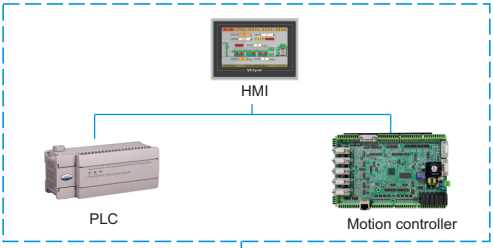
AC

Power supply

Single / three phase AC 220V/±15%

Circuit breaker(NFB)

Used to protect the drive from damage and cut off the power supply in case of over-current.



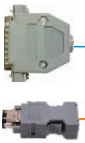
Host controller

CN1, I/O connector

I/O connector, connected to the host controller

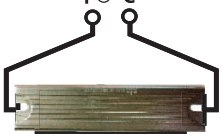
Magnetic contactor

When some abnormality occurs, the magnetic contactor can be switch off according to the servo drive fault output signal or other safety signal



L1
L2
P
C
U
V
W
PE

P⊕ C



CN2 encoder connector

For connecting encoder signal

AC synchronous servo motor

Brake resistor: optional

The function of brake resistor is used to avoid DC voltage too high caused by the servo motor deceleration or in power generating state.

If an external brake resistor is used, the brake resistor should be connected to the servo drive's P+ and C terminals, and leave the P+ and D terminals open-circuit.

If the internal brake resistor is used, short-circuit the P+ and D terminals, open-circuit between the P+ and C terminals.

