit
2004	09	P04-09	NotchFilter2_Deep	Operation setting	Valid immediately	100	0 to 100	-	16-bit
2004	0A	P04-10	NorthFilter2_Band	Operation setting	Valid immediately	4	0 to 12	-	16-bit
2004	12	P04-18	SpdFdbFilterTime	Operation setting	Valid immediately	10	1 to 1000	0.01 ms	16-bit

Group 2005

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2005	10	P05-16	Rotate SpdDtTh	Operation setting	Valid immediately	20	0 to 1000	rpm	16-bit
2005	13	P05-19	SpdZeroOutTh	Operation setting	Valid immediately	10	0 to 6000	rpm	16-bit
2005	14	P05-20	Tor Arrive Threshold	Operation setting	Valid immediately	100	0 to 300	%	16-bit
2005	15	P05-21	Tor Arrive Hysteresis	Operation setting	Valid immediately	10	0 to 20	%	16-bit
2005	19	P05-25	Touch probe Dli On Compensation Time	Operation setting	Valid immediately	500	-10000 to 10000	ns	16-bit
2005	1A	P05-26	Touch probe DI Off Compensation Time	Operation setting	Valid immediately	3780	-10000 to 10000	ns	16-bit

Group 2006

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2006	02	P06-02	Di1FunSel	Operation setting	Power-on again	0	0 to 32	-	16-bit
2006	03	P06-03	Di1LogSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	04	P06-04	Di1SrcSeL	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	05	P06-05	Di2FunSel	Operation setting	Power-on again	2	0 to 32	-	16-bit
2006	06	P06-06	Di2LogSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	07	P06-07	Di2SrcSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
2006	08	P06-08	Di3FunSel	Operation setting	Power-on again	3	0 to 32	-	16-bit
2006	09	P06-09	Di3LogSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	0A	P06-10	Di3SrcSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	0B	P06-11	Di4FunSel	Operation setting	Power-on again	4	0 to 32	-	16-bit
2006	0C	P06-12	Di4LogSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	0D	P06-13	Di4SrcSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	1A	P06-26	Do1FunSel	Operation setting	Valid immediately	132	128 to 148	-	16-bit
2006	1B	P06-27	Do1LogSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	1C	P06-28	Do2FunSel	Operation setting	Valid immediately	130	128 to 148	-	16-bit
2006	1D	P06-29	Do2LogSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	1E	P06-30	Do3FunSel	Operation setting	Valid immediately	129	128 to 148	-	16-bit
2006	1F	P06-31	Do3LogSel	Operation setting	Valid immediately	0	0 to 1	-	16-bit
2006	20	P06-34	CompDoOutputStatu	Operation setting	Valid immediately	0	0 to 1	-	16-bit

Group 200A

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
200A	01	P10-01	SpdRefJOG	Operation setting	Valid immediately	100	0 to 3000	rpm	16-bit
200A	02	P10-02	RstFuncFac	Shutdown setting	Valid immediately	0	0 to 65535	-	16-bit
200A	03	P10-03	ServoErrClear	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200A	04	P10-04	MotOLProtect_Coef	Operation setting	Valid immediately	100	1 to 800	%	16-bit
200A	05	P10-05	MotoTypeSel	Operation setting	Power-on again	0	0 to 65535	-	16-bit
200A	06	P10-06	AbsEncRst	Shutdown setting	Valid immediately	0	0 to 1	-	16-bit
200A	07	P10-07	ManualSetMotoCode	Operation setting	Power-on again	0	0 to 1	-	16-bit
200A	0B	P10-11	Motor Stuck Over Temp Enable	Operation setting	Valid immediately	0	0 to 1	-	16-bit

Groop 200C

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
200A	04	P12-04	CommDataWrEep	Operation setting	Valid immediately	1	0 to 1	rpm	16-bit

Group 200D

Object dictionary (Hex)		Function code (Dec)	Name	Setting method	Valid time	Default	Range	Unit	Data type
Index	Sub-index								
200D	01	P13-01	Virtual VDI_1 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	02	P13-02	Virtual VDI_2 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	03	P13-03	Virtual VDI_3 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	04	P13-04	Virtual VDI_4 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	05	P13-05	Virtual VDI_5 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	06	P13-06	Virtual VDI_6 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	0B	P13-11	CommVdo_1 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	0C	P13-12	CommVdo_2 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit
200D	0D	P13-13	CommVdo_3 input value	Operation setting	Valid immediately	0	0 to 1	-	16-bit

