SA710
USER MANUAL

Preface

Thanks for choosing the SA710 modularity family, including its vector frequency converter, control unit and other modules.

Before using the products, please read the manual first to make sure the performance and specification of the products are fully understood, so that the products can be installed and operated safely and achieve the best value for the customer. Specifically, the manual describes the demands for maintenance and reconditioning of the products, please read the manual or download relevant materials from our website when needed.

Only professional electrical engineer is allowed to install or debug the product wherever high voltage is applied.

In the manual, some information is marked with  (Caution) or  (Danger) to warn of the safety demands for moving, installing, operating and testing the products. Please follow the demands. If any question, please contact us for professional advices.

Please be noticed that the SA710 is a family of different modules. You can order different modules separately and some modules can run separately. You can build up your own product combination based on your demands. Below modules are illustrated in this manual: Power Unit (abbreviated as PU, functions to achieve the power conversion, motor control, protection etc.), Control Unit (abbreviated as CU, functions to achieve application control, control terminal and/or human interface), keypad, option cards and other options.

To fulfil more and more demands from the customer, we may upgrade our products and the manual as well, you may not receive the notification if no special agreement is made. Please keep attention to our website or consult us if any change happens

CONTENTS

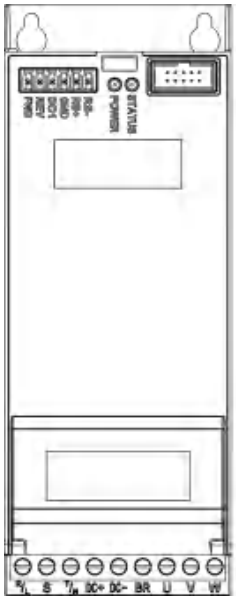
Chapter 1 Overview of the SA710 Modules

SA710 is a family of different modules, as listed below:

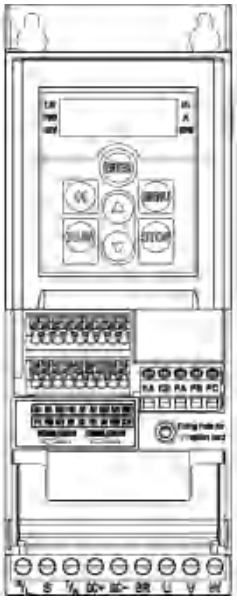
Name	Type	Specification	Function Description
Power Unit	PU00	200~240V: 0.37~4.0kW 380~480V: 0.75~630kW	Power Conversion, motor speed or torque control, a Control Unit is must to run the motor
	PU01	200~240V: 0.37~4.0kW 380~480V: 0.75~22kW	Power Conversion, motor speed or torque control, can run the motor with its built-in DI/DO/Modbus
Control Unit	CU00/ CU0H	6DI+2AI+AO+DO+2Relay+RS485 5 Digits LED Keypad 1 option card socket	Customer functions including IO, bus communication, keyboard operation and application processes; CU00 for PU 0-90kW; CU0H for PU 110-630kW.
	CU03	8DI+4DO+4AI+2AO+2RS485 5 Digits LED Keypad 2 option card sockets	Customer functions including IO, bus communication, keyboard operation and application processes; PLC function;
	CU0L	6DI+2AI+AO+DO+2Relay+RS485 5 Digits LED Keypad 1 option card socket	Customer functions including IO, bus communication, keyboard operation and application processes; Elevator functions SW built-in
Keypad	KP01	5 digits LED, incremental potential meter	Local operation, status monitoring, parameter set/read
	KP02	7line LCD, USB/Wi-Fi, real time clock	Local operation, status monitoring, parameter set/read or copy, SW update, Wireless control
Option Cards	PG01	12V/24V 150mA,50kHz	Common mode incremental encoder
	PG02	5V 200mA,200kHz	Differential mode incremental encoder
	PG03	5~7V,10kHz,2/4/6/8 poles	Resolver for speed/position sense
	IO01	3DI、2DO、2AI、2AO	IO Terminal option card
	DP01	DPV1	Profibus-DP
	PN01	IO, RT, IRT	ProfinET
	MT01	2 RJ45,100Mbit/s	Modbus TCP
	ET01	CoE,2 RJ45,100Mbit/s	EtherCAT
Din-rail Option	DR1	Only up to 2.2kW	For din-rail mounting
Panel-Through Option	PT1-PT7	Only from 11kW to 90kW	For panel-through mounting
Decoupling Plate	ED1-ED5	Only up to 22kW	For grounding the shielding of control wire and power cable

NOTE: a. Customize design for Control Unit is possible and compatible for all Power Unit.
b. More option cards are coming later

Below are several examples of the combination of different modules possible for application:

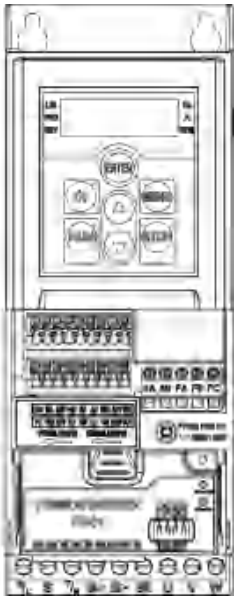


PU01 alone



PU00 + CU00/CU0H

PU00 +Customized CU



PU00 + CU00/CU0H + DP01

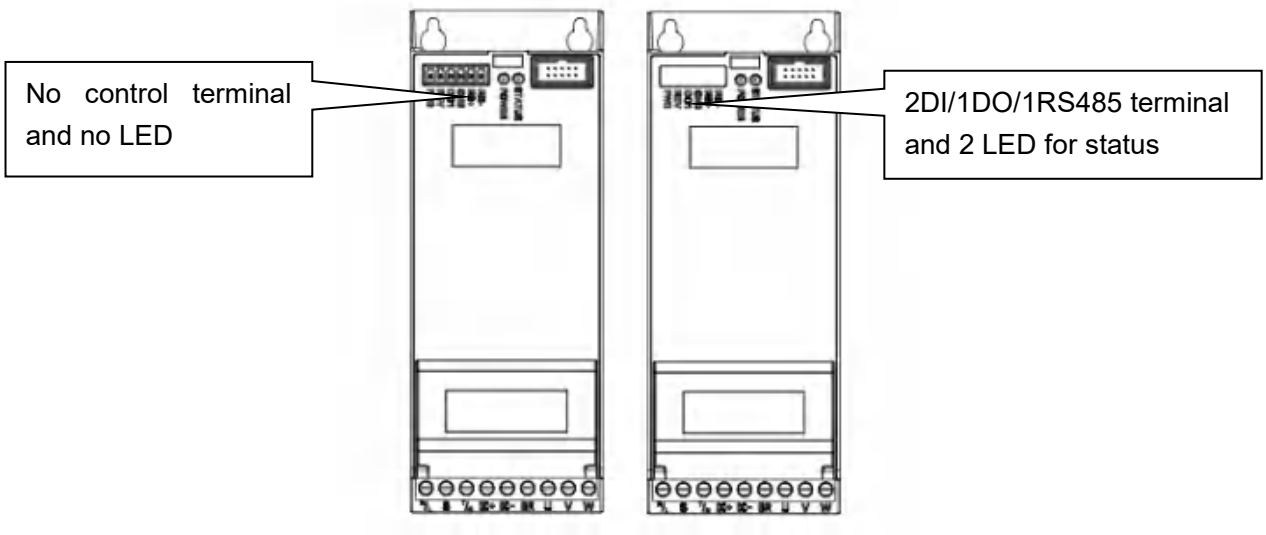
1.1 Type and Specification of main Power Unit of SA710

Currently two series of Power Unit can be ordered, listed as below:

Type Name	Power Range	Difference
PU00	0.37kW-630kW	No DI/DO/RS485 and no LED for status
PU01	0.37kW-7.5kW	2DI/1DO/1RS485 for control and 2LEDs for monitoring
	11kW-22kW	3DI/1RL/1AI/10V/1RS485 for control and 2LEDs for monitoring

Below picture shows where is the difference between PU00 and PU01:

▼ 0.37kW ~ 7.5kW:



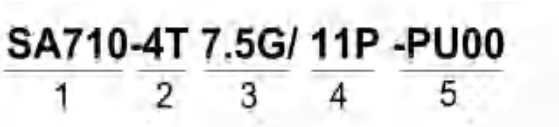
PU00 PU01

1.1.1 Nameplate for SA710 Power Unit (PU00/PU01)

Description of the Name Plate:

Item	Description
1	Type code
2	Power input specification
3	Power output specification
4	Sales number
5	Bar code
6	Order number
7	Certification logo: RoHS CE UL WEEE etc.
8	Warning information
9	QC Pass
10	Country of origin
11	Voltage/Power
12	QR code

Explanation of the Type Code:



No.		Description
1	SA710	SA710 family
2	4T	Line in voltage, 4T:3phase380V ;2T:3phase 220V or single phase 220V
3	7.5G	Power size. 7.5 means 7.5kW, G means for Heavy load
4	11P	11 means 11kW, P means for Heavy load. For Models not supporting dual rating, this will be null
5	PU00	Type of Power Unit

Note:(“/” and “-” are not counted in the number of digits)

1.1.2 Main Specifications and Models for SA710 Power Unit (PU00/PU01)

Model Type	Power (kW)	Voltage (V)	Heavy Load		Light Load		Air (m^3/h)
			Input (A)	Output (A)	Input (A)	Output (A)	
SA710-2T0.37G-PU00	0.37	1×200-240/ 3×200-240	6.5	2.5	-	-	17.2
SA710-2T0.75G-PU00	0.75		9.3	4.5	-	-	17.2
SA710-2T1.5G-PU00	1.5		15.5	7.5	-	-	17.2
SA710-2T2.2G-PU00	2.2		23	9.6	-	-	45.5
SA710-2T4.0G-PU00	4.0		33	16	-	-	90
SA710-2T5.5G-PU00	5.5	3×200-240	35.9	25	-	-	124
SA710-2T7.5G-PU00	7.5		43.4	32	-	-	170
SA710-2T11G-PU00	11		61	45	-	-	272
SA710-2T15G-PU00	15		82.5	61	-	-	303
SA710-2T18.5G-PU00	18.5		72	75	-	-	374
SA710-2T22G-PU00	22		88	91	-	-	408
SA710-4T0.75G/1.5P-PU00	0.75/1.5	3×380-440	3.7	2.3	5.8	3.7	17.2
		3×440-480	3.2	2.1	5.0	3.4	
SA710-4T1.5G/2.2P-PU00	1.5/2.2	3×380-440	6	3.8	8.5	5.3	17.2
		3×440-480	5.2	3.5	7.3	4.8	
SA710-4T2.2G/4.0P-PU00	2.2/4.0	3×380-440	8.5	5.3	14.0	8.5	17.2
		3×440-480	7.3	4.8	12.4	8.2	
SA710-4T4.0G/5.5P-PU00	4.0/5.5	3×380-440	15	9.6	18.6	11.2	45.5
		3×440-480	12.9	8.8	18.1	11.0	
SA710-4T5.5G/7.5P-PU00	5.5/7.5	3×380-440	20.8	13.0	24.7	15.5	90
		3×440-480	19.1	11.8	21.4	14.2	
SA710-4T7.5G/11P-PU00	7.5/11	3×380-440	27.1	17.0	33.1	22.0	90
		3×440-480	23.4	15.5	30.2	21.0	
SA710-4T11G/15P-PU00	11/15	3×380-440	35.9	25.0	42.5	31.0	124
		3×440-480	31.4	22.7	39.8	28.5	
SA710-4T15G/18.5P-PU00	15/18.5	3×380-440	43.4	32.0	50.2	36.0	170
		3×440-480	40.2	29.1	45.8	34.0	
SA710-4T-18.5G/22P-PU00	18.5/22	3×380-440	51.5	38.0	58.5	42.5	230
		3×440-480	46.1	34.5	54.0	40.0	
SA710-4T22G/30P-PU00	22/30	3×380-440	61	45.0	79.0	56.0	272
		3×440-480	54.5	40.9	73.0	51.0	
SA710-4T30G/37P-PU00	30/37	3×380-440	82.5	61.0	98.0	71.0	303
		3×440-480	74	52.0	90.0	65.0	
SA710-4T-37G/45P-PU00	37/45	3×380-440	72	75.0	87.0	90.0	374
		3×440-480	65	68.0	79.0	80.0	
SA710-4T45G/55P-PU00	45/55	3×380-440	88	91.0	102.0	104	408
		3×440-480	80	82.0	99.0	101	

Model Type	Power (kW)	Voltage (V)	Heavy Load		Light Load		Air (m^3/h)
			Input (A)	Output (A)	Input (A)	Output (A)	
SA710-4T55G/75P-PU00	55/75	3×380-440	110	112	142	145	476
		3×440-480	100	102	132	136	
SA710-4T75G/90P-PU00	75/90	3×380-440	148	150	170	175	595
		3×440-480	135	140	150	155	
SA710-4T-90G/110P-PU00	90/110	3×380-440	175	180	192	202	646
		3×440-480	155	160	172	179	
SA710-4T110G/132P-PU00	110/132	3×380-440	206	215	245	255	714
		3×440-480	183	190	225	235	
SA710-4T132G/160P-PU00	132/160	3×380-440	251	260	290	305	850
		3×440-480	231	240	285	295	
SA710-4T160G/185P-PU00	160/185	3×380-440	304	315	334	350	1029
		3×440-480	291	302	307	322	
SA710-4T185G/200P-PU00	185/200	3×380-440	350	365	370	385	1190
		3×440-480	320	335	336	352	
SA710-4T200G/220P-PU00	200/220	3×380-440	381	395	409	425	1292
		3×440-480	348	361	375	390	
SA710-4T220G/250P-PU00	220/250	3×380-440	420	435	453	461	1411
		3×440-480	383	398	419	425	
SA710-4T250G/280P-PU00	250/280	3×380-440	472	480	509	525	1564
		3×440-480	436	443	461	478	
SA710-4T280G/315P-PU00	280/315	3×380-440	525	540	568	585	1700
		3×440-480	475	490	510	522	
SA710-4T315G/355P-PU00	315/355	3×380-440	590	605	621	634	1870
		3×440-480	531	540	557	566	
SA710-4T355G/415P-PU00	355/415	3×380-440	647	660	694	725	2125
		3×440-480	580	590	628	655	
SA710-4T415G/450P-PU00	415/450	3×380-440	718	745	776	805	2380
		3×440-480	653	678	708	735	
SA710-4T450G/500P-PU00	450/500	3×380-440	836	827	932	918	2600
		3×440-480	722	714	805	793	
SA710-4T500G-PU00	500	3×380-440	932	918	/	/	3100
		3×440-480	805	793	/	/	
SA710-4T560G-PU00	560	3×380-440	1021	1028	/	/	3600
		3×440-480	882	888	/	/	
SA710-4T630G-PU00	630	3×380-440	1178	1100	/	/	4100
		3×440-480	1017	1000	/	/	

Note:Only PU00 are listed above, specifications of PU01 are the same as PU00.

1.1.3 Specification

Item			Specification
Line in	Voltage		Single Phase 200~240V -15%~+10%; 3 Phase 380~480V -15%~+10%;
	Frequency		50/60Hz±5%
	Unbalance		3%
Out put	Voltage		3 Phase 0~100% Line in voltage
	Frequency		0~590Hz
Main Control	Control algorithm		V/F control,Vector Control
	Motor Type		Induction Motor, PM Motor
	Start Torque		0.5Hz 150%
	Overload		Heavy load type: 150% 60s, 180% 3s; Light load type: 120% 60s, 150% 3s
	Switching Frequency		0.37~22kW: 2k~16kHz;30~90kW:2~8k; 110~160kW:2~4k; >=185kW:2~3k
	Speed resolution		Digital: 0.001Hz; Analogue: 0.5‰ of the maximal setup;
	Speed accuracy at Speed Open Loop		±0.5% of Nominal speed
	Source of Control Command		Keypad, DI inputs, Bus communication
	Source of Reference		Keypad, Analogue inputs, Pulse inputs, Bus communication
	Acieration/Deceleration setup		4 sets of acceleration/deceleration time, range: 0.05-6000.00s;
Basic Functions	Speed open loop, speed close loop, Process close loop, torque control (with/without speed sensor, Motor auto tuning, Load compensation, auto DC voltage regulation, DC brake/AC brake, speed limit, current/torque limit, fly start, KEB etc. Note: Speed close loop or torque control with speed sensor is OK only when a control unit and PG card are installed		
Application Functions	Multistage speed control by terminals or PLC function, S ramp, Mechanic brake, counter, Process PID, Jog etc.		
Protection Functions	Short circuit, Ground fault, line phase loss, under voltage, over voltage, over current, overload, over temperature, motor thermal protection, motor phase loss, control wire broken etc.		
Control Terminals	0.37-7.5kW	DI (Only PU01)	2 Dis for NPN and voltage input
		DO(Only PU01)	1 DO of 40mA
		RS485(Only PU01)	
	11-22kW	DI (Only PU01)	3 Dis for NPN and voltage input
		AI (Only PU01)	1AI of Current and Voltage input
		10V (Only PU01)	10V of 10mA
		RL (Only PU01)	1RL for SPST with 3A/250V
		RS485(Only PU01)	1 RS485/Modbus, maximal 38400bit/s;
	Connector		10 Pin IDC connector

Item		Specification
Operation Environment	Protection Level	IP20;
	Operation Ambient Temperature	Operating range: -10℃ ~ 60℃ As heavy load type: Nominal current to 50°C, derate from 50°C As light load type: Nominal current to 40°C, derate from 40°C
	Operation Ambient Humidity	5%-85%(No condensing at 95%);
	Vibration	<=90kW:1.14g; >=110kW: 0.7g ;
	Altitude	1000m, derate from 1000m
	Motor cable length	Shielded Cable: 50m;Un-shielded cable:100m
Others	Brake Chopper	Built in as default up to 22kW

1.1.4 Derating requirement

Derating with temperature: when used as heavy load type, derating is required from temperature higher than 50°C. 2.0% per degree is demanded. when used as heavy load type, derating is required from temperature higher than 40°C. 3.0% per degree is demanded.

Derating with altitude: derating is required from altitude higher than 1000m. 1% load per 100m or 0.5°C ambient temperature is demanded.

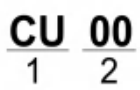
1.2 SA710 Control Unit (CU)

Currently only four types of Control Unit, CU00/ CU0H/CUOL/CU03/ are available. More Control Unit will be available depending on the demands from the market or customization.

1.2.1 Description of Name Plate

Item	Description
1	Model
2	Sales number(F0100001)+SW version(V002) + Production site (A)+SN number (0001) + week-year
3	Bar code
4	QC Pass

Explanation of the type code



NO.		Description
1	CU	Control Unit
2	00	The type of the Control Unit

1.2.2 Main specification and models of Control Unit

Model Type	CU00/CU0H/CU0L	CU02	CU03	CU04
Number of DI	6	5	8	6
Number of DO	1	1	4	2
Number of AI	2, Configurable as DI	2, Configurable as DI	4	2
Number of AO	1	2	2	1
Number of Relay	2	2	0	2
Bus communication	1 RS485	1 RS485	2 RS485	2 RS485
Power Supply	10V/30mA; 24V/200mA	10V/30mA; 24V/200mA	10V/30mA; 24V/200mA	10V/30mA; 24V/200mA
Number of Socket for Option Cards	1	1	2	2
Keypad	Integrated, undetachable	Integrated, undetachable	Detachable	Detachable
PLC (Customer developing SW)	No	NO	YES	NO
Comments	released	released	To be released	released

Note: CU can be customized if any further special demands

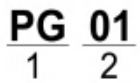
1.3 Option cards

SA710 Control Units support different types of option cards, including PG cards, Communication cards and IO extension cards.

1.3.1 Description of name plate

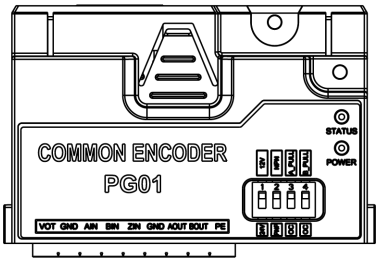
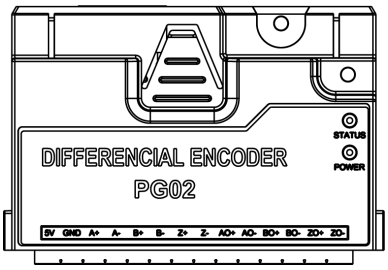
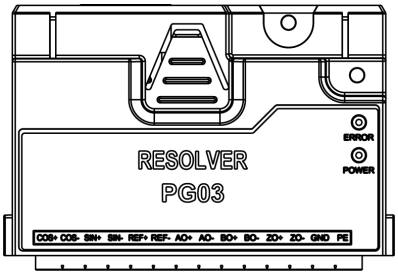
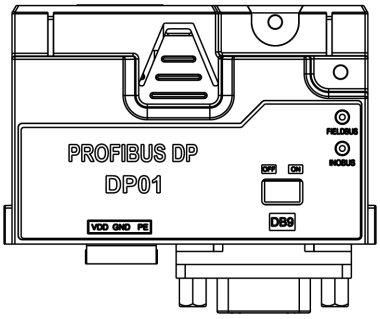
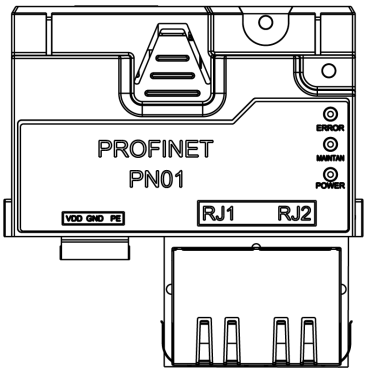
Item	Description
1	Model
2	Sales number(F0100001) + SW Version(V002) + Production site(A) + SN (0001)+week-year (518)
3	Bar code
4	QC Pass

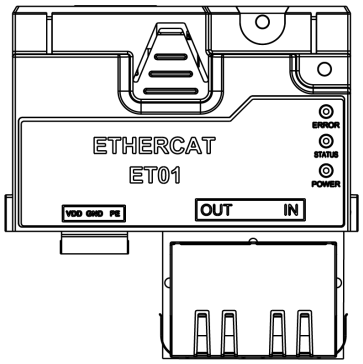
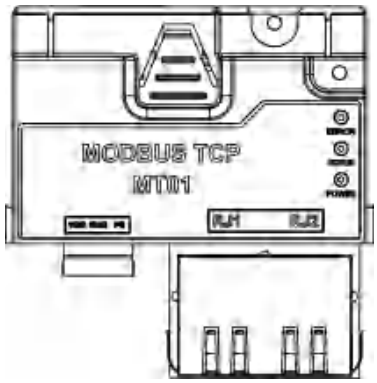
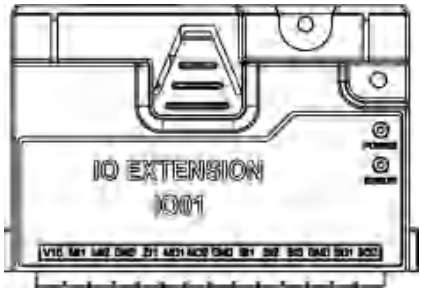
Explanation of the Type code:



NO.		Description
1	PG	Option card type (PG representing encoder card)
2	01	Option card model

1.3.2 Main specification and Models of option cards

Model type		Main Specification	Appearance
PG card	PG01	Power supply:12V/24V; 150mA; Input:A/B/Z, Voltage/OC/OE/push-pull,50kHz Divider Output:A1 B1(divider multiple: 1~255)	
	PG02	Power supply:5V, 200mA; Input:A+/A-,B+/B-,Z+/Z-differential signal, 200kHz Divider Output:A+/A-;B+/B-(divider multiple: 1~255)	
	PG03	Resolver Power supply:REF+/REF;(VRMS:5V~7V) Stimulation frequency:10kHz Inputs: SIN+/SIN-; COS+/COS- Number of pole pair: 2, 4, 6, 8	
Bus communication	DP01	Protocol: Profibus DPV0/DPV1 Terminal: DB9 with DP+, DP-, RTS, 5V, GND Baud rate: 9.6Kbps~12Mbps GSD file: available	
	PN01	Protocol: Profinet RT, IRT, ProfiDrive Terminal: RJ45 GSDML file:available	

Model type		Main Specification	Appearance
	ET01	Protocol : EtherCAT CoE Terminal:RJ45 XML file:available	
	MT01	Protocol : ModbusTCP Terminal:RJ45	
IO extension	IO01	Digitals(3DI+2DO) 4Analogs(2AI+2AO) 1Resister (1RI) 10V-1	

1.4 SA710 Keypad

SA710 supports two types of keypad: KP01 and KP02 with LED display and LCD display respectively.