1、Standard wiring for speed/torque control mode

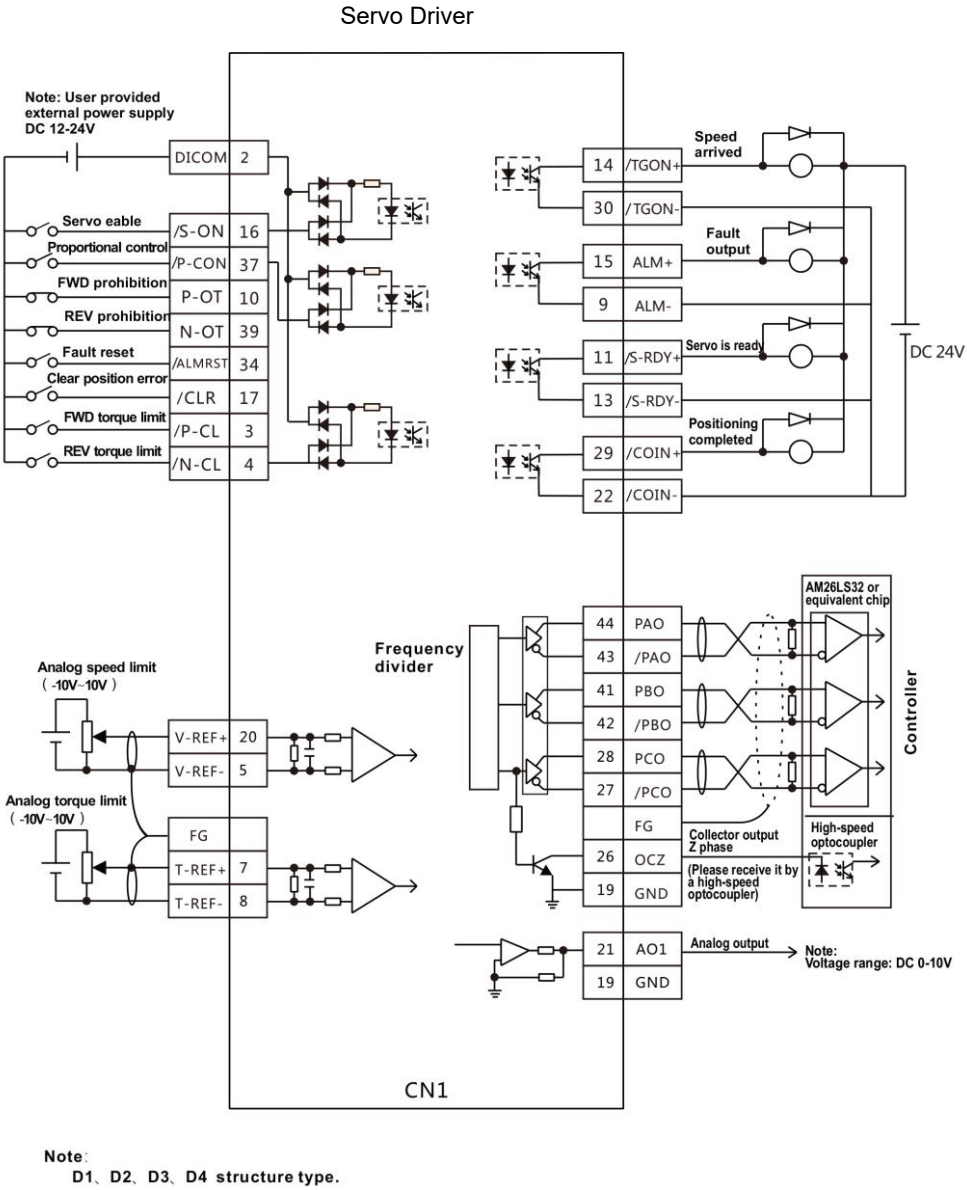


Figure 1-1 Standard wiring for VS510/VS512 speed/torque control

2、Standard wiring for position control mode

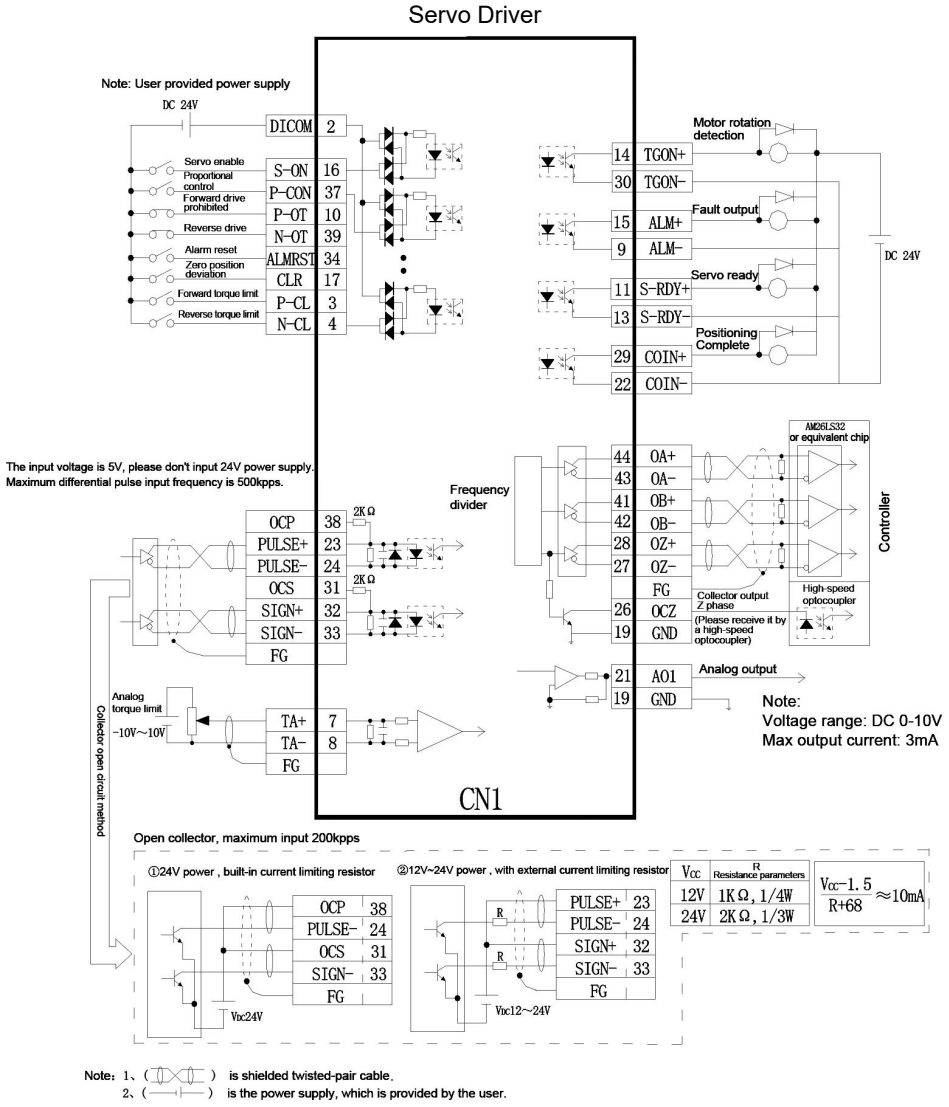


Figure 2-1 VS510/VS512 Position Control Standard Wiring

3、Wiring and Connection

3.1 Servo Part Components and Descriptions

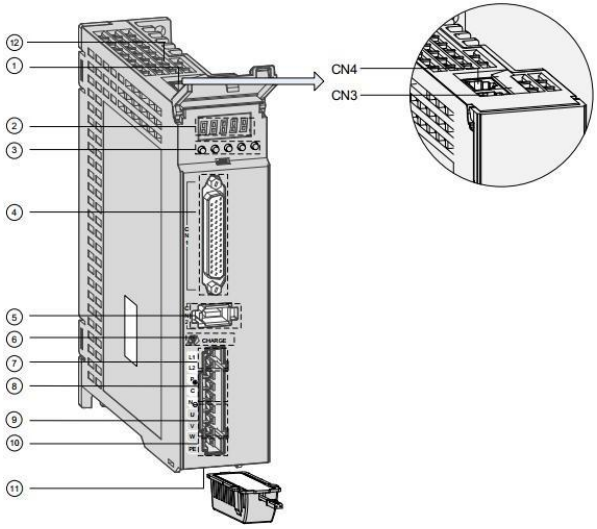


Figure 3-1 100W-750W Driver components and terminal arrangement

Note: 100W～750W without built-in braking resistor, need to connect external braking resistor in P and C ports.

No.	Component Name	Explanation
1	CN3、CN4 (Communication terminal)	EtherCAT communication command device connection, with CN3 as input and CN4 as output
2	LED display	5-bits seven-segment LED display the servo drive status and parameters
3	Key operator	MODE：Switch parameter mode ▲：Increase setting value ▼：Reduce setting value <<：shift key SET：Save modifications
4	CN1 (Control terminal)	Command input signal and other input/output signal terminals
5	CN2 (Encoder connection terminal)	Connect to the motor encoder
6	CHARGE(Bus voltage indicator light)	Used to indicate that the bus capacitor is in a charged state. When the indicator light is on, even if the main circuit power supply is on OFF， The internal capacitor of the servo still has charge, so please do not touch the power terminal to avoid electric shock
7	L1，L2 (Power input terminal)	Reference nameplate rated voltage level input power supply
	P，N (Servo bus terminal)	DC bus terminal
8	P，C (External brake resistor terminal)	When a braking resistor needs to be connected, connect the resistor between P and C
9	U、V、W (Motor terminal)	Connect servo motors U, V, W three-phase
10	Motor grounding terminal	Connect to the motor ground terminal
11	Installation position of battery box	When using an absolute value encoder, the battery pack can be installed in this position
12	USB interface	Connect with the upper computer