DI/DO channel function definition

DI channel function definition				
Channel function code	**Name**	**Function name**	**Description**	**Remark**
0	-	OFF (disable)	-	-
1	S-ON	Servo enabled	Invalid: Servo motor enabled function prohibited; Valid: Servo motor power-on enabled.	-
2	A-CLR	Fault and warning cleared	Invalid: Do not reset faults or warnings Valid: Reset fault or warning.	-
3	POT	Forward drive prohibited	Invalid: Forward drive allowed; Valid: Forward drive prohibited.	-
4	NOT	Reverse drive prohibited	Invalid: Reverse drive allowed; Valid: Reverse drive prohibited.	-
6	CL	Deviation counter reset	Invalid: The position deviation is not cleared; Valid: Position deviation is cleared.	-
8	E-STOP	Emergency stop	Invalid: Position lock after zero velocity stop; Valid: Do not affect the current running state.	-
10	GAIN-SEL	Gain switch	Invalid: Gain switch enable stop; Valid: Gain switch.	
18	TouchProbe1	Probe 1	Invalid: Probe 1 function enable stop; Valid: Probe position capture function.	
19	TouchProbe2	Probe 2	Invalid: Probe 2 function enable stop; Valid: Probe position capture function.	
26	HOMEORG	Origin signal	Invalid: Do not affect the current operation of servo motor Valid:Servo motor implements origin regression mode.	-

DO channel function definition				
Channel function code	**Name**	**Function name**	**Description**	**Remark**
128	-	OFF (disable)	-	-
129	RDY	Servo ready	Servo is ready, and could receive S-ON signal. Invalid: Servo is not ready Valid: Servo is ready	-
130	ALM	Fault signal	Valid when the fault is detected	-
131	WARN	Warning signal	Valid when warning signals are output	-
132	TGON	Rotation detection	When the absolute value of servo motor velocity is higher than 2005-10 set value: Invalid: The motor rotation detection signal is invalid Valid: The motor rotation detection signal is valid	-
133	ZSP	Zero velocity signal	The signal output by the servo motor when it stops: Invalid: Motor zero velocity signal is invalid Valid: Motor zero velocity signal is valid	-
134	P-COIN	Positioning completed	In the position control mode, the absolute value of the position deviation meets the setting conditions of the object dictionary 6067h and 6068h, indicating that the servo positioning is completed.	-
137	V-NEAR	velocity approach	-	-
138	T-COIN	Torque arrival	Invalid: The absolute value of torque instruction is less than the set value Valid: The absolute value of torque instruction reaches the set value	-
139	T-LIMIT	Torque limit	The confirmation signal of torque limit. Invalid: Motor torque is not limited Valid: Motor torque is limited	-
140	V-LIMIT	velocity limited	The confirmation signal of velocity limit in torque mode. Invalid: Motor velocity is not limited Valid: Motor velocity is limited	-

DO channel function definition

Channel function code	Name	Function name	Description	Remark
141	BRK-OFF	Brake output	Outputting this signal indicates that the brake of the servo motor is released.	To use this DO function, the device must be powered cycled.
142	SRV-ST	Servo start state Output	Invalid: Servo drive is in non-running mode Valid: Servo drive in running mode	-
145	COM_VDO1	Communication VDO1 output	Use communication VDO	-
146	COM_VDO2	Communication VDO2 output	Use communication VDO	
147	COM_VDO3	Communication VDO3 output	Use communication VDO	

Group 201E

Object dictionary (Hex)		Monitoring Quantity (Dec)	Monitoring name	Category	Unit	Data type
Index	Sub-index					
201E	01	U0-01	SrvStatus	Universal	-	16-bit
201E	02	U0-02	velocityDis	Universal	rpm	16-bit
201E	03	U0-03	SpdCmd	Universal	rpm	16-bit
201E	04	U0-04	PosCmdToSpd	Universal	rpm	16-bit
201E	05	U0-05	PulsErr	Universal	Equivalent pulse unit	32-bit
201E	07	U0-07	Encoder Err Cnt	Universal	-	16-bit
201E	08	U0-08	Sync0SubSm_Cnt	Universal	-	16-bit
201E	09	U0-09	PulsTotal	Universal	Instruction unit	32-bit
201E	0D	U0-13	EncTotal_LowWord (Low 32 bits)	Universal	Encoder unit	32-bit
201E	0F	U0-15	EncTotal_HighWord (High 32 bits)	Universal	Encoder unit	32-bit
201E	11	U0-17	DI inputsignal status	Universal	-	16-bit
201E	13	U0-19	DO output signal status	Universal	-	16-bit
201E	14	U0-20	InerRatioReal	Universal	%	16-bit
201E	17	U0-23	DisVibFreq	Universal	Hz	16-bit
201E	18	U0-24	DisVibMag	Universal	rpm	16-bit
201E	19	U0-25	PToqLimitDis	Universal	%	16-bit
201E	1A	U0-26	NToqLimitDis	Universal	%	16-bit
201E	1B	U0-27	PSpdLimitDis	Universal	rpm	16-bit
201E	1C	U0-28	NSpdLimitDis	Universal	rpm	16-bit
201E	1D	U0-29	MachineAngle	Universal	°	16-bit
201E	1E	U0-30	ElecAngle	Universal	°	16-bit
201E	1F	U0-31	DcBusVoltDisp	Universal	V	16-bit
201E	20	U0-32	Temperature_IPM	Universal	°C	16-bit
201E	21	U0-33	OutputPowerInst	Universal	W	16-bit