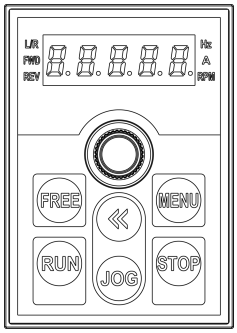
1.4.1 Description of the Name plate of keypad

Item	Description
1	Model
2	Sales number (F0100001) + SW version(V002) + Production site(A) + SN (0001) + week-year (518)
3	Bar code
4	QC Pass

Explanation of the type code:

NO.		Description
1	KP	Operation keyboard
2	01	Operation keyboard type

1.4.2 Main specification and model of keypad

Model Type		KP01	KP02
Main specification	Display	5 digits LED	Multi-lines LCD, Bilingual
	Remoting distance	15m	15m
	Additional Interface	No	USB, Wi-Fi
	Real Time Clock	No	Yes
	Interface Type	10PIN+RJ45	RJ45
Appearance			

1.5 Other options supported in SA710

Options for din-rail mounting, panel-through mounting and decoupling plate can be afforded for SA710 application. Din-rail mounting option is only for products up to 2.2kW. Panel-through mounting options are available only for products from 11kW to 90kW. Decoupling plates are available only for products up to 22kW.

In additional, based on the application demands, external chokes, brake resistor or filters could be necessary. The selection of these parts is recommended in this manual. You can buy from a third party, or ask for from us.

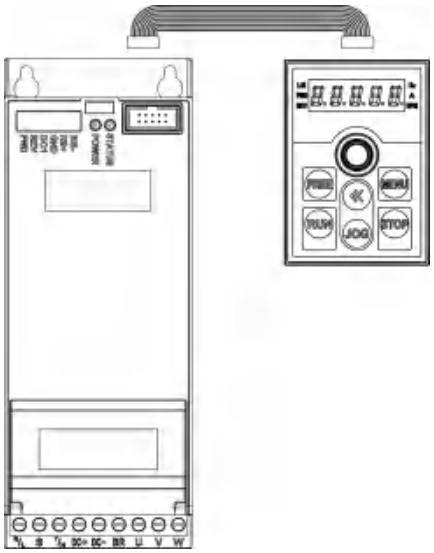
1.6 Guidance for use SA710 modules in combination

1.6.1 Power Units work alone

PU00 and PU01 can drive a motor alone.

1.6.1.1 PU00 works alone:

Because there is no DI or RS485 in PU00, the Unit cannot accept the commend from customer or system. Normally PU00 will not be used alone. However, you can connect a keypad, e.g. KP01 to the 10PIN connector and control the motor by the keypad (shown as below picture).

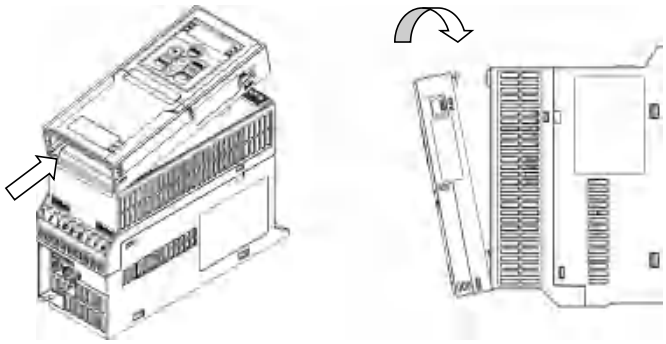


1.6.1.2 PU01 works alone

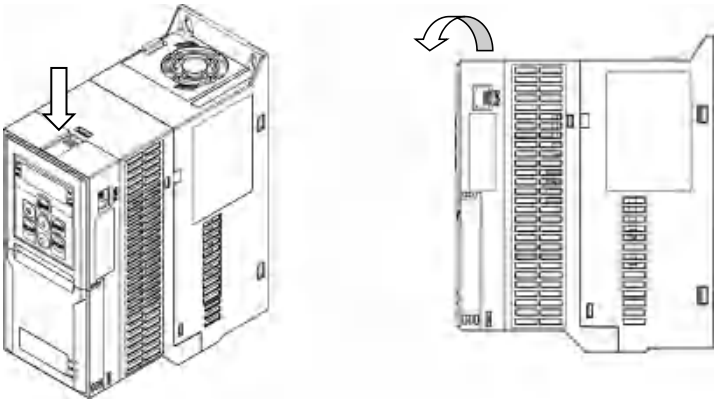
There are 2 DI, 1 DO and 1 RS485 interface built in PU01, you can send the command to and get feedback from the Power Unit via these terminals with PLC or other controller to achieve the automatic control. At the same time, you can connect a keypad to the Power Unit via the 10 PIN connector (reference to 1.6.1.1)

1.6.2 Combine the Control Unit with Power Unit

To achieve much more complex control than the Power Unit alone, including terminals control, special application and keypad control, you can install a Control Unit onto the Power Unit. You can install the Control Unit onto the Power Unit simply by a “click” or remove the Control Unit from the Power Unit without any special tools, as shown below.



Install the Control Unit onto the Power Unit:Clip the bottom of the Control Unit into the bracket of the Power Unit, then turn the Control Unit to the Power Unit, until a “click” at the top, the installation is finished.



Remove the Control Unit from the Power Unit: Press down the snap joint at the top, then turn and remove the Control Unit from the Power Unit.

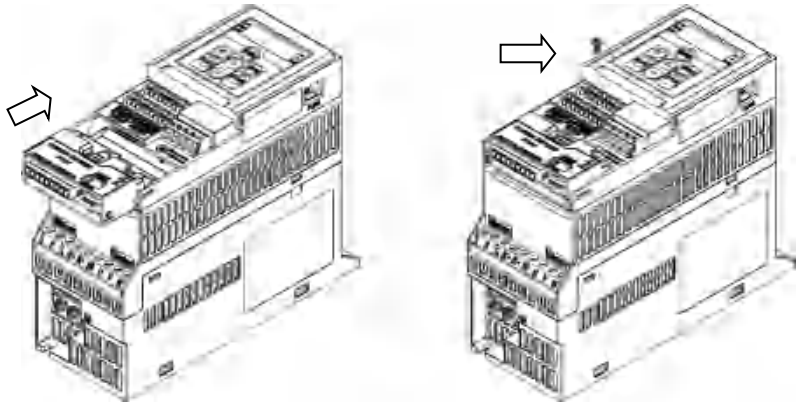
The connection between the Control Unit and Power Unit is achieved with special protocol defined . For example, when Power Unit PU00 and Control Unit CU00/CU0H are combined, then you get a standard frequency converter. The application control speed and terminal scan speed can be 1ms one time and the motor control speed can be 100uS one time fastest. you can set a parameter to define the response from the drive when the Control Unit is removed: alarm or continue to run the motor (default is to alarm and trip to stop). It not recommended to remove or plug the Control Unit while power is on, otherwise the product could be damaged.

Within SA710 family, any Control Unit is compatible with different Power Units (PU00, PU01 or any future released Power Unit). Specifically, a physically same Control Unit can be installed to different Power Unit and no other set up change is needed. On the other hand, different Control Unit (CU00/CU03/CU0H/CU0L or any future to be released Control Unit) can be installed to the same Power Unit to achieve different functions or the best performance/cost ratio. You don't need to change any SW or HW setup to achieve these.

1.6.3 Use option card or keypad on Control Unit

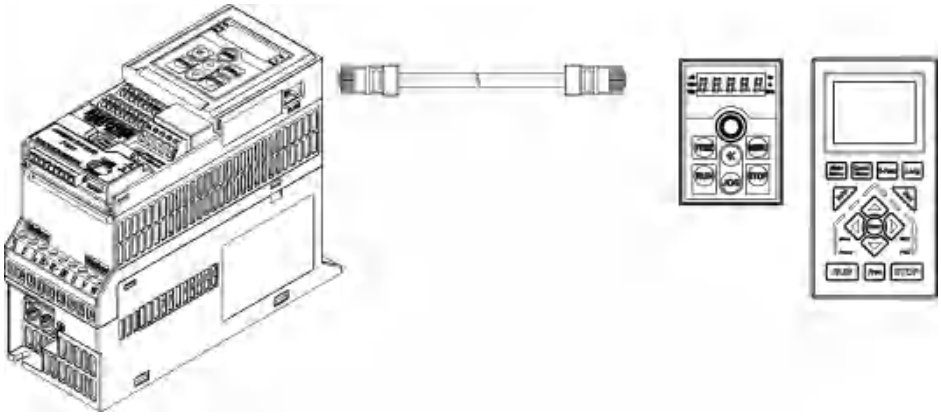
You can extend the function by connecting Option Card or Keypad to the Control Unit for CU00/CU0H, CU0L or /CU03 which can support different types of Option Cards, including PG01, PG02, PG03, DP01, PN01, IO01 etc. Only one Option Card can be installed in CU00/CU0H/CUOL at the same time. however, CU03 can support two.

How to install the Option Cards into a Control Unit is shown below.



Install the Option Card in Control Unit: Align the Option Card with the guide rail at the bottom of the Control Unit, then push up to the right position. Fix the Option Card with a screw at the top right corner of the option card.

Although CU00/CU0H/CU0L have an integrated keypad, you can connect an extension keypad (KP01, KP02 etc.) via the RJ45 connector. The connection is as below. Please be notified that, for products using CU00/CU0L (normally for products up to 90kW), if an extension keypad is installed, neither the integrated keypad nor the option card can operate.



CU03 has no integrated keypad. However, KP01 can be installed into CU03 (detachable) or connected to it via a cable. KP02 can be connected to CU00/CU0H or CU0L only by wire. There is no confliction between Keypad and Option Cards in CU03 for using them at the same time.

Chapter 2 Operation Instruction for SA710 Power Units

2.1 Safety Instruction for Power Units of SA710

Definition of Safety:

In the manual, the do's and don'ts of safety announcements are classified into two categories as below:

⚠ Caution: Not following the safety announcements may lead to damage of the product or equipment

⚠ Warning: Not following the safety announcements may lead to death or hurt to the humane body

2.1.1 Before Power On

⚠ Caution

The power supply must be within the specification of product.

Please install the product in a safe environment. Please operate the product within the specified ambient temperature and humidity, avoid direct sunlight to the product. Please prevent the product from dripping water because the protection level of product is IP20. Installing the product in an unsafe environment may lead to fire, explosion or electric shock.

If the product is installed in a cabinet, please ensure a good air conduct. Cooling fans to take the heat out of the cabinet is demanded especially when there are some other components that generates heat. The ambient temperature inside the cabinet should be controlled within specification of all the parts to avoid over temperature protection or fire.

You should NOT RUN/STOP the product by switching on/off the input power to the product, e.g. with a contactor. This operation may lead to damage of the product. Keypad, IO terminal or bus communication command is recommended to run/stop the product.

Installing contactor or air switch at the output side of the product is not recommended. If you have to do so, please make sure that the output current of the product is stopped when operating the contactor or switch.

It is prohibited to connect any capacitor or varistor directly at the output side of the product. Doing so may lead to unexpected failure of damage of the product.

High distortion over the standards in the power supply, including harmonics and unbalance, may lead to failure or damage of the product. Please avoid connecting to the common-connection-point directly with equipment which generate strong distortion in the grid, e.g. electric welding machine.

Make sure all the power ports (R/S/T/P/N/BR/U/V/W) are connected correctly, otherwise the product will be damaged when power on or start.

In factory default set up, motor thermal protection is disabled. If this function is demanded, please set the parameter according to the manual.

Isolation tests to the product or internal components could be destructive and damage the product. Please consult us if you need to do so.

Electronic components is sensitive to ESD, do not touch the PCBAs without ESD protection.

The product is designed for high voltage operation, only qualified electrical engineers can be responsible for the installation, commissioning, tests and maintenance for the product.

Do NOT move the product via the front cover of the product to avoid dropping hazard. Please use the bottom of the product or the specifically designed construction.

Warning

Make sure the power is off for enough time before connecting the wires

Please install the product on fire-proof material to avoid any fire hazard.

Do not install the product in the environment with explosive gases, otherwise there will be explosion hazard.

Connect the PE terminal to the safe ground. NEVER use the null line as ground, otherwise it may lead to electric shock.

It is strictly prohibited to disassemble the products and change the parts, components, connections or setup of the products without permission. Doing so may lead to electric shock, explosion etc.

Please install the product cover correctly before power on.

2.1.2 With Power on

Warning

NEVER plug or remove any part of the product when the product is powered except for the detachable keypad. Doing so may lead to product damage or humane injury or death.

Keep children and irrelevant person away from the product when it is powered on.

2.1.3 Running

Caution

Do Not switch in/off the motor to the product during running. Doing so may lead to failure or damage of the product.

Motor cable length exceeding the specification will reduce the life time of the products or lead to failure. If multi-motor is connected to the product, the total motor cable length should be within 50% of the specification. If motor cable length exceeds the limitation, please install filter at the output of the product.

Pay attention to the speed limitation for the motor bearing and other mechanical device.

Warning

Do NOT touch or detect the circuit with detector of multimeter, oscilloscope or any other equipment.

Do NOT open the front cover of the product during running.

If the Fault-Auto-Restart function is enabled by parameter setup, the motor may rotate again after failure. Please stay away from any moving part including the motor.

2.1.4 Power Off

Warning

Before touch the power terminals or any part inside the product, please make sure all the connections which can power the product have been removed, including AC line in, DC inputs.

Even all the connections which can power the product have be removed, there could still be residual voltage inside. Please wait for enough time according to the specification before touch the power terminals or any internal parts.

2.2 Mechanical and Electrical Installation

2.2.1 Mechanical Installation

2.2.1.1 Installation Environment

The operation ambient temperature should be within -10℃~60℃;

Install the product on fire-proof material;

Installation vibration should be not higher than 1.14g. Make sure the product is fixed properly to the installation surface;

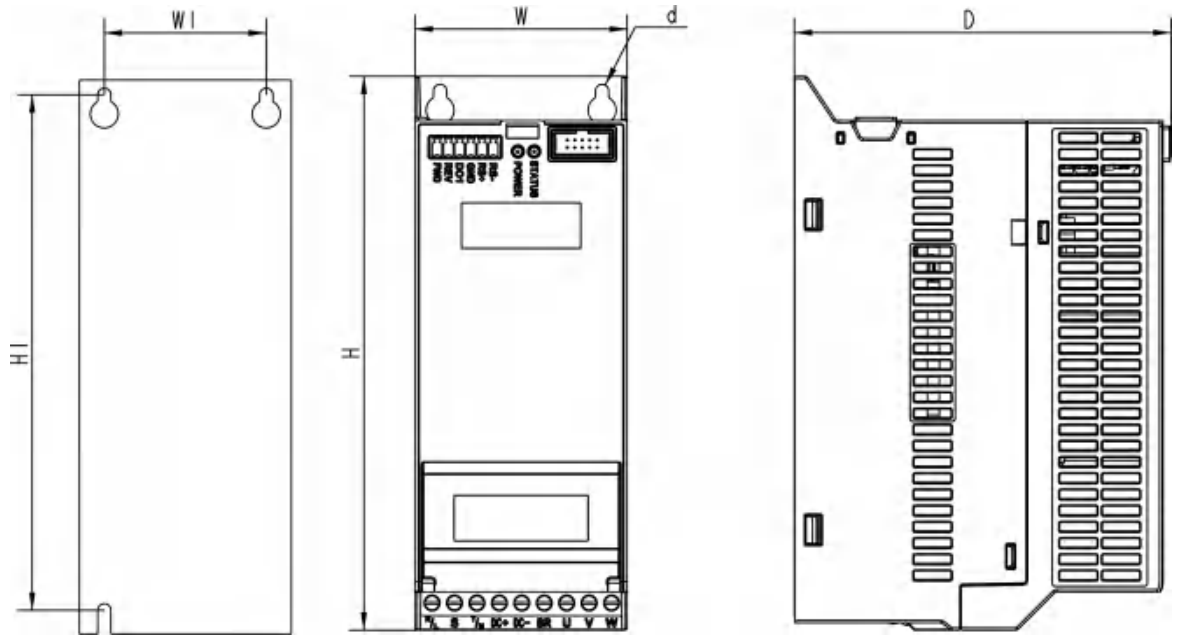
Ensure enough space around the product for heat dissipation;

Avoid direct sunlight, water dripping, condensing and humidity over limit;

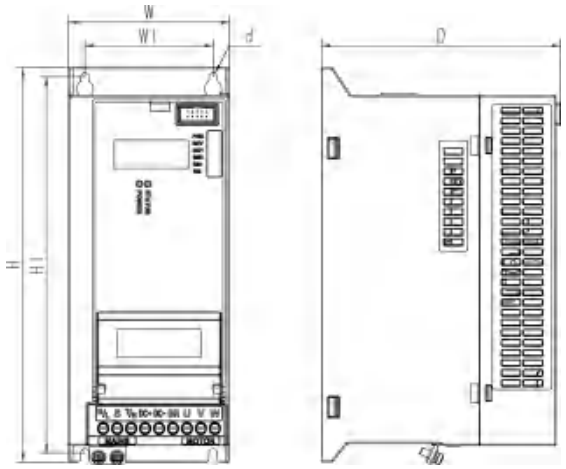
Do NOT install the product in environment with corrosive gas, inflammable gas or explosive gas;

Do NOT install the product in environment with oil contamination, dusty air or metal dust.

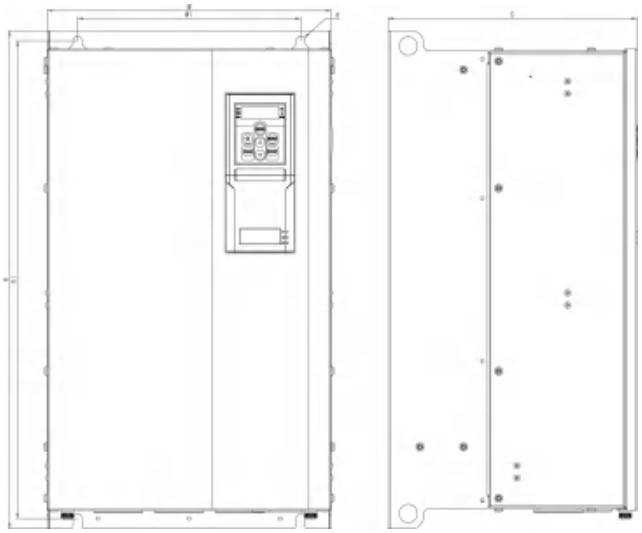
2.2.1.2 Outline and Installation Dimensions



D1 Power unit size

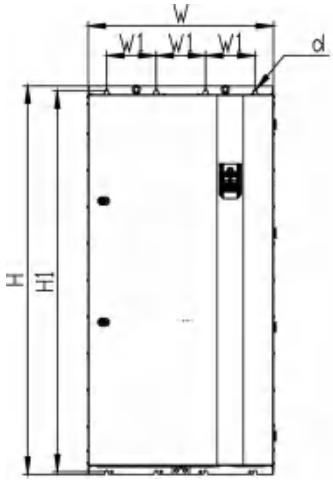


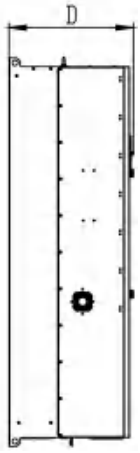
D2-D4 Power unit size



D5-D6 Power Unit/Complete inverter size

D7-D9 Complete inverter size





D10 Complete inverter size

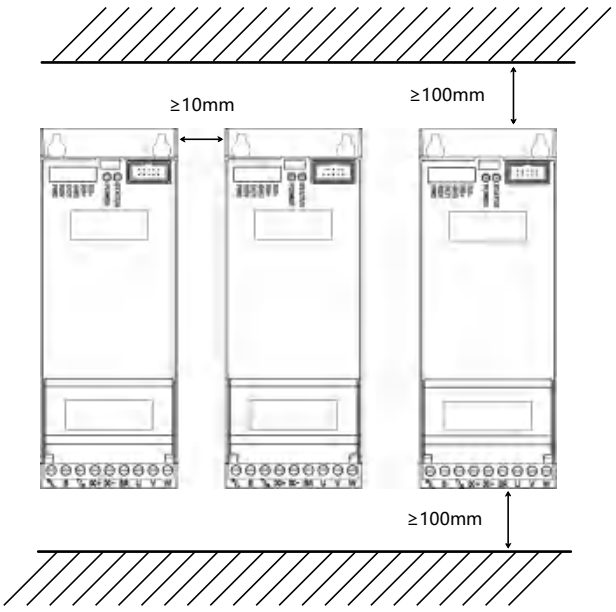
Frame Sizes:

Frame	Rated Power			Dimensions (mm)					
	1phase/3phase 220V	3phase 220V	3×380-480V	W	H	D	W1	H1	d
D1	0.37-1.5 kW	-	0.75-2.2 kW	72	188	128	55	175	4.5
D2	2.2 kW	-	4.0 kW	88	215	130	70	205	4.5
D3	4.0 kW	-	5.5-7.5 kW	100	250	135	80	240	4.5
D4	-	5.5-11kW	11-22 kW	170	370	150	145	355	6.5
D5	-	15-22kW	30-45 kW	280	490	245.5	220	470	9
D6	-	-	55-90 kW	330	620	265	270	600	9
D7	-	-	110-160 kW	320	870	380	240	845	13
D8	-	-	185-315 kW	500	1070	410	380	1040	13
D9	-	-	355-450 kW	650	1220	430	480	1190	13
D10	-	-	500-630 kW	750	1570	505	3×200	1540	13

2.2.1.3 Product Installation

Single Mounting and Side-by-Side Mounting

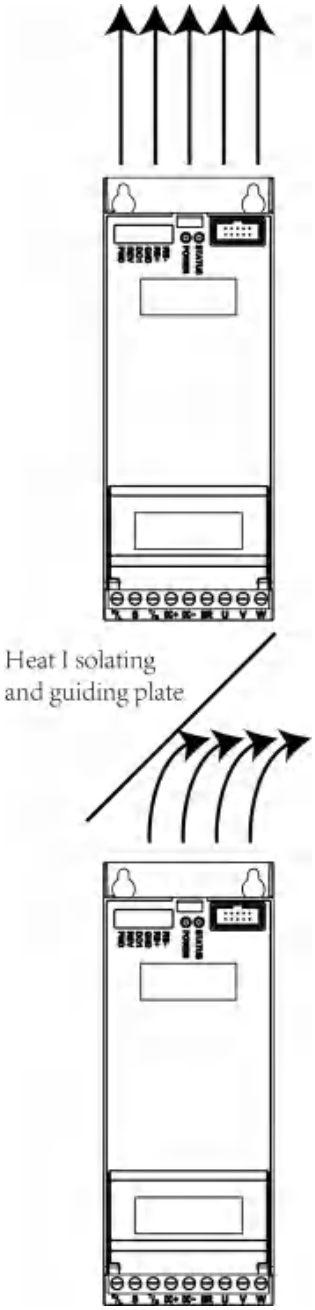
SA710 Power Units support side-by-side mounting as well as single mounting. Enough space around the product should be kept to ensure the heat dissipation, as stated below:



Note: If the demanded space cannot be guarantee, please date the product or lower down the ambient temperature

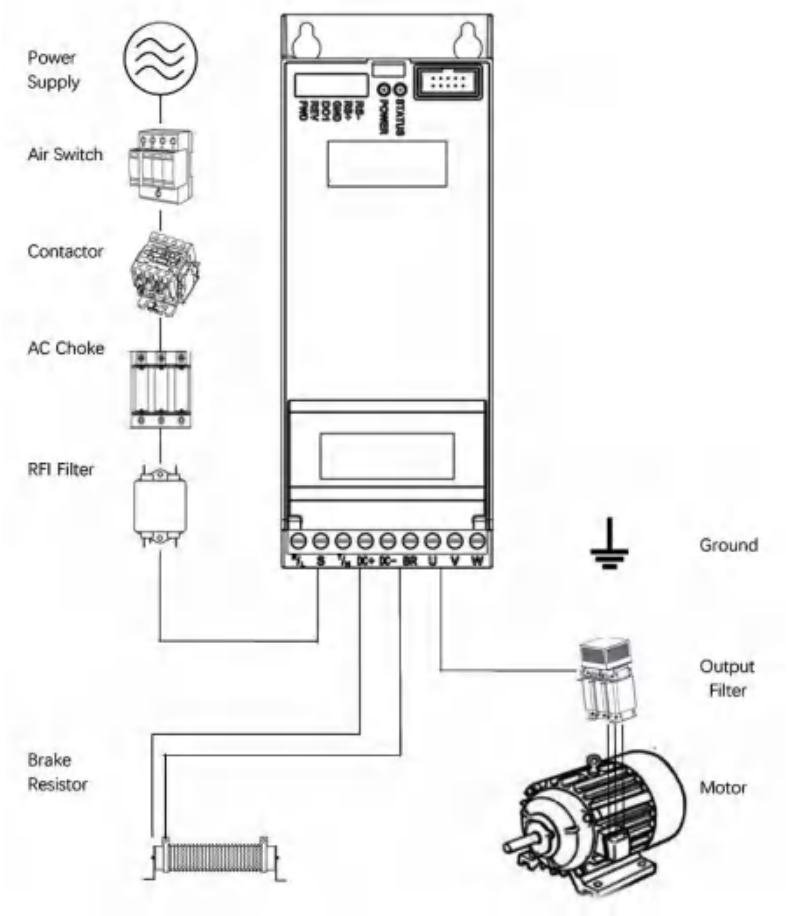
Above-Underneath Installation

When install products on top of another, the heat generated by the product underneath could increase the temperature of the product above. In this case a plate for heat isolating and guiding is necessary as shown in below picture.



2.2.2 Auxiliary Components Installation

Most possible auxiliary components installed as options for running the product are shown as below:



Name	Connect Point	Functions
Air Switch	First to the power supply	Cut the power automatically at high current to protect the product from further damage and limit the failure impact to other equipment
Contactor	Between the air switch and input port	Power on or power off for the product. Please limit the on-off frequency within 2 times per minute, otherwise the product may be damaged. Do NOT run/stop the motor by switching the power with contactor. Doing so may damage the product.
Input Choke	At the input port	To restrain harmonics to the line in current, or to protect the product in harsh grid with voltage distortion or unbalance, AC choke can be connected between the power supply and input port of the product. Please be aware of that AC choke will increase the voltage drop so that reduce the maximal load capacity.
RFI filter	At the input port	In order to achieve higher level of EMC performance especially for conducted emission to the grid, RFI filter should be connected between the power supply and the input port of the product.
Brake Resistor/Brake Chopper	P and BR terminal for Brake Resistor, P and N terminal for Brake Chopper	Brake resistor can be used to consume the electric power generated by the motor when the motor is running at generator mode. For product without integrated brake chopper, external brake chopper should be installed. Please be aware of that, NOT use brake resistor to protect the product at high grid voltage. Energy feedback unit should be used instead of brake resistor in case that the motor will run in generator mode for long duration or high power will be generated.

Name	Connect Point	Functions
Output choke, Sine filter	At the output port	Dv/dt choke can be installed to protect the motor from damage by voltage spike in case long motor cable or traditional motor designed for grid direct connection is used. In case of very long motor cable or the motor has specific demands to limit the power loss of harmonic current, sine filter can be used.

2.2.2.1 Selection Guide for air switch, fuse and contactor

Below is the guide for air switch, fuse and contactor:

Product Type Code	Air Switch (A)	Fuse (A)	Contactor (A)
SA710-2T0.37G-PU00	10	10	10
SA710-2T0.75G-PU00	25	25	16
SA710-2T1.5G-PU00	32	32	25
SA710-2T2.2G-PU00	40	40	32
SA710-2T4.0G-PU00	40	40	32
SA710-2T5.5G-PU00	63	63	40
SA710-2T7.5G-PU00	63	63	63
SA710-2T11G-PU00	100	100	100
SA710-2T15G-PU00	150	150	100
SA710-2T18.5G-PU00	150	150	100
SA710-2T22G-PU00	175	175	135
SA710-4T0.75G/1.5P-PU00	10	10	10
SA710-4T1.5G/2.2P-PU00	10	10	10
SA710-4T2.2G/4.0P-PU00	16	16	10
SA710-4T4.0G/5.5P-PU00	25	25	25
SA710-4T5.5G/7.5P-PU00	32	32	25
SA710-4T7.5G/11P-PU00	40	40	32
SA710-4T11G/15P-PU00	63	63	40
SA710-4T15G/18.5P-PU00	63	63	63
SA710-4T18.5G/22P-PU00	100	100	63
SA710-4T22G/30P-PU00	100	100	100
SA710-4T30G/37G-PU00	150	150	100
SA710-4T37G/45P-PU00	150	150	100
SA710-4T45G/55P-PU00	175	175	135
SA710-4T55G/75P-PU00	200	200	150
SA710-4T75G/90P-PU00	250	250	200
SA710-4T90G/110P-PU00	300	300	240
SA710-4T110G/132P-PU00	350	350	260
SA710-4T132G/160P-PU00	400	400	350
SA710-4T160G/185P-PU00	500	500	450

Product Type Code	Air Switch (A)	Fuse (A)	Contactor (A)
SA710-4T185G/200P-PU00	630	630	450
SA710-4T200G/220P-PU00	630	630	550
SA710-4T220G/250P-PU00	800	800	550
SA710-4T250G/280P-PU00	800	800	630
SA710-4T280G/315P-PU00	800	800	630
SA710-4T315G/355P-PU00	1000	1000	630
SA710-4T355G/415P-PU00	1000	1000	800
SA710-4T415G/450P-PU00	1200	1200	800
SA710-4T450G-PU00	1200	1200	800
SA710-4T500G-PU00	1400	1400	1000
SA710-4T560G-PU00	1600	1600	1200
SA710-4T630G-PU00	1800	1800	1400

2.2.2.2 Selection Guide for Brake Resistor

The customer can select brake resistor with resistance and power as calculation below. Basically, the bigger system inertia, shorter deceleration time or more often the motor brakes, the bigger power and smaller resistance of the brake resistor are needed. Please be aware of the the resistance cannot be smaller than the limitation as stated in below table, otherwise the product may be damaged.

▼ Brake resistance selection:

The calculation of brake resistance:$R = U_{DcB}^2 \div (K_{BF} \times P_{Nom})$

U_{DcB} --- the threshold DC voltage triggering the resistor brake function. (This value can be set in the parameter via control keypad or bus communication, normally 385Vdc for 200V product and 710Vdc for 380V product);

P_{Nom} --- The rated power of motor;

K_{BF} --- Brake factor, the bigger inertia, shorter deceleration time, the bigger factor value is needed. K_{BF} value is recommended in range of 0.8~2.0. 1.0 is recommended for general application, 1.5 is recommended for bigger inertia, 2.0 is recommended for steel works equipment;

▼ Selection of brake resistor power

Instant brake power calculation: $P_B = U_{DcB}^2 \div R$

In theory, the power size of the brake resistor can be selected ad instant brake power, but a correction factor should be used based on brake frequency and brake duty to avoid wasting of cost and space. The correction factor is used as: $Pr = K_{Bt} \times P_B$

K_{Bt} = 0.12~ 0.9 is the correction factor. Normal selection is 0.12,the more frequent in acceleration/deceleration, the longer duration for deceleration, the bigger value of K_{Bt} is needed. Normally for escalator etc., a value of 0.9 is recommended, for Centrifugal equipment a value of 0.6 is recommended. (Please be ware of that the selection of power also depends on the cooling condition.

A recommendation for selection of brake resistor (For applications in which motor work in brake not very frequent and not long duration)

Line in Voltage (V)	Motor Power (kW)	Brake Resistance (Ω)	Brake Power(W)
1×200-240	0.37	≥200	100
1×200-240	0.75	≥100	200
1×200-240	1.5	≥50	400
1×200-240	2.2	≥35	550
3×380-440	0.75	≥300	200
3×380-440	1.5	≥160	400
3×380-440	2.2	≥100	600
3×380-440	4	≥75	800
3×380-440	5.5	≥50	1200
3×380-440	7.5	≥35	1500
3×380-440	11	≥25	2500
3×380-440	15	≥20	3000
3×380-440	18.5	≥15	3600
3×380-440	22	≥12	5000
3×380-440	30	≥9	7000

2.2.2.3 Selection for input/output AC choke

Selection guide for input AC choke:

Line in Voltage (V)	Motor Power (kW)	Choke Current (A)	Choke Inductance (2% voltage drop) (mH)
3 x 200-240	0.37	3.0	2.70
3 x 200-240	0.75	5.0	1.60
3 x 200-240	1.5	7.4	1.10
3 x 200-240	2.2	10.0	0.80
3×380-440	0.75	3.0	4.60
3×380-440	1.5	5.0	2.80
3×380-440	2.2	7.0	2.00
3×380-440	4	10.0	1.40
3×380-440	5.5	15.0	0.93
3×380-440	7.5	20.0	0.70
3×380-440	11	30.0	0.47
3×380-440	15	40.0	0.35
3×380-440	18.5	50.0	0.28
3×380-440	22	60.0	0.24
3×380-440	30	75.0	0.19

Note:a. AC choke is not recommended as a good solution to control the harmonic current

b. It’s not recommended to add AC choke at input for products already has built-in choke.

Selection guide for output AC choke (≤200m motor cable, dv/dt < 500v/uS)

Line in Voltage (V)	Motor Power (kW)	Choke Current (A)	Choke Inductance /2% voltage drop (mH)
200 - 240	0.37	2.50	3.24
	0.75	4.5	1.80
	1.5	7.50	1.08
	2.2	9.60	0.84
3×380-440	0.75	2.30	6.08
3×380-440	1.5	3.80	3.68
3×380-440	2.2	5.30	2.64
3×380-440	4	9.00	1.56
3×380-440	5.5	13.00	1.08
3×380-440	7.5	17.00	0.82
3×380-440	11	25.00	0.56
3×380-440	15	32.00	0.44
3×380-440	18.5	38.00	0.36
3×380-440	22	45.00	0.32
3×380-440	30	61.00	0.22
3×380-440	37	75	0.18
3×380-440	45	91	0.16
3×380-440	55	112	0.12
3×380-440	75	150	0.10
3×380-440	90	180	0.08
3×380-440	110	215	0.06
3×380-440	132	260	0.06
3×380-440	160	315	0.04
3×380-440	185	365	0.04
3×380-440	200	395	0.04
3×380-440	220	435	0.03
3×380-440	250	480	0.03
3×380-440	280	540	0.03
3×380-440	315	605	0.02
3×380-440	355	660	0.02
3×380-440	415	745	0.02
3×380-440	450	827	0.02
3×380-440	500	918	0.017
3×380-440	560	1028	0.014
3×380-440	630	1157	0.011

2.2.2.4 Selection for Filters

RFI filter at input

With RFI filter as stated in below table or RFI filter with similar performance installed at the input side of the product, the product can achieve Class A1 EMC performance.

Voltage (V)	Motor Power (kW)	Rated Current for RFI filter (A)	Type of RFI Filter
220V	0.37	5	NFI-0005-SA
	0.75	5	NFI-0005-SA
	1.5	10	NFI-0010-SA
	2.2	10	NFI-0010-SA
	4.0	20	NFI-0020-SA
380V	0.75	5	NFI-0005-SA
	1.5	5	NFI-0005-SA
	2.2	10	NFI-0010-SA
	4	10	NFI-0010-SA
	5.5	20	NFI-0020-SA
	7.5	20	NFI-0020-SA
	11	36	NFI-0036-SA
	15	36	NFI-0036-SA
	18.5	50	NFI-0050-SA
	22	50	NFI-0050-SA
	30	65	NFI-0065-SA
	37	80	NFI-0080-SA
	45	100	NFI-0100-SA
	55	150	NFI-0150-SA
	75	150	NFI-0150-SA
	90	200	NFI-0200-SA
	110	250	NFI-0250-BA
	132	250	NFI-0250-BA
	160	300	NFI-0300-BA
	185	400	NFI-0400-BA
	200	400	NFI-0400-BA
	220	400	NFI-0400-BA
	250	600	NFI-0600-BA
	280	600	NFI-0600-BA
	315	600	NFI-0600-BA
	355	900	NFI-0900-BA
	415	900	NFI-0900-BA
	450	900	NFI-0900-BA
	500	900	NFI-0900-BA
	560	900	NFI-0900-BA
	630	1200	NFI-1200-BA

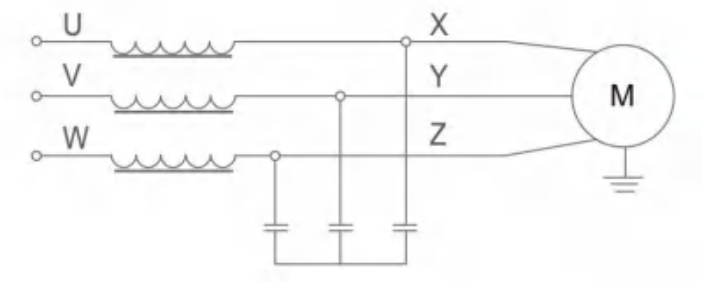
Note:The RFI filter types are recommended based on products from Shanghai Eagtop. Please find more information from website of Shanghai Eagtop http://www.eagtop.com/.

Sine Filter at Output

Below is the recommendation to select sine filter at output.

Voltage (V)	Motor Power (kW)	Rated Current (A)	Inductance (mH)	Capacitance C(uF)
220V	0.37	9	1.60	16.0
	0.75	9	1.60	16.0
	1.5	9	1.60	16.0
	2.2	9	1.60	16.0
	4.0	18	1.50	16.0
380V	0.75	10	2.50	10.0
	1.5	10	2.50	10.0
	2.2	10	2.50	10.0
	4	18	2.50	10.0
	5.5	18	1.50	16.0
	7.5	18	1.50	16.0
	11	30	0.78	32.0
	15	30	0.78	32.0
	18.5	60	0.38	64.0
	22	60	0.38	64.0
	30	60	0.38	64.0
	37	110	0.260	148.0
	45	110	0.260	148.0
	55	110	0.260	148.0
	75	180	0.160	240.0
	90	180	0.160	240.0
	110	270	0.110	350.0
	132	270	0.110	350.0
	160	450	0.066	600.0
	185	450	0.066	600.0
	200	450	0.066	600.0
	220	450	0.066	600.0
	250	750	0.040	1000.0
	280	750	0.040	1000.0
	315	750	0.040	1000.0
	355	750	0.040	1000.0
	415	1000	0.033	1200.0
	450	1000	0.033	1200.0
	500	1200	0.027	1500.0
	560	1200	0.027	1500.0
	630	1200	0.027	1500.0

The values (Inductance, Capacitance) are based on sine filter circuit.



Note:the recommended values are suitable for switching frequency not low than factory default set and motor running frequency not high than 200Hz. If the application conditions are beyond the limit, please update the selection, or consult us.

You can also select sine filter from other third part. Below is the recommendation based on products from Shanghai Eagtop.

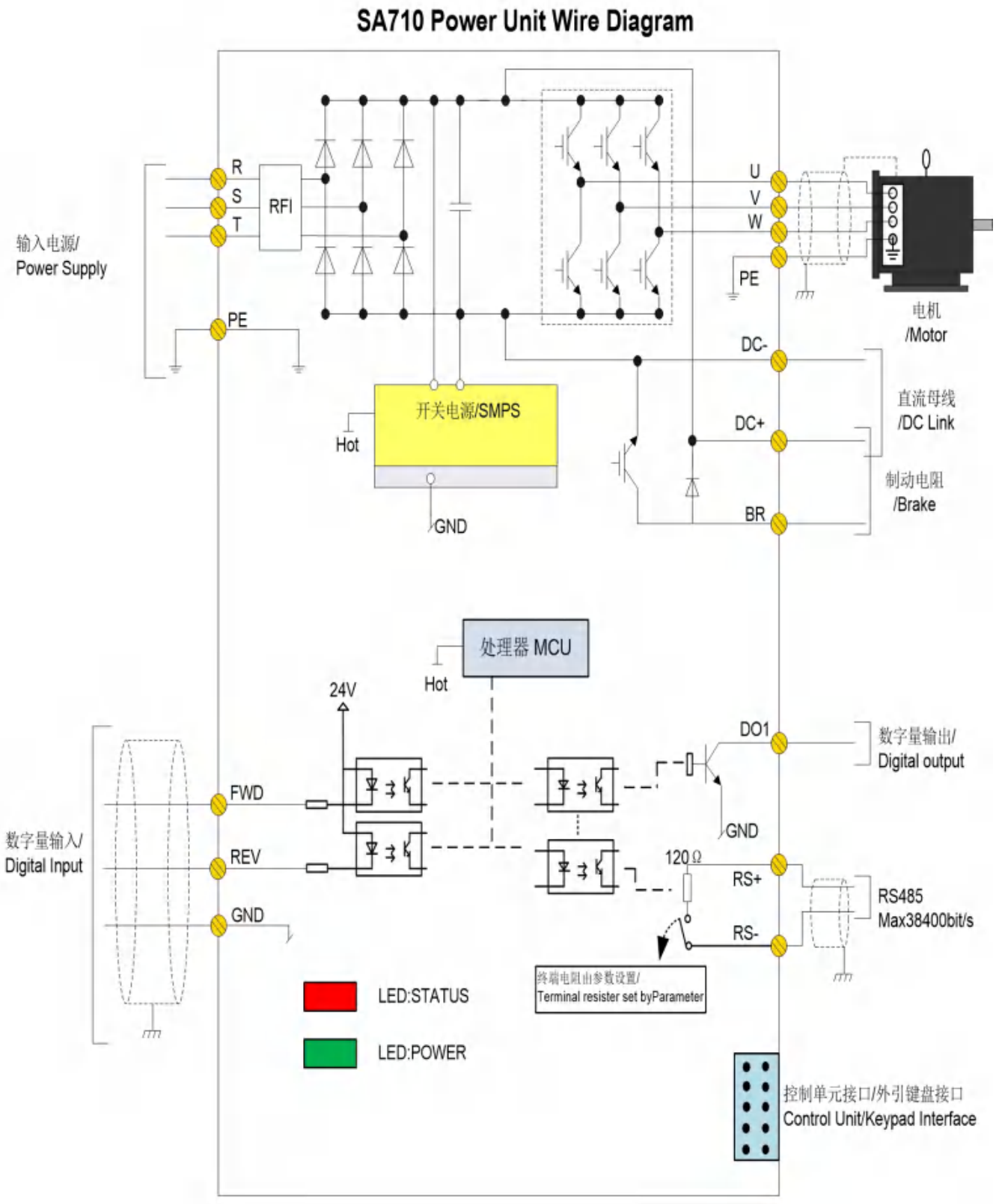
Motor Power (kW)	Rated Current (A)	Type of Sine Filter
5.5	15	OSF-0015-EISA-E4M0
7.5	20	OSF-0020-EISA-E3M0
11	30	OSF-0030-EISA-E2M0
15	40	OSF-0040-EISA-E1M4
18.5	50	OSF-0050-EISA-E1M2
22	60	OSF-0060-EISA-E1M0
30	80	OSF-0080-EISA-EM80
37	90	OSF-0090-EISA-EM65
45	120	OSF-0120-EISA-EM52
55	150	OSF-0150-EISA-EM45
75	200	OSF-0200-EISA-EM35
110	250	OSF-0250-EISA-EM30
132	300	OSF-0300-EISA-EM24
160	360	OSF-0360-EISA-EM20
200	450	OSF-0450-EISA-EM15
250	500	OSF-0500-EISA-EM15
280	600	OSF-0600-EISA-EM12
315	660	OSF-0660-EISA-EM10
355	750	OSF-0750-EISA-EM09
415	900	OSF-0900-EISA-E75U
450	1000	OSF-1000-EISA-E60U
500	1200	OSF-1200-EISA-E65U
560	1200	OSF-1200-EISA-E65U
630	1200	OSF-1200-EISA-E65U

Note: Please contact Shanghai Eagletop more the limitations for switching frequency, motor frequency and more information, or check in the website of Shanghai Eagletop http://www.eagtop.com/.