1kW～2kW Component Description

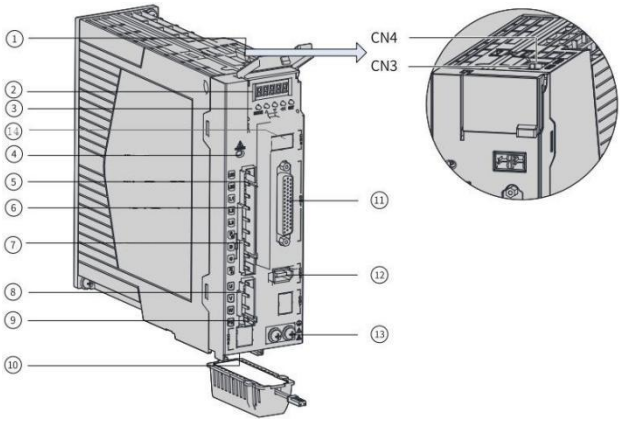


Figure 3-2 1kW～2kW Driver components and terminal arrangement

No.	Component Name	Explanation
1	CN3、CN4((Communication terminal)	EtherCAT communication command device connection, with CN3 as input and CN4 as output
2	LED display	5-bits seven-segment LED display the servo drive status and parameters
3	Key operator	MODE：Switch parameter mode ▲：Increase setting value ▼：Reduce setting value <<：shift key SET：Save modifications
4	CHARGE(Bus voltage indicator light)	Used to indicate that the bus capacitor is in a charged state. When the indicator light is on, even if the main circuit power supply is on OFF， The internal capacitor of the servo still has charge, so please do not touch the power terminal to avoid electric shock
5	L1C，L2C(Control circuit power input terminal)	Reference nameplate rated voltage level input control circuit power supply
6	R，S，T (Main circuit power input terminal)	Reference nameplate rated voltage level input main circuit power supply
7	P，D，C (External brake resistor connection terminal)	When an external braking resistor is needed (first remove the short-circuit between P and D), connect the resistor to P. Between C
	P，N(Servo bus terminal)	DC bus terminal
8	U、V、W(Motor terminals)	Connect servo motors U, V, W three-phase
9	Motor grounding terminal	Connect to the motor ground terminal
10	Installation position of battery box	When using an absolute value encoder, the battery pack can be installed in this position
11	CN1(Control terminal)	Command input signal and other input/output signal terminals
12	CN2(Encoder connection terminal)	Connect to the motor encoder
13	Servo drive grounding terminal	Connect to the power grounding terminal and perform grounding treatment
14	USB interface	Connect with the upper computer

3.2 Braking resistor connection

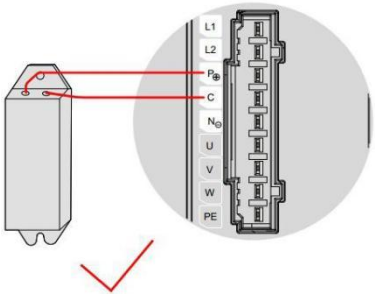


Figure 3-3 External brake resistor wiring

Warn
Precautions for wiring brake resistors: 1. Do not connect the braking resistor between P and N, as it may cause a short circuit or fire; 2. The resistance value of the braking resistor should not be less than the minimum resistance value, otherwise it may cause damage to the driver; 3. Please install the external braking resistor on non combustible materials such as metal; 4. When connecting external brake resistors to models with a power of 1kW or above, please remove the short circuit between P and D, otherwise it may cause over-current damage to the brake pipe.

4、 Communication port signal wiring (CN3, CN4 plugs)

The servo drive provides EtherCAT communication interface, which is led out through CN3 and CN4 sockets. When using EtherCAT models, CN3 is the input and CN4 is the output.

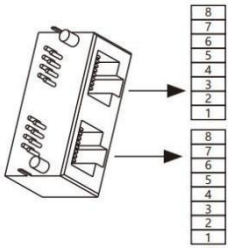
Outline Drawing	Pin number	Signal name	Abbreviation	Signal direction
	1	Sending data+	TD＋	Output
	2	Sending data-	TD-	Output
	3	Accept data+	RD+	Input
	4	Not used	—	—
	5	Not used	—	—
	6	Accept data -	RD-	Input
	7	Not used	—	—
	8	Not used	—	—

Figure4-1 CN3、CN4 Pin distribution

5、Detailed parameter list

Parameter	Name	Unit	Setting Range	Factory value	Effective method
Pn000	Basic Function Switch 0	——	0000～00B3	0010	Connect the power again

n.□□□×	Rotation direction selection	
	0	Take CCW direction as the forward rotation direction
	1	Using CW direction as the forward rotation direction (reverse mode)
	2-3	Keep parameters (do not change)

n.□□×□	Control mode selection	
	0	Speed control (analog command)
	1	Position control (pulse train command)
	2	Torque control (analog command)
	3	Speed control (contact command)
	4	Speed control (contact command) ← → Speed control (analog command)
	5	Speed control (contact command) ← → Position control (pulse train command)
	6	Speed control (contact command) ← → Torque control (analog command)
	7	Position control (pulse train command) ← → Speed control (analog command)
	8	Position control (pulse train command) ← → Torque control (analog command)
	9	Torque control (analog command) ← → Speed control (analog command)
	A	Speed control (analog command) ← → Speed control with fixed zero position
	B	Position Control (Pulse Train Instruction) ← → Position Control (Pulse Prohibition)
n.□×□□	Keep parameters (do not change)	

n.×□□□	Keep parameters (do not change)

6、Selection and setting of control operation

When using pulse trains for position control, please set the following user parameters:

User Parameters		Significance	
Pn000	n.□□1□	Control mode selection: Position control (pulse train instruction)	
Pn000	n.□□□×	0	Take CCW direction as the forward rotation direction
		1	Using CW direction as the forward rotation direction (reverse mode)
Pn50A	n.□□×□	0	External enablement is effective, and it takes effect after CN1-16 is turned on
		7	Keep the S-ON signal fixed as' valid '. Power on forced activation.
Pn216	0～65535	Position command acceleration/deceleration time parameter (unit: 0.1ms)	