Object dictionary (Hex)		Monitoring Quantity (Dec)	Monitoring name	Category	Unit	Data type
Index	Sub-index					
201E	22	U0-34	OutputPowerAverage	Universal	W	16-bit
201E	23	U0-35	HourTotalRun	Universal	h	16-bit
201E	25	U0-37	MinTotalRun	Universal	min	16-bit
201E	26	U0-38	SecTotalRun	Universal	s	16-bit
201E	27	U0-39	ToqOutRate	Universal	%	16-bit
201E	28	U0-40	HourCurrentRun	Universal	h	16-bit
201E	2A	U0-42	MinCurrentRun	Universal	min	16-bit
201E	2B	U0-43	SecCurrentRun	Universal	s	16-bit
201E	2C	U0-44	DisPwrInst	Universal	W	16-bit
201E	2E	U0-46	DisPwrAvg	Universal	W	16-bit
201E	30	U0-48	PwrUpCount	Universal	Times	16-bit
201E	31	U0-49	MotorOverLoadCount	Universal	0.01%	16-bit
201E	32	U0-50	MotoTotal_LowWord (lower 32-bits)	Universal	Circle	32-bit
201E	33	U0-51	MotoTotal_HighWord (high 32-bits)	Universal	Circle	32-bit
201E	34	U0-52	Encoder resolution	Universal	bit	16-bit
201E	35	U0-53	MotoModel	Universal	-	16-bit
201E	36	U0-54	AbsEncIn1Cycle	Universal	Encoder unit	32-bit
201E	37	U0-55	AbsEncMultiTurn	Universal	Circle	32-bit
201E	3A	U0-58	Bk Relay CtrlCnt	Universal	-	32-bit
201E	3B	U0-59	HistoryVbusMax	Universal	V	16-bit
201E	3C	U0-60	HistoryPowerMax	Universal	W	16-bit
201E	3D	U0-61	EscP0InvalidFrame_Cnt	Universal	-	16-bit
201E	3E	U0-62	EscP1InvalidFrame_Cnt	Universal	-	16-bit
201E	3F	U0-63	EscP0RxErr_Cnt	Universal	-	16-bit
201E	40	U0-64	EscP1RxErr_Cnt	Universal	-	16-bit

201E	41	U0-65	EscP1FwRxErr_Cnt	Universal	-	16-bit
201E	42	U0-66	EscP1FwRxErr_Cnt	Universal	-	16-bit
201E	43	U0-67	EscP0LostlinkCnt	Universal	-	16-bit
201E	44	U0-68	EscP1LostlinkCnt	Universal	-	16-bit

Group 201F

Object dictionary (Hex)		Monitoring Quantity (Dec)	Monitoring name	Category	Unit	Data type
Index	Sub-index					
201F	01	U1-01	NowErrorCode	Warning	-	16-bit
201F	02	U1-02	NowWarmCode	Warning	-	16-bit
201F	03	U1-03	IuWarmOccur	Warning	A	16-bit
201F	04	U1-04	IvWarmOccur	Warning	A	16-bit
201F	05	U1-05	BusVoltAtFaultOccur	Warning	V	16-bit
201F	06	U1-06	IGBTTempFaultOccur	Warning	°C	16-bit
201F	07	U1-07	IqWarmOccur	Warning	%	16-bit
201F	08	U1-08	IdWarmOccur	Warning	%	16-bit
201F	09	U1-09	PosErrWarmOccur	Warning	Encoder units	32-bit
201F	0A	U1-10	SpdWarmOccur	Warning	rpm	16-bit
201F	0B	U1-11	TimeWarmOccur	Warning	s	16-bit
201F	0C	U1-12	ErrCntCurRun	Warning	-	16-bit
201F	0D	U1-13	WarmCntCurRun	Warning	-	16-bit
201F	0E	U1-14	ErrorTotalCnt	Warning	-	16-bit
201F	0F	U1-15	WarmTotalCnt	Warning	-	16-bit
201F	10	U1-16	ErrCodeLast1st	Warning	-	16-bit
201F	11	U1-17	ErrCodeLast2nd	Warning	-	16-bit
201F	12	U1-18	ErrCodeLast3rd	Warning	-	16-bit
201F	13	U1-19	ErrCodeLast4th	Warning	-	16-bit
201F	14	U1-20	ErrCodeLast5th	Warning	-	16-bit

201F	15	U1-21	WarmCodeLast1st	Warning	-	16-bit
201F	16	U1-22	WarmCodeLast2nd	Warning	-	16-bit
201F	17	U1-23	WarmCodeLast3rd	Warning	-	16-bit
201F	18	U1-24	WarmCodeLast4th	Warning	-	16-bit
201F	19	U1-25	WarmCodeLast5th	Warning	-	16-bit
201F	1A	U1-26	vd5SingleBoardTestResult	-	-	16-bit

