



[V1.4]

SM22 Servo Drives User Manual (Brief Version)



Zhejiang Synmot Electrical Technology Co., Ltd

Preface

Thank you for purchasing our SM22 series servo drives. The SM22 servo drives are dedicated designed for general servo applications and hydraulic servo systems. In addition to standard servo drive functions, SM22 can also implement the control of hydraulic pumps, it is a cost effective servo drive in the middle to high power range.

The manual is guideline of SM22 series hydraulic servo drive in a brief version. It is a guideline for installation, parameter setting, on-site commissioning, troubleshooting and maintenance of the SM22 servo drives. Before using the servo drive, please read the manual carefully and keep well for further reference in order to properly using of servo drives. Agent and supporting staffs need to deliver the drive together with the manual to end customers.

Unpacking inspection:

Upon unpacking,

- 1) Please make sure the drive and motor's nameplate is same as what you ordered, the box contains the device, certificate of conformity, manual and warranty.
- 2) Please check appearance of damage and parts losing under delivery.
- 3) Any of the above appearance happen, please contact us or agent to solve the problem.

First usage:

Customers using the product for first time, please read the manual carefully. If you have any doubt concerning some functions and performance, please contact our engineers for technical advises, which is very important to correctly using of drive.

We reserve the right of commitment to the constant improvement of the servo drive, any amendment of data without prior notice.

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Chapter 1 Product Information

1.1 Order string of Synmot servo drives

S M - 22 - 15 D C - O R C

Designation	Company code
SM	Shortened form of Synmot

Designation	Serial number
10	General-purpose
20	1-G electrohydraulic
21	Water-cooled drive
22	2-G electrohydraulic

Designation	Max. power(W)
Double-digit power number + one letter	
A	x1
B	x10
C	x100
D	x1000
E	x10000
50A	50W
75B	750W
15D	15KW

Designation	Type of interface board
R	RS485
C	CAN
P	Powerlink

Designation	Position feedback
E	Incremental
A	Absolute
R	Resolving

Designation	Identification code
0	Standard
1	Identification code 1
...	...

Designation	Voltage class
A	One-phase 220V
B	Three-phase 220V
C	Three-phase 380V
D	Three-phase 480V
E	DC 300V

1.2 Outline of SM22 drives

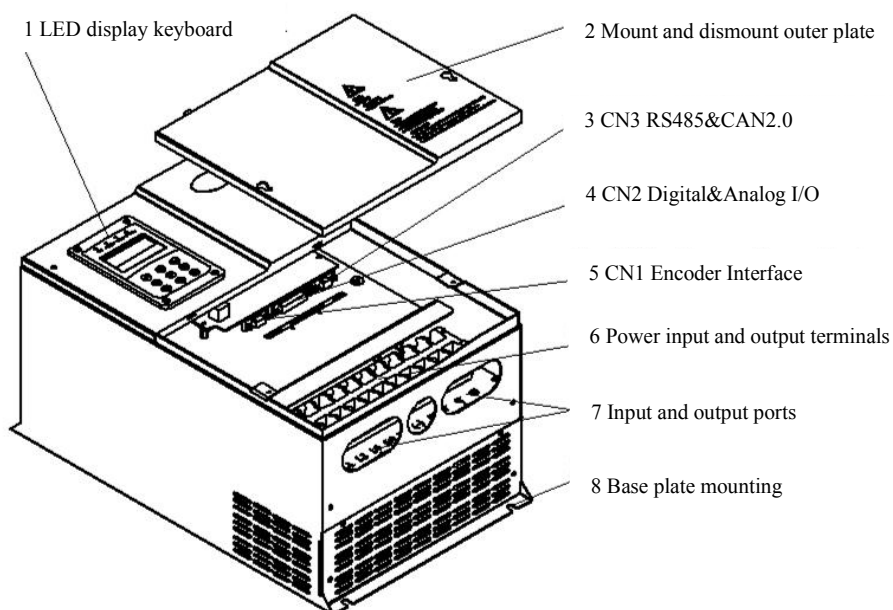


FIG. 1 Outline of SM22 series 11-90kW

1.3 SM22 drive series

Drive model	Input voltage (Vac)	Power capacity (KVA)	Rated power (kW)	Rated current (A)	Applicable pressure of injection	Applicable max. flow (L/min)
SM22-11DC-0RC	3PH AC 380V ±20%	17	11	25	17.5 MPa	65
SM22-15DC-0RC		21	15	32		70
SM22-18DC-0RC		24	18.5	37		85
SM22-22DC-0RC		30	22	45		110
SM22-30DC-0RC		40	30	60		150
SM22-37DC-0RC		57	37	75		180
SM22-45DC-0RC		69	45	90		220
SM22-55DC-0RC		85	55	115		260
SM22-75DC-0RC		114	75	150		360
SM22-90DC-0RC		134	90	175		420

1.4 Selection guide of braking resistors

Drive model	Recommended power of braking resistor	Recommended resistance	Braking unit	Built-in braking resistor
SM22-11DC-0RC	1000W	≥32Ω	Standard built-in	None
SM22-15DC-0RC	1000W			
SM22-18DC-0RC	2000W	≥16Ω		
SM22-22DC-0RC	2000W			
SM22-30DC-0RC	2500W			
SM22-37DC-0RC	5000W	≥8Ω		
SM22-45DC-0RC	5000W			
SM22-55DC-0RC	5000W			
SM22-75DC-0RC	5000W			
SM22-90DC-0RC	5000×2W			

1.5 Outline and mounting dimensions

Drive model	Location of mounting holes		Outline dimensions				Diameter of mounting holes	Weight (Kg)
	W1	H1	H	H2	W	D	R	
SM22-11DC-ORC	187	315	307	330	230	180	Ø7	12
SM22-15DC-ORC								
SM22-18DC-ORC	235	445	430	460	285	226	Ø8	21
SM22-22DC-ORC								
SM22-30DC-ORC								
SM22-37DC-ORC	260	580	544	600	384	265	Ø10	40
SM22-45DC-ORC								
SM22-55DC-ORC								
SM22-75DC-ORC	343	678	650	690	470	300	Ø10	66
SM22-90DC-ORC								

Table 1 Outline dimensions and mounting hole locations

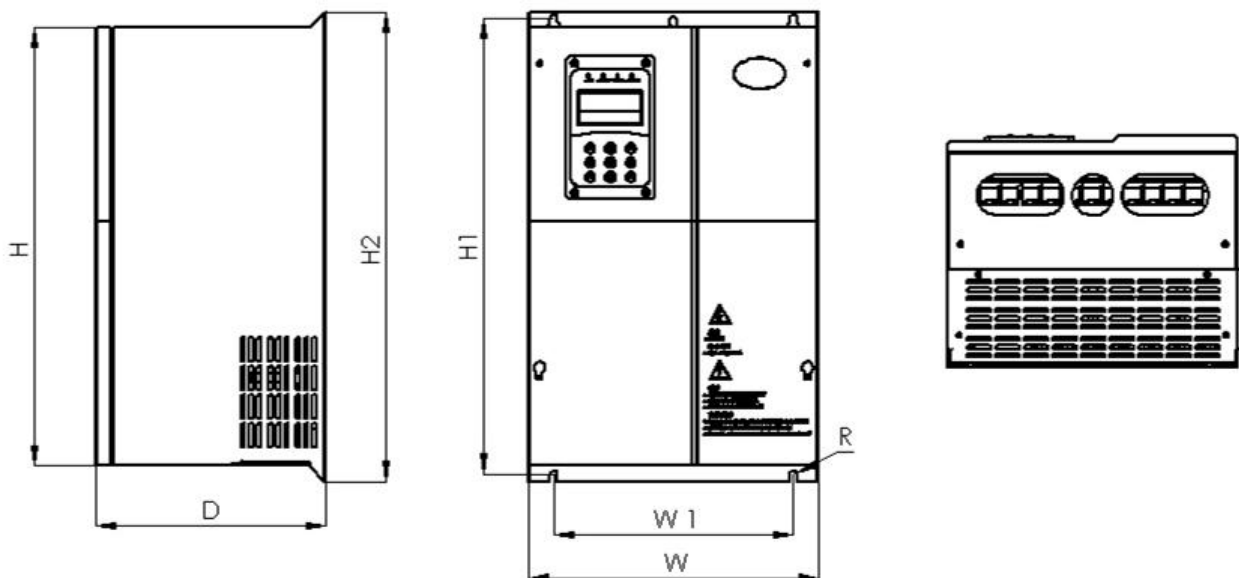


FIG. 2 Outline and mounting dimensions of SM22 series 11-90kW

Chapter 2 Operation Panel

The LED operation panel of the drives is provided with four status indicators, four unit indicators, eight keys and a 6-digit segment display. The LED operation panel is connected with the main control panel through an 8-core cable.

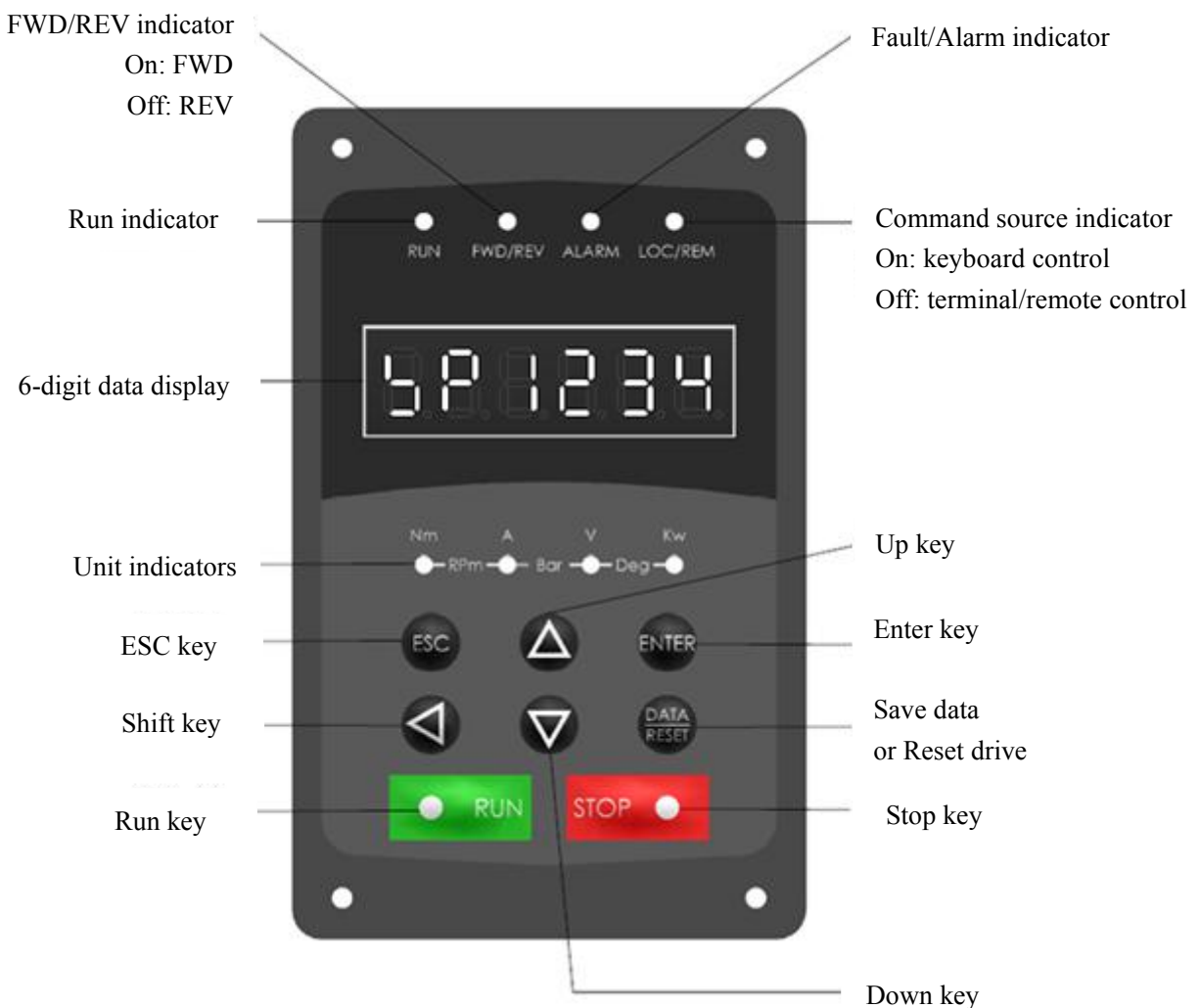


FIG. 3 Outside view

2.1 Function indicators

- RUN : run indicator, ON represents that the drive is running and OFF represents that the drive is stopped.
- FWD/REV: FWD/REV indicator, ON represents being in a reverse rotation and OFF for stopped or forward.
- ALARM : fault indicator, ON represents being in a fault state.
- LOC/REM : command source indicator, ON represents being controlled by keyboard and OFF for IO ports.

2.2 Unit indicator (●: represents the indicator is on, ○: represents the indicator is off)

- : Nm Unit of torque
- : A Unit of current
- : V Unit of voltage
- : kW Unit of power
- : Rpm Unit of speed
- : Bar Unit of pressure
- : Deg Unit of temperature

2.3 Operating of keyboard

Eight keys are available on the operation panel to perform the functions such as modifying data, and starting and stopping the drive.









Key	Name	Function
	ESC key	Back to the previous menu
	Enter key	Enter the next menu, and confirm functions and parameters
	Up key	Last data or function code
	Down key	Next data or function code
	Shift key	Switch the parameters displayed when the drive is running; Select a digit bit to be modified during data inputting.
	Data/reset	Reset and save modified parameters in a non-running state.
	Run key	When panel enabling is active, start the drive.
	Stop key	When panel enabling is active, stop the drive.