6.1 Pulse wiring

6. 1.1 Collector pulse command input (built-in current limiting resistor)

Type	Signal name	CN1 Pin	Name
Input	OCP	CN1-38	24V collector open circuit input
	/PULSE	CN1-24	Command pulse input
	OCS	CN1-31	24V collector open circuit input
	/SIGN	CN1-33	Instruction direction input

6. 1.2 Differential pulse command input

Type	Signal name	CN1 Pin	Name
Input	PULSE	CN1-23	5V differential input
	/PULSE	CN1-24	Command pulse input
	SIGN	CN1-32	5V differential input
	/SIGN	CN1-33	Instruction direction input

6.2 Selection of input filter for signal instruction

Pn200	n.0□□□	Use linear drive signals to input instructions into filter 1. （～1Mpps)
	n.1□□□	Use the open collector signal to input instructions into the filter. （～200kpps）
	n.2□□□	Use linear drive signals to input instructions into filter 2. （1Mpps ～ 4Mpps）

6.3 Setting of input signal form for pulse command

Set the user parameter Pn200.0 according to the specifications of the command controller for the input pattern on the servo driver side.

Pn200	n.□□□0	Symbol+pulse, positive logic
	n.□□□1	CW+CCW pulse sequence, positive logic
	n.□□□2	90 ° phase difference two-phase pulse (A-phase+B-phase) with a 1-fold increment, positive logic
	n.□□□3	Reserve
	n.□□□4	90 ° phase difference two-phase pulse (A-phase+B-phase) with 4-fold increment， positive logic
	n.□□□5	Symbol+pulse sequence, negative logic
	n.□□□6	CW+CCW pulse sequence, negative logic

6.4 Electronic gear ratio setting

If the mechanical reduction ratio between the motor shaft and the load side is m/n, the set value of the electronic gear ratio can be calculated by the following equation. (When the servo motor rotates m turns and the load shaft rotates n turn)

$$\text{Electronic gear ratio } \frac{B}{A} = \frac{\text{Encoder resolution}}{\text{Displacement of the load shaft after one rotation (command unit)}} \times \frac{m}{n}$$

*17 bit encoder resolution is 131072 * 23 bit encoder resolution is 8388608

For example, the displacement of the 17 bit encoder motor shaft after one rotation is 1000, and the reduction ratio m/n is 1:1

$$\text{Then the electronic gear ratio } \frac{B}{A} = \frac{131072}{1000} \times 1$$

	Parameter	Set value
Electronic gear ratio	Pn20E	131072
	Pn210	1000

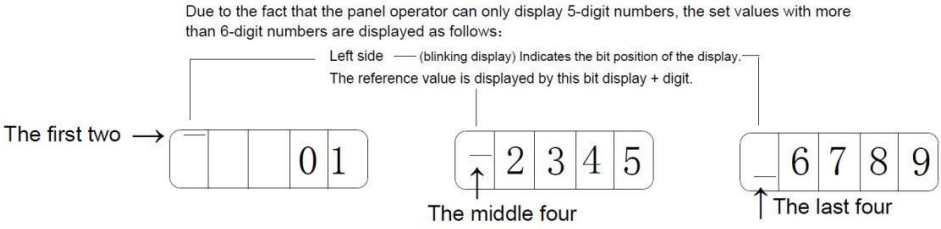
■ Important

The setting range of electronic gear ratio: 0.001 ≤ electronic gear ratio (B/A) ≤ 4000

When the above range is exceeded, the servo drive cannot operate normally. Please change the mechanical composition or instruction unit.

6.5 Gear ratio parameters Pn20E,Pn210 attention：

Pn20E and Pn210 are long parameters. As the keyboard digital display can only show five digits, the gear ratio parameters are divided into high, medium, and low settings. The set values are displayed as follows:



The resolution of the encoder can be confirmed by the servo motor model.