Group 2020

Object dictionary (Hex)		Monitoring Quantity (Dec)	Monitoring name	Category	Unit	Data type
Index	Sub-index					
2020	01	U2-01	ProductSer	Device	-	16-bit
2020	02	U2-02	Model1	Device	-	16-bit
2020	03	U2-03	Model2	Device	-	16-bit
2020	04	U2-04	FirewareVer	Device	-	16-bit
2020	05	U2-05	HardwareVer	Device	-	16-bit
2020	06	U2-06	ExFactoryYear	Device	Year	16-bit
2020	07	U2-07	ExFactoryMonth	Device	Month	16-bit
2020	08	U2-08	ExFactoryDay	Device	Day	16-bit
2020	09	U2-09	DeviceSerNum1	Device	-	16-bit
2020	0A	U2-10	DeviceSerNum2	Device	-	16-bit
2020	0B	U2-11	DeviceSerNum3	Device	-	16-bit
2020	0C	U2-12	EtherCAT XML version number	Device	-	16-bit
2020	0D	U2-13	DeviceSerNum5	Device	-	16-bit
2020	0E	U2-14	DeviceSerNum6	Device	-	16-bit
2020	0F	U2-15	DeviceSerNum7	Device	-	16-bit
2020	10	U2-16	DeviceSerNum8	Device	-	16-bit

Group 6000

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
603F	Error code	RO	TPDO	0	0 to 65535	-	16-bit
6040	Control word	RW	RPDO	0	0 to 65535	-	16-bit
6041	Status word	RO	TPDO	0	0 to 65535	-	16-bit
605A	Quick-stop option code	RW	No	2	0 to 7	-	16-bit
605B	Shutdown option code	RW	No	0	0 to 1		16-bit
605C	Servo OFF shutdown mode selection	RW	No	0	0 to 1	-	16-bit
605D	Halt option code	RW	No	1	1 to 3	-	16-bit
605E	Fault shutdown mode selection	RW	No	0	0 to 3	-	16-bit
6060	Modes of servo operation	RW	RPDO	0	0 to 10	-	8-bit
6061	Modes operation	RO	TPDO	0	0 to 10	-	8-bit
6062	Position demand value	RO	TPDO	0	-	Instruction unit	32-bit
6063	Position feedback value	RO	TPDO	0	-	Encoder Units	32-bit
6064	Position feedback value	RO	TPDO	0	-	Instruction unit	32-bit
6065	Position deviation excess threshold	RW	RPDO	524288	0 to $(2^{32}$-1)	Instruction unit	32-bit
6066	Position deviation detection time window	RW	RPDO	0	0 to $(2^{32}$-1)	ms	32-bit
6067	Position arrival threshold	RW	RPDO	0	0 to 2^{32}	Encoder Units	32-bit
6068	Position arrival time window	RW	RPDO	0	0 to 65535	1ms	16-bit
606C	Velocity actual value	RW	TPDO	0	-2^{31} to $(2^{31}$-1)	Instruction unit/s	32-bit
606D	Velocity arrival threshold	RW	RPDO	30	0 to 65535	rpm	16-bit

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
606E	Velocity arrival window time	RW	RPDO	100	0 to 65535	ms	16-bit
6071	Target torque	RW	RPDO	0	-3000 to 3000	0.1%	16-bit
6072	Maximun torque	RW	RPDO	3000	0 to 3000	0.1%	16-bit
6074	Torque instruction	RO	TPDO	0	-3000 to 3000	0.1%	16-bit
6077	Torque actual value	RO	TPDO	0	-3000 to 3000	0.1%	16-bit
607A	Target position	RW	RPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit	32-bit
607C	Home offset	RW	RPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit	32-bit
607F	Maximun velocity	RW	RPDO	13107200	0 to $(2^{32}-1)$	Instruction unit/s	32-bit
6081	Profile velocity	RW	RPDO	218453	0 to $(2^{32}-1)$	User position velocity unit	32-bit
6083	Profile acceleration	RW	RPDO	13107200	0 to $(2^{32}-1)$	Instruction unit/s^2	32-bit
6084	Profile deceleration	RW	RPDO	13107200	0 to $(2^{32}-1)$	Instruction unit/s^2	32-bit
6085	Quick stop deceleration	RW	RPDO	100	0 to $(2^{32}-1)$	User acceleration unit	32-bit
6086	Motion profile type	RW	RPDO	0	-2^{15} to $(2^{15}-1)$	-	16-bit
6087	Torque slope	RW	RPDO	1000	0 to $(2^{32}-1)$	0.1%/s	32-bit
6091: 01	Gear ratio	RW	RPDO	1	1 to $(2^{32}-1)$	-	32-bit
6091: 02	Motor revolutions	RW	RPDO	1	1 to $(2^{32}-1)$	-	32-bit
6098	Homing method	RW	RPDO	1	1 to 35	-	8-bit
6099: 01	velocity during search for switch	RW	RPDO	432537	0 to $(2^{32}-1)$	Instruction unit/s	32-bit
6099: 02	velocity during	RW	RPDO	218453	0 to	Instruction	32-bit