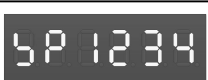

Table 2 Operating of keyboard

2.4 Segment LED display


6-digit segment LED displays are available on the operation panel to display the information about the drive such as state, parameters and monitoring data.

The operation of the keyboard and display has been organized into 4 layers of display interface, and named as Layer-0, 1, 2 and 3. In short, press **ENTER** key will enter the next layer of display interface, whilst press **ESC** will return to the last layer of display interface.

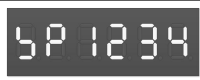







Layer-0 display interface:

	Ready	Ready for run
	Self-locking	The motor is in a self-locked or automatic tuning mode
	Running	The motor is running with data displayed, such as speed
	Fault	The servo drive has faults and displays a fault code.





Once the power is on, the 6-digit segment displays will display that the digits are counted down from 9~1 to 0 and enter the ready state. If the digits cycle between 5 and 1, and the 6-digit segment displays cannot enter the ready state, it indicates that the 3-phase current samples have a high zero drift, and the drive need a zero shift correction.

There are up to 26 operating parameters can be selected to be displayed in the panel. In between, 8 common operating parameters can be quickly selected through the shift key , when the drive is running.


8 common operating parameters

Display	Name	Function
	Motor speed	rotating speed of the motor, in rpm
	Output current	output current of the drive, in A, rms
	Output power	drive output power, in kW
	Output torque	output torque of the motor, in Nm
	Flow setting	flow setting is expressed by voltage values of 0~10V, in V
	Pressure setting	pressure setting value from a PC or PLC, in Bar
	Pressure feedback	measured pressure using a pressure sensor, in Bar
	DC Bus voltage	DC bus voltage of the drive, in V

Layer-1 display interface: function selection layer

	Data display	The next layer includes dP-00 ~ dP-25 and has 26 operating parameters can be monitored in total. The function of data monitoring can be enabled in any status.
	Parameter setting	The next layer includes Pr-000 ~ Pr-127 and has 128 user parameters in total. Viewing parameters can be directly done in any status. Modifying parameters can be done in a stopped status only for safety reason. Enter the parameter protection password Pr-000 before modifying parameters.
	Auxiliary functions	The next layer includes four auxiliary functions: Jog, Aut, Adj and Err. The auxiliary functions can be used in a stopped status only.
	Parameter storage	The next layer includes two parameter storage functions: SAV and dEF. The parameter storage can be used in a stopped status only. The operation of saving parameters is valid when modified parameters have been confirmed. Enter the parameter protection password Pr-000 before restoring factory settings.

Layer-2 display interface: Operating parameter display

	<p>Data display</p>	<p>Display the value of operating parameters through Enter key to select..Change monitored objects through Up key and Down key. Change the digit position to be modified through the shift key (flickering digit is valid)</p>
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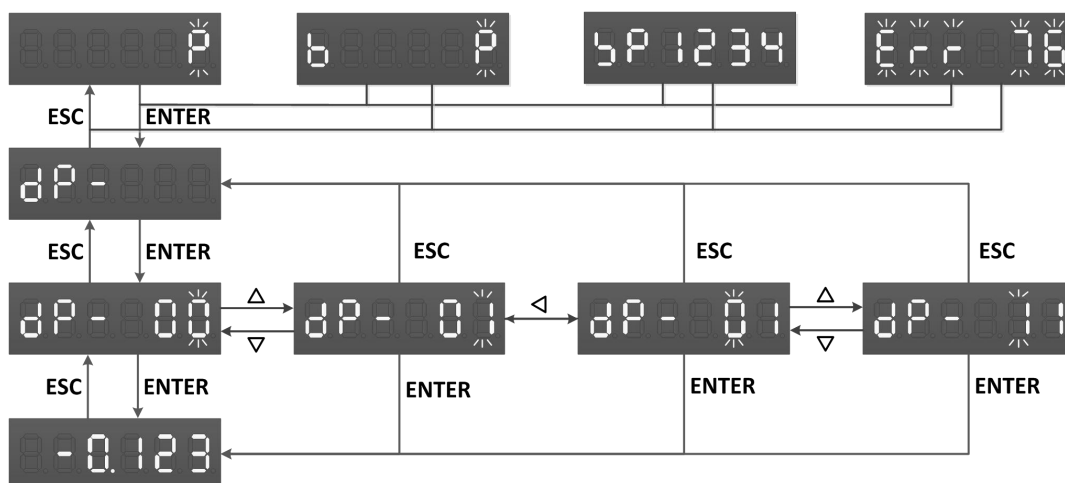


FIG. 4 Operation procedure of monitoring data

Display code	Name	Precision	Display code	Name	Precision
dP-00	motor speed	1 RPM	dP-13	rotor position	0.1°
dP-01	motor speed command	1 RPM	dP-14	input terminal status	—
dP-02	output current	0.1 A	dP-15	output terminal status	—
dP-03	output power	0.1 kW	dP-16	cumulative working time	1 H
dP-04	output torque	0.1 Nm	dP-17	cumulative power-on time	1 H
dP-05	drive temperature	0.1 DEG	dP-18	analog output-1	0.001 V
dP-06	motor temperature	0.1 DEG	dP-19	analog output-2	0.001 V
dP-07	Busbar voltage	0.1 V	dP-20	AD1 (after correction)	0.001 V
dP-08	Output voltage	0.1 V	dP-21	AD2 (after correction)	0.001 V
dP-09	AD1 (before correction)	0.001 V	dP-22	AD3 (after correction)	0.001 V
dP-10	AD2 (before correction)	0.001 V	dP-23	flow setting	0.01 V
dP-11	AD3 (before correction)	0.001 V	dP-24	pressure setting	0.1 Bar
dP-12	Electrical angle	0.1°	dP-25	pressure feedback	0.1 Bar

Table 3 List of operating parameters

Layer-2 display interface: auxiliary functions

Display	Name	Function
	Jog running	Start the jog function in any control mode. Press the UP key to enable running at a forward jogging speed Press the DOWN key to enable running at a forward jogging speed
	Automatic zero tuning	Automatically find the zero position of the motor, including dynamic and static zero setting.
	Zero drift correction	Automatically correct the zero drift of AD1, AD2 and AD3
	Fault recording	View the drive error records and time

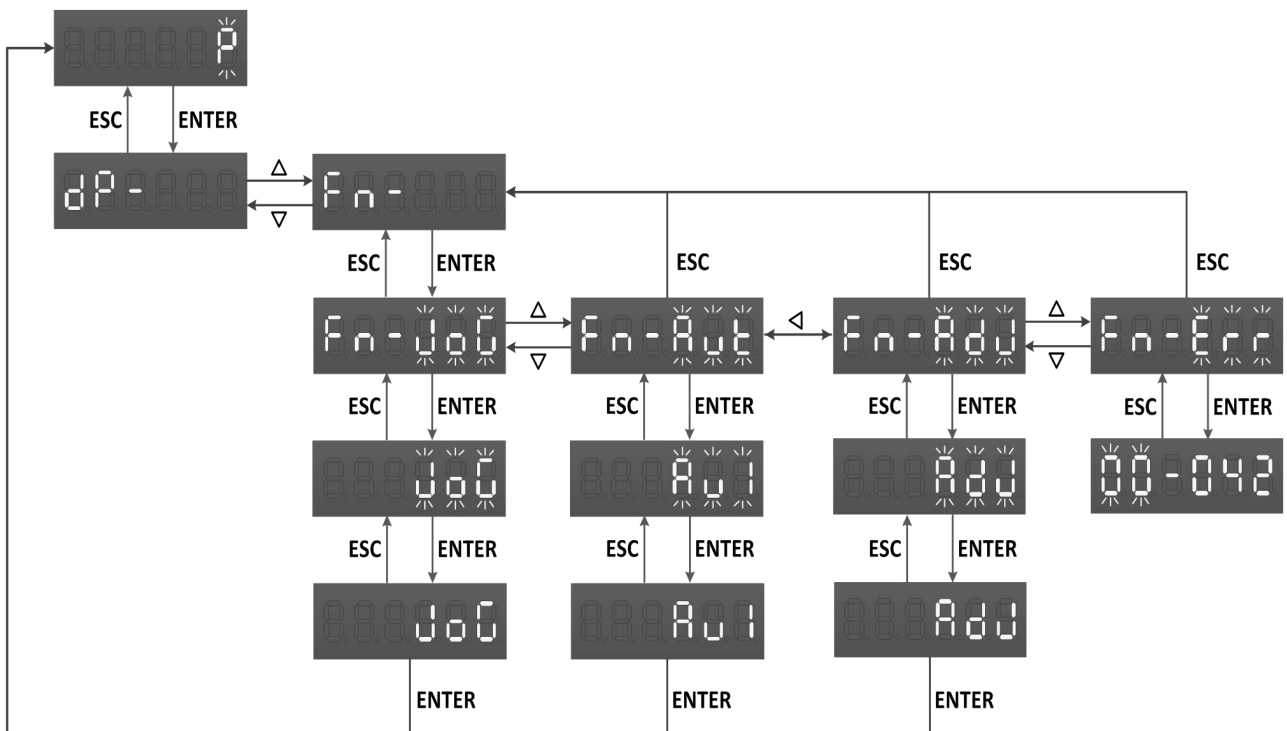




FIG. 5 Operation procedure of auxiliary functions

Layer-2 display interface: parameter storage

Display	Name	Function
	Save parameters	Parameters are saved and saved to EERPOM after modification
	Restore factory settings	User parameters are restored to factory settings

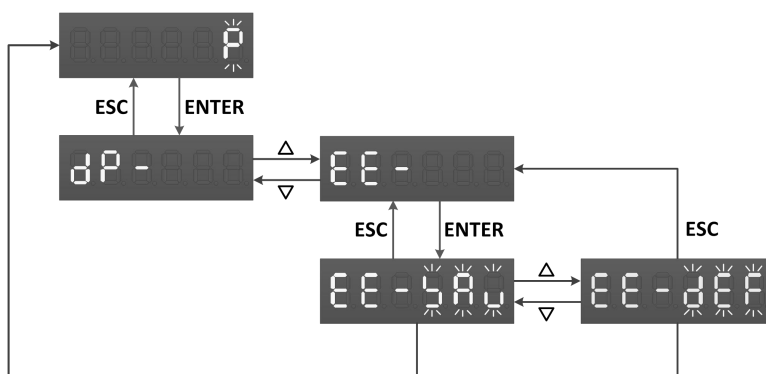



FIG. 6 Operation procedure of parameter storage

Layer 2 display interface: parameter setting

Display	Name	Function
	Parameter setting	View and modify drive parameters. Modification of the parameters requires entering passwords.

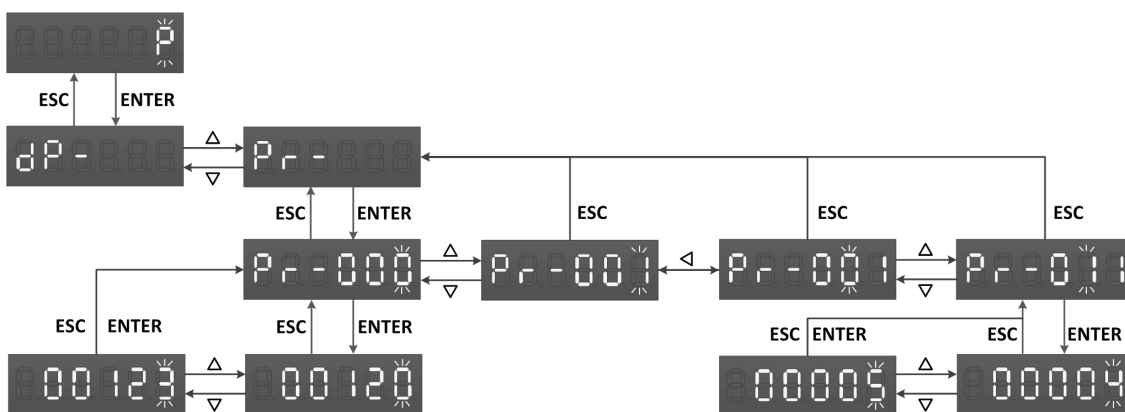






FIG. 7 Operation procedure of parameter setting

In Layer-3, both press the  key or the  key will return to Layer-2. The difference is that press  , it will cancel the modification of a parameter and return to Layer-2, while press  , it will save modified parameters as variables and return to the Layer-2.

2.5 Examples of operation

Example 1: dynamic zero setting

Fully open the overflow valve to ensure the motor has no load;

In "P" state, press **ENTER**; press the ▲ and ▼ keys to display "Fn-", and press **ENTER**; press the ▲ and ▼ keys to display "Fn-Aut";

Press **ENTER**. Press the ▲ and ▼ keys to display "Au1", and press **ENTER**. The display returns to "P" automatically. Connect servo-on signals, automatic zero tuning will begin.

Example 2: modify parameters

In "P" or "Err" state, press **ENTER**; press the ▲ and ▼ keys to display "Pr-", and press **ENTER**; when "Pr-000" is displayed, press **ENTER**;

Press the ▲ key to change "00120" into "00123", and press **ENTER**; press the ▲ and ▼ keys to display "Pr-XXX", and press **ENTER**;

Press the ▲ and ▼ keys to change "YYYYY" into "ZZZZZ", and press **ENTER**; press the DATA/RESET key to save parameters and restart the drive.

Example 3: jog running

In "P" or "Err" state, press Enter; press the ▲ and ▼ keys to display "Fn-", and press **ENTER**; press the ▲ and ▼ keys to display "Fn-Jog", and press **ENTER**. As the display "Jog" flickers, press **ENTER** to stop the flickering and the function will be started. Connect Servo-on signals, and the drive will enter a jog running status.