2.2.3 Power Unit PU00/PU01 Electrical Instructions

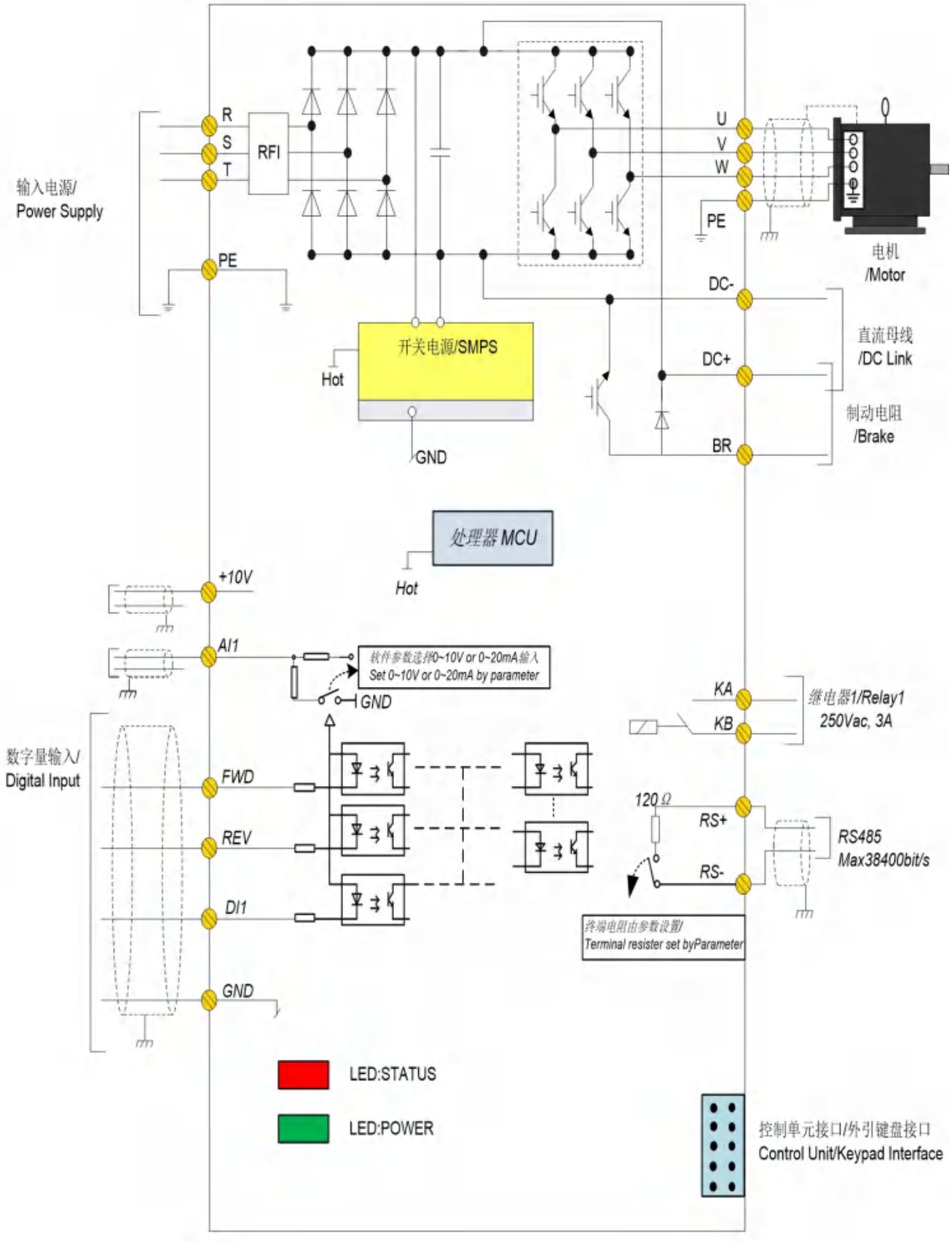
2.2.3.1 Power Unit PU00/PU01 Electrical Diagram

▼ 0.37-7.5kW PU Diagram



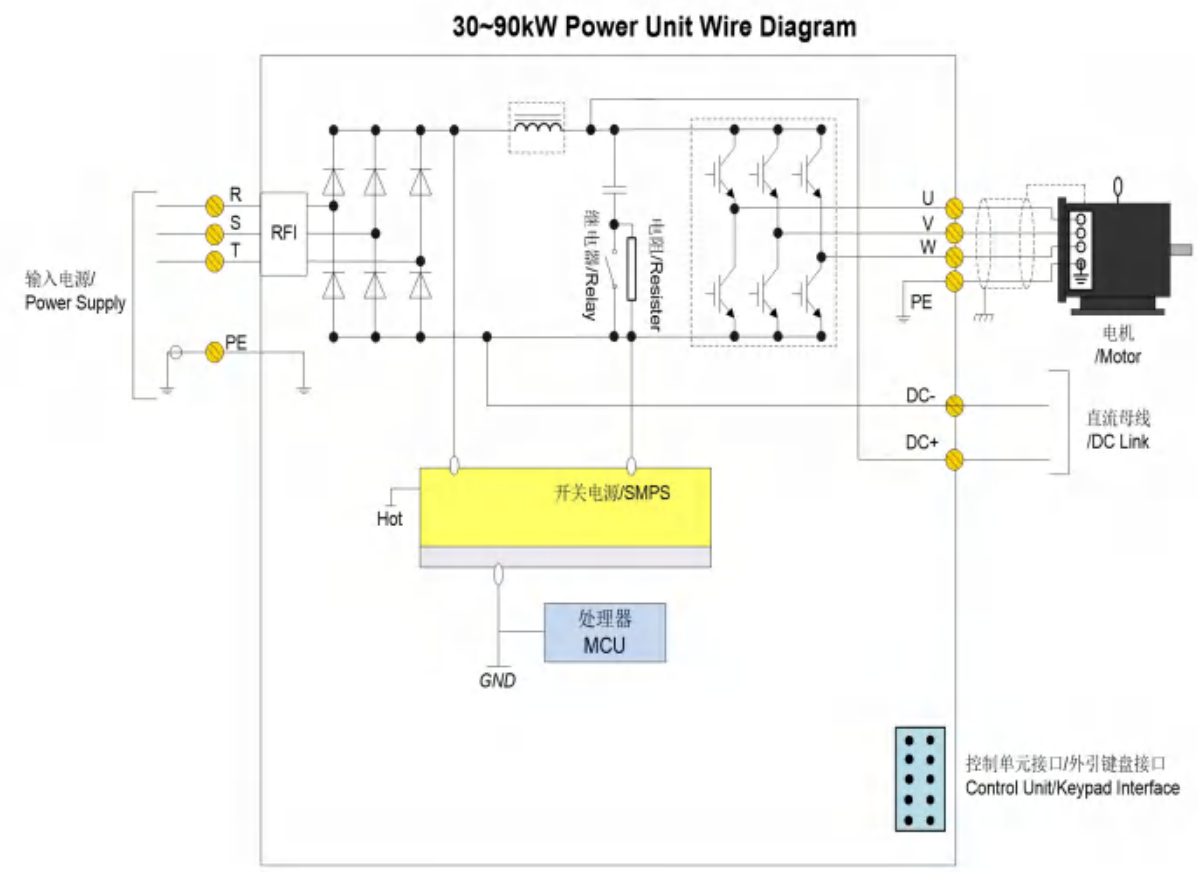
Note: For PU00, there is no terminals for IO Ports (FWD, REV, DO1, RS+/RS-) and no Status LED lights.

▼ 11-22kW PU Diagram



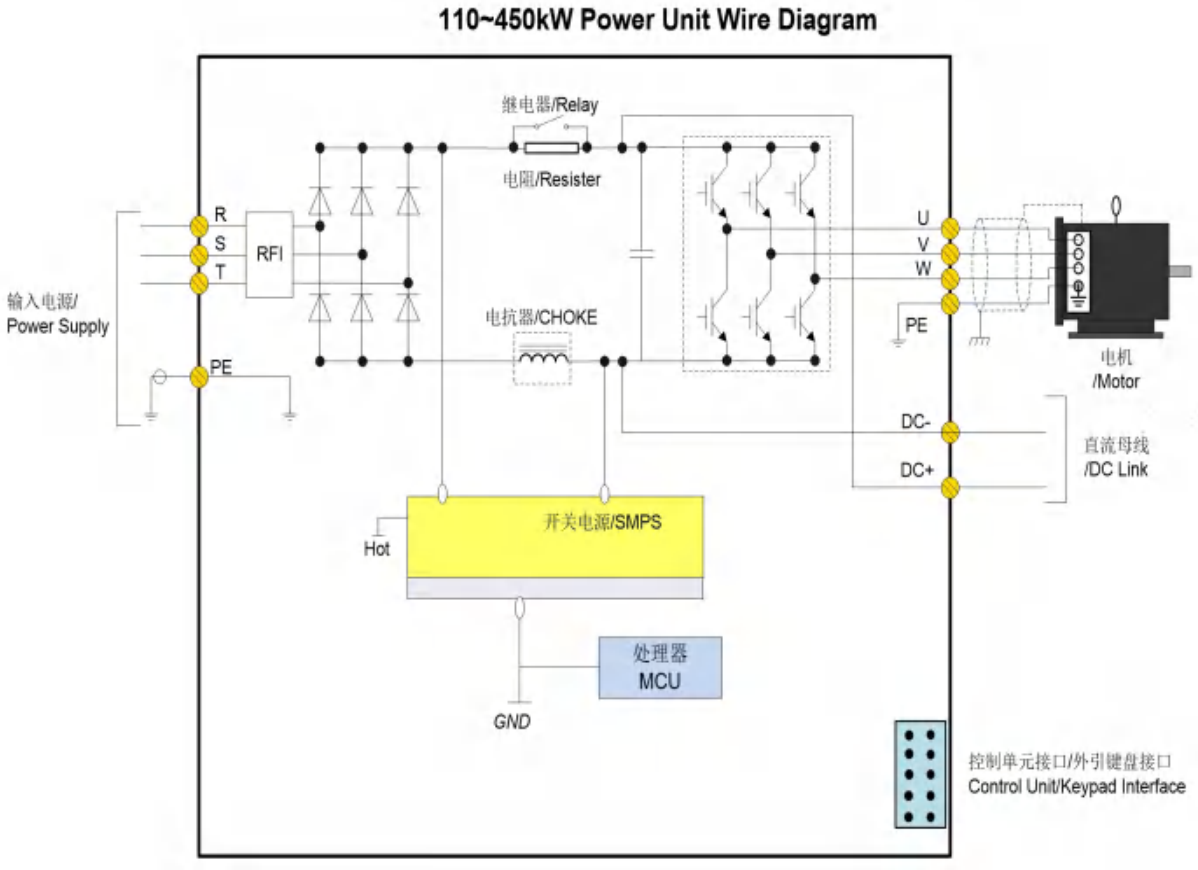
Note: For PU00, there is no terminals for IO Ports (FWD, REV, DI1, AI1, DO1, RS+, RS-, KA/KB) and no Status LED lights.

▼ 30 - 90kW PU Diagram

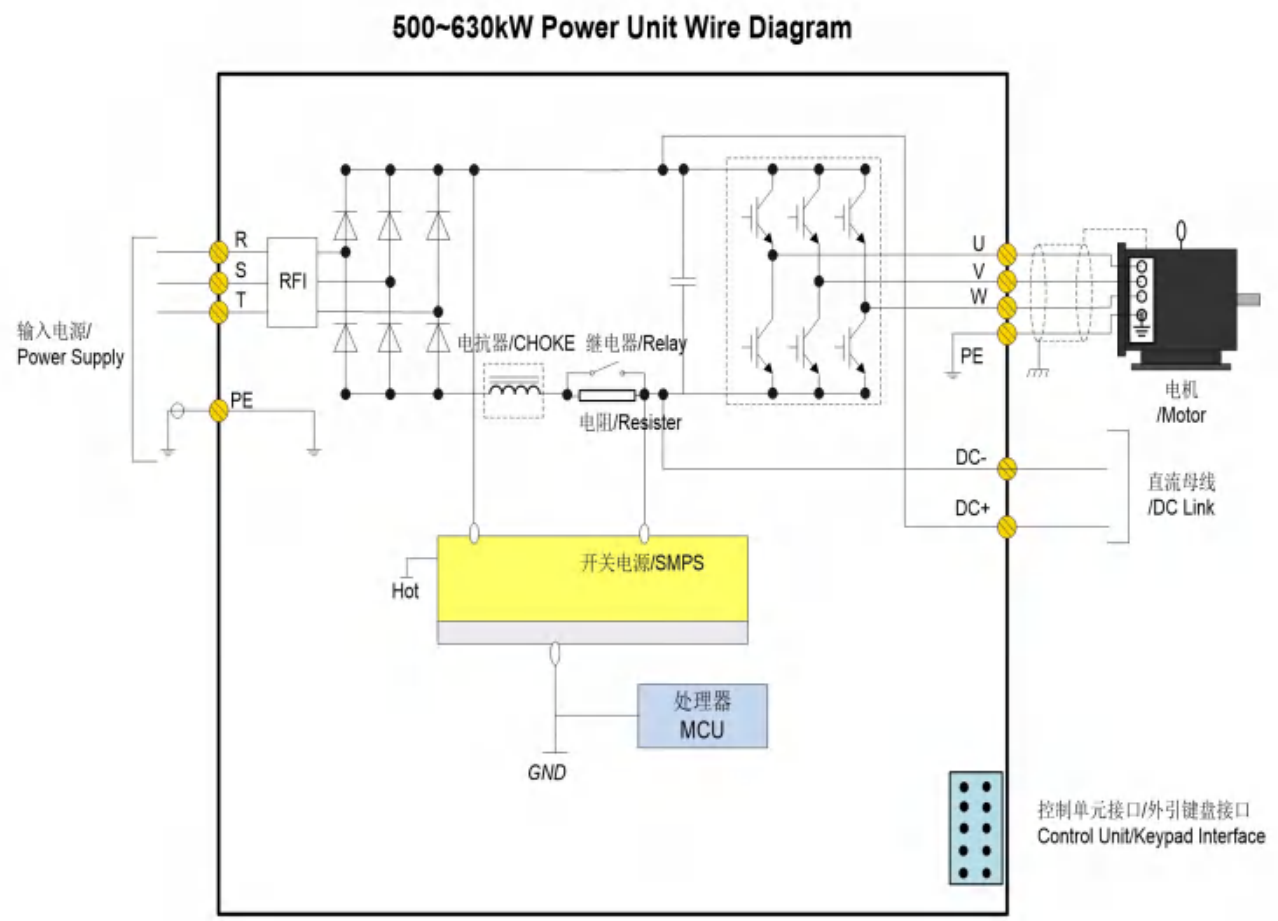


Note: Only 30 kW has no Integrated reactor.

▼ 110-450kW PU Diagram

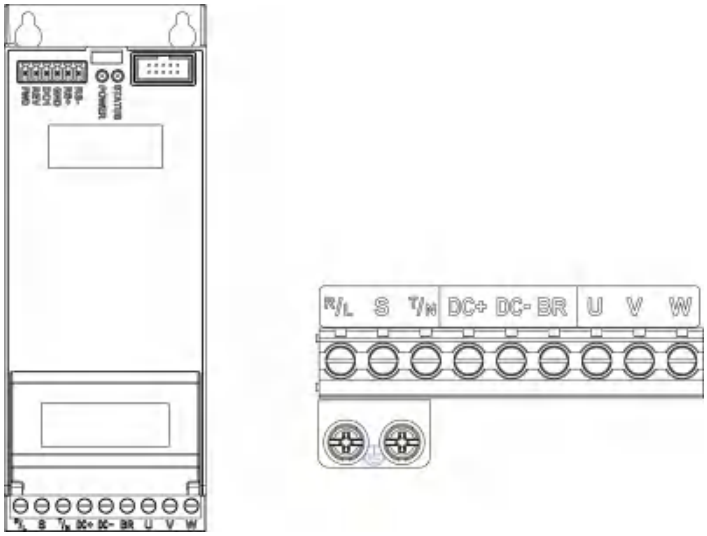


▼ 500kW-630 kW PU Diagram



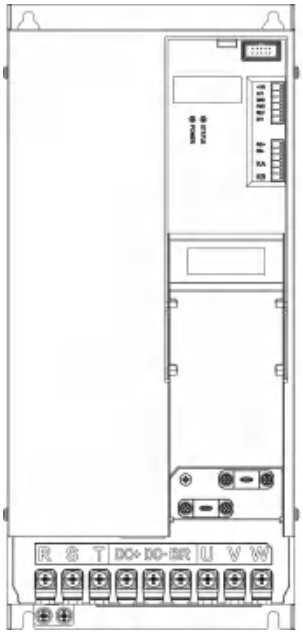
2.2.3.2 Power Unit PU00/PU01 Power Terminals

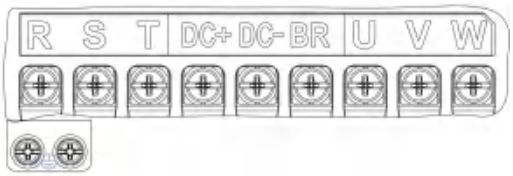
▼ 0.37~7.5kW Power Terminals diagram and terminal description



Terminal Name	Terminal Functions
R/L、S、T/N	Terminals for power inputs from grid
U、V、W	Terminals for Power output to motor
DC+、DC-	Terminals for DC link supply or Load sharing
DC+、BR	Terminals for Brake resistor
⏚	For ground connection

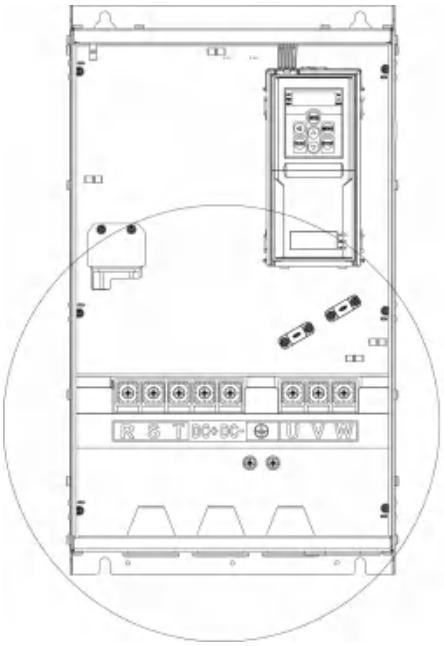
▼ 11-22kW Power Terminals diagram and terminal description

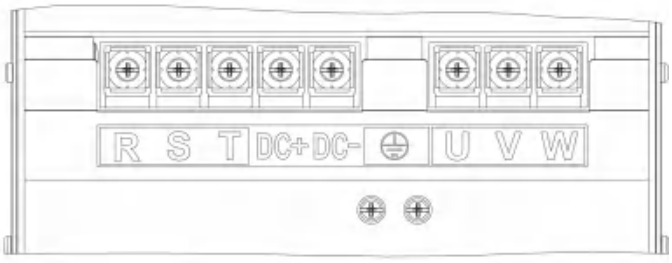




Terminal Name	Terminal Functions
R、S、T	Terminals for power inputs from grid
U、V、W	Terminals for Power output to motor
DC+、DC-	Terminals for DC link supply or Load sharing
DC+、BR	Terminals for Brake resistor
⏚	For ground connection

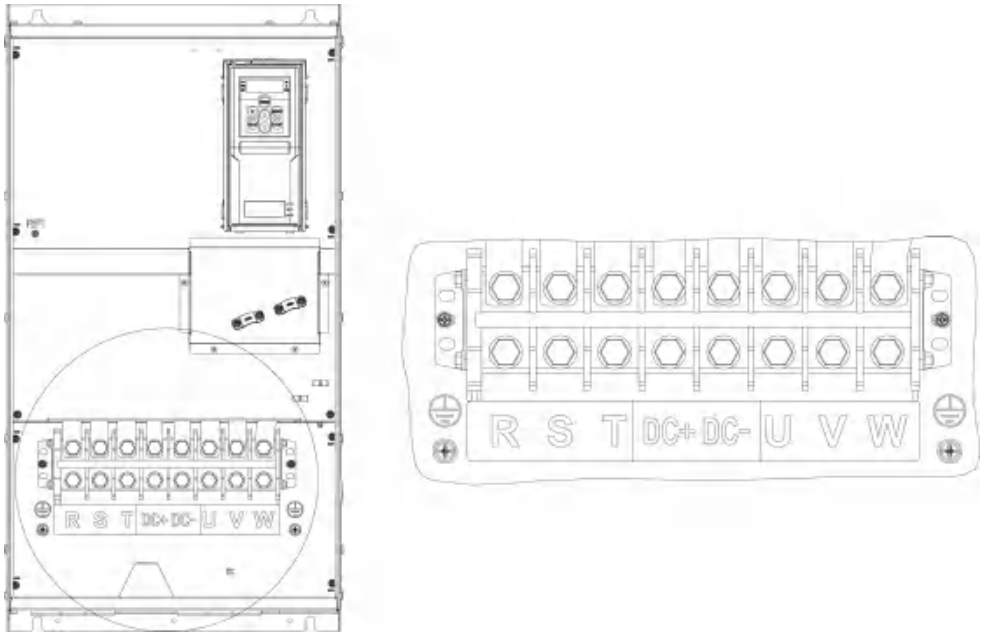
▼ 30-45kW Power Terminals diagram and terminal description