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
	search for zero				$(2^{32}-1)$	unit/s	
609A	Home acceleration	RW	RPDO	655360	0 to $(2^{32}-1)$	Instruction unit/s^2	32-bit
60B0	Position offset	RW	RPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit	32-bit
60B1	Velocity offset	RW	RPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit/s	32-bit
60B2	Torque offset	RW	RPDO	0	-3000 to 3000	0.1%	16-bit
60B8	Touch probe function	RW	RPDO	0	0 to 65535	-	16-bit
60B9	Touch probe status	RO	TPDO	0	0 to 65535	-	16-bit
60BA	Touch probe Pos1 Pos Value	RO	TPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit	32-bit
60BB	Touch Probe Pos1 Neg Value	RO	TPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit	32-bit
60BC	Touch Probe Pos2 Pos Value	RO	TPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit	32-bit
60BD	Touch Probe Pos2 Neg Value	RO	TPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit	32-bit
60C5	Max profile acceleration	RW	RPDO	0	0 to $(2^{32}-1)$	Instruction unit/s^2	32-bit
60C6	Maximun deceleration	RW	RPDO	0	0 to $(2^{32}-1)$	Instruction unit/s^2	32-bit
60D5	Probe 1 rising edge count	RO	TPDO	0	0 to 65535	-	16-bit
60D6	Probe 1 fallng edge count	RO	TPDO	0	0 to 65535	-	16-bit
60D7	Probe 2 rising edge count	RO	TPDO	0	0 to 65535	-	16-bit
60D7	Probe 2 falling edge count	RO	TPDO	0	0 to 65535	-	16-bit
60E0	Positive direction torque limit value	RW	RPDO	3000	0 to 3000	0.1%	16-bit
60E1	Negative direction torque limit value	RW	RPDO	3000	0 to 3000	0.1%	16-bit
60F4	Following deviation	RO	RPDO	-	-	Instruction unit	32-bit
60FC	Motor position instruction	RO	TPDO	-	-	Encoder units	32-bit

Object dictionary (Hex)	Name	Accessibility	Data mapping	Default	Data range	Unit	Data type
	feedback						
60FD	DI status	RO	TPDO	0	-	-	32-bit
60FE-01	Digital output object dictionary (physical output)	RW	RPDO	0	0 to 65535	-	32-bit
60FE-02	Digital output object dictionary (phsical output enable)	RW	RPDO	0	0 to 65535	-	32-bit
60FF	Target velocity	RW	RPDO	0	-2^{31} to $(2^{31}-1)$	Instruction unit/s	32-bit
6502	Supported drive modes	RO	TPDO	-	-	-	32-bit

11.2 List of fault and warning codes

Clearable: the panel can stop the fault display state by giving a "clear signal".
Stop immediately: The control action state stops immediately.

Code	Content	Cleanable	Immediately stop	Code	Content	Cleanable	Immediately stop
Er.01	Parameter damage		○	Er.34	Motor overload protection	✔	○
Er.02	Parameter storage error		○	Er.35	Electronic gear ratio exceeds limit	✔	○
Er.03	ADC reference source error		○	Er.36	Position deviation is too large	✔	○
Er.04	AD current sampling conversion error		○	Er.37	Abnormal torque saturation	✔	○
Er.05	Abnormal FPGA communication		○	Er.38	Main circuit electrical phase loss	✔	○
Er.06	Wrong FPGA program version		○	Er.39	Emergency stop	✔	○
Er.07	Clock exception		○	Er.40	Encoder battery failure	✔	○
Er.09	Abnormal network status switching	✔	○	Er.41	Motor (encoder) over temperature	✔	○
Er.10	Loss of synchronization	✔	○	Er.42	Encoder write fault	✔	○
Er.11	Unburned XML configuration file	✔	○	Er.43	Drive overload fault	✔	○
Er.12	Network initialization failed	✔	○	Er.44	Homing timeout fault	✔	○
Er.13	Synchroniza	✔	○	Er.45	Servo	✔	○

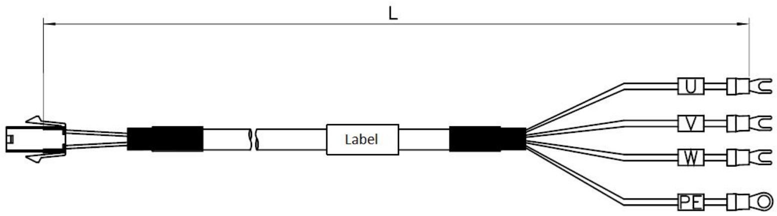
Code	Content	Cleanable	Immediately stop	Code	Content	Cleanable	Immediately stop
	tion period setting error				drive stall over temperature protection		
Er.14	Synchronization period error is too large	✔		Er.60	ADC conversion is not completed		○
Er.20	Overcurrent		○	Er.61	Internal software fault		○
Er.21	Main power supply is undervoltage	✔	○	Er.62	Internal software fault		○
Er.22	Main power supply is overvoltage	✔	○	Er.63	Internal software fault		○
Er.23	Braking resistor is not connected	✔	○	Er.64	Internal software fault		○
Er.24	The braking resistor is turned on abnormally		○	Er.65	Internal software fault		○
Er.25	Wrong motor model	✔	○	A-80	Power limit alarm	✔	
Er.26	Wrong motor model		○	A-81	Over velocity alarm	✔	
Er.27	Encoder is disconnected		○	A-82	Overload	✔	
Er.28	Encoder Z pulse is lost		○	A-83	Braking resistor is over temperature or overload	✔	
Er.30	Encoder UVW signal error		○	A-84	Parameter modification that	✔	