Only in **Layer-3**, press the ▲ key to make the motor inch forward, and press the ▼ key to make the motor inch reversely. If it will return to **Layer-2** interface as ESC is pressed, the function of jog running will be stopped and the drive will restore the original control mode. (Please stop the enable signals first before escape)

Example 4: panel enabling

Where Pr-100=1, panel enabling is active (the command source indicator is on), the start and stop of the drive is controlled by the RUN and STOP keys.

2.6 LCD operation panel and indicators

LCD operation panel

The LCD operation panel of the drives is provided with four operating state indicators, nine keys and a LCD displayer, as shown in figure 8. The LCD operation panel is connected with the main control board through an 8-core cable.

The drive software can work with either a LED or LCD operation panel. The selection of display panel is set by application parameter setting during manufacturing. The LED operation panel can only be recognized by the drives during setting in LED display mode. If there is no LCD operation panel installed in the drives, please don't select the LCD display mode. This may cause the LED display panel is not supported and cannot be modified back to the LED display mode.

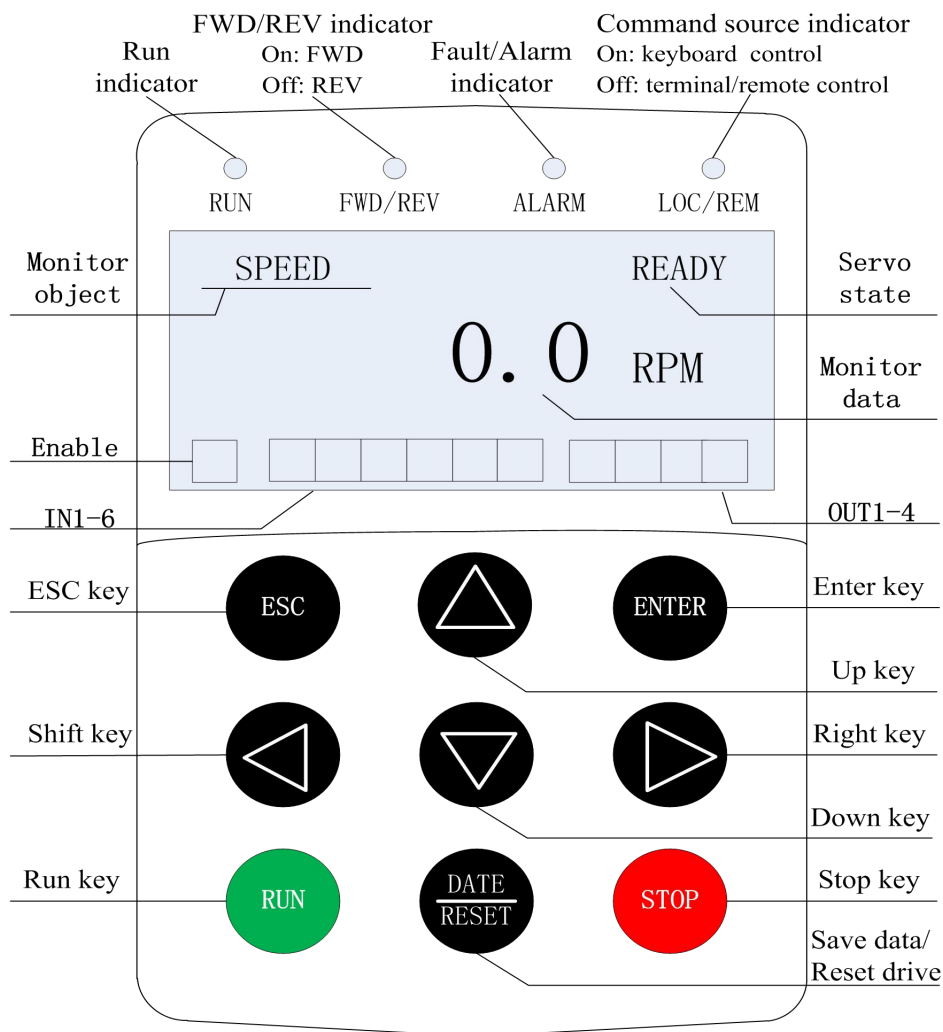


Fig.8 Outside view of LCD operation panel

- **RUN** : run indicator, ON represents that the drive is running and OFF represents that the drive is stopped.
- **FWD/REV** : FWD/REV indicator, ON represents being in a reverse rotation and OFF for stopped or forward.
- **ALARM** : fault indicator, ON represents being in a fault state.
- **LOC/REM** : command source indicator, ON represents being controlled by keyboard and OFF for IO ports.

2.7 LCD digital IO ports status display

There are eleven digital ports status indicators on the LCD display panel. ON indicates the inputs signal is valid, whilst OFF indicates the output is invalid. It consists of three sections from left to right:

- 1: servo-enable input status
- 2: 6 digital input IO status
- 3: 4 digital output IO status

2.8 Operating of LCD keyboards

There are nine keys on operation panel to implement the all kind of functions, including modifying parameter, starting and stopping the drive etc.










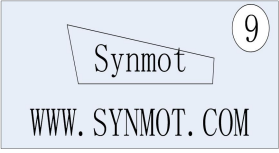

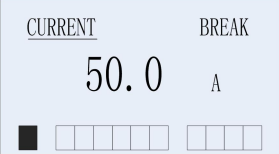
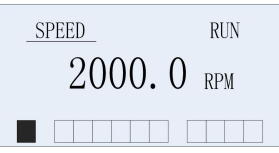




Key	Name	Function
	ESC key	Back to the previous menu
	Enter key	Enter the next menu, confirm functions or parameters
	Up key	Last data or function code
	Down key	Next data or function code
	Left key	Select the LCD parameters displayed when the panel is on Layer-0 or Layer-3
	Right key	Select a digit bit to be modified during data inputting
	Data/reset	Reset and save modified parameters in a non-running state
	Run key	When panel enabling is active, start the drive
	Stop key	When panel enabling is active, stop the drive

Fig.9 Function of keys

2.9 LCD displayer

The LCD displayer installed on the operation panel can display the information about the drive such as operating status, parameter setting, monitoring internal variable, and can also be selected to display Chinese or English.

Layer-0 display interface: status and data display layer (Change monitored objects through SHIFT key)

Display interface	Comment																								
	Power on and starting up interface																								
	Ready: Ready for run																								
	Self-locking: The motor is in a self-locked or automatic tuning mode																								
	Running: The motor is running with data displayed, such as speed																								
	Fault: The servo drive has an error and displays an error code																								
  	<p>On the menu of Layer-0, the monitored data can be cyclically switched through LEFT key and RIGHT key. (Switching the monitored data cannot be done in a fault status)</p> <table border="1"> <thead> <tr> <th>Items</th> <th>Display</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Motor speed</td> <td>Rotating speed of the motor, in rpm</td> </tr> <tr> <td>2</td> <td>Output current</td> <td>Output current of the drive, in A,rms</td> </tr> <tr> <td>3</td> <td>DC Bus voltage</td> <td>DC bus voltage of the drive, in V</td> </tr> <tr> <td>4</td> <td>Motor temperature</td> <td>Temperature of the motor, in °C</td> </tr> <tr> <td>5</td> <td>Drive temperature</td> <td>Temperature of the drive, in °C</td> </tr> <tr> <td>6</td> <td>Output power</td> <td>Drive output power, in KW</td> </tr> <tr> <td>7</td> <td>Run time</td> <td>Total running-time of the drive,in H</td> </tr> </tbody> </table>	Items	Display	Function	1	Motor speed	Rotating speed of the motor, in rpm	2	Output current	Output current of the drive, in A,rms	3	DC Bus voltage	DC bus voltage of the drive, in V	4	Motor temperature	Temperature of the motor, in °C	5	Drive temperature	Temperature of the drive, in °C	6	Output power	Drive output power, in KW	7	Run time	Total running-time of the drive,in H
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7	Run time	Total running-time of the drive,in H																							

Layer-1 display interface: functions selection layer

Display interface	Comment
<pre> * * MENU. MAIN * * >> 1: DATA. MON 2: PARA. SET </pre>	<p>Data display:</p> <p>Three monitored variables can be simultaneously viewed, which can be selected from D01 to D13 thirteen parameters.</p>
<pre> * * MENU. MAIN * * >> 2: PARA. SET 3: FUNC. AUX </pre>	<p>Parameter setting:</p> <p>Viewing parameters and modifying parameters.</p>
<pre> * * MENU. MAIN * * >> 3: FUNC. AUX 4: LANGUAGE </pre>	<p>Auxiliary functions:</p> <p>The next layer includes four auxiliary functions: automatic zero tuning, zero drift correction, jog running, fault recording.</p>
<pre> * * MENU. MAIN * * >> 4: LANGUAGE 1: DATA. MON </pre>	<p>Language setting:</p> <p>Selection the language between Chinese and English.</p>

Layer-2,3,4 display interface: function layer

1. Running data

Display interface	Comment																																				
<p>Layer-2: parameters setting</p> <pre> * * DATA. MON * * > D00: DISABLE D01: SPEED. M D02: CURRENT </pre> <p>Layer-3: parameters display</p> <pre> * * DATA. MON * * DISABLE: 0 SPEED. M: 50 CURRENT: 10.6 </pre>	<p>The selection of monitoring objects: three sets of monitoring data can be displayed on the interface. Select one set of data display through UP or DOWN key, change monitored objects through LEFT or RIGHT key. Set parameter, press ENTER key into Layer-3 display interface and display monitoring data. Data display as follows:</p> <table border="1"> <thead> <tr> <th>Items</th> <th>Name</th> <th>Items</th> <th>Name</th> </tr> </thead> <tbody> <tr> <td>D00</td> <td>Monitoring close</td> <td>D07</td> <td>Rotor position</td> </tr> <tr> <td>D01</td> <td>Motor speed</td> <td>D08</td> <td>Analog input-1</td> </tr> <tr> <td>D02</td> <td>Output current</td> <td>D09</td> <td>Analog input-2</td> </tr> <tr> <td>D03</td> <td>DC Bus voltage</td> <td>D10</td> <td>Analog input-3</td> </tr> <tr> <td>D04</td> <td>Output power</td> <td>D11</td> <td>Pressure setting</td> </tr> <tr> <td>D05</td> <td>Motor temperature</td> <td>D12</td> <td>Pressure feedback</td> </tr> <tr> <td>D06</td> <td>Drive temperature</td> <td>D13</td> <td>Flow setting</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Items	Name	Items	Name	D00	Monitoring close	D07	Rotor position	D01	Motor speed	D08	Analog input-1	D02	Output current	D09	Analog input-2	D03	DC Bus voltage	D10	Analog input-3	D04	Output power	D11	Pressure setting	D05	Motor temperature	D12	Pressure feedback	D06	Drive temperature	D13	Flow setting				
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D05	Motor temperature	D12	Pressure feedback																																		
D06	Drive temperature	D13	Flow setting																																		

2. Application parameter

Display interface	Comment
<p>Layer-2: parameter number setting</p> <pre data-bbox="228 696 531 864"> ** PARA. SET ** ----- PARA: PR-00<u>0</u> DATA: 120 ----- PARA. PASSWORD </pre> <p>Layer-3: parameter value setting</p> <pre data-bbox="228 1525 531 1693"> ** PARA. SET ** ----- PARA: PR-000 DATA: 0012<u>0</u> ----- PARA. PASSWORD </pre>	<p>Viewing/modifying drive parameters:</p> <p>Before modifying parameters, you need enter the parameter protection password Pr-000.</p> <p>In total, there are 128 user parameters which can be selected from Pr-000 to Pr-127. Press ENTER key into Layer-3 display interface and display parameter value after setting parameters number, modify parameter value through LEFT or RIGHT key as shown in the following figure:</p> <pre data-bbox="767 801 1109 965"> ** PARA. SET ** ----- PARA: PR-000 DATA: 0012<u>3</u> ----- -456 ~ 2000 </pre> <p style="text-align: right;">PARAMETER RANGE</p> <p>Press ENTER key again to save the parameter value and return to Layer-2 as the following figure.</p> <p>(Note: During modifying the parameter protection password Pr-000, if the password is correct, press ENTER key can back to Layer-2 and directly skip to Pr-010.)</p> <pre data-bbox="754 1541 1109 1720"> ** PARA. SET ** ----- PARA: PR-01<u>0</u> DATA: 5 ----- POLE PAIR NO </pre> <p style="text-align: right;">PARAMETER NAME</p> <p>Modified parameters, press DATA/RESET key for long time to save parameters and automatically reset the drive.</p>

3. Auxiliary functions

Display interface	Comment
Function one: automatic zero tuning	
<p>Layer-2 Function selection</p> <pre data-bbox="225 412 531 555"> ** FUNC. AUX ** FUNC: AUTO RUN MODE: OFF FUNC1: AUTO RUN </pre> <p>Layer-3 Mode selection</p> <pre data-bbox="225 698 531 842"> ** FUNC. AUX ** FUNC: AUTO RUN MODE: MODE2 STATIC RUN:ON </pre> <p>Layer-4 Function application</p> <pre data-bbox="225 985 531 1128"> ** FUNC. AUX ** FUNC: AUTO RUN MODE: MODE2 D06: 50.0 °C </pre>	<p>On Layer-2 interface, select automatic zero tuning function through UP or DOWN key and press ENTER key into Layer-3.</p> <p>On Layer-3 interface, select zero tuning mode through UP or DOWN key. The one mode is dynamic zero tuning and the other is static zero tuning, while press ENTER key into Layer-4 to enable the function.</p> <p>On Layer-4 interface, the function of automatic zero tuning is enabled. Note: only on the interface zero tuning can be done. On Layer-4 interface, press SHIFT key can change monitoring parameters. It has been changed into D06 as shown in the left figure.</p>
Function two: zero drift correction	
<p>Layer-2 Function selection</p> <pre data-bbox="225 1359 531 1503"> ** FUNC. AUX ** FUNC: AUTO DRI MODE: OFF FUNC2: DRI. ADJ </pre> <p>Layer-3 Switch selection</p> <pre data-bbox="225 1646 531 1789"> ** FUNC. AUX ** FUNC: AUTO DRI MODE: ON SELT ADJ: ON </pre> <p>Layer-4 Function application</p> <pre data-bbox="225 1933 531 2076"> ** FUNC. AUX ** FUNC: AUTO DRI MODE: ON D01: 0 RPM </pre>	<p>On Layer-2 interface, select zero drift correction function through UP or DOWN key and press ENTER key into Layer-3.</p> <p>On Layer-3 interface, select zero drift through UP or DOWN key, press ENTER key into Layer-4 to enable the function.</p> <p>On Layer-4 interface, zero drift correction function is enabled. Automatically correct the zero drift of AD1, AD2 and AD3 and restart the drive.</p>