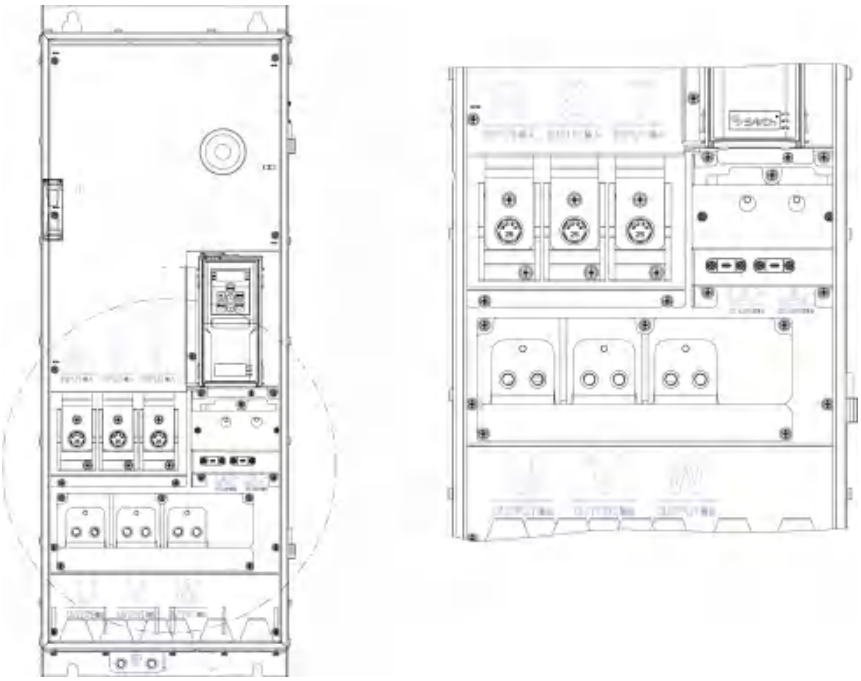
Terminal Name	Terminal Functions
R、S、T	Terminals for power inputs from grid
U、V、W	Terminals for Power output to motor
DC+、DC-	Terminals for DC link supply or Load sharing
⏚	For ground connection

▼ 55-90kW Power Terminals diagram and terminal description



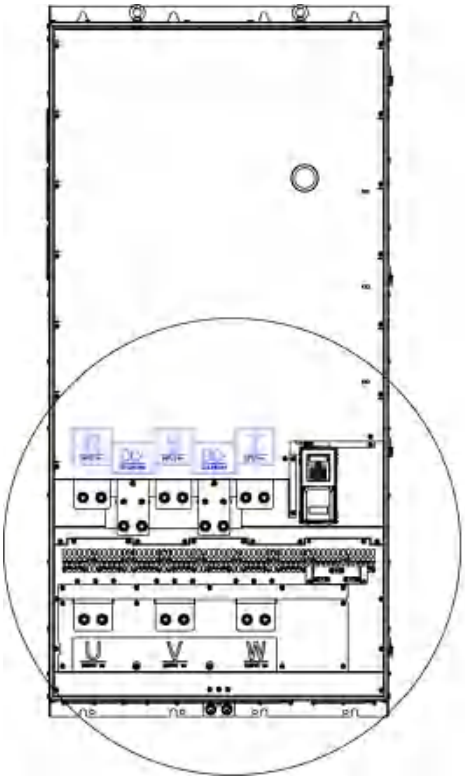
Terminal Name	Terminal Functions
R、S、T	Terminals for power inputs from grid
U、V、W	Terminals for Power output to motor
DC+、DC-	Terminals for DC link supply or Load sharing
⏚	For ground connection

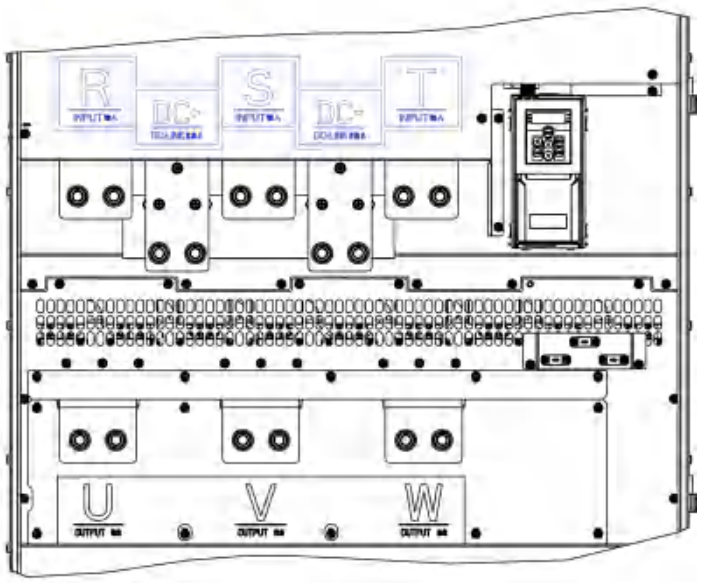
▼ 110-450kW Power Terminals diagram and terminal description



Terminal Name	Terminal Functions
R、S、T	Terminals for power inputs from grid
U、V、W	Terminals for Power output to motor
DC+、DC-	Terminals for DC link supply or Load sharing
⏚	For ground connection

▼ 500-630 kW Power Terminals diagram and terminal description





Terminal Name	Terminal Functions
R、S、T	Terminals for power inputs from grid
U、V、W	Terminals for Power output to motor
DC+、DC-	Terminals for DC link supply or Load sharing
⏚	For ground connection

2.2.3.3 Recommended Specifications for Power Circuits installation

Product Type	Input Wire (mm^2)	Output Wire (mm^2)	Power Terminal Screw	Power Terminal Torque (N·m)	Grounding Screw	Grounding Torque (N·m)
SA710-2T0.37G-PU00	1	1	M3	0.5-0.7	M4	1.0-1.2
SA710-2T0.75G-PU00	1.5	1	M3	0.5-0.7	M4	1.0-1.2
SA710-2T1.5G-PU00	1.5	1	M3	0.5-0.7	M4	1.0-1.2
SA710-2T2.2G-PU00	2.5	1.5	M3	0.5-0.7	M4	1.0-1.2
SA710-2T4.0G-PU00	2.5	1.5	M3	0.5-0.7	M4	1.0-1.2
SA710-2T5.5G-PU00	4	2.5	M5	1.6-2.0	M5	1.6-2.0
SA710-2T7.5G-PU00	6	4	M5	1.6-2.0	M5	1.6-2.0
SA710-2T11G-PU00	10	6	M5	1.6-2.0	M5	1.6-2.0
SA710-2T15G-PU00	10	10	M6	2.0-2.5	M6	2.0-2.5
SA710-2T18.5G-PU00	16	16	M6	2.0-2.5	M6	2.0-2.5
SA710-2T22G-PU00	16	16	M6	2.0-2.5	M6	2.0-2.5
SA710-4T0.75G/1.5P-PU00	1	1	M3	0.5-0.7	M4	1.0-1.2
SA710-4T1.5G/2.2P-PU00	1	1	M3	0.5-0.7	M4	1.0-1.2
SA710-4T2.2G/4.0P-PU00	1	1	M3	0.5-0.7	M4	1.0-1.2

Product Type	Input Wire (mm^2)	Output Wire (mm^2)	Power Terminal Screw	Power Terminal Torque (N·m)	Grounding Screw	Grounding Torque (N·m)
SA710-4T4.0G/5.5P-PU00	1.5	1.5	M3	0.5-0.7	M4	1.0-1.2
SA710-4T5.5G/7.5P-PU00	1.5	1.5	M3	0.5-0.7	M4	1.0-1.2
SA710-4T7.5G/11P-PU00	2.5	1.5	M3	0.5-0.7	M4	1.0-1.2
SA710-4T11G/15P-PU00	4	2.5	M5	1.6-2.0	M5	1.6-2.0
SA710-4T15G/18P-PU00	6	4	M5	1.6-2.0	M5	1.6-2.0
SA710-4T18G/22P-PU00	10	4	M5	1.6-2.0	M5	1.6-2.0
SA710-4T22G/30P-PU00	10	6	M5	1.6-2.0	M5	1.6-2.0
SA710-4T30G/37P-PU00	10	10	M6	2.0-2.5	M6	2.0-2.5
SA710-4T37G/45P-PU00	16	16	M6	2.0-2.5	M6	2.0-2.5
SA710-4T45G/55P-PU00	16	16	M6	2.0-2.5	M6	2.0-2.5
SA710-4T55G/75P-PU00	25	25	M8	8-10	M6	2.0-2.5
SA710-4T75G/90P-PU00	35	35	M8	8-10	M6	2.0-2.5
SA710-4T90G/110P-PU00	70	70	M8	8-10	M6	2.0-2.5
SA710-4T110G/132P-PU00	95	95	InputM12 OutputM10*2	Input20-25 Output12-16	2*M10	12-16
SA710-4T132G/160P-PU00	120	120	InputM12 Output2*M10	Input20-25 Output12-16	2*M10	12-16
SA710-4T160G/185P-PU00	150	150	InputM12 Output2*M10	Input20-25 Output12-16	2*M10	12-16
SA710-4T185G/200P-PU00	2*70	2*70	2*M12	30-38	2*M10	12-16
SA710-4T200G/220P-PU00	2*95	2*95	2*M12	30-38	2*M10	12-16
SA710-4T220G/250P-PU00	2*95	2*95	2*M12	30-38	2*M10	12-16
SA710-4T250G/280P-PU00	2*120	2*120	2*M12	30-38	2*M10	12-16
SA710-4T280G/315P-PU00	2*120	2*120	2*M12	30-38	2*M10	12-16
SA710-4T315G/355P-PU00	2*150	2*150	2*M12	30-38	2*M10	12-16
SA710-4T355G/415P-PU00	2*185	2*185	2*M12	30-38	2*M10	12-16
SA710-4T415G/450P-PU00	2*240	2*240	2*M12	30-38	2*M10	12-16
SA710-4T450G/500P-PU00	2*240	2*240	2*M12	30-38	2*M10	12-16
SA710-4T500G-PU00	2*240	2*240	2*M12	30-38	2*M10	12-16
SA710-4T560G-PU00	4*120	4*120	2*M12	30-38	2*M12	30-38
SA710-4T630G-PU00	4*150	4*150	2*M12	30-38	2*M12	30-38

Note: The recommended Specifications are based on 25℃ambient and heavy load type conditions when use VV type single conductor wire. Please reference to the IEC standards for other conditions.

2.2.3.4 Guidance for Selection of Residual-Current Circuit Breaker

When install residual-current circuit breaker between the power supply and product's input (R、S、T), please consider the leakage current at normal operation. With the product running, leakage current can be generated from sources as below, even there is nothing abnormal:

Due to parasitic capacitance between motor cable and ground, as well as between motor winding and motor case, generated by PWM output from the product.

Due to the unbalance of the grid power supply or the tolerance of the RFI capacitors, there could be residual current going through the grounding capacitors.

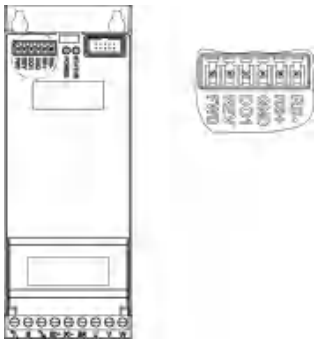
For application with frequency converter, special residual-current circuit breaker should be applied, as suggested below:

Specialized circuit breaker (only sensing current of low frequency) with rated residual current higher than 10mA

If normal circuit breaker is selected, the rated residual current should be higher than 200mA and response time should be more than 0.1 second.

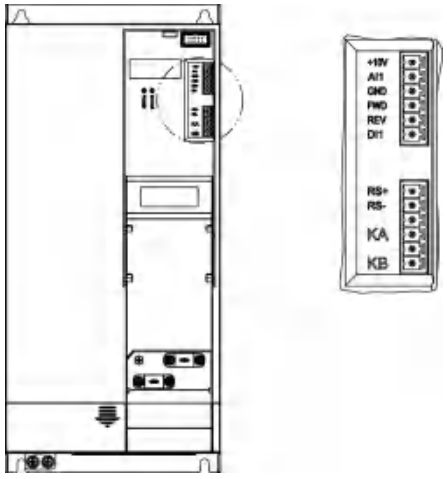
2.2.3.5 PU01 Control Terminals

▼ 0.37-7.5kW PU01 Control terminals and terminals Specifications



Name	Function	Specification
RS+, RS-	RS485 communication	Max Bit Rate: 38400bit/s; Configurable termination resistor (default: open)
DO1	Digital Output	1. Output mode: Open Collector;
		2. Output current: max 40Ma;
GND	Signal Gnd	Grounding for both digital and analogue signals
REV,FWD	Digital Input	3. Input Type: NPN or Voltage input
		4. Input Impedance:3.6kΩ;
		5. Voltage range: 0-30V;

▼ 11-22KW PU01 Control terminals and terminals Specifications



Specifications of Control Terminals 11-22kw of PU01:

Name	Function	Specification
RS+, RS-	RS485 communication	Max Baud Rate: 38400bit/s; Configurable termination resistor, open in default
FWD, REV,DI1	Digital Input	1. Input type: NPN and PNP
		2. Input Impedance:3.6kΩ;
		3. Input Voltage:0-30V;
AI1	Analogue input	Configurable as analogue voltage inputs, analogue current inputs as well as digital inputs. 1．As Analogue Voltage Inputs: Input Impedance: 10kΩ; Input Voltage Range: 0~10V; 2．As Analogue Current Inputs: Input Impedance: ≤500Ω; Input Current Range: 0~20mA;
+10V	10V signal power supply	Max 10mA
KA-KB	Relay output	Resistive Load: 250VAC 3A/30VDC 3A; Inductive Load: 250VAC 0.2A/24VDC 0.1A (cosφ=0.4);
GND	Signal Ground	

2.2.4 EMC Guidance for Electrical Wiring

2.2.4.1 EMC Standards

SA710 follow the IEC standards: IEC/EN61800-3 (Adjustable speed electrical power drive systems part 3:EMC requirements and specific test methods).

IEC/EN61800-3 defines the EMC demands from two aspects: EMC interference and EMC immunity. EMC interference includes radiated emission, conducted emission and low frequency current emission. EMC immunity includes radiated immunity, conducted immunity, surge, burst, ESD and immunity to low frequency disturbance from the grid power supply (voltage dips, notch, sag and fluctuation, unbalance, distortion and frequency variation). SA710 follow all the demands except for:

External AC choke is needed to achieve IEC 61000-3-2/IEC 61000-3-12 for drives below 30kW (refer to 2.2.2.3)

External RFI filter is needed to achieve class C1 or C2 (IEC 61800-3) level conducted emission performance (refer to 2.2.2.4). If no external RFI filter is installed, SA710 is not intended to be used on a low-voltage public network which supplies domestic premises directly.

2.2.4.2 Guidance for EMC Noise Handling

While used on a common supply with other equipment, even though an RFI filter is built in SA710 already too limited the conducted emission, depending on the sensitivity of equipment and the background of the environment, there is still certain possibility to disturb other equipment to malfunction. Below measures are recommended to avoid the EMC issue:

Install an RFI filter before the product

Install a power filter before the equipment sensitive to EMC noise

Isolate the power supply for the product from the equipment sensitive to EMC noise, normally with isolation transformer.

Use shielded wire for control signals and shielded cable for motor, ground the shielding properly

Avoid wiring the control signals in parallel with power circuits, especially, avoid tiring the control wires together with the power cables. If a cross between control wire and power cable cannot be avoided, please cross the wires perpendicularly.

If no reliable grounding point or no shielded motor cable available, please use an additional wire to connect the motor shell to the PE terminal and layout this wire together with the 3 motor phases as close and tight as possible.

Installing ferrite cores at the input or the output of the product as common choke helps a lot to solve the EMC issue in most cases.

2.2.4.3 Leakage Current Handling

As stated in 2.2.3.4, there are different reasons for leakage current. The leakage current issue should be handled properly to avoid any mis operation of the residual-current circuit breaker or interference to other equipment. Below are the recommendations:

Lower the switching frequency and use as short as possible motor cable to limit the high frequency leakage current;

Install AC choke or sine filter at the output of the product;

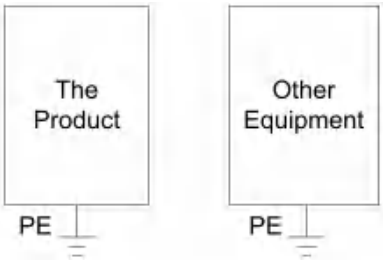
Take measures to limit the unbalance of the power supply.

2.2.4.4 Handling the Induced Voltage

In case there is no grounding point, there could be induced voltage on the motor shell or other metals connected to the motor shell. Connecting the motor shell to the PE terminal of the product helps to limit the induced voltage. But please be aware that, the only safe way is to ground the motor and product properly.

2.2.4.5 Grounding

Please ground the system as blow:



Use thick wire for ground to reduce the grounding impedance;

Use as short as possible grounding wire;

Grounding the product to the ground point as close as possible;

Use four-wire motor cable, and connect the motor shell to the PE terminal of the product with one of the four wires, and grounding this wire to the dedicated grounding point;

Put the grounding wires far away from the input/outputs of the equipment which are sensitive to EMC Noise.

2.3 List of Parameters

Parameter Group 0:General Control Mode and Commands				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P00.01	Control Mode	0: Speed Mode Speed Sensor less 1: Speed Mode with Speed Sensor 2: Torque Mode Speed Sensor less 3: Torque Mode with Speed Sensor		0
*P00.02	Motor Control Principle	0:V/F 1:Vector Control 1 2:Vector Control 2		1
P00.03	Macro-program	0:Invalid 1:Pump Control 2:Simple PLC		0
*P00.04	Torque Characteristics	0:CT 1:VT 9:AEO		0
*P00.05	Motor Speed Direction	0:Clockwise 1:Anticlockwise 2:Bidirectional		2
*P00.09	Motor Reverse Direction	0:Invalid 1:Reverse selection is valid		0
P00.10	Speed Set Source Selection	0:main set source 1:Multi preset value with priority 2:Calculation of main set source and additional set source. 3:Switchover between main set source and additional set source. 4:Switchover between main set source and the calculation of main set source and additional set source 5:Switchover between additional set source and the calculation of main set source and additional set source		2
P00.11	Main Set Source	0:No function; 1:Terminal AI1 2:Terminal AI2 5:Pulse input, use pulse input as set source 10:Multi preset value 0 + Up/Down 11:Multi preset values 20:Communication 21:Process PID 30:Keypad		1
P00.12	Additional Set Source	Same as P00.11		20
P00.13	Torque Set Source for Torque Mode	Same as P00.11		1

Parameter Group 0:General Control Mode and Commands				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P00.14	Set Value Calculation from Main and Additional Source	0:Main Set Source + Additional Set Source 1:Main Set Source - Additional Set Source 2:Maximal Value of Main and Additional Set Source 3:Minimal Value of Main and Additional Set Source		0
P00.15	Speed Set Range	0:0~P00.16 1:-P00.16~P00.16		0
P00.16	Base Value for Speed Set	0.0~590.0		50.0
P00.17	Control Site	0:Terminal or Bus Communication 1:Terminal 2:Bus Communication		0
P00.18	Selection of Communication Control Source	0:Null 1:Local RS485 2:Bus from Option Card		1
P00.29	Control Command Source Switch Enable	0:Disable 1:Enable		0
P00.30	Multi Preset Value0	-100.00~100.00	%	0.00
P00.31	Multi Preset Value1	-100.00~100.00	%	0.00
P00.32	Multi Preset Value2	-100.00~100.00	%	0.00
P00.33	Multi Preset Value3	-100.00~100.00	%	0.00
P00.34	Multi Preset Value4	-100.00~100.00	%	0.00
P00.35	Multi Preset Value5	-100.00~100.00	%	0.00
P00.36	Multi Preset Value6	-100.00~100.00	%	0.00
P00.37	Multi Preset Value7	-100.00~100.00	%	0.00
P00.38	Multi Preset Value8	-100.00~100.00	%	0.00
P00.39	Multi Preset Value9	-100.00~100.00	%	0.00
P00.40	Multi Preset Value10	-100.00~100.00	%	0.00
P00.41	Multi Preset Value11	-100.00~100.00	%	0.00
P00.42	Multi Preset Value12	-100.00~100.00	%	0.00
P00.43	Multi Preset Value13	-100.00~100.00	%	0.00
P00.44	Multi Preset Value14	-100.00~100.00	%	0.00
P00.45	Multi Preset Value15	-100.00~100.00	%	0.00
P00.46	UP/DOWN Step Value	0.01~100.00	%	0.10
P00.47	Save Up/Down Set Value	0:Not Save 1:Save when Stop 2:Save when Power Down		0
P00.48	Jog Speed	0.0~400.0HZ	Hz	5.0
P00.49	Ramp Time Resolution	0:0.1s 1:0.01s		1

Parameter Group 0:General Control Mode and Commands				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P00.50	Ramp 1 Type	0:Linear 1:S ramp		0
P00.51	Ramp 1 Ramp Up Time	0.01~655.35S	s	*
P00.52	Ramp 1 Ramp Down Time	0.01~655.35S	s	*
P00.53	Ramp 2 Type	0:Linear 1:S ramp		0
P00.54	Ramp 2 Ramp Up Time	0.01~655.35S	s	*
P00.55	Ramp 2 Ramp Down Time	0.01~655.35S	s	*
P00.56	Ramp 3 Type	0:Linear 1:S ramp		0
P00.57	Ramp 3 Ramp Up Time	0.01~655.35S	s	*
P00.58	Ramp 3 Ramp Down Time	0.01~655.35S	s	*
P00.59	Ramp 4 Type	0:Linear 1:S ramp		0
P00.60	Ramp 4 Ramp Up Time	0.01~655.35S	s	*
P00.61	Ramp 4 Ramp Down Time	0.01~655.35S	s	*
P00.62	Jog Ramp Time	0.01~655.35S	s	*
P00.63	S Ramp Up Initiate Period	0.01~655.35S	s	*
P00.64	S Ramp Up Termination Period	0.01~655.35S	s	*
P00.65	S Ramp Down Initiate Period	0.01~655.35S	s	*
P00.66	S Ramp Down Termination Period	0.01~655.35S	s	*
P00.80	Local Address	1~127		1
P00.81	Baud Rate	0:2400 1:4800 2:9600 3:19200 4:38400 5~9:Reserved		2
P00.82	Communication Data Format (Parity/Stop Bits)	0:Even parity (1 stop bit) 1:Odd parity (1 stop bit) 2:No parity (1 stop bit) 3:No parity (2 stop bit)		0
P00.83	Min. Communication Response Delay	0.000~0.500	s	0.002
P00.84	Max. Communication Response Delay	0.010~10.000	s	5.000
P00.85	Message Response	0:Normal Reponses 1:Only Response Exceptional Message 2:Not Response		0
P00.86	Parameter (Set by Communication) Saving at Power Down	0:Not Save Parameter at Power Down 1:Save Parameter at Power Down		0
P00.87	Communication terminal resistance selection	0:Open 1:Close		0

Parameter Group 0:General Control Mode and Commands				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P00.88	Communication Timeout Time	0.01~650.00	s	1.00
P00.89	Communication Timeout Response Function	0:No Function 2:Stop Motor 3:Jogging 4:Run with Max Frequency P05.03 5:Alarm Fault and Trip to stop 6:Warning		0
P00.90	Reset Communication Timeout	0:No Action 1:Reset the Timeout		0