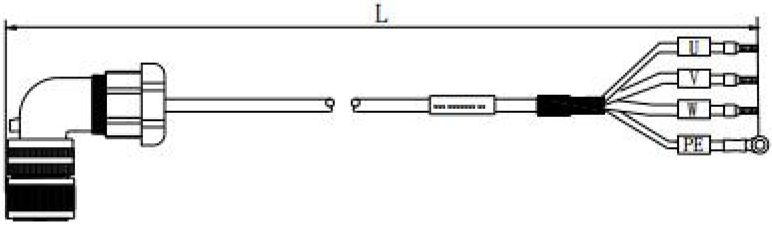
Code	Content	Cleanable	Immediately stop
Er.31	Power cable disconnection	✔	○
Er.32	Exceeding motor maximum velocity		○
Er.33	Power module is over temperature	✔	○

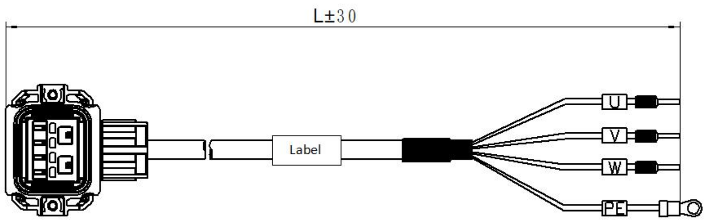
Code	Content	Cleanable	Immediately stop
	needs to be powered on again		
A-88	Main circuit instantaneous power failure	✔	
A-89	Duplicate DI port configuration	✔	
A-90	Duplicate DO port configuration	✔	
A-91	Parameter modification is too frequent	✔	
A-92	Encoder battery voltage low warning	✔	
A-93	Encoder read and write check is abnormal and frequency is too high	✔	

11.3 Wire

Table 11-1 Appearance of servo motor power cable

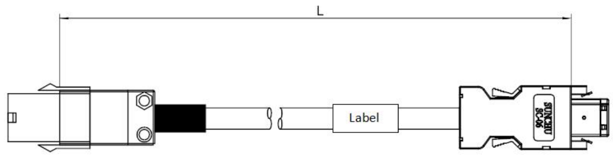
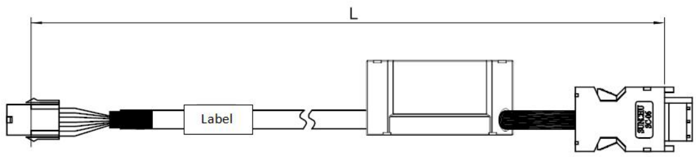
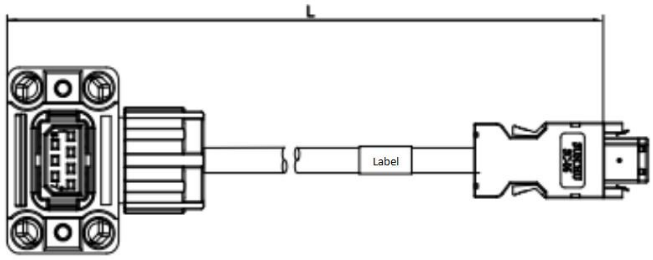
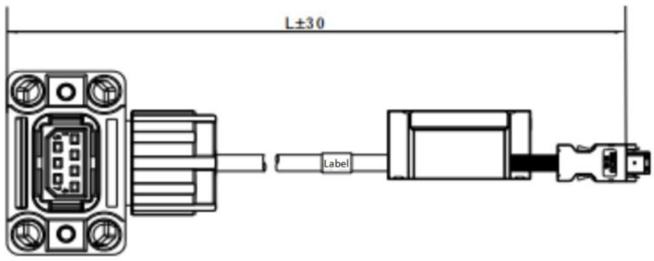
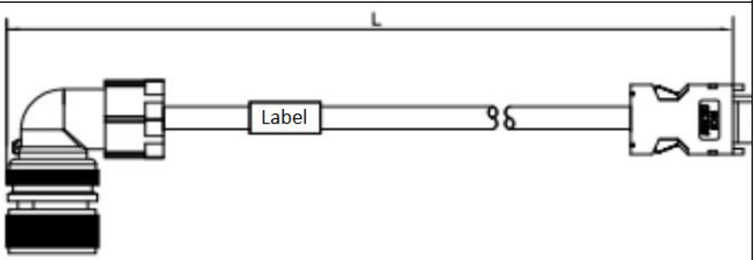
<table>
<tr><th>Wire type</th><th>Cable length L</th><th>Appearance drawing of cable</th></tr>
<tr><td>P-Z3O1-R4M-3MX4</td><td>3 meters</td><td rowspan="3">