Display interface	Comment
Function three: jog running	
<p>Layer-2 Function selection</p> <pre> ** FUNC. AUX ** FUNC: JOG MODE MODE: OFF FUNC3: JOG RUN </pre> <p>Layer-3 Switch selection</p> <pre> ** FUNC. AUX ** FUNC: JOG MODE MODE: ON JOG MODE: ON </pre> <p>Layer-4 Function application</p> <pre> ** FUNC. AUX ** FUNC: JOG MODE MODE: ON D01: 0 RPM </pre>	<p>On Layer-2 interface, select the jog running through UP or DOWN key and press ENTER key into Layer-3.</p> <p>On Layer-3 interface, select the jog running through UP or DOWN key, press ENTER key into Layer-4 to enable jog function.</p> <p>On Layer-4 interface, when the jog function is selected and servo-on is enabled, press UP key to drive the motor rotating forward at a jogging speed, press DOWN key to drive the motor rotating backward at a jogging speed.</p> <p>Note: To turn off the jog function, need disable servo-on input, then press ESC key to exit the Layer-4 interface.</p>
Display interface	Comment
Function four: restore factory setting	
<p>Layer-2 Function selection</p> <pre> ** FUNC. AUX ** FUNC: PAR. REC MODE: OFF FUNC4: PAR. REC </pre> <p>Layer-3 Switch selection</p> <pre> ** FUNC. AUX ** FUNC: PAR. REC MODE: ON PAR. RECO: ON </pre> <p>Layer-4 Function application</p> <pre> ** FUNC. AUX ** FUNC: PAR. REC MODE: ON D00: 0 </pre>	<p>On Layer-2 interface, select the factory setting through UP or DOWN key and press ENTER key into Layer-3.</p> <p>On Layer-3 interface, select the restoring factory setting through UP or DOWN key, press ENTER key into Layer-4 to enable the settings.</p> <p>On Layer-4 interface, factory setting is restored and the drive is automatically restarted.</p>

4. Panel language

Display interface	Comment
<p>Layer-2 Language selection</p> <pre> ** LANGUAGE ** >> CHINESE ENGLISH </pre> <p>Layer-3 Language usage</p> <pre> ** LANGUAGE ** CHINESE >> ENGLISH </pre>	<p>On Layer-2 interface, select Chinese or English through UP or DOWN key and press ENTER key into Layer-3.</p> <p>Change language to English.</p>


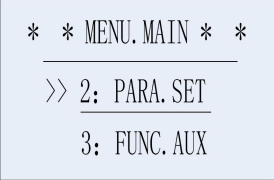
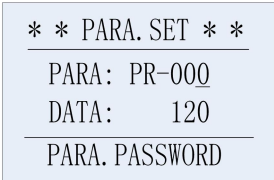
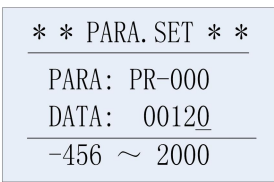
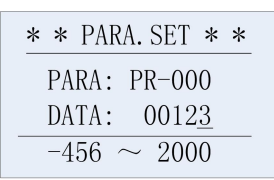
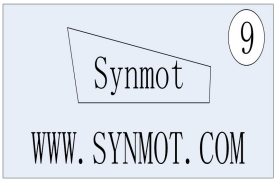
2.10. Examples of LCD operation

Example 1: dynamic zero setting

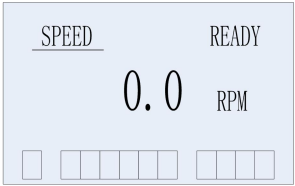
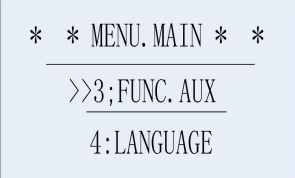
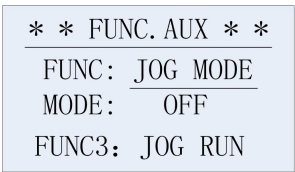
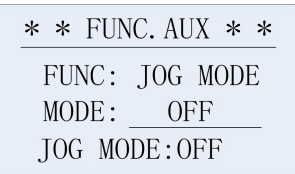
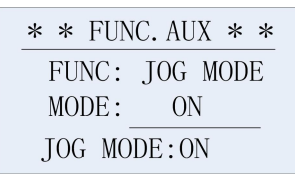
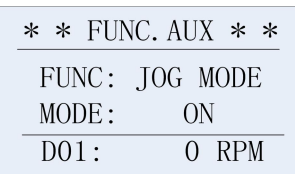
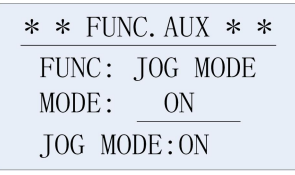
Fully open the over flow value to ensure the motor has no load.

Display interface	Comment
<pre> SPEED READY 0.0 RPM [] [] [] [] [] [] [] [] </pre>	<p>1. Enter the ready state.</p>
<pre> ** MENU. MAIN ** >> 3: FUNC. AUX 4: LANGUAGE </pre>	<p>2. Enter the main menu, select auxiliary functions.</p>
<pre> ** MENU. MAIN ** MODE: AUTO RUN MODE: OFF FUNC1: AUTO RUN </pre>	<p>3. Enter auxiliary functions menu, select automatic zero tuning in the function section.</p>
<pre> ** FUNC. AUX ** FUNC: AUTO RUN MODE: MODE1 DYNAMIC RUN: ON </pre>	<p>4. Select the mode of dynamic zero tuning on the auxiliary functions menu mode.</p>
<pre> ** FUNC. AUX ** FUNC: AUTO RUN MODE: MODE1 D06: 50.0 °C </pre>	<p>5. Press ENTER key into Layer-4 to enable the function.</p>
<pre> Synmot (9) WWW.SYNMOT.COM </pre>	<p>6. When the enable is open, start automatic zero tuning. Accomplish zero tuning and automatically reset.</p>

Example 2: modifying parameters

Display interface	Comment
 <p>SPEED 0.0 RPM READY</p>	<p>1. Enter ready or alarm state on Layer-0 menu.</p>
 <p>* * MENU.MAIN * * >> 2: PARA.SET 3: FUNC.AUX</p>	<p>2. Enter the main menu, select application parameters setting.</p>
 <p>* * PARA.SET * * PARA: PR-000 DATA: 120 PARA. PASSWORD</p>	<p>3. Enter parameters setting interface and set a parameter number.</p>
 <p>* * PARA.SET * * PARA: PR-000 DATA: 00120 -456 ~ 2000</p>	<p>4. Press ENTER key and set parameters value.</p>
 <p>* * PARA.SET * * PARA: PR-000 DATA: 00123 -456 ~ 2000</p>	<p>5. Press ENTER key and save the modified parameter value, back to parameter number setting.</p>
 <p>Synmot WWW.SYNMOT.COM</p>	<p>6. Steps 1~5 is the process of modifying parameter-000. The other parameters can be modified in a similar way. After modifying the parameters, press DATA/RESET key to save parameters to EEPROM and restart the drive.</p>

Example 3: jog running

Display interface	Comment
	<p>1. Enter ready state on Layer-0 menu as in the left figure.</p>
	<p>2. Press UP key to select auxiliary functions as in the left figure.</p>
	<p>3. Press UP key to select jog functions.</p>
	<p>4. Press ENTER key into Layer-3 interface as in the left figure.</p>
	<p>5. Press UP key to open function as in the left figure.</p>
	<p>6. Press ENTER key into Layer-4 interface to open function.</p>
	<p>7. When the servo-on input is enabled, press UP key to drive the motor rotating forward at a jogging speed, press DOWN key to drive the motor rotating reversely at a jogging speed. The jogging speed is set by parameter Pr-049.</p> <p>When the servo-on input is disabled, press ESC key to exit the Layer-4 interface and turn off the jog function.</p>

3.2 Definitions of CN1 terminals for encoders

Pin	Incremental encoder		Absolute encoder		Resolver	
	Name	Mark	Name	Mark	Name	Mark
1	Input of encoder phase A	A+	ABS-1 input	ABS-1	SIN signal	SIN+
2		A-	ABS-1N input	ABS-1 N		SIN-
3	Input of encoder phase B	B+	—	—	COS signal	COS+
4		B-	—	—		COS-
5	Input of encoder phase Z	Z+	—	—	R excitation signal	REF+
6		Z-	—	—		REF-
7	Input of encoder phase U	U+	—	—	—	—
8		U-	—	—	—	—
9	Input of encoder phase V	V+	—	—	—	—
10		V-	—	—	—	—
11	Input of encoder phase W	W+	—	—	—	—
12		W-	—	—	—	—
13	5V supply	5V	5V supply	VCC	—	—
14	5V ground	GND	5V ground	GND	5V ground	GND
15	Motor temperature sensor	RT1	Motor temperature sensor	RT1	Motor temperature sensor	RT1

3.3 Definitions of CN2 terminals for control signals

Pin	Terminal name	Mark	Description
25	Digital GND	GND	Digital GND of the drive
30	24V	+24V	Provide a 24V internal power supply. The load current shall not exceed 100 mA.
29	Input has a common anode	COM+	Digital input ports have a common anode DC12~24V, current $\leq 100\text{mA}$.
11	Servo enabling	Servo	Input terminal of servo-on
12	Programmable digital input port	IN1	Programmable digital input port. Specific output signals can be independently set by the user parameter Pr-080~Pr-085.
13		IN2	
14		IN3	
15		IN4	
27		IN5	
28		IN6	
40	Programmable digital output port	OUT1B	Programmable digital output port. Specific output signals can be independently set by the user parameters Pr-086~Pr-089. The maximal load of OUT1 is 2.0A 30V. The maximal load of OUT2 is 100mA 30V. The maximal load of OUT3, 4 is 30mA 30V.
41		OUT1A	
42		OUT2A	
43		OUT3A	
44		OUT4A	
26	Output has a common cathode	COM-	The digital output ports 1, 2 and 3 have a common cathode
10	Cathode of OUT4	OUT4COM-	Cathode of digital output port 4
9	+10V	10V	The internal +10V power supply of the analog circuit. The load current shall not exceed 100 mA.
37	Analog GND	GNDA	Analog GND of the drive
7	Differential double-end bipolar input	AIN1+	Differential double-end bipolar analog voltage input (intended for flow given) In case of double-end differential connection, the input voltage range: -5V~+5V In case of single end grounding, the input voltage range: -10V~+10V
8		AIN1-	
21	Unipolar input	AIN2+	Unipolar analog voltage input. The reference point is GNDA (intended for pressure given) Input voltage range: 0~10V

Pin	Terminal name	Mark	Description																		
24	Differential unipolar input	AIN3+	Unipolar analog voltage input. The reference point is GNDA (intended for pressure feedback) Input voltage range: -10V~+10V																		
23		AIN3-																			
6	Analog voltage output 1	DAC1	Analog voltage output 1. The reference point is GNDA. Output voltage range: -10V~+10V Output signals can be set by the user parameters Pr-091 (DAC1) and Pr-101 (DAC2).																		
22	Analog voltage output 2	DAC2																			
39	Motor temperature sensor	RT1	Input of motor temperature sensor. It is a same input as Pin 15 on CN2. Users can select one to connect the sensor.																		
36	Analog GND	GNDA	Analog GND of the drive																		
3	Output of encoder phase A	OA+	+ signal output of encoder phase A after frequency division																		
4		OA-	— signal output of encoder phase A after frequency division																		
19	Output of encoder phase B	OB+	+ signal output of encoder phase B after frequency division																		
18		OB-	— signal output of encoder phase B after frequency division																		
1	Output of encoder phase Z	OZ+	+ signal output of encoder phase Z																		
2		OZ-	- signal output of encoder phase Z																		
5	Collector output of phase Z	CZ	Collector output of encoder phase Z																		
20	Encoder signal GND	GND	Encoder signal GND																		
32	Position pulse phase A signal input	Pulse+	<table border="1"> <thead> <tr> <th colspan="3">The drive can receive four types of command pulses</th> </tr> <tr> <th>Command type</th> <th colspan="2">Output wave of corresponding pins</th> </tr> <tr> <td rowspan="2">Pulse + Pulse</td> <th>Forward</th> <th>Reverse</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Pulse + Direction</td> <td> </td> <td> </td> </tr> <tr> <td rowspan="2">Pulse - Direction</td> <td> </td> <td> </td> </tr> <tr> <td rowspan="2">A + B Pulse</td> <td> </td> <td> </td> </tr> </tbody> </table>	The drive can receive four types of command pulses			Command type	Output wave of corresponding pins		Pulse + Pulse	Forward	Reverse	Pulse + Direction			Pulse - Direction			A + B Pulse		
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Command type	Output wave of corresponding pins																				
Pulse + Pulse	Forward	Reverse																			
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	A + B Pulse																				
31		Pulse-																			
34	Position pulse phase B or direction signal	Dir+																			
33		Dir-																			
17	Error clearing signal	CLR+	Error clearing signal input +																		
16		CLR-	Error clearing signal input —																		