Parameter Group 1:Basics for Inverter and Motor Control				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P01.00	Switching Frequency	2~16:2~16 kHz		*
*P01.01	Grid Type	2~122		*
*P01.02	Motor Type	0:Induction Motor 1:SPM 2:IPM without Saturation 3:IPM with Saturation		0
*P01.03	Rated Motor Power	0.12~450	kW	*
*P01.04	Rated Motor Voltage	50~1000	V	*
*P01.05	Rated Motor Frequency	20~400	Hz	*
*P01.06	Rated Motor Current	0.1~1200	A	*
*P01.07	Rated Motor Speed	100~24000	rpm	*
*P01.08	Rated Motor Torque	0.1~6553.5	N·m	*
*P01.13	Autotuning for Motor Parameters	0:No Function 1:Simple Static Motor Auto Tuning 2:Complete Static Motor Auto Tuning		0
*P01.14	Stator Resistance (Rs)	0.001~65.535	Ω	*
*P01.15	Rotor Resistance (Rr)	0.001~65.535	Ω	*
*P01.16	Stator Leakage Reactance (X1)	0.001~65.535	Ω	*
*P01.17	Main Reactance (Xh)	0.01~655.35	Ω	*
*P01.18	Ld, PM D-axis Inductance	0.01~655.35	mH	*
*P01.19	Lq, PM Q-axis Inductance	0.01~655.35	mH	*
*P01.20	Ld-s, PM D-axis Inductance Saturated	0.01~655.35	mH	*
*P01.21	Lq-s, PM Q-axis Inductance Saturated	0.01~655.35	mH	*
*P01.22	Saturation Current at D-axis for Ld-s	20~200	%	100
*P01.23	Saturation Current at Q-axis for Lq-s	20~200	%	100
*P01.24	Number of Motor Poles	2~200	P	4
*P01.25	BEMF at Rated Speed for PM	0~9000	V	*

Parameter Group 1:Basics for Inverter and Motor Control				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
*P01.26	Motor Cable Length	0~150	m	10
*P01.27	System Inertia	0.00~655.35	kg·m2	*
P01.32	Load Compensation Gain for Low Speed	0~199	%	100
P01.33	Load Compensation Gain for High Speed	0~199	%	100
P01.34	Motor Magnet Current at 0 Speed	0~300	%	100
P01.35	Cut in Speed for Normal Magnet Current	0.0~10.0	Hz	0.0
P01.36	Min Motor Current at Low Speed	0~120	%	80
P01.37	Slip Compensation Gain	-400~399	%	*
P01.38	Slip Compensation Time Constant	0.05~5.00	s	*
P01.39	Resonance Damping Gain	0~3000	%	*
P01.40	Time Constant for Resonance Damping Filter	0.005~0.050	s	0.005
P01.41	Damping Coefficient for PM	0~2000	%	120
P01.42	Damping Time Constant for Low-Speed range (PM)	0.01~20.00	s	0.8
P01.43	Damping Time Constant for High-Speed range (PM)	0.01~20.00	s	0.8
P01.44	Time Constant for Current Filter (PM)	0.001~1.000	s	0.5
P01.45	Min Torque at Torque Mode Start	-100~100	%	5
P01.46	Min Torque Cut Out Speed at Torque Mode Start	0.1~50.0	Hz	3.0
P01.53/ P01.55/ P01.57/ P01.59/ P01.61	Voltage for V/F curve points	0.0~999.9	V	*
P01.54/ P01.56/ P01.58/ P01.60/ P01.62	Frequency for V/F curve Points	0.0~590.0	Hz	*
P01.63	PM Start Method	0:Initial Position Detection (IPD) 1:Parking		1
*P01.64	IM Start Method	0:Direct Start 1:Fly start		0
P01.67	Min Valid Speed Set	0.00~50.00	Hz	0.1
P01.68	Bypass Frequency for IM Low Speed	0.0~20.0	Hz	0.0
P01.70	Delay Time at Start	0.0~10.0	s	0.0

Parameter Group 1:Basics for Inverter and Motor Control				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P01.71	Delay Function at Start	0:Free Coast 1:DC Hold		0
P01.72	DC Hold Current	0~150	%	50
P01.79	Stop Method at Torque Control Mode	0:Stop with Torque Mode 1:Stop with Speed Mode		0
P01.80	Function at Stop	0:Free Coast 1:DC hold		0
P01.81	Cut in Speed for Function at Stop	0.0~400.0	Hz	0.0
P01.82	DC Brake Current (IM)	0~150	%	50
P01.83	DC Brake Time (IM)	0.0~60.0	s	2
P01.84	DC Brake Cut in Speed (IM)	0.0~400.0	Hz	0.0
P01.85	Demagnetizing Rate at DC Cut in	0~100	%	100
P01.86	Parking Current (PM Start)	0~150	%	80
P01.87	Parking Time (PM Start)	0.1~60.0	s	3.0
P01.91	Brake Function	0:No Function 1:Resistor Brake 2:AC Brake		0
P01.92	Max AC Brake Current	0~150	%	100
P01.93	AC Brake Gain	1.0~2.0		1.4
P01.94	Threshold Voltage for Brake Function	Grid Dependent	V	*
P01.95	Resistor Brake Resistance	5~65535	Ω	*
P01.97	Mechanic brake cut-out current	0.00~1200.00	A	0.00
P01.98	Mechanic brake cut-in frequency	0.0~400.0	Hz	0.0

Parameter Group 2: Digital Terminal Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P02.00	DI Positive-Negative Logic Selection	0~65535		0
P02.01	DO/Relay Positive-Negative Logic Selection	0~65535		0
P02.02	DI Input Mode	0:NPN Input 1:PNP Input		0
P02.03	Pulse Auto Start/Stop Function Enable	0:Disable 1:Enable		0
P02.04	DI Filter time	2~16	ms	4
P02.05	FWD Input Function Selection	0:No Function 1:Reset 2:Coast to Stop (Negative Logic) 3:Coast to Stop and Reset (Negative Logic)		10
P02.06	REV Input Function Selection			12
P02.07	DI Function Selection - Terminal D1			22
P02.08	DI Function Selection - Terminal D2			23
P02.09	DI Function Selection - Terminal D3			24

Parameter Group 2: Digital Terminal Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P02.10	DI Function Selection - Terminal D4	4:Stop (Negative Logic) 10:Run 11:Forward/Reverse Selection 12:Run in Reverse Direction 13:Pulse run forward 14:Pulse run reverse 15:Forward Jog 16:Reverse Jog 17:Pulse stop 20:Forbid Forward 21:Forbid Reverse 22:Preset Value Command Bit 1 23:Preset Value Command Bit 2 24:Preset Value Command Bit 3 25:Preset Value Command Bit 4 26:Ramp Time Selection Bit 1 27:Ramp Time Selection Bit 2 30:Speed UP 31:Speed DOWN 32:Counter A 34:Reset Counter A 35:Counter B 37:Rest Counter B 40:Pulse Input 41:Switch Set Source 42:Switch Speed Mode/Torque Mode 50:External Fault Input 51:Freeze PID output		25
P02.21	Action for DI as External Fault Input	0:No Action 2:Stop and Warning 3:Jog and Warning 4:Run to Max Speed P05.03 and Warning 5:Alarm Fault and Trip to stop 6:Warning 7:Alarm and Trip to coast stop 8:Same as 7 but only valid at running stage		0
P02.22	DO Function Selection - Terminal	0:No operation 1:Drive ready 2:Remote control ready 3:Drive ready/stop 4:Drive running, the drive is running 5:Drive running/No warning, the drive is running and no warning is present		0

Parameter Group 2: Digital Terminal Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P02.22	DO Function Selection - Terminal DO1	6:Run in current range 7:Run on reference 8:Reverse 10:Alarm 11:Alarm or warning 12:Thermal warning 13:Ready 14:Remote ready 15:Loacl Bus OK 20:Out of current range 21:Below current low 22:Above current high 23:Out of frequency range 24: Below frequency low 25:Above frequency high 26:Out of feedback range 27:Below feedback low 28:Above feedback high 29:Out of reference range 30:Below reference low 31:Above reference high 40:Drive in Local mode 41:Drive in Remote mode 42:Mech. brake control 43:External alarm 44:Unbalance warning 47:Counter A 48:Counter B 49:Option Communication Card OK		0
P02.28	Relay Output Function Selection - RL1	Same as P02.22		10
P02.29	Relay on Delay Time - RL1	0.00~600.00	s	0.00
P02.30	Relay off Delay Time - RL1	0.00~600.00	s	0.00
P02.31	Relay Output Function Selection - RL2	Same as P02.22		0
P02.32	Relay on Delay Time - RL2	0.00~600.00	s	0.00
P02.33	Relay off Delay Time - RL2	0.00~600.00	s	0.00
P02.40	UP/Down Functional Initial Maintenance Time	2~60000	ms	4
P02.46	Save DI Counter Value at Power down	0:Save None 1:Save Counter A 2:Save Counter B 3:Save Both Counter A and B		0

Parameter Group 2: Digital Terminal Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P02.47	Counter A Preset threshold	0~65535		65535
P02.48	Counter B Preset threshold	0~65535		65535
P02.50	Min Frequency for Pulse Input 1	0.00~P02.51	kHz	0.00
P02.51	Max Frequency for Pulse Input 1	P02.50~100.00	kHz	50.00
P02.52	Set Value/Feedback Value Versus Min Frequency for Pulse Input 1	-200.00~200.00	%	0.00
P02.53	Set Value/Feedback Value Versus Max Frequency for Pulse Input 1	-200.00~200.00	%	100.00
P02.54	Pulse input 1 Filter Time	1~1000	ms	100
P02.60	Pulse output 1 function selection	0:Digital output 1:Output frequency 2:Output current 3:Output Power 4:Motor Speed 5:Output voltage 10:Set Value 11:Feedback 13:Set Value from Bus 14:Pulse input 1 input frequency 15:Terminal AI1 input value 16:Terminal AI2 input value 20:DC link voltage 30:Output Torque		0
P02.61	Min Frequency for Pulse Output 1	0.00~P02.62	kHz	0.00
P02.62	Max Frequency for Pulse Output 1	P02.61~100.00	kHz	50.00
P02.63	Function Value Versus Min Frequency for Pulse Output 1	0.00~200.00	%	0.00
P02.64	Function Value Versus Max Frequency for Pulse Output 1	0.00~200.00	%	100.00
P02.70	Encoder Resolution	1~32767		1024
P02.71	Encoder Rotation Direction	0: Forward 1: Reverse		0
P02.72	Encoder Frequency dividing Output Factor	1~255		1

Parameter Group 3: Analogue Terminal Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P03.00	Signal Type - Terminal AI1	0:Analogue Voltage 1:Analogue Current		0
P03.01	Terminal AI1 Filter Time	0.00~10.00	s	0.01
P03.02	Zero Voltage Dead Band - Terminal AI1	0.00~20.00	V/mA	0.00

Parameter Group 3: Analogue Terminal Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P03.03	Min Input Voltage - Terminal AI1	0.00~P03.04	V	0.15
P03.04	Max Input Voltage - Terminal AI1	P03.03~10.00	V	10.00
P03.05	Min Input Current - Terminal AI1	0.00~ P03.06	mA	0.15
P03.06	Max Input Current - Terminal AI1	P03.05~20.00	mA	20.00
P03.07	Set Value/Feedback Value Versus Min Input -Terminal AI1	-200.00~200.00	%	0.00
P03.08	Set Value/Feedback Value Versus Max Input -Terminal AI1	-200.00~200.00	%	100.00
P03.09	Signal Type - Terminal AI2	0:Analogue Voltage 1:Analogue Current		1
P03.10	Terminal AI2 Filter Time	0.00~10.00	s	0.01
P03.11	Zero Voltage Dead Band - Terminal AI2	0.00~20.00	V/mA	0.00
P03.12	Min Input Voltage - Terminal AI2	0.00~P03.13	V	0.15
P03.13	Max Input Voltage - Terminal AI2	P03.12~10.00	V	10.00
P03.14	Min Input Current - Terminal AI2	P03.15~19.99	mA	0.15
P03.15	Max Input Current - Terminal AI2	P03.14~20.00	mA	20.00
P03.16	Set Value/Feedback Value Versus Min Input -Terminal AI2	-200.00~200.00	%	0.00
P03.17	Set Value/Feedback Value Versus Max Input -Terminal AI2	-200.00~200.00	%	100.00
P03.48	Analogue Live Zero Timeout Time	1~99	s	10
P03.49	Live Zero Timeout Function	0:No Action 2:Stop and Warning 3:Jog and Warning 4:Run at Max Speed P05.03 and Warning 5:Alarm Fault and Trip to stop		0
P03.50	Signal Type - Terminal AO1	0:0~20mA 1:4~20mA 3:0~10V		3
P03.51	Output Function Selection- AO1	0:No function 1:Output frequency 2:Output current 3:Output Power 4:Motor Speed 5:Output voltage 10:Set Value 11:Feedback 13:Set Value from Bus 14:Pulse input 1 input frequency 15:Terminal AI1 input value 16:Terminal AI2 input value		0

Parameter Group 3: Analogue Terminal Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
		20:DC link voltage 30:Output Torque		
P03.52	Value Versus Min Output - AO1	0.00~200.00	%	0.00
P03.53	Value Versus Max Output - AO1	0.00~200.00	%	100.00
P03.54	Min Output Voltage/Current - AO1	0.00~P03.55		0.00 /4.00
P03.55	Max Output Voltage/Current - AO1	P03.54~10.00/20.00		10.00 /20.00
P03.68	Min Set Value from Keypad	-200.00~200.00	%	0.00
P03.69	Max Set Value from Keypad	-200.00~200.00	%	100.00
P03.90	Enable Analogue Input as Digital Input	0:Keep as Analogue Inputs 1:Enable Analogue Inputs as Digital Inputs		0
P03.91	Function Selection for AI1 as DI	Same as P02.05		0
P03.92	Function Selection for AI2 as DI	Same as P02.05		0

Parameter Group 4: Process PID and Other Controllers				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P04.00	Process PID Feedback Source	0:No Function 1:Terminal AI1 2:Terminal AI2 5:Pulse Input 1 20:Bus Communication 31:Inverter Output Current 32: Output Torque 33: DC Bus Voltage		0
P04.01	Process PID Set Source	0:No Function 1:Terminal AI1 2:Terminal AI2 5:Pulse Input 11 10:Preset Value 0 + UP/DOWN 11:Multi Preset Value 20:Bus Communication 30:Keypad		0
P04.02	Fiducial Value for Process PID Set/Feedback	0.0~3000.0		50.0
P04.04	Process PID Control Logic: Positive/Negative	0:Positive 1:Negative		0
P04.05	Process PID Anti Windup	0:Disable 1:Enable		1
P04.06	Cut-in Frequency for Process PID Speed Mode	0.0~200.0	Hz	0.0

Parameter Group 4: Process PID and Other Controllers				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P04.07	Proportional Gain - Process PID 1	0.0~10.00		0.30
P04.08	Integration Time - Process PID 1	0.01~655.35	s	10.00
P04.09	Differential Time - Process PID 1	0.00~10.00	s	0.00
P04.10	Proportional Gain - Process PID 2	0.00~10.00		0.30
P04.11	Integration Time - Process PID 2	0.01~655.35	S	10.00
P04.12	Differential Time - Process PID 2	0.00~10.00	S	0.00
P04.13	Process PID Differential Limit	1.0~50.0		5.0
P04.14	Error Tolerance Limit to Enable Process PID	0.0~200.0	%	0.1
P04.15	Process PID Out/In Mode to Error Tolerance	0~2		0
P04.16	Process PID Error Bandwith 1	0.0~200.0	%	200
P04.17	Process PID Error Bandwith 2	0.0~200.0	%	200
P04.18	Process PID Output Low Limit	-100.00~100.00	%	0.00
P04.19	Process PID Output High Limit	-100.00~100.00	%	100.00
P04.20	Process PID Upper Limit Source Selection	0~30		0
P04.22	Process PID Integration Output Low Limit	-100.00~100.00	%	0.00
P04.23	Process PID Integration Output High Limit	-100.00~100.00	%	100.00
P04.30	Speed PID Proportional Gain	0.000~1.000		0.010
P04.31	Speed PID Integration Time	2.0~2000.0	ms	8.0
P04.32	Speed PID Differencing Time	0.0~200.0	s	30.0
P04.33	Speed PID Differential Limit	1.000~20.000		5.000
P04.34	Speed PID Speed Signal Filter Time	1.0~100.0		10.0
P04.40	Torque PI Proportional Gain	0~500	%	100
P04.41	Torque PI Integration Time	0.002~2.000	s	0.020
P04.51	PM Current Limit Controller Feedforward Gain	0~400	%	100
P04.52	Proportional Gain - Current Limit Controller	0~500	%	100
P04.53	Integration Time - Current Limit Controller	0.000~2.000	s	0.020
P04.54	Filter Time - Current Limit Control	2.0~100.0	ms	*
P04.61	Isd PI Control Bandwidth	10~200	Hz	30
P04.62	Isd PI Control Damping Coefficient	1~200		100
P04.63	Isd Load Compensation Coefficient	0.1~1.0		0.5
P04.64	Isq PI Control Bandwidth	0.01~1.00	Hz	0.03
P04.65	Isq PI Control Damping Coefficient	1~200		1

Parameter Group 5: Limitation, Protection and Failure Detection				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
*P05.02	Motor Low Speed Limit	0.0~590.0	Hz	0.0
*P05.03	Motor High Speed Limit	0.0~590.0	Hz	65.0
P05.04	Torque Limit at Motor Mode	0~1000	%	160
P05.05	Torque Limit at Generator Mode	0~1000	%	160
P05.06	Source Selection for Speed Limit at Torque Mode	0~30		0
P05.07	Max Current Limit	0~300	%	*
*P05.08	Max Output Frequency Limit	0.0~590.0	Hz	65.0
P05.09	Threshold for Low Current Warning	0.00~P09.16	A	0.0
P05.10	Threshold for High Current Warning	0.00~P09.16	A	*
P05.11	Threshold for Low Speed Warning	0.0~590.0	Hz	0.0
P05.12	Threshold for High Speed Warning	0.1~590.0	Hz	65.0
P05.13	Threshold for Low Set Value Warning	-200.00~200.00	%	0.00
P05.14	Threshold for High Set Value Warning	-200.00~200.00	%	100.00
P05.15	Threshold for Low Feedback Warning	-200.00~200.00	%	0.00
P05.16	Threshold for High Feedback Warning	-200.00~200.00	%	100.00
*P05.17	Motor Phase Loss Protection	0:Disable 1:Low Sensitivity Detection 2:High Sensitivity Detection		1
P05.18	Enable Current Limit/Torque Limit Warning	0:Disable 1:Enable		1
P05.19	Motor Speed Feedback Loss Function	0:No Function 3:Jog and Warning 4:Run to Max Speed P05.03 and Warning 5:Alarm Fault and Trip to stop 11:Switch to Speed Sensor less Mode		5
P05.20	Speed Error for Speed Feedback Loss Detection	1~6000	rpm	300
P05.21	Time for Speed Feedback Loss Detection	0.00~60.00	s	2
P05.22	Threshold for Communication with CU Timeout	0.10~60.00	s	1.00
P05.23	Communication with CU Timeout Function	0:No Function 2:Stop and Warning 3:Jog and Warning 4:Run to Max Speed P05.03 and Warning 5:Alarm Fault and Trip to stop 6:Warning		5

Parameter Group 5: Limitation, Protection and Failure Detection				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P05.26	Motor Thermal Protection Function	0:No Function 1:ETR Warning 2:ETR Alarm Fault 3:ETR Warning for Self-cooled Motor 4:ETR Alarm Fault for Self-cooled Motor		0
P05.27	Motor Overload Protection Time	0.1~60.0	min	2.0
P05.28	Threshold for Motor Overload Protection	100~160	%	150
P05.29	Function at Mains Phase Loss	0:No Action 1:Only Waring 2:Trip to stop and Alarm Fault (Heavy Load) 3:Trip to stop and Alarm Fault (Mid Load) 4:Trip to stop and Alarm Fault (Light Load)		3
P05.30	Alarm/Fault Lock Handling	0:Not Lock, Alarm/Fault Resettable without Re-Power On 1:Lock, Alarm/Fault Lock Resettable only after Re-Power On		1
P05.31	Delay Time to Alarm Current Limit Fault	0~60	s	60
P05.32	Delay Time to Alarm Torque Limit Fault	0~60	s	60
P05.33	Action at Warning	0:Trip to stop and Alarm Fault directly 1:Warning and Re-catch Motor after Failure Disappear		1
P05.34	Method to Re-catch Motor at Warning	0:Speed Track(IM/PM) and Angle Track (Fly start) 1:Direct Re-catch		0
P05.60	Load loss detection function	0:Disabled 1:Enabled		0
P05.61	Load loss detection threshold	0.1~200.0%	%	5
P05.62	Load loss detection Filter Time	0.1~600.0	S	1

Parameter Group 6: Keypad Operation and Display				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P06.03	Customer Defined Value for Min Speed	0.0~6553.5		0.0
P06.04	Customer Defined Value for Max Speed	0.0~6553.5		100.0
P06.05	Keypad Display Option	0~8191		0

Parameter Group 6: Keypad Operation and Display				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P06.31	Local/Remote Mode Selection	0:Remote Mode 1:Local Mode		0
P06.32	Free key function Selection	0:Disabled 1:Reverse RUN		0
P06.34	Lock Keypad for Parameter Edit	0:Disabled 1:Enabled and Lock		0
P06.35	Resolution for frequency set via keyboard	0:0.1 1:1.0 2:10	Hz	1
P06.50	Speed ratio	0.01~655.35		1.00
*P06.51	Current Display Correction factor	0.01~655.35		1
*P06.52	Power Display Correction factor	0.01~655.35		1

Parameter Group 7: Auxiliary and Special Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P07.00	Special Operation Function	0:No Function 9:Reset Parameters to Factory Defaults		0
P07.01	Function at Re-Power	0:Resume with Set Value as Set before Re-power (Local Mode) 1:Not Run, but Keep Set Value as Set before Re-power (Local Mode) 2:Not Run and Clear Set Value (Local Mode) 3: Resume with Set Value as Set before Re-power (all values)		1
*P07.10	Min Switch Frequency	2~16:2~16 kHz	kHz	2
*P07.11	Over Modulation Coefficient	90.0~115	%	100.0
*P07.12	DC-Link Voltage PWM Compensation Function	0:Compensate Average DC voltage 2:Compensate DC Ripple Voltage		0
P07.13	DC-link Voltage PWM Compensation Disable at VF control	0:Disable 1:Enable		1
P07.14	Dead Time Compensation Adjustment Coefficient	0~200	%	100
P07.17	Max Speed for Dead Time Compensation	20~590	Hz	*
P07.26	Function at Mains failure	0:No Function 1:Passive Ramp Down 2:Passive Ramp Down,Trip and Alarm 3:Coast and Fly start 4:KEB Control 5:KEB Control, Trip and Alarm 6:Trip to Coast and Alarm		0