Motor model 1：VSM-□□□-□□□□□□□-□□□□

Sign	Specifications	Resolution ratio
C	17 bit single coil absolute value magnetic encoder	131072
B	23 bit multi turn absolute value optical encoder	8388608
E	Import 17 bit single coil absolute value magnetic encoder	131072
A	Import 23 bit multi circle absolute value optical encoder	8388608

7、Speed control operation

7.1.1 Analog speed mode setting

User Parameters		Significance	
Pn000	n.□□0□	Control mode selection: speed control (analog speed)	
Pn000	n.□□A□	Control mode selection: speed control (analog command) ← → speed control with fixed zero position, When the input voltage of the speed command (V-REF) is lower than the speed set by the zero fixed value (Pn501) in the ON state of the zero fixed signal (/P-CON or/ZCLAMP), the servo lock function is activated. At this point, a position loop is formed inside the servo unit, and the speed command will be ignored.	
Pn50A	n.□□×□	0	External enablement is effective, and it takes effect after CN1-16 is turned on.
		7	Keep the S-0N signal fixed as' valid '. Power on forced activation.

7.1 .2 Soft start setting

User Parameters	Significance
Pn305	Soft start acceleration time (unit: 1ms)
Pn306	Soft start deceleration time (unit: 1ms)
Pn307	Speed command filtering time constant (unit: 0.01ms)

7.1.3 /ZCLAMP Zero fixed position

User Parameters		Significance
Pn50A	n.□□□1	Change the allocation of sequential control input signals based on different signals.
Pn50D	n.□□□7	Keep the/ZCLAMP signal fixed as' valid '.
Pn501	10	Zero fixed value (unit: 1min-1)

The zero position fixed function refers to the function of servo locking when the input voltage of the speed command (V-REF) is lower than the speed set by the zero position fixed signal (/P-CON or /ZCLAMP) in the ON state. At this point, a position loop is formed inside the servo unit, and the speed command will be ignored.

7.1.4 Specification of speed command input signal

In order to control the speed of the servo motor in proportion to the input voltage, it is necessary to set the speed command input signal. Maximum input voltage: DC ± 10V

Type	Signal name	Connector pin number	Meaning
Input	V-REF+	CN1-20	Speed command input signal
	V-REF-	CN1-5	Speed command input signal with signal ground

7.1.5 Example of speed command input

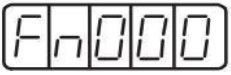
Rated speed of motor at Pn300=006.00: 6.00V [factory setting]

Speed command input	Rotation direction	Speed	750W motor
+6V	FWD	Rated speed	3000min-1
-3V	REV	1/2 Rated speed	-1500min-1
+1V	FWD	1/6 Rated speed	500min-1

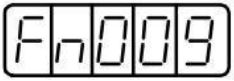
7.1.6 Operation steps for automatic adjustment of analog quantity

Attention: Please set the servo driver to servo OFF and input a 0V command voltage through the command controller or external circuit.

1. Press MODE key，Select the auxiliary function mode.



2. Press▲key or▼key，select automatic adjustment of instruction bias.

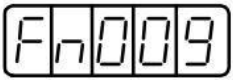


3. Press SET key display as follow:

4. Press MODE key automatic adjustment.

Blinking donE，return the display of the function number.

5. Press SET key，return the display of the function number.

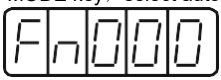


■ Additions

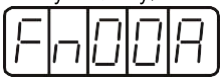
Please make sure to automatically adjust the instruction bias in the servo OFF state. Even if the initialization of parameter setting values (Fn005) is performed, the adjustment values cannot be initialized.

7.1.7 Operation steps for manual adjustment of analog quantity

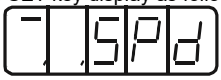
1. Press MODE key，select automatic adjustment of instruction bias.



2. Press ▲ key or ▼ key，Select automatic adjustment of instruction bias.



3. Press SET key display as follow:

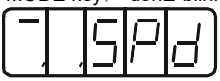


4. Press SET key，Display the current bias amount.

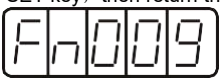
5. Press UP or DOWN key，adjust the motor to stop. This value is the offset:

（example）

6. Press MODE key，“donE”blinking display, then switch to the left image display.



7. Press SET key，then return the display of "Fn00A".



7.2 Basic settings for internal speed control

7.2.1 Internal speed command input signal

Type	Signal name	Connector pin number	Meaning
Input	/P-CON(/SPD-D)	CN1-37	Switch the rotation direction of the servo motor.
	/P-CL(/SPD-A)	CN1-3	Select the internal setting speed.
	/N-CL(/SPD-B)	CN1-4	Select the internal setting speed.

7.2.2 Internal speed mode setting

Parameter		Meaning
Pn000	n. □□3□	The control mode is selected as speed control using internal set speed control.