3.4 Definitions of CN3 communication terminals

Pin	Terminal name	Mark	Description
1	RX+	RX+	Positive receiving terminal of RS485 communication signals
2	CAN-GND	CAN GND	CAN signal GND
4	RX-	RX-	Negative receiving terminal of RS485 communication signals
5	GND	GND	RS485 signal GND
6	TX+	TX+	Positive transmitting terminal of RS485 communication signals
7	CANH	CANH	Positive terminal of CAN communication signals
8	TX-	TX-	Negative transmitting terminal of RS485 communication signals
9	CANL	CANL	Negative terminal of CAN communication signals

3.5 Definitions of CN2 adapter for control signals

No.	Mark	Definitions
1	P	Pressure given
2	Q	Flow given
3	GND A	Analog GND
4	DA1	Analog output 1
5	DA2	Analog output 2
6	GND A	Analog GND
7	GND A	Analog GND (pressure sensor)
8	24V	24V output (pressure sensor power supply)
9	AD3	Pressure feedback
10	IN0	Servo enabling
11	GND	Digital GND
12	COM-	Common port of digital output
13	AML	Error-reporting signal (OUT1 low-level output)
14	AMH	Error-reporting signal (OUT1 high-level output)
15	IN1A	Digital input 1
16	IN2A	Digital input 2
17	OUT2A	Digital output 2
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Chapter 4 Parameter Description and Common Fault Codes

4.1 List of user parameters

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pr-000	Parameter password	-456~200	-456~200	120	1	All
Pr-001	Hardware number	Drive information parameter	—	—	1	All
Pr-002	Software version	Drive information parameter	—	—	1	All
Pr-003	Software year	Drive information parameter	—	—	1	All
Pr-004	Software date	Drive information parameter	—	—	1	All
Pr-005	Manufacturing date	Drive information parameter	—	—	1	All
Pr-006	Manufacturing series no	Drive information parameter	—	—	1	All
Pr-007	Rated voltage	Drive information parameter	—	—	1	All
Pr-008	Rated current	Drive information parameter	—	—	1	All
Pr-009	Peak current	Drive information parameter	—	—	1	All
Pr-010	Number of the pole pairs of the motor	1~50pp	1~50	—	1	All

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pr-011	Resistance of the winding wire of the motor	0~240ohm	0~60000	—	250	All
Pr-012	D-axis inductance Ld (mh)	0~120 mH	0~60000	—	500	All
Pr-013	Q-axis inductance Lq (mh)	0~120 mH	0~60000	—	500	All
Pr-014	Back electromotive force (V/krpm)	0~900 V	0~9000	—	10	All
Pr-016	Motor protection temperature	50~160℃	50~160	140	1	All
Pr-017	Field-weakening control	0~2	0~2	2	1	All
Pr-018	Field-weakening KP regulation	0~5000	0~5000	10	1	All
Pr-019	Field-weakening KI regulation	0~5000	0~5000	0	1	All
Pr-020	Position feedback type	1~5	1~5	—	—	All
Pr-021	Number of encoder lines	256~12000	256~12000	2500	1	All
	Number of encoder digits	2 ⁸ ~2 ¹⁶	8~16	12	-	All
Pr-022	Motor zero position	0~359.9 °	0~3599	00	10	All
Pr-023	User zero degree angle	-359.9~359.9 °	-3599~3599	0	10	A
Pr-024	Stop position control	—	—	—	—	—
Pr-025	Min. voltage of AD2	0.00~10.00V	0-1000	5	100	A
Pr-026	Max. voltage of AD2	0.00~10.00V	0-1000	999	100	A
Pr-027	Compensation	-1000~1000	-1000~1000	0	1	A
Pr-028	Bottom pressure	0~100 Bar	0-100	0	1	A
Pr-029	Resonance speed	0~20000rpm	0~20000	0	1	All
Pr-030	PWM frequency	1~7	1~7	2	—	All

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pr-031	Current (%)	5%~100%	5~100	100	1	All
Pr-032	Parameter reserved	—	—	—	—	—
Pr-033	Kp-current loop	1~5000	1~5000	500	1	All
Pr-034	Ki-current loop	1~5000	1~5000	100	1	All
Pr-035	Current phase (degree)	-30~30°	-30720~30720	0	1024	All
Pr-036	Forward torque limit (%)	0~100%	0~100	0	1	All
Pr-037	Reverse torque limit (%)	0~100%	0~100	0	1	All
Pr-038	Min. voltage of pressure feedback	0.00~10.00V	0-1000	5	100	A
Pr-039	Max. voltage of pressure feedback	0.00~10.00 V	0-1000	999	100	A
Pr-040	Control mode	1~10	1~10	3	—	All
Pr-041	Kp-speed loop	1-5000	1~5000	500	1	All
Pr-042	Ki-speed loop	1-5000	1~5000	500	1	All
Pr-043	Reaching speed	10~10000 Rpm	10~10000	1000	1	All
Pr-044	Bottom flow	0~1000 Rpm	0~100	0	1	All
Pr-045	Max. speed	1~20000 Rpm	1~20000	2100	1	All
Pr-046	Over-speed protection	1~20000 Rpm	1~20000	3000	1	All
Pr-047	Min. voltage of AD1	0.0~10.0 V	0~100	5	10	All
Pr-048	Max. voltage of AD1	0.0~10.0 V	0~100	999	10	All
Pr-049	Jogging speed	1~1000	1~1000	50	1	All
Pr-050	Starting mode	0~2	0~2	0	1	A

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pr-050	Starting mode	0~2	0~2	0	1	A
Pr-051	Starting current	0~100%	0~100	10	1	A
Pr-052	Starting time	0~300 S	0~30000	20	100	A
Pr-053	Starting acceleration	—	—	—	—	—
Pr-054	Max. acceleration	0~300 S	0~30000	2	100	All
Pr-055	Max. deceleration	0~300 S	0~30000	2	100	All
Pr-056	S-curve	0~3 S	0~300	2	100	All
Pr-057	Kd differential-speed	0~800	0~800	50	1	All
Pr-058	Low-speed compensation	0~5000	0~5000	300	1	A
Pr-059	Parameter reserved	—	—	—	—	—
Pr-060	Definition of forward direction	0~1	0~1	1	1	All
Pr-061	Direction of rotation	0~2	0~2	0	1	All
Pr-062	Motor self-locking	0~3	0~3	0	1	All
Pr-063	Self-locking current (%)	0~100%	0~100	0	1	All
Pr-064	Stopping mode	0~1	0~1	0	100	All
Pr-065	Stopping deceleration	0~300s	0~30000	5	100	All
Pr-066	Self-clocking time	0~300s	0~30000	5	100	All
Pr-067	Time delay in brake release	0~300s	0~30000	0	100	All
Pr-065	Stopping deceleration	0~300s	0~30000	5	100	All
Pr-066	Self-clocking time	0~300s	0~30000	5	100	All

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pr-067	Time delay in brake release	0~300s	0~30000	0	100	All
Pr-068	Parameter reserved	—	—	—	—	—
Pr-069	Parameter reserved	—	—	—	—	—
Pr-070	Motor pulse	1~6	1~6	1	1	All
Pr-071	Frequency dividing ratio of pulses	1~256	1~256	1	1	All
Pr-072	User pulse	1~4	1~4	1	1	All
Pr-073	Oil pressure of the system	0Bar~Pr-074	0~500	160	1	A
Pr-074	Max. oil pressure	Pr-073~500 Bar	0~500	250	1	A
Pr-075	Min. position error	—	—	—	—	—
Pr-076	Oil pressure sensor Fault detection time	10mS~320000mS	1~32000	1000	10	A
Pr-077	Oil pressure control - Kp	1~2000	1~2000	1000	1	A
Pr-078	Oil pressure control - Ki	1~1000	1~1000	150	1	A
Pr-079	Max. reverse speed (%)	0%~100%	0~100	15	1	A
Pr-080	Digital input IN-1	0~24	0~24	0	1	All
Pr-081	Digital input IN-2	0~24	0~24	0	1	All
Pr-082	Digital input IN-3	0~24	0~24	0	1	All
Pr-083	Digital input IN-4	0~24	0~24	0	1	All
Pr-084	Digital input IN-5	0~24	0~24	0	1	All
Pr-085	Digital input IN-6	0~24	0~24	0	1	All
Pr-086	Digital output OUT-1	0~9	0~9	2	1	All
Pr-087	Digital output OUT-2	0~9	0~9	0	1	All
Pr-088	Digital output OUT-3	0~9	0~9	0	1	All
Pr-089	Digital output OUT-4	0~9	0~9	0	1	All

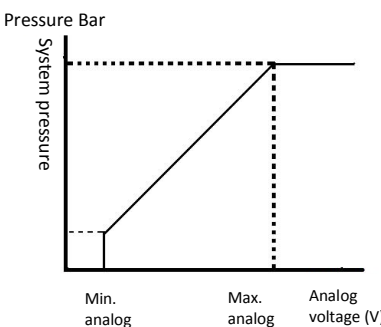
Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pr-090	LED display	0~8	0~8	1	—	All
Pr-091	Analog output 1	0~4	0~4	1	—	All
Pr-092	Gain of analog output 1	1~200	1%~200%	100	100	All
Pr-093	PWM mode	0~3	0~3	1	—	All
Pr-094	Speed filtering constant	200~2048	200~2048	512	1	All
Pr-095	Pressure sensor model	0~2	0~2	10	—	A
Pr-096	Oil pressure given filtering constant	5~1024	5~1024	50	1	A
Pr-097	Oil pressure feedback filtering constant	0~2048	0~2048	128	1	A
Pr-098	Torque filtering constant	100~2048	100~2048	1024	1	All
Pr-099	Parameter reserved	—	—	—	—	—
Pr-100	Enabling signal selection	0~1	0~1	0	—	All
Pr-101	Analog output 2	0~4	0~4	3	—	All
Pr-102	Gain of analog output 2	1~200	1%~200%	100	100	All
Pr-103	Min. analog output 1	0~500	0~5.00V	3	100	All
Pr-104	Min. analog output 2	0~500	0~5.00V	3	100	All
Pr-105	Pressure reach	0~2500	0~250.0 Bar	1400	10	A
Pr-106	Max. acceleration of oil pressure command	0~2000	0~2000ms	5	50	A
Pr-107	Parameter reserved	—	—	—	—	—
Pr-108	Parameter reserved	—	—	—	—	—
Pr-109	Parameter reserved	—	—	—	—	—

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pr-110	Analog input sampling value - 1	0V~Pr-112	0~1000	100	100	All
Pr-111	Analog input correction value -1	0V~10.00V	0~1000	100	100	All
Pr-112	Analog input sampling value - 2	Pr-112 ~ Pr-114	0~1000	300	100	All
Pr-113	Analog input correction value -2	0V~10.00V	0~1000	300	100	All
Pr-114	Analog input sampling value - 3	Pr-112 ~ Pr-116	0~1000	500	100	All
Pr-115	Analog input correction value -3	0V~10.00V	0~1000	500	100	All
Pr-116	Analog input sampling value - 4	Pr-112~ Pr-118	0~1000	700	100	All
Pr-117	Analog input correction value -4	0V~10.00V	0~1000	700	100	All
Pr-118	Analog input sampling value - 5	Pr-112~ 10.00V	0~1000	900	100	All
Pr-119	Analog input correction value -5	0V~10.00V	0~1000	900	100	All
Pr-120	CAN communication address	-256~256	-256~256	0	1	A
Pr-121	Initial speed of the slave	5~2000	5~2000	100	1	A
Pr-122	Min. slave input	0 Rpm~ Pr-124	0~10000	200	1	A
Pr-123	Min. slave input correspondence	0 Rpm~ Pr-045	0~10000	200	1	A
Pr-124	Intermediate slave input	Pr-122~ Pr-126	0~10000	700	1	A
Pr-125	Intermediate slave input correspondence	0 Rpm~ Pr-045	0~10000	700	1	A
Pr-126	Max. slave input	Pr-124~ Pr-045	0~10000	1200	1	A
Pr-127	Max. slave input correspondence	0 Rpm~ Pr-045	0~10000	1200	1	A

4.2 Description of user parameters

Parameter code	Parameter name	Function	K
PR-00	Parameter password	Parameter needed for starting the drive internal functions 120: view the external parameters of the drive 123: allow to modify the external parameters of the drive 125: allow to restore factory settings 130: allow automatic zero setting of the drive 150: resetting of the drive 155: clearing and reset of drive fault records -112: query of drive alarm codes Range: -456~200, default: 120	—
PR-01	Hardware number	Drive power level code (information and parameters are not allowed to be changed)	—
PR-02	Software version	Drive software version number (information and parameters are not allowed to be changed)	—
PR-03	Software year	Year drive software compiled (information and parameters are not allowed to be changed)	—
PR-04	Software date	Month/day drive software compiled (information and parameters are not allowed to be changed)	—
PR-05	Month/year of drive manufacture	Month/year of drive manufactured (information and parameters are not allowed to be changed)	—
PR-06	Manufacturing SN	Manufacturing code of the drive (information and parameters are not allowed to be changed)	—
PR-07	Rated voltage	Rated input voltage of the drive (V) (information and parameters are not allowed to be changed)	—
PR-08	Rated current	Rated output current of the drive (A) (information and parameters are not allowed to be changed)	—
PR-09	Peak current	Peak output current of the drive (A) (information and parameters are not allowed to be changed)	—
PR-10	Number of the pole pairs of the motor	Number of the pole pairs of the motor (1:2) pairs of poles, (2:4) pairs of poles, (3:6) pairs of poles, (4:8) pairs of poles... Range: 1~50pp, and set based on specific motor parameters	1