Parameter Group 7: Auxiliary and Special Functions				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P07.27	Threshold Triggering Mains Voltage Sag Function	100~220/380	V	*
P07.28	KEB Control Gain	0 ~ 500	%	100
P07.35	Interval to clear the number of times of alarm auto reset performed	0~6000	min	0
P07.36	Method to Reset Alarm Fault	0:Reset by Command 1~10:Auto Reset for 1~10 Times 11:Auto Reset for Unlimited Times		0
P07.37	Alarm Auto Reset Waiting Time	0~600	s	10
*P07.38	VT Function Level	40~90	%	90
*P07.39	Min Magneton at AEO	40~75	%	66
P07.40	Magneton Optimization Factor (PM)	-400~400	%	10
P07.41	Control of cooling fan	0:On-off at Start/Stop 4:On-off according to temperature 5:Run at power on		0
P07.46	Threshold Voltage for OVC Function	Grid Voltage Dependent	V	*
P07.47	OVC Function	0:Disable 1:Enable with Mode 1 2:Enable with Mode 2		*
P07.48	OVC Integration Time	0.01~0.10	s	*
P07.49	OVC Proportional Gain	0~200	%	*
P07.50	Bypass Speed Start 1	0.0~590.0	Hz	0.0
P07.51	Bypass Speed End 1	0.0~590.0	Hz	0.0
P07.52	Bypass Speed Start 2	0.0~590.0	Hz	0.0
P07.53	Bypass Speed End 2	0.0~590.0	Hz	0.0
P07.54	Bypass Speed Start 3	0.0~590.0	Hz	0.0
P07.55	Bypass Speed End 3	0.0~590.0	Hz	0.0
P07.60	Delay time for restart after re-power	0.0~3600.0	s	0.0

Parameter Group 8: Basic and Running Information				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P08.00	PU SW Version			
P08.01	CU SW Version			
P08.30	Total Days with Power On	0~9999	d	
P08.31	Total Running Hours	0~60000	h	
P08.32	Total Energy Consumed (kWh)	0~65535	kWh	
P08.33	Number of Power Ups	0~65535		
P08.34	Number of Over-Temperatures	0~65535		
P08.35	Number of Over-Voltages	0~65535		
P08.36	Reset Consumed Energy Counter	0:Not Reset 1:Reset		0

Parameter Group 8: Basic and Running Information				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P08.37	Reset Running Hours Counter	0:Not Reset 1:Reset		0
P08.39	Total Running Time	0~60000	h	
P08.40~ P08.49	Alarm Log			
P08.50~ P08.59	Warnings Log			

Parameter Group 9: Real Time Running Status Monitoring				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P09.00	Control Word	0~65535		
P09.01	Status Word	0~65535		
P09.02	Set Value	-4999.0~4999.0		
P09.04	Motor Speed	0~24000	rpm	
P09.05	Output Power	0.000~655.35	kW	
P09.06	Output Voltage	0.0~6553.5	V	
P09.07	Output Frequency	0.0~590.0	Hz	
P09.08	Output Current	0.00~655.35	A	
P09.09	Output Torque	-200.0~200.0	%	
P09.10	Motor Thermal Load Status	0~100	%	
P09.11	DC Link Voltage	0~65535	V	
P09.13	Heatsink or IGBT Temperature	-128~127	℃	
P09.14	Inverter Thermal Load Status	0~255	%	
P09.15	Nominal Inverter Current	0.0~6553.5	A	
P09.16	Max Inverter Current	0.0~6553.5	A	
P09.19	PID Set Value	-200.0~200.0	%	
P09.20	PID Feedback Value	-200.0~200.0		
P09.21	PID Output	-200.0~200.0	%	
P09.22	Digital Input	0~65535		
P09.23	AI1 Analogue Input Type	0:0~10V 1:0~20mA		
P09.24	AI1 Input Value	0.00-20.00	V/mA	
P09.25	AI2 Analogue Input Type	0:0~10V 1:0~20mA		
P09.26	AI2 Input Value	0.00-20.00	V/mA	
P09.34	Set Value by Pulse Input	-200.0~200.0	%	
P09.35	Frequency of Pulse Input	0.00~100.00	KHz	
P09.37	Speed Feedback from Encoder		Rps	
P09.38	DO Output Status	0~255		
P09.39	Relay Output Status	0~65535		

Parameter Group 9: Real Time Running Status Monitoring				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P09.40	AO1 Output	0.00-20.00	V/mA	
P09.43	Pulse Output Frequency	0.00~100.00	kHz	
P09.45	Counter A Value	0~65535		
P09.46	Counter B Value	0~65535		
P09.47	Set Value from Bus Communication	-32768~32767		
P09.48	Variable Defined by Customer	0~6553.5		

Parameter Group 19:Simple PLC				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P19.00	SPLC control mode	0:once running then keep running 1:once running then stop 2:cycle running		0
P19.01	SPLC store selection	0:No function 1:save at Stop 2:save at Power down		0
P19.02	Clear SPLC Reset times	0:No action; 1:SPLC Reset times		0
P19.10	SPLC multi-speed0	-100.00%~100.00%	%	0
P19.11	SPLC multi-speed1	-100.00%~100.00%	%	0
P19.12	SPLC multi-speed2	-100.00%~100.00%	%	0
P19.13	SPLC multi-speed3	-100.00%~100.00%	%	0
P19.14	SPLC multi-speed4	-100.00%~100.00%	%	0
P19.15	SPLC multi-speed5	-100.00%~100.00%	%	0
P19.16	SPLC multi-speed6	-100.00%~100.00%	%	0
P19.17	SPLC multi-speed7	-100.00%~100.00%	%	0
P19.18	SPLC multi-speed8	-100.00%~100.00%	%	0
P19.19	SPLC multi-speed9	-100.00%~100.00%	%	0
P19.20	SPLC multi-speed10	-100.00%~100.00%	%	0
P19.21	SPLC multi-speed11	-100.00%~100.00%	%	0
P19.22	SPLC multi-speed12	-100.00%~100.00%	%	0
P19.23	SPLC multi-speed13	-100.00%~100.00%	%	0
P19.24	SPLC multi-speed14	-100.00%~100.00%	%	0
P19.25	SPLC multi-speed15	-100.00%~100.00%	%	0
P19.26	SPLC step0 ramp time	0.0~6000.0	S	0
P19.27	SPLC step1 ramp time	0.0~6000.0	S	0
P19.28	SPLC step2 ramp time	0.0~6000.0	S	0
P19.29	SPLC step3 ramp time	0.0~6000.0	S	0
P19.30	SPLC step4 ramp time	0.0~6000.0	S	0
P19.31	SPLC step5 ramp time	0.0~6000.0	S	0
P19.32	SPLC step6 ramp time	0.0~6000.0	S	0

Parameter Group 19:Simple PLC				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P19.33	SPLC step7 ramp time	0.0~6000.0	S	0
P19.34	SPLC step8 ramp time	0.0~6000.0	S	0
P19.35	SPLC step9 ramp time	0.0~6000.0	S	0
P19.36	SPLC step10 ramp time	0.0~6000.0	S	0
P19.37	SPLC step11 ramp time	0.0~6000.0	S	0
P19.38	SPLC step12 ramp time	0.0~6000.0	S	0
P19.39	SPLC step13 ramp time	0.0~6000.0	S	0
P19.40	SPLC step14 ramp time	0.0~6000.0	S	0
P19.41	SPLC step15 ramp time	0.0~6000.0	S	0
P19.42	SPLC step0 running time	0.0~6000.0	S	0
P19.43	SPLC step1 running time	0.0~6000.0	S	0
P19.44	SPLC step2 running time	0.0~6000.0	S	0
P19.45	SPLC step3 running time	0.0~6000.0	S	0
P19.46	SPLC step4 running time	0.0~6000.0	S	0
P19.47	SPLC step5 running time	0.0~6000.0	S	0
P19.48	SPLC step6 running time	0.0~6000.0	S	0
P19.49	SPLC step7 running time	0.0~6000.0	S	0
P19.50	SPLC step8 running time	0.0~6000.0	S	0
P19.51	SPLC step9 running time	0.0~6000.0	S	0
P19.52	SPLC step10 running time	0.0~6000.0	S	0
P19.53	SPLC step11 running time	0.0~6000.0	S	0
P19.54	SPLC step12 running time	0.0~6000.0	S	0
P19.55	SPLC step13 running time	0.0~6000.0	S	0
P19.56	SPLC step14 running time	0.0~6000.0	S	0
P19.57	SPLC step15 running time	0.0~6000.0	S	0
P19.80	Average Speed	0~65535	RPM	
P19.81	Current Running step	0~15		
P19.82	Current Running step time	0.0~6553.5	S	
P19.83	SPLC Reset times	0~65535		

Parameter Group 20:Pump				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P20.00	pump control mode	0:Pressure control mode 3:Solar-pump mode		0
P20.01	minimum output frequency	0.00~P20.02	%	40
P20.02	maximum output frequency	P20.01~100.00	%	100
P20.60	Sleep enable selection	0:disable 1:enable		0
P20.61	Sleep frequency threshold	0.00~100.00	%	2
P20.62	Sleep pressure threshold	0.00~100.00	%	2

Parameter Group 20:Pump				
Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P20.63	Sleep detection time	0.0~300.0	S	10
P20.64	minimum sleep time	0.0~1800.0	S	300
P20.65	wake up pressure threshold	0.00~100.00	%	10
P20.66	wake up detection time	0.0~60.0	S	1

Note:a. Parameters marked with '*' on the parameter number cannot be changed during motor running. '*' in the Factory default column means the default value vary with the different product types.

2.4 Detailed Description for Parameters

2.4.1 Parameter Group 0: General Control Mode and Commands

Parameter Number	Parameter Name	Value Range	Unit	Factory Default
P00.01	Control Mode	0: Speed Mode Speed Sensor less 1: Speed Mode with Speed Sensor 2: Torque Mode Speed Sensor less 3: Torque Mode with Speed Sensor		0

0: Speed control without speed sensor, open loop control with motor speed set as control target, for general purpose.

1: Speed control with speed sensor, close loop control with speed sensed by encoder as feedback and motor speed set as control target.

2: Torque control without speed sensor, open loop control with output torque set as control target without motor speed sensor. This function is only valid in vector control mode 1 (P 0.02). The torque PID parameters are detailed in parameter P04.4*.

3: Torque control with speed sensor, open-loop control with output torque set as control target. And motor speed is sensed and used in the control to achieve higher performance of the torque control.

Note: If the operating mode is changed, the parameters P-15 and P-16 will be restored to factory values.

Par. No.	Name	Range	Unit	Default
*P00.02	Motor Control Principle	0: V/F 1: Vector Control 1 2: Vector Control 2		1

Select the motor control principle.

0: V/F, for special motor or parallel connected motors in special motor applications. When V/F is selected the characteristic of VF curve can be set in parameters P01.53/P01.55/P01.57/P01.59/P01.61 for voltages and P01.54/P01.56/P01.58/P01.60/P01.621 for frequencies

1: Vector Control 1, Vector Control by decoupling the magnet current and torque current, suitable for most general applications. Correct motor parameters are important to achieve the best performance. Only VC 1 supports PM motor;

2: Vector Control 2, Suitable for applications demanding higher start torque or higher load impact performance. More sensitive to motor parameters and parameters P04.5* and P04.6* need to be tuned carefully.

Par. No.	Name	Range	Unit	Default
P00.03	Macro-program	0:Invalid 1:Pump Control 2: Simple PLC		0

0:Macro-program invalid

1:enable Pump application, please refer Group 20 detail description.

2:enable simple PLC application, please refer Group 19 detail description.

Par. No.	Name	Range	Unit	Default
*P00.04	Torque Characteristics	0:CT; 1:VT; 9:AEO		0

Select the torque characteristic of the load.

0: Constant torque, Load keeps high torque to the motor also at low speed, applies to most industry applications.

1: Variable torque, Load torque to the motor varies with the speed change, normally lower torque at lower speed, usually applies to fan or pump applications.

9: Auto Energy optimization (AEO), Automatically optimizes energy consumption by optimizing the magnet current. Usually suitable for fan or pump applications.

Note: If the parameter is set to [1] or [9], it may lead to out of control of the motor due to reduction in torque capacity, or lead to current oscillation.

Par. No.	Name	Range	Unit	Default
*P00.05	Motor Speed Direction	0:Clockwise; 1:Anticlockwise; 2:Bidirectional		2

Select the motor speed direction(s). It can be used to prevent unwanted motor direction.

0: Clockwise, the motor shaft rotates in clockwise direction, this setting prevents the motor from running in counter clockwise direction;

1: Anticlockwise, motor shaft rotates in anticlockwise direction, this setting prevents the motor from running in clockwise direction;

2: Both directions,with this setting, the motor can run in both directions;

Par. No.	Name	Range	Unit	Default
*P00.09	Motor Direction Reverse Selection	0: No function; 1: Reverse Direction		0

.0:No function,The Motor maintains the current running direction.

1:Reverse the direction,The Motor runs in reversed direction.

Par. No.	Name	Range	Unit	Default
P00.10	Speed Set Source Selection	0~5		2

Select set value source.

0: main set source, only the main set source is used;

1: Multi preset value with priority

For example, set P00.11 = 1 (AI1 as main set source), P00.12 = 11 (Mulita preset value as additional set source),

P02.07 = 22, P02.08 = 23, P02.09 = 24, P02.10 =25 If DI1 is valid and DI2, DI3 and DI4 are invalid, the set value is P00.31. If DI1~DI4 are all invalid, the set value is corresponding to the value of AI1. Note that P00.30 cannot have the priority.

2: Calculation of main set source and additional set source.

3: Switchover between main set source and additional set source.

The set source can be switched by the digital input terminal function (one of the parameters from P02.05 to P02.10 set to 41). When the corresponding terminal is invalid, the main set source is selected; when the terminal is valid, the additional set source is selected.

4: Switchover between main set source and the calculation of main set source and additional set source

5: Switchover between additional set source and the calculation of main set source and additional set source

Selecting 4 or 5 works similar as selecting 3.

Par. No.	Name	Range	Unit	Default
P00.11	Main Set Source	0~30		1
P00.12	Additional Set Source	Same as P00.11		20

Select the source for main set and additional set.

0: No function;

1: Terminal AI1, use analogue input AI1 as set source, refer to P03.00~P03.17;

2: Terminal AI2, use analogue input AI1 as set source, refer to P03.00~P03.17;

5: Pulse input, use pulse input as set source, refer to P02.50~P02.53;

10: Multi preset value 0 + Up/Down, use preset set value 0 plus Up/Down adjustment as set source, refer to P00.30~P00.45, P00.46 and P02.05;

11: Multi preset values, refer to ever to P00.30~P00.45 and P02.05;

20: Communication, use value from bus compunction;

21: Process PID, use the output of Process PID control as set source;

30: Keypad, use the command for keypad as set resource, refer to P03.68~P03.69;

Par. No.	Name	Range	Unit	Default
P00.13	Torque Set Source for Torque Mode	Same as P00.11		1

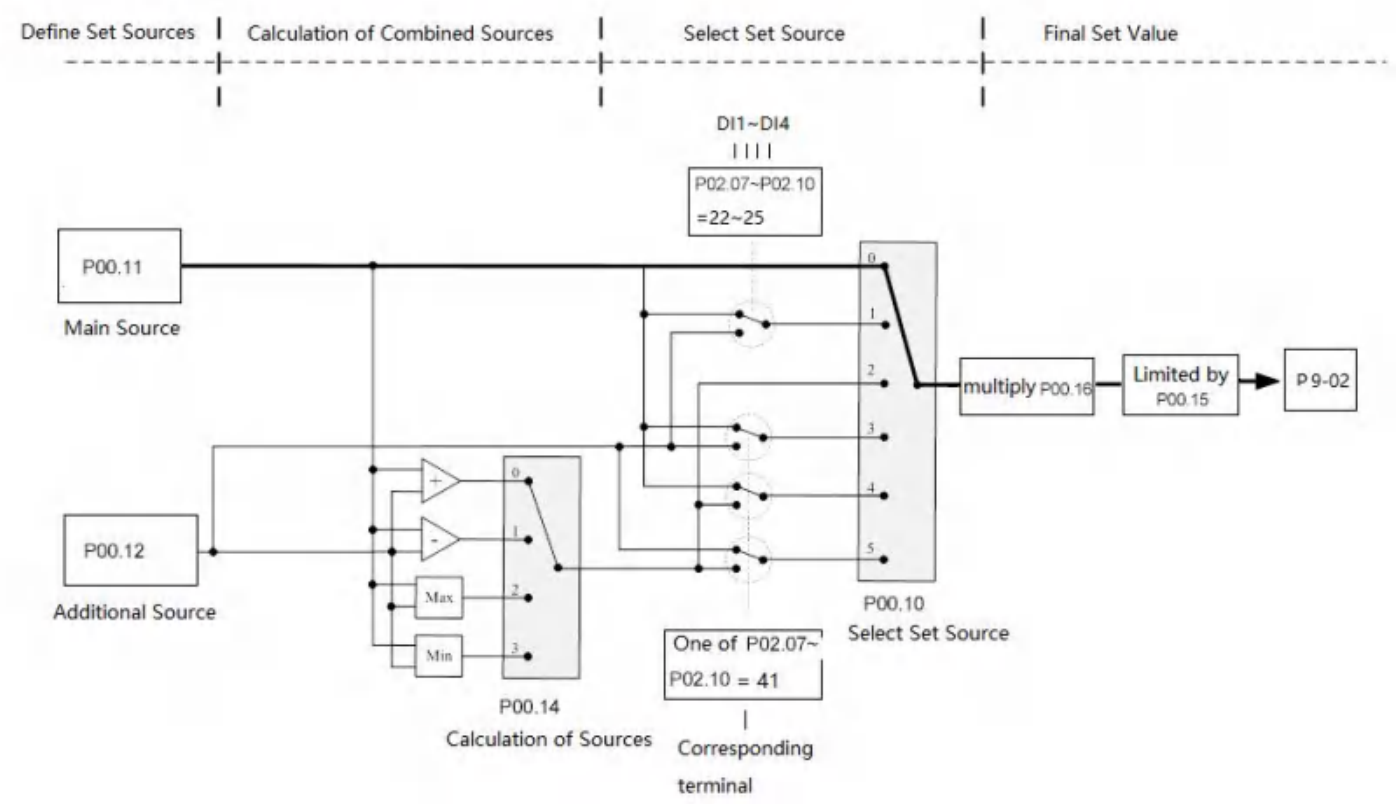
Select the set source for torque control, the base value for set source is based on P01.08 rated motor torque.

Par. No.	Name	Range	Unit	Default
P00.14	Set Value Calculation from Main and Additional Source	0:Main Set Source + Additional Set Source 1:Main Set Source - Additional Set Source 2:Maximal Value of Main and Additional Set Source 3:Minimal Value of Main and Additional Set Source		0

This parameter is used to set calculation of main and additional set source, the calculated results can be used for parameter P00.10 options [2], [4] and [5].

Par. No.	Name	Range	Unit	Default
P00.15	Speed Set Range	0:0~P00.16; 1:-P00.16~P00.16		0
P00.16	Base Value for Speed Set	0.0~590.0		50.0

These two parameters are used to control the range of the set value and used as percentage calculation base. Based on Parameters P00.10, P00.11, P00.12, P00.14, P00.15 and P00.16, the set value for speed mode can be calculated as below:



Par. No.	Name	Range	Unit	Default
P00.17	Control Site	0:Terminal or Bus Communication 1:Terminal 2:Bus Communication		0

The start, stop, reverse, jog commands can be given both through digital input terminals and communication, this parameter is used to select the drive control command site.

0: Terminal or Bus Communication, controlled by both digital input terminals and bus communication;

1: Terminal, controlled only by digital input terminals;

2: Communication only, controlled by bus communication only;

Par. No.	Name	Range	Unit	Default
P00.18	Selection of Communication Control Source	0:Null 1:Local RS485 2:Bus from Option Card		1

Par. No.	Name	Range	Unit	Default
P00.29	Control Command Source Switch Enable	0:Disable 1:Enable		0

When P00.29=0, terminal function to switch the speed set source (function 41) is only used to switch the speed set source.

When P00.29=1, terminal function to switch the speed set source (function 41) switches the speed set source and command source at the same time (when the terminal function 41 is valid, it switches the command source to the terminal command at the same time, that is, the terminal pulse start-stop is valid; When the terminal function 41 is invalid, it switches the command source to remote start/stop command at the same time, that is, bus communication control.

Par. No.	Name	Range	Unit	Default
P00.30~P00.45	Multi Preset Values	-100.00~100.00	%	0.00

Different values preset in P00.30~P00.45 can be activated by different status of DI1 ~DI4 terminals (P02.07~P02.10 are set to [22] ~ [25])

For the relationship between active preset value and the status of DI terminals.

The maximum speed of 16 segments can be set by different combinations of states of the four terminals of a multi-segment instruction, as shown in the following table:

Preset Value Command Bit 4	Preset Value Command Bit 3	Preset Value Command Bit 2	Preset Value Command Bit 1	Parameter selected	Speed segments
OFF	OFF	OFF	OFF	P00.30	0
OFF	OFF	OFF	ON	P00.31	1
OFF	OFF	ON	OFF	P00.32	2
OFF	OFF	ON	ON	P00.33	3
OFF	ON	OFF	OFF	P00.34	4
OFF	ON	OFF	ON	P00.35	5
OFF	ON	ON	OFF	P00.36	6
OFF	ON	ON	ON	P00.37	7
ON	OFF	OFF	OFF	P00.38	8
ON	OFF	OFF	ON	P00.39	9
ON	OFF	ON	OFF	P00.40	10
ON	OFF	ON	ON	P00.41	11
ON	ON	OFF	OFF	P00.42	12
ON	ON	OFF	ON	P00.43	13
ON	ON	ON	OFF	P00.44	14
ON	ON	ON	ON	P00.45	15

In speed control mode, 100% preset value is corresponding to P00.16. In torque control mode, 100% is corresponding to P01.08 rated motor torque.

Par. No.	Name	Range	Unit	Default
P00.46	UP/DOWN Step Value	0.01~100.00	%	0.10

To set the set value change step each time when a DI terminal valid. 100% for parameter P00.16. The corresponding terminal must be set with UP/DOWN function for UP/Down function (one of parameters from P02.05 to P02.10 set to [30] [31]). The UP/DOWN function is used when parameter P00.11 or P00.12 is set to [10].