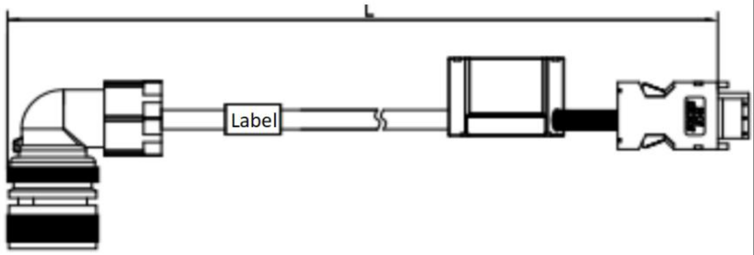
Suitable for [VD5L/E drive], which can connect [60/80 flange conductor motor]</td></tr>
<tr><td>P-Z3O1-R4M-5MX4</td><td>5 meters</td></tr>
<tr><td>P-Z3O1-R4M-10MX4</td><td>10 meters</td></tr>
<tr><td>P-Z3O1-H28J4M-3MX4</td><td>3 meters</td><td rowspan="3">

Suitable for [VD5L/E drive], which can connect [110 flange conductor motor]</td></tr>
<tr><td>P-Z3O1-H28J4M-5MX4</td><td>5 meters</td></tr>
<tr><td>P-Z3O1-H28J4M-10MX4</td><td>10 meters</td></tr>
<tr><td>P-Z3O1-MC4S-3MX4</td><td>3 meters</td><td rowspan="3">

Suitable for [VD5L/E drive], which can connect [60/80 flange conductor motor]</td></tr>
<tr><td>P-Z3O1-MC4S-5MX4</td><td>5 meters</td></tr>
<tr><td>P-Z3O1-MC4S-10MX4</td><td>10 meters</td></tr>
</table>

Table 11-2 Appearance diagram of servo encoder cable

Wire type	Cable length L	Appearance drawing of cable
E-J1394-R9M-3MX5-A	3 meters	 Suitable for [VD5L/E drive], which can connect [60/80 flange conductor motor (single-turn encoder)]
E-J1394-R9M-5MX5-A	5 meters	
E-J1394-R9M-10MX5-A	10 meters	
E-J1394-R9M-3MX7-A1	3 meters	 Suitable for [VD5L/E series drive], which can connect [60/80 flange conductor motor (multi-turn encoder)]
E-J1394-R9M-5MX7-A1	5 meters	
E-J1394-R9M-10MX7-A1	10 meters	
E-J1394-MC7S-3MX5-A	3 meters	 Suitable for [VD5L/E series drive], which can connect [60/80 flange connector motor (single-turn encoder)]
E-J1394-MC7S-5MX5-A	5 meters	
E-J1394-MC7S-10MX5-A	10 meters	
E-J1394-MC7S-3MX7-A1	3 meters	 Suitable for [VD5L/E series drive], which can connect [60/80 flange connector motor (multi-turn encoder)]
E-J1394-MC7S-5MX7-A1	5 meters	
E-J1394-MC7S-10MX7-A1	10 meters	
E-J1394-H28K7M-3MX5-A	3 meters	 Suitable for [VD5L/E series drive], which can connect [110 flange motor (single-turn encoder)]
E-J1394-H28K7M-5MX5-A	5 meters	
E-J1394-H28K7M-10MX5-A	10 meters	

Wire type	Cable length L	Appearance drawing of cable
E-J1394-H28K7M-3MX7-A1	3 meters	 Suitable for [VD5L/E series drive], which can connect [110 flange motor (multi-turn encoder)]
E-J1394-H28K7M-5MX7-A1	5 meters	
E-J1394-H28K7M-10MX7-A1	10 meters	

11.4 Correspondence of international standards

The products meet the requirements of EMC standards:
Certification information

Certification name	Certification symbol	Instruction Name		Standards	
CE certification	CE	EMC instruction	2014/30/EU	Servo drive Servo motor	EN 61800-3 C2

The VD5 series drives comply with European EMC Directive 2014/30/EU and meet the requirements of EN 61800-3 C2 under the following conditions.

① The recommended external EMC filter should be installed at the input terminal of the drive, and the shielded wire should be selected at the output terminal. Ensure the reliable grounding of the filter and 360° overlapping grounding of output cable shielding. For the selection of EMC filters, check "11.4.1 Hardware Requirements (1) EMC Filter Recommendations" below Table 11-3 Recommended manufacturers and models of EMC Input filters";

② The input terminal needs to be equipped with AC inductors that meet the requirements;

③ Shielded cable shall be used for driving cable between drive and motor. Please refer to below for cable selection and installation: "11.4.1 Hardware Requirements"【 (3) Cable requirements and wiring】";

④ Install the drive and wiring according to the recommended cable wiring method as below: "11.4.1 Hardware Requirements"【 (3) Cable requirements and wiring】";

⑤ Install a common mode filter if necessary.

11.4.1 Hardware requirements

(1) EMC filter recommendation

Recommended model: SCHAFFNER models are recommended as shown in the following table:

Table 11-3 Recommended manufacturers and models of EMC input filters

Series	Drive model	Rated input current IN	Filter model SCHAFFNER
VD5L-0xxSA1G			
Single-phase 220V	VD5L-003SA1G	0.9	FN 2090-1-06
	VD5L-010SA1G	3.6	FN 2090-4-06
	VD5L-014SA1G	6.7	FN 2090-8-06
	VD5L-015SA1G	6.7	FN 2090-16-06
VD5E-0xxSA1G			
Single-phase 220V	VD5E-003SA1G	0.9	FN 2090-1-06
	VD5E-010SA1G	3.6	FN 2090-4-06
	VD5E-014SA1G	6.7	FN 2090-8-06

Applicable to European EMC directives.