Parameter code	Parameter name	Function	K
PR-11	Wire resistance (ohm)	Motor winding line-line resistance (2 x phase resistance) If specific motor parameters are unknown, set it as 0 Range: 0~240 ohm, and set based on specific motor parameters	250
PR-12	D-axis inductance Ld (mH)	D-axis inductance of the motor (generally half the line-line inductance of the motor) If specific motor parameters are unknown, set it as 0 Range: 0~120mH, and set based on specific motor parameters	500
PR-13	Q-axis inductance Lq (mH)	Q-axis inductance of the motor (generally half the line-line inductance of the motor) If specific motor parameters are unknown, set it as 0 Range: 0~120mH, and set based on specific motor parameters	500
PR-14	Back electromotive force (V/krpm)	Back electromotive force constant of the motor (line voltage) If motor parameters are unknown, set it as 0 Range: 0~900 V/krpm, and set based on specific motor parameters	10
PR-16	Motor protection temperature	Max. operating temperature of motor winding. The drive will give an alarm if the threshold is exceeded. Range: 50~160°C default: 140 (Class H motor) and 130 (Class F motor)	1
PR-17	Field-weakening control	Field-weakening control mode Correct motor parameters must be set (the field-weakening function of some motors cannot be started) 0: not use field-weakening control 1: field-weakening control level I 2: field-weakening control level II Range: 0~2, default: 2	—
PR-18	Field-weakening KP regulation	Field-weakening KP regulation, proportional gain Range: 0~5000, default: 10	1
PR-19	Field-weakening KI regulation	Field-weakening KI regulation, integral gain Range: 0~5000, default: 0	1

Parameter code	Parameter name	Function	K	
PR-20	Position feedback type	Type of rotor position feedback encoder 1: Encoder+ (incremental encoder, with 3-phase Hall signals) 2: Encoder (incremental encoder, without Hall signals) 3: Resolver (one-pair-pole resolver) 4: Resolver (multi-pair-pole resolver) 5: ABS (absolute encoder, such as 17-bit, 33-bit encoder)	—	
PR-21	Number of encoder lines	Number of encoder lines, range: 256~12000, default: 2500 or Number of encoder bits, range: 2~16, default: 12	1	
PR-22	Motor zero position	Encoder or resolver zero position expressed by electrical angle Can be automatically obtained by automatic zero tuning Range: $-359.9^{\circ} \sim 359.9^{\circ}$, default: 0	10	
PR-23	User zero degree angle	Rotor zero-position that can be defined by users so that the drive can display rotor angle based on user requirements (in mechanical angle) Range: $-359.9^{\circ} \sim 359.9^{\circ}$, default: 0	10	
PR-24	Stop position control	The parameter does not have corresponding function Default: 0	-	
PR-25	Min. voltage of AD2 (Pressure given)	Users can use a segment of voltage in analog as the effective input. Setting an appropriate minimum analog voltage can avoid the measure error caused by zero drift. Range: 0~10V, default: 0.05V	 <p>Pressure Bar</p> <p>System pressure</p> <p>Min. analog</p> <p>Max. analog</p> <p>Analog voltage (V)</p> <p>Analog versus pressure curve</p>	100
PR-26	Max. voltage of AD2 (Pressure given)	Users can use a segment of voltage in analog as the effective input. The parameter must be greater than the min. analog voltage Range: 0~10V, default: 9.95V		
PR-27	Compensation	The special parameter mode is enabled Range: -1000~1000, default: 0	-	

Parameter code	Parameter name	Function	K
PR-28	Bottom pressure	Where the given pressure of the system is lower than the bottom pressure, it will run at the bottom pressure Range: 0~100.0 Bar, default: 0 Bar	10
PR-29	Resonance speed	The resonance frequency needing suppression corresponds to the actual motor speed. Range: 0rpm~max. speed, default: 0 (function stopped)	
PR-30	PWM frequency	Setting of PWM switching frequency 1: 4kHz, 2: 6 kHz, 3: 8kHz, 4: 10kHz, 5: 12kHz, 6: 14kHz and 7: 16kHz 10 and 12k provides the best control performance, 16k makes the motor generate the lowest noise, and 4k makes the drive have the highest efficiency. The current loop PI may need readjustment if PWM frequency is changed. Range: 1~7, default: 2 (above 10kW), 3(below 10kW)	—
PR-31	Current (%)	To limit the max. output current of the drive (expressed by the percentage of the peak current of the drive) Range: 5%~100%, default: 100	1
PR-32	Max. torque	The parameter does not have corresponding function Default: 0	-
PR-33	Kp-current loop	Current loop PI control parameter: proportional gain constant The greater the parameter is, the faster the current responses dynamically Too great parameter will cause bigger current ripples, and even generate current oscillation. Adjust it to the maximum and then decrease it to 100 when no current waveform oscillation is generated. Range: 1~5000, default: 500	1
PR-34	Ki-current loop	Current loop PI control parameter: integral gain constant Range: 1~5000, default: 100	1
PR-35	Current phase (degree)	Phase angle of current leading. It is not recommended to be used in normal running. Parameter range: -30~30°, default: 0	1024

Parameter code	Parameter name	Function	K
PR-36	Forward torque limit	<p>Forward/reverse output torque limit, expressed by the percentage of the maximum effective system torque</p> <p>Mode 1: used with the forward and reverse torque limit signals of the digital input function. The maximum forward and reverse output torques do not exceed the set values when signals are effective</p> <p>Setting range: 0~100</p> <p>Mode 2: adjust the maximum output torque together with unipolar voltage (the bipolar mode of the speed). AD2_min corresponds to the maximum torque, and AD2_max corresponds to the minimum torque (when PR36=-1).</p> <p>Or AD2_min corresponds to the minimum torque, and AD2_max corresponds to the maximum torque (when PR36=-100)</p> <p>Parameter range: -100~100, default: 0</p>	1
PR-37	Reverse torque limit	<p>Reverse torque limit</p> <p>Or AD2_min corresponds to the minimum torque, and AD2_max corresponds to the maximum torque (when PR36=-100)</p> <p>Parameter range: -100~100, default: 0</p>	
PR-38	Min. voltage of AD3 (Pressure feedback)	<p>The minimum is used to set the voltage corresponding to the minimum of the feedback pressure signal of the pressure sensor</p> <p>Range: 0~10V, default: 0.05V</p>	100
PR-39	Max. voltage of AD3 (Pressure feedback)	<p>The maximum is used to set the voltage corresponding to the maximum of the feedback pressure signal of the pressure sensor</p> <p>Range: 0~10V, default: 9.95V</p>	100
PR-40	Control mode	<p>Selection of drive control mode:</p> <ul style="list-style-type: none"> 1: Position control (pulse input) 2: Speed control (0~10V) 3: Oil pressure control (-10~10V) 4: Speed control (preset curve) 5: Speed control (RS-485/CAN2.0) 6: Automatic zero setting of the system, test running 7: Position control (preset curve) 8: Position control (RS-485/CAN2.0) 9: Panel speed control 10: Undefined mode - 2 11: Special user control mode 1 <p>Users can switch to preset speed curve and RS 485 control mode through a digital input or switch between position control mode and speed control mode.</p>	—

Parameter code	Parameter name	Function	K
PR-41	Kp-speed control	Speed control loop PI control parameter: proportional gain constant The greater the parameter is, the faster the motor responses dynamically, but it may causes speed oscillation. Adjust it to the maximum and then decrease it to 50-100 when no oscillation is generated. Range: 1~5000, default: 500	1
PR-42	Ki-speed control	Speed control loop PI control parameter: integral gain constant The greater the parameter is, the faster the motor responses dynamically, but it may causes overshooting. Adjust it to the maximum and then decrease it to 50 when no overshooting and oscillation are generated. Range: 1~10000, default: 500	1
PR-43	Reaching speed	The value the speed reaches, which is used with output of signals at time of the speed reaching a value When the speed reaches the value, the corresponding digital output port outputs active level Range: 10~15000, default: 1000 rpm	1
PR-44	Bottom flow	Bottom pressure value must be set if the bottom flow is not 0. Range: 0~100rpm, default: 0 rpm	1
PR-45	Max. speed	It proportionally corresponds to the maximum analog input voltage. When the analog input is the maximum, the speed is the maximum speed. (Adjust the parameter PR-46 over-speed protection if the parameter is adjusted) Range: 1~20000 rpm, default: 2100	1
PR-46	Over-speed protection	Over-speed protection of the motor. When the running speed of the motor exceeds the speed set, the drive will give alarm signals and the display outputs alarm errors (typical \geq max. speed $\times 120\%$) Range: 1~20000, default: 3000	1

Parameter code	Parameter name	Function	K
PR-47	Min. voltage of AD1 (Flow given)	<p>Users can use a segment of voltage in analog as the effective input. Setting an appropriate minimum analog voltage can avoid the voltage error caused by zero drift.</p> <p>Range: 0~10V. Default: 0.05V</p>	<p>Motor speed (rpm)</p> <p>Max. speed</p> <p>0</p> <p>Min. analog voltage</p> <p>Max. analog voltage</p> <p>Analog voltage (V)</p> <p>Analog versus speed graph</p>
PR-48	Max. voltage of AD1 (Flow given)	<p>Users can use a segment of voltage in analog as the effective input. The parameter must be greater than the min. analog voltage</p> <p>Range: 0~10V, default: 9.95V</p>	
PR-49	Jogging speed	<p>The rotating speed of the motor in jogging mode (it is the negative speed corresponding to the value for reverse jogging)</p> <p>Range: 0~100rpm, default: 50 rpm</p>	1
PR-50	Starting mode	<p>Starting mode in the sensorless control mode (the designated software version has the function)</p> <p>0: open-loop starting, 1: normal starting mode I, and 2: normal starting mode II</p> <p>Range: 0~2, default: 0</p>	1
PR-51	Starting current	<p>Starting current in the sensorless control mode (the designated software version has the function)</p> <p>Expressed by the percentage of rated current</p> <p>Range: 0%~100%, default: 10</p>	1
PR-52	Starting time	<p>Self-locking time before entry of a running status (valid without position sensing or photoelectric Encoder)</p> <p>Range: 0~300 s, default: 0.02 s</p>	100
PR-53	Starting acceleration	<p>The parameter does not have corresponding function</p> <p>Default: 0</p>	
PR-54	Max. acceleration	<p>Max. acceleration limit, expressed by the time taken for the motor to accelerate from 0 to 1000rpm.</p> <p>The smaller the value is, the greater the acceleration is. The value of 0 means that there is no acceleration limit.</p> <p>Range: 0~300 s, default: 0.02 s</p>	100

Parameter code	Parameter name	Function	K
PR-55	Max. deceleration	Max. deceleration limit, expressed by the time taken for the motor to decelerate from 1000 rpm to 0 rpm. The smaller the value is, the greater the deceleration is. The value of 0 means that there is no deceleration limit. Range: 0~300 s, default: 0.02 s	100
PR-56	S-curve	S-curve control time. Used for the speed curve at the beginning and end phases of smooth acceleration and deceleration to reduce system impact. The greater the value is, the better the effect is, but too great will affect the dynamic response of the system. If the value is 0, there is no S-curve control Range: 0~3 s, default: 0.02 s	100
PR-57	Kd-speed control	Internal PID compensation of speed loop, related with acceleration Range: 0-800, default: 50	1
PR-58	Low-speed compensation	Integral gain compensation of speed loop (valid for position mode and forced zero speed and very low speed range) Range: 0-5000, default: 300	1
PR-59	Parameter reserved	-	-
PR-60	Definition of forward direction	CCW is forward, CW is reverse (definition of face-up motor shaft) 0: clockwise: the direction of rotation is CW; the connection of the servo drive power lines is U, W and V 1: counter-clockwise: the direction of rotation is CCW; the connection of the servo drive's power lines is U, V and W	—
PR-61	Direction of rotation	Limit to direction of rotation, default: both 0: Both (allow the motor to run in the forward and reverse directions) 1: + only (allow the motor to run in the forward direction only) 2: - only (allow the motor to run in the reverse direction only)	—
PR-62	Motor self-locking	Enabling of motor self-locking control. The parameter needs to be used with self-locking control input signals. 0: not started (not allow self-locking) 1: Mode I (the motor shaft is not allowed to rotate) 2: Mode II (the motor shaft is allowed to rotate, and the torque of rotation is greater than that in an unself-locked status) 3: Mode III (automatic adjustment of self-locking current)	—

Parameter code	Parameter name	Function	K
PR-63	Self-locking current (%)	The current at the time of self-locking when power is on, expressed by the percentage of rated current. Range: 0~100%, default: 25%	1
PR-64	Stopping mode	Deceleration and stopping mode of the motor after enabling is closed 0: Free stop (the motor does not output torque and stops depending on loads and resistance) 1: Brake stop (the motor decelerates at a set deceleration, keeps self-locked for a period of time once stopped, and disconnects torque output. The period of time is defined by self-locking time.) Range: 0~1, default: 0	—
PR-65	Stopping deceleration	Max. deceleration of brake stop, expressed by the time taken for the motor to decelerate from 1000 rpm to 0 rpm. The smaller the value is, the greater the deceleration is. The value of 0 means that there is no deceleration limit Range: 0~300 s, default: 0.05 s	100
PR-66	Self-clocking time	The self-locking time after the motor is stopped through brake stop (delay closing torque output before actuating the contracting brake) Range: 0~300 s, default: 0.05 s	100
PR-67	Time delay in brake release	Delay time of brake release signals (delay closing contracting brake after the motor outputs torque) Range: 0~300 s, default: 0.05 s	100
PR-68	Parameter reserved	-	-
PR-69	Parameter reserved	-	-
PR-70	Motor pulse	1: Pulse + Pulse; 2: Pulse + Direction; 3: Pulse - Direction 4: 2*Pulse + Direction; 5: 2*Pulse - Direction; 6: No output Range: 1~6, default: 6	1
PR-71	Frequency dividing ratio of pulses	Frequency dividing ratio of encoder pulses Range: 1~256, default: 1	1
PR-72	User pulse	In oil pressure control mode, this parameter does not have the corresponding function Default: 0	1
PR-73	Oil pressure of the system	The max. given pressure of the system Range: 0~500 Bar, default: 160 Bar	1