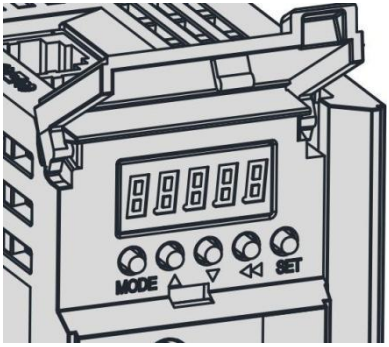
8.2.3 Selection of internal set speed

The internal set speed can be selected by the ON/OFF combination of the input signal.

Input signal			Motor rotation direction	Running speed
/P-CON(/SPD-D)	/P-CL(/SPD-A)	/N-CL(/SPD-B)		
OFF	OFF	OFF	FWD	Stop at internal speed 0.
	OFF	ON		Run at the internal set speed 1 set by Pn301.
	ON	ON		Run at the internal set speed of Pn302.
	ON	OFF		Run at the internal set speed of Pn303.
ON	OFF	OFF	REV	Stop at internal speed 0.
	OFF	ON		Run at the internal set speed 1 set by Pn301.
	ON	ON		Run at the internal set speed of Pn302.
	ON	OFF		Run at the internal set speed of Pn303.

8、The functions of the panel operator

The panel operator is a built-in operator composed of a panel display and panel switches on the front panel of the servo drive. The panel operator can be used to set various parameters, display operation instructions, status, etc.
Here is a description of the names and functions of the panel operation keys.

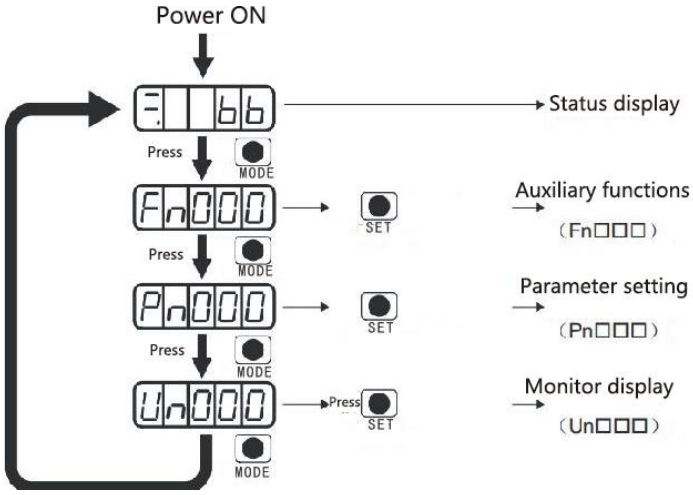


Key	Key Name	Function
MODE	Mode key	Press this key to select status display mode, parameter setting mode, monitoring mode, and auxiliary function mode. Press this key to save the settings and exit when setting parameters.
SET	Setting key	Press this key to display the settings and values of each parameter, as well as to enter the parameter setting state and clear alarms.
▲	Up-down key	Press this key to display the settings and values of each parameter. Press the INC key to increase the set value. Press the DEC key to decrease the set value.
▼	Flip button	
<<	Shift button	Used to select the current location that needs to be modified when setting parameters

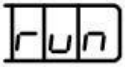
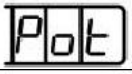
8.1 Switching between basic modes

By switching the basic modes of the panel operator, operations such as displaying the operating status, setting parameters, and executing commands can be performed.

The basic mode includes status display mode, parameter setting mode, monitoring mode, and auxiliary function mode. After pressing the MODE key, each mode will switch in the order shown in the following figure.



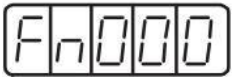
■ Status display code content

Brevity code	Display contents
	Base blockade in progress Servo OFF state. (The motor is in a non powered state)
	Running Servo ON status. (The motor is in a powered state)
	Prohibit forward drive state Indicates that the input signal (P-OT) is in an open circuit state.
	Prohibit reversing the driving state Indicates that the input signal (N-OT) is in an open circuit state.
	Alarm status Flashing display of alarm number

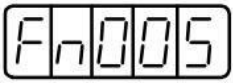
8.2 Operation to restore factory values

The following are the steps to restore the factory default values of parameters.

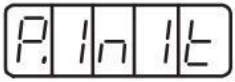
1. Press MODE key，Select the auxiliary function mode.