Servo drives and motors cannot be used in ordinary families or connected to low-voltage public communication circuits. The drive may send radio frequency if the similar loops above is connected.

For its application to EMC directives, please use noise filters and surge absorbers and ferrite magnetic rings. As for the EMC Directive's applies on machinery and equipment, and the final mechanical equipment for assembling drives and motors must be confirmed.

(2) Requirements for AC input inductors

The AC input inductor is mainly used to reduce the filtering in the input current. As an optional accessory, it should be external connect when the application environment has high harmonic requirements.

(3) Cable requirements and wiring

① Cable requirements

In order to meet the EMC requirements of CE marking, shielding cables with shielding layer must be used. Shielding cable has three phase conductors and four phase conductors. If the conductivity of the shielding cable layer cannot meet the requirements, a separate PE wire needs to be added. Or shielding cable with four phase conductors, one of which is PE wire. In order to effectively suppress the emission and conduction of radio frequency interference, the shielding layer of shielding wire is composed of coaxial copper braided tape. In order to increase shielding effectiveness and electrical conductivity, the braiding density of shielding layer should be greater than 90%.

② Wiring requirements

Motor cables and their PE shielded wire (twister shield) should be as short as possible to reduce electromagnetic radiation and stray current and capacitive current outside the cable. If the length of motor cable exceeds 100m, it is required to install output filter or dv/dt inductor. It is recommended that all control cables should be shielding cables. Motor cable wiring must be far away from other cable wiring. Motor cables of several drives can be wired side by side. It is recommended to put the motor cable, input power cables and control cables respectively distributed in different troughs. In order to avoid electromagnetic interference caused by rapid changes in the output voltage of the drive, long-distance side-by-side routing of motor cables and other cables should be avoided.

When the control cable must pass through the power cable, ensure that the included angle between the two cables is kept at 90 degrees as much as possible. Do not put other cables through the drive. The power input and output cables of the drive and weak current signal cables (such as control cables) should not be arranged in parallel as far as possible, but vertically when conditions permit. Cable troughs must be well connected and well grounded. Aluminum trough can be used to improve equipotential. Filters, drives and motors should be well overlapped with the system (machinery or device), and spraying protection should be done in the installation part, and conductive metals should be fully contacted.

(4) Leakage current suppression

Because the output of the drive is a high-velocity pulse voltage, high-frequency leakage current will be generated. Drive equipment will generate DC leakage current in protective conductor, and B-type (delay type) leakage protection circuit breaker must be used. If it’s necessary to install multiple drives, each drive shall be provided with a leakage protection circuit breaker.

11.4.2 Recommendations for common EMC issues

Drive products belong to strong interference equipment. When there are problems in wiring and grounding during use, interference may still occur. When interference with other equipment occurs, the following methods can be adopted for rectification.

Table 11-4 Common EMC interference problems and rectification methods

Interference states	Rectification method
Switch trip of leakage protection circuit breaker	◆Reduce the carrier frequency without affecting the performance; ◆Reduce the length of driving cable; ◆Add a magnet ring to the input drive; ◆If the power-on trips instantly, it is necessary to disconnect the large ground current at the input terminal; (Disconnect the ground of the external or internal filter and the ground terminal of the input port to the ground y capacitor) ◆In case of running or enabling trip, leakage current suppression measures should be installed at the input terminal. (Leakage current filter, safety capacitor and magnet ring, magnet ring)
Interference caused by drive running	◆The motor shell is connected to the PE end of the drive; ◆The PE terminal of the drive is connected to the power grid PE; ◆Add a magnet ring to input power; ◆Power supply or magnet ring is added to the interfered signal port; ◆Add additional common ground connection between devices.
Communication interference	◆Connect the motor shell to the PE end of the drive; ◆Connect the PE terminal of the drive to the power grid PE; ◆Add a magnet ring to input power cable; ◆Add matching resistors to the communication cable source and load terminal; ◆Differential cable of communication cable adds external communication common ground cable; ◆Shielded wires for communication cables, and the shielding layer is connected to the communication common place; ◆Multi-node communication wiring needs daisy chain, and the length of branch cable is less than 30cm.
I/O interference	◆Low-velocity DI increases capacitance filtering, and the maximum value is recommended to 0.1μF; ◆AI increases capacitance filtering, and the recommended maximum value is 0.22μF.

Notice

◆This series of products should strictly comply with EMC-related electrical installation requirements in the manual to meet EMC certification standards;
◆When the CE marking is attached to the equipment or device with this series of products, please confirm whether the final equipment or device meets the European unified standard, and the relevant responsibility shall be borne by the customer of the final assembled product;
◆For more product certification information, please consult our agent or sales person in charge.