Parameter code	Parameter name	Function	K
PR-74	Max. oil pressure	The full-scale pressure of the pressure sensor Range: oil pressure of the system 0~500 Bar, default: 250 Bar	1
PR-75	Min. position error	In oil pressure control mode, this parameter does not have the corresponding function, Default: 0	-
PR-76	Oil pressure sensor Fault detection time	The maximum duration without pressure feedback signal, whist the motor has a continuous torque output. Range: 10~320000 ms, default: 10000 ms	100
PR-77	Oil pressure control - Kp	Pressure loop PI control parameter: proportional gain constant The greater the parameter is, the faster the pressure responses dynamically, but it easily generates pressure oscillation. Adjust it to the maximum and then decrease it to 50-100 when no oscillation is generated. Range: 1~2000, default: 1000	1
PR-78	Oil pressure control Ki	Pressure loop PI control parameter: integral gain constant The greater the parameter is, the faster the pressure responses dynamically, but too great parameter easily generates overshooting. Adjust it to the maximum and then decrease it to 50 when no overshooting and oscillation are generated. Range: 1~1000, default: 150	1
PR-79	Max. reverse speed (%)	When pressure feedback is greater than the pressure set, the maximum reverse release speed is PR-45*N% rpm Range: 0~100%, default: 15%	1
PR-80	Digital input IN-1	Definitions of programmable digital input functions 0: Disable (not use the pin) 1: ZeroSpeed&CLR (zero-speed clamping) 2: Braking Mode (the motor locks itself when there is no enabling signal)	—
PR-81	Digital input IN-2	3: Dir. Control (direction control) 4: + Dir Prohibit (forward running is prohibited) 5: - Dir Prohibit (reverse running is prohibited) 6: CLR Rev/Angle (clearing signals) 7: RS485 Enable (switch to RS 485 control)	

PR-82	Digital input IN-3	8: Preset Enable (switch to preset curve control) 9: Preset-1 (preset curve selection -1) 10: Preset-2 (preset curve selection -2) 11: Preset-3 (preset curve selection -3)	
PR-83	Digital input IN-4	12: +Torque Limit (forward torque limit is enabled) 13: -Torque Limit (reverse torque limit is enabled) 14: Reset (reset the drive) 15: Speed/Position (switch between speed loop control and position loop control) 16: +10V ⇔ ±10V (switch between unipolar control and bipolar control)	
PR-84	Digital input IN-5	17: Goto_Stop_Position (the orientation function of the drive) 18: GEAR_B_1(selection of the second electronic gear ratio) 19: GEAR_B_2 (selection of the third electronic gear ratio) 20: CCW_Run_Enable (valid in the analog control mode, and the motor rotates forward) 21: CW_Run_Enable (valid in the analog control mode, and the motor rotates reversely)	
PR-85	Digital input IN-6	22: Speed_Pulse_Enable (if started, closed-loop control of position is changed as pulse speed following) 23: Forced_Fan_on (forced turning-on of fan) 24: Can_Disable (Can speed command is not used, and pressure mode is restored)	
PR-86	Digital output OUT-1	Programmable digital output of set values 0: Disable (not use the pin)	
PR-87	Digital output OUT-2	1: SERVO Ready (servo ready signal) 2: Drive Fault (alarm signals for servo faults) 3: Pos.Err.Alarm (position error exceeds the preset value)	
PR-88	Digital output OUT-3	4: Position Reach (position reaching signal) 5: Speed Reach (speed reaching signal) 6: Brake Release (brake release signal) 7: Internal Test (test signal)	—
R-89	Digital output OUT-4	8: Zero Speed (zero speed signal output) 9: Pressure Reach (pressure reaching signal)	

Parameter code	Parameter name	Function	K
PR-90	LED display	<p>Definitions of the LED monitoring data display of running status</p> <p>0: No display 3: Output power 6: given pressure</p> <p>1: Motor speed 4: Output torque 7: Feedback pressure</p> <p>2: Motor current 5: given flow 8: Busbar voltage</p>	—
PR-91	Analog output 1	<p>Definitions of the outputs of analog voltage</p> <p>0: function stopped</p> <p>1: motor speed (the max. forward speed corresponds to +10V)</p> <p>2: output torque (the max. forward torque corresponds to +10V)</p> <p>3: pressure feedback (the max. forward pressure feedback corresponds to +10V)</p> <p>4: pressure setting (the max. pressure setting corresponds to +10V)</p> <p>5: test voltage 1 (constant output +6V)</p> <p>6: test voltage 2 (constant output -6V)</p> <p>7: test voltage 3 (constant output 0V)</p>	—
PR-92	Gain of analog output 1	<p>Scaling ratio of analog output signals (1%~200%)</p> <p>Parameter range: 1~200, default: 100</p>	100
PR-93	PWM mode	<p>Selection of PWM modes</p> <p>0: high-efficiency PWM (may sensitive to parameters)</p> <p>1: high-performance PWM (with the best current waveform)</p> <p>2: variable frequency high- efficiency PWM</p> <p>3: variable frequency high-performance PWM</p> <p>Selection of variable frequency high-performance or variable frequency high-efficiency can improve the machine in the terms of some resonance phenomena and noise</p> <p>In most application, it is highly recommended to use: 1 (high-performance PWM)</p>	—
PR-94	Speed filtering constant	<p>Speed filtering constant. The smaller the constant is, the better the filtering effect, but dynamic response is slow</p> <p>Range: 100~2048, default: 512</p>	1
PR-95	Pressure sensor type	<p>Pressure sensor model code: 4: 1-5V; 5: 0-5V; 10: 0-10V</p>	-
PR-96	Oil pressure given filtering constant	<p>Oil pressure command signal filtering constant. The smaller the constant is, the better the filtering effect, but dynamic response is slow</p> <p>Range: 1~2048, default: 50</p>	1

Parameter code	Parameter name	Function	K
PR-97	Oil pressure feedback Filtering constant	The value is used for smoothing oil pressure feedback. The smaller the value is, the better the smoothing effect is, but too small value will cause lagging Range: 1~2048, default: 128	1
PR-98	Torque filtering constant	The smaller the filtering constant is, the stronger the filtering effect, but dynamic response is slow Parameter range: 100~2048, default: 1024	
PR-98	Parameter reserved	-	-
PR-100	Enabling signal selection	Selection of drive starting signal sources 0: digital IO enabled; 1: LED panel enabled Range: 0~1, default: 0	-
PR-101	Analog output 2	Same as PR-91	-
PR-102	Gain of analog output 2	Scaling ratio constant of analog output signals (1%~200%) Parameter range: 1~200, default: 100	100
PR-103	Analog output 1 Minimum	Setting an appropriate minimum analog voltage can shield small zero drift Range: 0~10V. Default: 0.03V	100
PR-104	Analog output 2 Minimum	Setting an appropriate minimum analog voltage can shield small zero drift Range: 0~10V. Default: 0.03V	100
PR-105	Pressure reach	When pressure reaches the set value, OUT port outputs active level Range: 0~250.0 Bar Default: 100 Bar	10
PR-106	Oil pressure command Max. acceleration	The minimum time for the pressure setting to accelerate from 0 to the maximum oil pressure. The smaller the value is, the greater the acceleration is Range: 0~2000ms Default: 250ms	50
PR-107	Parameter reserved	-	-

Parameter code	Parameter name	Function	K
PR-108	Parameter reserved	-	-
PR-109	Parameter reserved	-	-
PR-110	Analog input Sampling Point -1	Sample point-1 for analog input signal correction Range: 0V~PR-112, default: 1V	10
PR-111	Analog input Corrected value -1	Corrected value for Sample point-1 Range: 0V~10.00V, default: 1V	10
PR-112	Analog input Sampling point -2	Sample point-2 for analog input signal correction Range: PR-110~PR-114, default: 3V	10
PR-113	Analog input Corrected value -2	Corrected value for Sample point-2 Range: 0V~10.00V, default: 3V	10
PR-114	Analog input Sampling point -3	Sample point-3 for analog input signal correction Range: PR-112~PR-116, default: 5V	10
PR-115	Analog input Corrected value -3	Corrected value for Sample point-3 Range: 0V~10.00V, default: 5V	10
PR-116	Analog input Sampling point -4	Sample point-4 for analog input signal correction Range: PR-114~PR-118, default: 7V	10
PR-117	Analog input Corrected value -4	Corrected value for Sample point-4 Range: 0V~10.00V, default: 7V	10
PR-118	Analog input Sampling point -5	Sample point-5 for analog input signal correction Range: PR-116~10V, default: 9V	10

Parameter code	Parameter name	Function	K
PR-119	Analog input Corrected value -5	Corrected value for Sample point-5 Range: 0V~10.00V, default: 9V	10
PR-120	CAN communication Node address	Used for switching CAN communication modes 0: CAN closed; 1~255: Nth slave -1~-8: master and N slaves Range: -8~255, default: 0	1
PR-121	Initial speed of the slave	CAN on-line mode, speed dead time set for the master If the speed of the master is less than the value, speed command of zero speed is sent to the slave Range: 0~1000rpm, default: 100rpm	1
PR-122	Min. slave input	CAN on-line mode, the min. adjusting speed set for the slave Range: 0rpm~PR-124, default: 200rpm	1
PR-123	Min. slave input correspondence	CAN on-line mode, the min. adjusting speed set for the slave Range: 0rpm~max. speed, default: 200rpm	1
PR-124	Intermediate slave input	CAN on-line mode, the intermediate-point adjusting speed set for the slave Range: PR-122~PR-126, default: 700rpm	1
PR-125	Intermediate slave input correspondence	CAN on-line mode, the speed corresponding to the intermediate-point adjusting speed set for the slave Range: 0rpm~max. speed, default: 700rpm	1
PR-126	Max. slave input	CAN on-line mode, the max. adjusting speed set for the slave Range:PR-124~max. speed, default: 1200rpm	1
PR-127	Max. slave input correspondence	CAN on-line mode, the speed corresponding to the max. adjusting speed set for the slave Range: 0rpm~max. speed, default:1200rpm	1

4.3 Description of internal parameters (note: customers must not make any change)

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pd-000	Parameter reserved	—	—	0	—	All
Pd-001	Parameter reserved	—	—	0	—	All
Pd-002	Manufacturing number	0~65535	0~65535	—	—	All
Pd-003	Month/year of drive manufacture	0~65535	0~65535	—	—	All
Pd-004	Software date	0~65535	Read-only parameter	—	—	All
Pd-005	Drive code	0~65535	Read-only parameter	—	—	All
Pd-006	Hardware code	0~65535	Read-only parameter	—	—	All
Pd-007	Software code	0~65535	Read-only parameter	—	—	All
Pd-008	Rated current	0~65535	0~65535	—	—	All
Pd-009	Peak current	0~65535	0~65535	—	—	All
Pd-010	Hardware information 1	0~65535	Read-only parameter	—	—	All
Pd-011	Hardware information 2	0~65535	Read-only parameter	—	—	All
Pd-012	Rated voltage	0~65535	Read-only parameter	—	—	All
Pd-013	Max. brake power	0~256	0~256	256	1	
Pd-014	Parameter reserved	—	—	0	—	All
Pd-015	Built-in test mode	0~7	0~7	0	1	
Pd-016	On-line PID test	0~3	0~3	0	1	
Pd-017	Fixed Q-axis current	0~32000	0~32000	0	1	
Pd-018	Fixed D-axis current	0~32000	0~32000	0	1	
Pd-019	Parameter reserved	—	—	0	—	All
Pd-020	Ia sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-021	Ib sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pd-022	Ic sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-023	Ia zero drift correction	-10%~10%	-1000~1000	—	10000	All
Pd-024	Ib zero drift correction	-10%~10%	-1000~1000	—	10000	All
Pd-025	Ic zero drift correction	-10%~10%	-1000~1000	—	10000	All
Pd-026	AD1 sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-027	AD2 sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-028	AD2 zero drift correction	-4.88V~ 4.88V	-1000~1000	—	204.8	All
Pd-029	AD2 negative sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-030	Udc sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-031	+24V sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-032	+15V sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-033	-15V sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-034	+5V sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-035	T_motor sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-036	T_drive sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-037	AD1 zero drift correction	-2.44V~ 2.44V	-1000~1000	—	409.6	All
Pd-038	AD3 zero drift correction	-2.44V~ 2.44V	-1000~1000	—	409.6	All
Pd-039	AD3 sampling coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-040	DAC1 output coefficient correction	-10%~10%	-1000~1000	—	10000	All
Pd-041	DAC2 output coefficient correction	-10%~10%	-1000~1000	—	10000	All