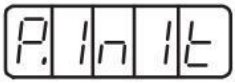
2. Press▲key or ▼key，Select the function number for restoring factory settings of parameters.



3. Press SET key，Enter the factory reset parameter mode.



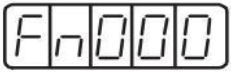
4. Press MODE key，Restore the parameters to factory values.
5. Blinking donE，Return the display of the function number.



8.3 Operation in JOG mode

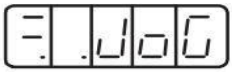
The following are the operating steps for running the motor in JOG mode.

Press MODE key，select the auxiliary function mode.



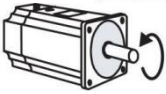
2. Press▲ key or ▼ key，select the function number for the Jog operation mode.

3. Press SET key，enter JOG operation mode.

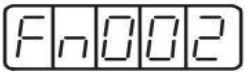


4. Press MODE key，enter the servo ON state (motor powered on).

5. Press the MODE key to switch between servo ON and servo OFF states. If you want to operate the motor, you must servo ON.
6. Press ▲ key or ▼ key，during the button press, the motor rotates at a speed of Pn304.



7. Press SET key，Return the display of the function number. At this time, the servo is turned off (the motor is not powered on).



WARN
Attention: When the display status of the short code is  , it indicates that the servo is in the ON state and the motor is powered on. At this time, it is not possible to restore the factory values of the parameters or perform jog operations.

9、List of Auxiliary Functions

Function code	Content
Fn000	Display alarm records
Fn002	JOG running
Fn003	Origin search
Fn004	Program JOG running
Fn005	Initialize parameter settings
Fn006	Clear alarm records
Fn008	Setting (initialization) of absolute value encoder and resetting of encoder alarm
Fn009	Automatic adjustment of analog (speed/torque) command bias
Fn00A	Manual adjustment of speed command bias
Fn00B	Manual adjustment of torque command bias
Fn00C	Adjust the bias of the analog monitoring output
Fn00D	Adjust the gain of analog monitoring output
Fn00E	Automatically adjust the bias of the motor current detection signal
Fn00F	Manually adjust the bias of the motor current detection signal
Fn010	Set parameter writing prohibition
Fn012	Display software version
Fn013	Set the upper limit value of the number of rotations when the alarm "Inconsistent upper limit value of the number of rotations (A.CC0)" occurs
Fn01B	Initialize the detection value of vibration detection
Fn01E	Confirm servo unit and motor ID
Fn020	Set the origin position
Fn030	Software reset
Fn200	Set no adjustment value
Fn201	Advanced automatic tuning
Fn202	Command input advanced automatic tuning
Fn203	Single parameter tuning
Fn204	A-type vibration suppression control function
Fn205	Vibration suppression function
Fn206	EasyFFT
Fn207	Online vibration monitoring

10、Monitoring Display List

Un number	Display content	Unit
Un000	Motor speed	min-1
Un001	Speed command	min-1
Un002	Internal torque command (value relative to rated torque)	%
Un003	Rotation angle 1 (number of encoder pulses starting from the C-phase origin: displayed in decimal)	Encoder pulse
Un004	Rotation angle 2 (angle from the origin of the magnetic pole (electrical angle))	deg
Un005	Input signal monitoring	—
Un006	Output signal monitoring	—
Un007	Input command pulse speed (only valid during position control)	min-1
Un008	Position deviation (only valid during position control)	Instruction unit
Un009	Cumulative load rate (value when rated torque is set to 100%: displays effective torque for a 10 second cycle)	%
Un00A	Regenerative load rate (value based on 100% renewable energy that can be processed: displays the regenerative power consumption for a 10 second cycle)	%
Un00B	DB resistor power consumption (based on the value of 100% of the power that can be processed during dynamic brake action: displaying the DB power consumption for a 10 second cycle)	%
Un00C	Input command pulse counter	Instruction unit
Un00D	Feedback pulse counter	Encoder pulse
Un00E	Fully closed-loop feedback pulse counter	Encoder resolution
Un012	Total running time	Unit 100ms
Un013	Feedback pulse counter	Instruction unit
Un014	Effective gain monitoring (first gain=1, second gain=2)	—
Un015	Safety input/output signal monitoring	—
Un020	Rated speed of motor	min-1
Un021	Maximum speed of motor	min-1
Un022	Peripheral device monitor (a monitor that displays usage status relative to the installation environment)%	%
Un140	Bus voltage	1V