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pd-042	DAC1 zero drift correction	-1V~1V	-1000~1000	—	1000	All
Pd-043	DAC2 zero drift correction	-1V~1V	-1000~1000	—	1000	All
Pd-044	AD1 user zero drift value	-10V~10V	-5120~5120	—	512	All
Pd-045	AD2 user zero drift value	-10V~10V	-5120~5120	—	512	All
Pd-046	AD3 user zero drift value	-10V~10V	-5120~5120	—	512	All
Pd-047	Parameter reserved	—	—	0	—	All
Pd-048	Parameter reserved	—	—	0	—	All
Pd-049	Parameter reserved	—	—	0	—	All
Pd-050	Udc sampling filtering coefficient	1~2048	1~2048	200	1	
Pd-051	15V sampling filtering coefficient	1~2048	1~2048	50	1	
Pd-052	Temperature sampling filtering coefficient	1~2048	1~2048	15	1	
Pd-053	Acceleration filtering coefficient	1~2048	1~2048	100	1	
Pd-054	Speed filtering coefficient	1~2048	1~2048	1000	1	
Pd-055	Resonance quality factor	10~1024	10~1024	10	1	
Pd-056	Resonance trapping depth	0~1024	0~1024	0	1	
Pd-057	Parameter reserved	—	—	0	—	All
Pd-058	Polarity of digital input level	00000~ 11111	00000~ 11111	0	1	
Pd-059	Polarity of digital output level	0000~1111	0000~1111	0	1	
Pd-060	Definition of the forward direction of the encoder	0~1	0~1	0	1	
Pd-061	Dead-time compensation level	0~8	0~8	3	1	
Pd-062	RS485/CAN communication baud rate	0~206	0~206	6	1	
Pd-063	Display panel model	0~8	0~8	6	1	
Pd-064	Power on, enable, reset and restart	0~1	0~1	1	1	
Pd-065	Low-speed PID initial speed	0~1000	0~1000	128	1	

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pd-066	Ki_speed adjustment factor	0~10000	0~10000	1024	1	
Pd-067	Kp_speed adjustment factor	0~2000	0~2000	1024	1	
Pd-068	Acceleration at the first segment of S-curve	0~60	0~60	0	1	
Pd-069	Restart at undervoltage	0~111	0~111	0	1	
Pd-070	Pulse/speed FIFO filter	0~77	0~77	3	1	
Pd-071	Speed I/II switching point	0~64	0~64	8	1	
Pd-072	Low-speed compensation smooth transition	0~1	0~1	1	1	
Pd-073	Position-loop control function	0~111	0~111	100	1	
Pd-074	Position-loop over-speed limit	0.1%~100%	1~1000	100	1000	
Pd-075	Position-loop speed limit	1~1000	1~1000	100	1	
Pd-076	Position-loop error clearing	0~1000	0~1000	0	1	
Pd-077	Compensation-1	0~5	0~5	0	1	
Pd-078	Parameter reserved	—	—	0	—	All
Pd-079	Parameter reserved	—	—	0	—	All
Pd-080	Very low speed range	2~16	2~16	2	1	
Pd-081	Kp adjustment coefficient of very low speed range	1~8000	1~8000	512	1	
Pd-082	Torque fluctuation compensation parameter	0~32000	0~32000	0	1	
Pd-083	Speed fuzzy PI compensation coefficient	0~6464	0~6464	0	1	
Pd-084	Speed PI acceleration compensation coefficient	0~6464	0~6464	0	1	
Pd-085	Position returning curve acceleration	10~100	10~100	20	1	
Pd-086	Parameter reserved	—	—	0	—	All

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pd-087	Parameter reserved	—	—	0	—	All
Pd-088	Parameter reserved	—	—	0	—	All
Pd-089	Parameter reserved	—	—	0	—	All
Pd-090	+24V no detect	0~1	0~1	1	1	All
Pd-091	Type of drive temperature sensor	0~1	0~1	1	1	All
Pd-092	Max. dwell pressure	0~250.0 Bar	0~2500	0	10	All
Pd-093	Max. dwell time	0~180 S	0~180	0	1	All
Pd-094	Selection of multi-point correction channel	0~3	0~3	0	0	All
Pd-095	Pressure feedback adjustment coefficient	-10%~10%	-100~100	0	1000	All
Pd-096	Cumulative power-on time 1 (h)	0~65535	Read-only parameter	—	—	All
Pd-097	Cumulative running time 1 (h)	0~65535	Read-only parameter	—	—	All
Pd-098	Cumulative power-on time 2 (h)	0~65535	Read-only parameter	—	—	All
Pd-099	Cumulative running time 2 (h)	0~65535	Read-only parameter	—	—	All
Pd-100	First timing protection time password	0~65535	0~65535	0	1	All
Pd-101	First timing protection time	0~65535 H	0~Pd-105	0	1	All
Pd-102	Second timing protection time password	0~65535	0~65535	0	1	All
Pd-103	Second timing protection time	0~65535 H	Pd-103~Pd-107	0	1	All
Pd-104	Third timing protection time password	0~65535	0~65535	0	1	All
Pd-105	Third timing protection time	0~65535 H	Pd-105~Pd-109	0	1	All
Pd-106	Fourth timing protection time password	0~65535	0~65535	0	1	All

Parameter code	Function name	Data range	Set range	Factory value	Factor	Applicability
Pd-107	Fourth timing protection time	0~65535 H	Pd-107~65535	0	1	All
Pd-108	Cumulative business timing time (h)	0~65535 H	0~65535	0	1	All
Pd-109	Cumulative business timing time (s)	0~3600 S	0~3600	0	1	All
Pd-110	Parameter reserved	—	—	0	—	All
Pd-111	Parameter reserved	—	—	0	—	All
Pd-112	Error record-1 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-113	Error record-1 (power-on time)	0~65535	Read-only parameter	—	—	All
Pd-114	Error record-2 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-115	Error record-2 (power-on time)	0~65535	Read-only parameter	—	—	All
Pd-116	Error record-3 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-117	Error record-3 (power-on time)	0~65535	Read-only parameter	—	—	All
Pd-118	Error record-4 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-119	Error record-5 (power-on time)	0~65535	Read-only parameter	—	—	All
Pd-120	Error record-5 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-121	Error record-5 (power-on time)	0~65535	Read-only parameter	—	—	All
Pd-122	Error record-6 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-123	Error record-6 (power-on time)	0~65535	Read-only parameter	—	—	All
Pd-124	Error record-7 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-125	Error record-7 (power-on time)	0~65535	Read-only parameter	—	—	All
Pd-126	Error record-8 (fault code)	0~65535	Read-only parameter	—	—	All
Pd-127	Error record-8 (power-on time)	0~65535	Read-only parameter	—	—	All

4.4. Common fault codes

Fault code	Fault name	Fault description
Err 12	Over-current protection	The current is too high. The hardware has faults if errors are reported when the power is turned on; please check the wiring of the motor and the parameter settings if errors are reported during running.
Err 13	IGBT protection	The hardware has faults if errors are reported when the power is turned on; please check the wiring of the motor and the temperature of IGBT if errors are reported during running.
Err 14	Overload or locked rotor protection	The load is too heavy or the motor rotor has been locked, or inaccurate zero position of the motor causes too high operating current.
Err 15	Brake over-current protection	The hardware has faults if errors are reported when the power is turned on. The braking resistance is too low if errors are reported during running, or inappropriate acceleration/deceleration time is set.
Err 16	IGBT temperature protection	The IGBT is over-heated and detected by NTC. After resetting, the error continuously reported may be a fault caused by hardware circuit.
Err 19	Pressure sensor has faults	Please check whether the pressure sensor is damaged, or it may be caused by the power supply and wiring of the pressure sensor.
Err 21	Software overvoltage protection	If it is reported that the sampling circuit of the busbar has faults when the power is turned on with the power supply voltage. (No such error in the software after 2012)
Err 22	Software undervoltage protection	If it is reported that the sampling circuit of the dc busbar has faults when the power is turned on with the power supply voltage. (No such error in the software after 2012)
Err 23	Hardware overvoltage protection	The hardware has faults if errors are reported when the power is turned on. Please check the braking resistor and adjust the acceleration and deceleration if errors are reported during running.
Err 24	Hardware undervoltage protection	The hardware has faults when the power is turned on with the power supply voltage.
Err 25	Phase-lack protection	Please check if there is any phase lack in the 3-phase AC input. If normal, it may be a fault of hardware circuit.
Err 31	Internal +15V Overvoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;
Err 32	Internal +15V Undervoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;

Fault code	Fault name	Fault description
Err 33	Internal -15V Overvoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;
Err 34	Internal -15V Undervoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;
Err 35	Internal +5V Overvoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;
Err 36	Internal +5V Undervoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;
Err 37	Internal +24V Overvoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;
Err 38	Internal +24V Undervoltage	The hardware has faults when the power is turned on with the power supply voltage. Please check whether there exists external power interference if errors are reported during start and stop;
Err 41	Drive overheat protection	The hardware or temperature sensor is damaged if errors are reported when the power is turned on. Please check the cooling passages and fan of the drive if errors are reported during running.
Err 42	Motor overheat protection	The hardware or temperature sensor is damaged if errors are reported when the power is turned on. Please check the heat dissipation and temperature protection of the motor if errors are reported during running.
Err 61	Over-speed protection	The encoder has faults or there exists electromagnetic interference if errors are reported when the power is turned on. Please check the motor and overspeed protection parameters if errors are reported during running.
Err 71	Position feedback error	Z signal detection is abnormal. Resolver signals may be heavily interfered or resolver chips are damaged.
Err 75	Encoder error protection	The encoder circuit may be damaged, causing UVW signals to have a low level. (Only Encoder+)
Err 76	Encoder error protection	The encoder may not be wired or its circuit may be damaged, causing UVW signals to have a high level. (Only Encoder+)
Err 77	Resolver error protection	Resolver angle reading is abnormal. The resolver chips may be damaged or the resolver circuit may be damaged (only 2812 main board has such error)

Fault code	Fault name	Fault description
Err 78	Resolver error protection	Resolver angle reading is abnormal. The resolver chips may be damaged or the resolver circuit may be damaged
Err 81	Automatic zero setting error	Automatic zero setting cannot find encoder Z signals
Err 82	Automatic zero setting error	UVW wire sequence may be not correct, or may not match the settings of the parameters defined for the forward/reverse directions.
Err 83	Automatic zero setting error	The settings of the motor polar and encoder parameters are not correct, or the encoder is damaged or motor overload causes a locked rotor.
Err 84	Automatic zero setting error	The zero position of the motor is found, and the speed during the test running fluctuates too much. Please check the loads of the motor, and set an appropriate PI parameters
Err 99	Error in the communication of the master	The master detects that the setting of the communication address of the slave is not correct. Please make sure that the communication address of the slaves does not repeat.
Err100	Error in the communication of the slaves	The slave cannot detect the CAN commands from the master. Please check that the CAN communication lines of the slave are properly connected.
Err10x	Error in the communication of the master	The master cannot detect that the Xth drive's signals or the slave reports errors. Please check the status and the communication line of the slave.
Err120	Business timing 1 protection	First running time reaches. Please enter timing password 1 or permanent password.
Err121	Business timing 2 protection	Second running time reaches. Please enter timing password 2 or permanent password.

Appendix:

Table of Common-used Servo Motor Parameters

Motor model	Rated torque (Nm)	Rated speed (rpm)	Rated power (kW)	RLL resistance Parameter Pr_11	Ld inductance Parameter Pr_12	Lq inductance Parameter Pr_13	Ke back-electromotive force Parameter Pr_14
SM-200H13D17C-Rn21F	73	1700	13	104	2050	2950	1749
SM-200H17D17C-Rn21F	96	1700	17	71	1550	2250	1783
SM-200H21D17C-Rn21F	118	1700	21	47	1150	1700	1742
SM-200H25D17C-Rn21F	140	1700	25	36	900	1350	1705
SM-260H30D17C-Rn21F	169	1700	30	23	1135	1474	1747
SM-260H34D17C-Rn21F	191	1700	34	20	1029	1338	1773
SM-260H37D17C-Rn21F	208	1700	37	17	900	1172	1756
SM-260H42D17C-Rn21F	236	1700	42	14	773	1007	1732
SM-260H47D17C-Rn21F	264	1700	47	13	737	963	1790
SM-260H51D17C-Rn21F	286	1700	51	12	678	885	1787
SM-260H58D17C-Rn21F	326	1700	58	9	539	704	1713

Remarks:

Customers don't need to make any change to most of the parameters of Synmot servo drive SM22, and only needs enter the parameters of the motor of the corresponding model in the table above when using different type of servo motors.

Product warranty

Customer	Entity name			
	Address			
	Contact person		Tel.	
Agent <input type="checkbox"/> OEM <input type="checkbox"/>	Entity name			
	Address			
	Contact person		Tel.	
Product information	Product model			
	Bar code			
Operating conditions	Equipment type			
	Technique requirements			
Fault analysis	Faults (brief description)			


The product is produced under Synmot strict quality management and inspection. The warranty period is generally 12 months from the date of purchase.

◆ Free services

Where any fault occurs during normal use within the warranty period, the machine can be sent to the company licensed store or appointed service center for free repair service.

◆ Paid services

The machine cannot have free warranty service in the following situations:

- Faults occur or damages are made due to deliberate or inadvertent behavior
- Faults occur or damages are made due to use of abnormal voltage or incorrect plugging/unplugging
- Faults occur or damages are made due to force majeure such as natural disasters (e.g. fire, flood and earthquake)
- Faults occur or damages are made due to installation, repair, change or dismounting carried out by people other than those of the company's authorized bodies (licensed store).
- Products without the mark 
- Products are beyond their warranty period

Customer Orientation High-standard Service

———— Hot service line: (86)574-87645000 ————

Zhejiang Synmot Electrical Technology Co., Ltd

Address: No. 118, Weiliu Road, Xiaogang, Beilun, Ningbo
Zhejiang, P. R. China

Tel: (86)574-87645000

Fax: (86)574-87646788

Postal Code: 315801

Website: www.synmot.com/en