Par. No.	Name	Range	Unit	Default
P00.47	Save Up/Down Set Value	0:Not Save 1:Save when Stop 2:Save when Power Down		0

This parameter is used for setting whether to save the set value changed by Up/Down function if the drive stops or after it is powered down.

Par. No.	Name	Range	Unit	Default
P00.48	Jog Speed	0.0~400.0	Hz	5.0

The jog speed is a fixed output speed at which the drive is running when the jog function is activated by DI terminal.

Jog speed has the highest priority when a variety of commands are activated.

Par. No.	Name	Range	Unit	Default
P00.49	Ramp Time Resolution	0:0.1s 1:0.01s		1

There are two kinds of ramp time resolution for different applications.

After modifying this parameter, the ramp time defined in P00.51~P00.66 will be reset back to factory defaults.

Par. No.	Name	Range	Unit	Default
P00.50	Ramp 1 Type	0:Linear;1:S ramp		0
P00.51	Ramp 1 Ramp Up Time	0.01~655.35	s	*
P00.52	Ramp 1 Ramp Down Time	0.01~655.35	s	*
P00.53	Ramp 2 Type	0:Linear;1:S ramp		0
P00.54	Ramp 2 Ramp Up Time	0.01~655.35	s	*
P00.55	Ramp 2 Ramp Down Time	0.01~655.35	s	*
P00.56	Ramp 3 Type	0:Linear;1:S ramp		0
P00.57	Ramp 3 Ramp Up Time	0.01~655.35	s	*
P00.58	Ramp 3 Ramp Down Time	0.01~655.35	s	*
P00.59	Ramp 4 Type	0:Linear;1:S ramp		0
P00.60	Ramp 4 Ramp Up Time	0.01~655.35	s	*
P00.61	Ramp 4 Ramp Down Time	0.01~655.35	s	*
P00.62	Jog Ramp Time	0.01~655.35	s	*
P00.63	S Ramp Up Initiate Period	0.01~655.35	s	*
P00.64	S Ramp Up Termination Period	0.01~655.35	s	*
P00.65	S Ramp Down Initiate Period	0.01~655.35	s	*
P00.66	S Ramp Down Termination Period	0.01~655.35	s	*

Ramp Up Time: The total ramp time from 0Hz to rated motor frequency (P01.05)

Ramp Down Time: The total ramp time from rated motor frequency (P01.05) to 0Hz.

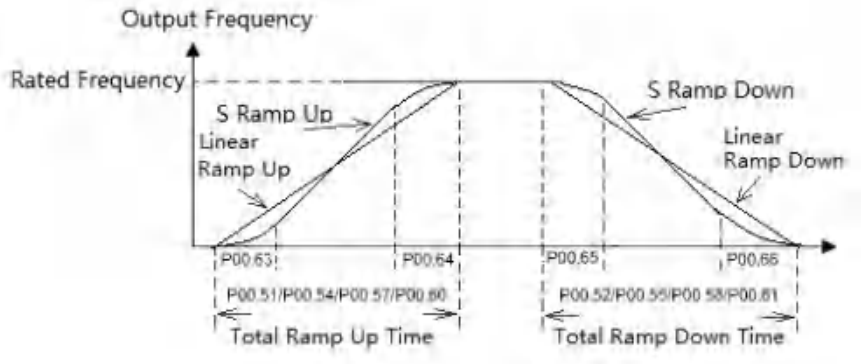
Ramp Type:

0: Linear, motor ramps up/down with constant acceleration/deceleration speed;

2: S ramp, motor ramps up/down with changing acceleration/deceleration speed to get a smooth speed change.

Normally the changing speed of acceleration/deceleration speed is constant.

The ramp times and ramp types are shown below:



F or S ramp, P00.63 plus P00.64 should not be more than the total ramp up time defined by P00.51/P00.54/P00.57/P00.60, P00.65 plus P00.66 should not be more than the total ramp down time defined by P00.52/P00.55/P00.58/P00.61.

Par. No.	Name	Range	Unit	Default
P00.80	Local Address	1~127		1

Select the address for the bus communication in the range of 1 ~127.

Par. No.	Name	Range	Unit	Default
P00.81	Baud Rate	0:2400 1:4800 2:9600 3:19200 4:38400 5~9:Reserved		2

Select baud rate for bus communication.

Par. No.	Name	Range	Unit	Default
P00.82	Communication Data Format (Parity/Stop Bits)	0:Even parity (1 stop bit) 1:Odd parity (1 stop bit) 2:No parity (1 stop bit) 3:No parity (2 stop bit)		0

Par. No.	Name	Range	Unit	Default
P00.83	Min. Communication Response Delay	0.000~0.500	s	0.002

Specify the minimum delay time between receiving a request and transmitting a response. This is used for overcoming modem turnaround delays.

Par. No.	Name	Range	Unit	Default
P00.84	Max. Communication Response Delay	0.010~10.000	s	5.000

Specify the maximum permissible delay time between transmitting a request and receiving a response. If the delay time exceeds this value, the drive will not respond to received data.

Par. No.	Name	Range	Unit	Default
P00.85	Message Response	0:Normal Reponses; 1:Only Response Exceptional Message 2:Not Response		0

This parameter is used to control Modbus message response.

Attention: the drive will response to the READ command and not response to the RADIO message no matter what P00.85 set.

Par. No.	Name	Range	Unit	Default
P00.86	Parameter (Set by Communication) Saving at Power Down	0:Not Save Parameter at Power Down 1:Save Parameter at Power Down		0

This parameter is used to control whether the parameters which is changed by communication WRITE command should be saved at power down.

Par. No.	Name	Range	Unit	Default
P00.87	Communication terminal resistance selection	0:Open 1:Close		0

This parameter is to enable the built-in termination resistor for RS485 bus.

Par. No.	Name	Range	Unit	Default
P00.88	Communication Timeout Time	0.01~650.00	s	1.00

If the time between two successful reception of telegrams exceeds this parameter, it indicates that the communication has stopped or failed, then the function set in P00.89 (Communication Timeout Function) will be activated. If this parameter is set to 0, then the timeout function defined in P00.89 is disabled.

Note: The time-out counter is triggered ONLY by a valid communication, so if the product never received any successful telegrams from power on, it will never trigger timeout function.

Par. No.	Name	Range	Unit	Default
P00.89	Communication Timeout Response Function	0:No Function 2:Stop Motor 3:Jogging 4:Run with Max Frequency P05.03 5:Trip to stop and Alarm Fault 6:Warning		0

This parameter is used to set the action performed by the inverter when communication is interrupted.

0: No function

2: Ramp down to stop the motor and report "u.62" warning

3: Jogging, overruled to jog speed running and report “u.62” warning

4: Max. speed, overruled to max. speed running limited by P05.03 and report "u.62" warning

5: Trip to coast stop and alarm fault “A.62”.

6: Warning, continues to run at latest received control word and report "u.62" warning

Par. No.	Name	Range	Unit	Default
P00.90	Reset Communication Timeout	0:No Action 1:Reset the Timeout		0

The Communication Timeout flag can only be reset by this parameter. If the flag is not reset, even communication recovers and the alarm is cleared, the drive will continue to report communication timeout.

2.4.2 Group 1 Basics for Inverter and Motor Control

Par. No.	Name	Range	Unit	Default
P01.00	Switching Frequency	2~16:2~16 kHz		*

This parameter is used to adjust the carrier frequency of the frequency converter. The influence of carrier frequency on frequency converter and motor is as follows:

Carrier frequency	LOW → HIGH
Motor noise	LOUD → LOW
Inverter temperature rise	LOW → HIGH
Output leakage current	SMALL → LARGE
Output current harmonics	LARGE → SMALL
Radiation Frequency Interference	SMALL → LARGE

Carrier frequency setting general considerations:

1.Reduce the carrier frequency when the motor line is too long.

2.Reduce the carrier frequency when there is RFI issue.

3.Reduce the carrier frequency when there is high frequency leakage current issue.

4.Reduce the carrier frequency when the temperature rise of the converter is high.

5.Increase the carrier frequency when there is motor noise issue.

Note:

1.0.37~22kW:2k~16kHz; 30~90kW:2~8k; 110~160kW:2~4k; >=185kW:2~3k

2. If the carrier frequency is set high, the temperature rise of the converter will increase. In this case please derate the use of the product, otherwise the converter could be in danger of overheating alarm or damage.

Par. No.	Name	Range	Unit	Default
*P01.01	Grid Type	2~122		*

Selects the grid type. Output frequency and voltage will be changed according to the grid type.

2: 200-240V/50Hz

12: 380-440V/50Hz

22: 440-480V/50Hz

102: 220-240V/60Hz

112: 380-440V/60Hz

122: 440-480V/60Hz

Par. No.	Name	Range	Unit	Default
*P01.02	Motor Type	0:Induction Motor 1:SPM 2:IPM without Saturation 3:IPM with Saturation		0

Different parameters are active when the option is selected. See the following table, "√" means active.

	[0] Induction Motor	[1] ~ [3] PM Motor
P00.04 Torque Characteristics	√	
P01.18 Ld, PM D-axis Inductance		√
P01.19 Lq, PM Q-axis Inductance		√
P01.20 Ld-s, PM D-axis Inductance Saturated		√
P01.21 Lq-s, PM Q-axis Inductance Saturated		√
P01.22 Saturation Current at D-axis for Ld-s		√
P01.23 Saturation Current at Q-axis for Lq-s		√
P01.24 Number of Motor Poles		√
P01.25 BEMF at Rated Speed for PM		√
P01.27 System Inertia		√
P01.32 Load Compensation Gain for Low Speed	√	
P01.33 Load Compensation Gain for High Speed	√	
P01.34 Motor Magnet Current for Low P01.32 Speed	√	
P01.35 Cut In Speed for Normal Magnet Current	√	
P01.36 Min Motor Current at Low Speed		√
P01.37 Slip Compensation Gain	√	
P01.38 Slip Compensation Time Constant	√	
P01.39 Resonance Damping Gain	√	
P01.40 Time Constant for Resonance Damping Filter	√	
P01.41 Damping Coefficient for PM		√
P01.42 Damping Time Constant for Low Speed range (PM)		√
P01.43 Damping Time Constant for High Speed range (PM)		√
P01.44 Time Constant for Current Filter (PM)		√
P01.53~P01.62 V/F curve points	√	
P01.63 PM Start Method		√
P01.64 IM Start Method	√	
P01.86 Parking Current (PM Start)		√
P01.87 Parking Time (PM Start)		√

Note:Only the key parameters are listed above. Please check the description for each parameter.

Par. No.	Name	Range	Unit	Default
*P01.03	Rated Motor Power	Depends on the nameplate of the motor	kW	*

Par. No.	Name	Range	Unit	Default
*P01.04	Rated Motor Voltage	50~1000	V	*
*P01.05	Rated Motor Frequency	20~400	Hz	*
*P01.06	Rated Motor Current	Depends on the nameplate of the motor	A	*
*P01.07	Rated Motor Speed	100~24000	rpm	*
*P01.08	Rated Motor Torque	0.1~6553.5	N·m	*

Please set the values according to the motor nameplate. The factory value is determined by the inverter power size. Regardless of the control mode used, it is recommended that the relevant parameters be set correctly according to the motor nameplate.

When the motor power rating (P01.03) or motor voltage rating (P01.04) is changed, parameters P01.14 ~ P01.23 will be automatically reset back to the default value (factory set).

Note: If the difference between motor power size and frequency converter power size is too large, it may result in reduction of control performance or loss of the motor protection.

Par. No.	Name	Range	Unit	Default
*P01.13	Auto Tuning for Motor Parameters	0:No Function 1:Simple Static Motor Auto Tuning 2:Complete Static Motor Auto Tuning		0

More accurate motor parameters can be obtained by using motor parameter auto tuning function to further optimize control performance.

Static motor parameter auto tuning function eliminates the need for rotating motors.

Static easy motor parameter auto tuning only learns about stator parameters.

Static full motor parameter auto tuning enables self-learning of most parameters including stator and rotator parameters (resistance, inductance and mutual inductance).

Note: Please set the motor parameters correctly according to the motor nameplate, then set P01.13=1 or 2 to start auto motor tuning. If motor parameters are not set correctly, the motor parameter auto tuning function may lead to motor damage or impact the accuracy of the parameter tuned.

For induction motor, parameters including P01.02 motor type, P01.03 motor power, P01.04 motor voltage, P01.05 motor frequency, P01.06 motor current, P01.07 motor speed should be set before the motor parameter tuning function. For PM motor, parameters including P01.02 motor type, P01.06 motor current, P01.07 motor speed, P01.08 motor torque, P01.24 motor poles, P01.25 motor back EMF should be set.

Motor parameter auto tuning only allows motor with one power size up or two power size down comparing to the rated inverter power.

The parameters tuned by the parameter auto tuning function are listed as below:

Induction Motor	PM motor
P01.14 Stator Resistance (Rs)	P01.14 Stator Resistance (Rs)
P01.15 Rotor Resistance P01.16 Stator Leakage Reactance (X1) P01.17 Main Reactance (Xh)	P01.18 Ld, PM D-axis Inductance P01.19 Lq, PM Q-axis Inductance P01.20 Ld-s, PM D-axis Inductance Saturated P01.21 Lq-s, PM Q-axis Inductance Saturated P01.22 Saturation Current at D-axis for Ld-s P01.23 Saturation Current at Q-axis for Lq-s

Par. No.	Name	Range	Unit	Default
*P01.14	Stator Resistance (Rs)	Depends on motor power size	Ω	*
*P01.15	Rotor Resistance (Rr)	Depends on motor power size	Ω	*
*P01.16	Stator Leakage Reactance (X1)	Depends on motor power size	Ω	*
*P01.17	Main Reactance (Xh)	Depends on motor power size	Ω	*
*P01.18	Ld, PM D-axis Inductance	Depends on motor power size	mH	*
*P01.19	Lq, PM Q-axis Inductance	Depends on motor power size	mH	*
*P01.20	Ld-s, PM D-axis Inductance Saturated	Depends on motor power size	mH	*
*P01.21	Lq-s, PM Q-axis Inductance Saturated	Depends on motor power size	mH	*
*P01.22	Saturation Current at D-axis for Ld-s	20~200	%	100
*P01.23	Saturation Current at Q-axis for Lq-s	20~200	%	100

Normally you cannot get these values from the motor nameplate, you need to run the motor parameter auto tuning function or ask them from the motor supplier. If you failed to do both, then the factory defaults will be used for control which cannot be used to achieve the proper performance.

Par. No.	Name	Range	Unit	Default
*P01.24	Number of Motor Poles	2~200	P	4

This parameter is used to set the number of motor poles.

Par. No.	Name	Range	Unit	Default
*P01.25	BEMF at Rated Speed for PM	0~9000	V	*

This parameter sets the back EMF of the PMSM at the rated speed. Back EMF can usually be obtained by disconnecting all external connections of the motor at a specified speed (e.g., 1000 RPM), measuring the line voltage on motor phases at that speed, and converting it to the rated speed (back EMF is proportional to speed).

Par. No.	Name	Range	Unit	Default
*P01.26	Motor Cable Length	0~150	m	10

Enter the motor cable length connected between the motor and the drive. Set correct cable length can suppress noises resulted from the motor.

Par. No.	Name	Range	Unit	Default
*P01.27	System Inertia	0.00~655.35	$kg \cdot m^2$	*

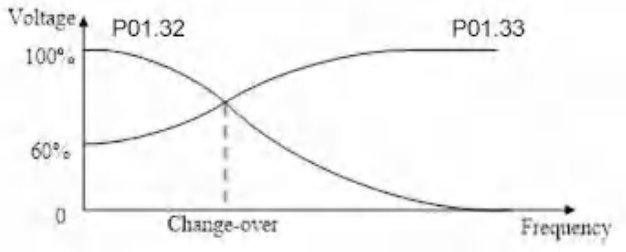
This parameter normally needs to be obtained by auto tuning function.

Par. No.	Name	Range	Unit	Default
P01.32	Load Compensation Gain for Low Speed	0~199	%	100
P01.33	Load Compensation Gain for High Speed	0~199	%	100

Load compensation is used to compensate the output voltage according to the load current to obtain the optimum load characteristic. The value of P01.32 mainly works for low-speed range and P01.33 mainly for high-speed range. Low speed load compensation also works at high speed, but its effect decreases with the increasing of motor speed increases. High speed load compensation also works at low speed, but its effect decreases with decreasing of motor speed. The low and high-speed change over point is calculated automatically according to

the motor parameters, normally it's around 5Hz.

Below figure shows how P01.32 and P01.33 change over with the motor speed.



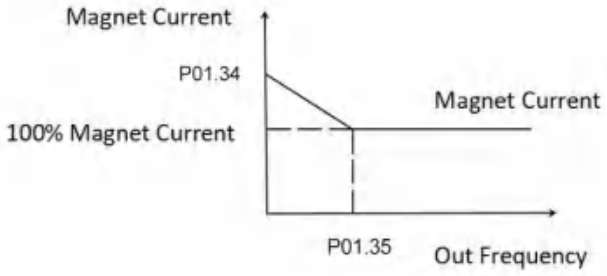
In most applications, only low speed load compensation is required. You can gradually increase P01.32 to improve the starting torque. In case the output current is too high, you can also reduce the value. Low-speed load compensation should not be adjusted around 100%. A too large value it will easily lead to excessive current of inverter and serious motor heating.

The high-speed load compensation P01.33 should also be adjusted near 100%. In case the output current is low at motor speed range higher than 10Hz, you can increase the value to improve the torque capacity. If the current is too high you can reduce the value.

Par. No.	Name	Range	Unit	Default
P01.34	Motor Magnet Current at 0 Speed	0~300	%	100
P01.35	Cut in Speed for Normal Magnet Current	0.0~10.0	Hz	0.0

Using P01.34 Motor Magnet Current at 0 Speed along with P01.35 Cut in speed for Normal Magnet Current, you can obtain different thermal load and shaft performance on the motor when running at low speed (under P01.35) by adjusting the motor magnet current. The default value is 100%, you can increase the value to get higher start torque, or reduce the value to decrease the motor heat at low speed in case that the application does not need a high start torque.

The control of the magnet current according to P01.34/P01.35 is shown as in below figure.



Par. No.	Name	Range	Unit	Default
P01.36	Min Motor Current at Low Speed	0~120	%	80

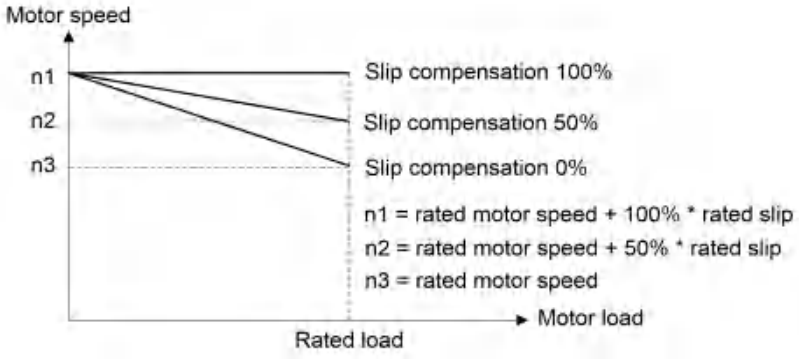
Define the minimum motor current at low speed to ensure the ability to start motor with load. This parameter works only for PM motor.

Par. No.	Name	Range	Unit	Default
P01.37	Slip Compensation Gain	-400~399	%	*

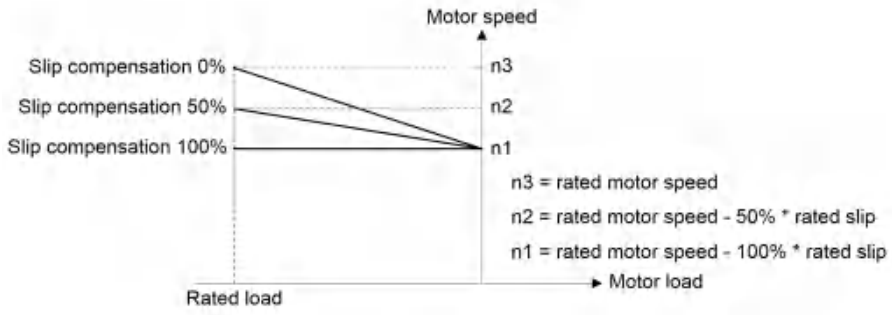
When the motor is running at a motoring state, motor speed drops with the increase of load. When the motor is running at a generating state, motor speed will increase with the increase of load. Appropriate slip compensation can maintain constant motor speed when the motor load is changing.

If this parameter is set to 100%, it indicates that the compensation when the motor bears rated load is the rated motor slip.

Diagram of slip compensation is shown below:



Slip compensation at motoring state



Slip compensation at generating state

When having more than one motor on the same shaft there is a need for some kinds of load sharing between the motors. This can be achieved by running motors in speed open loop and one with 0 or negative slip compensation, so called droop control.

Par. No.	Name	Range	Unit	Default
P01.38	Slip Compensation Time Constant	0.05~5.00	s	*

This parameter is to control the response speed of slip compensation, a higher value a slower reaction. If low frequency resonance problems occur, set it to a high value.

Par. No.	Name	Range	Unit	Default
P01.39	Resonance Damping Gain	0~3000	%	*
P01.40	Time Constant for Resonance Damping Filter	0.005~0.050	s	0.005

Motor (especially >=30kW motor) speed and current resonance is likely to occur due to load vibration, and may lead to system failure even trigger the over current protection. This is particularly obvious during no-load or light-load applications. Do not change these parameters if the motor has no resonance. Increase the P01.39 value properly only when the motor has obvious resonance. The larger the value is, the better the resonance dampening result will be. But a higher value in P01.39 will reduce the speed response performance. P01.40 should be set properly to ensure the damping function, a smaller value makes the response of damping function faster, but two small value can result in instability of the control.

Par. No.	Name	Range	Unit	Default
P01.41	Damping Coefficient for PM	0~2000	%	120

The value of P01.41 controls the dynamic performance of the PM motor. Higher value gives higher dynamic performance. Lower value gives lower dynamic performance but it’s better to control the mechanical resonance. If the damping gain is too high or low, the control becomes unstable.

Par. No.	Name	Range	Unit	Default
P01.42	Damping Time Constant for Low Speed range (PM)	0.01~20.00	s	0.8

This time constant is used below 10% rated speed. Obtain quick control through a short damping time constant. However, if this value is too short, the control could become unstable.

Par. No.	Name	Range	Unit	Default
P01.43	Damping Time Constant for High Speed range (PM)	0.01~20.00	s	0.8

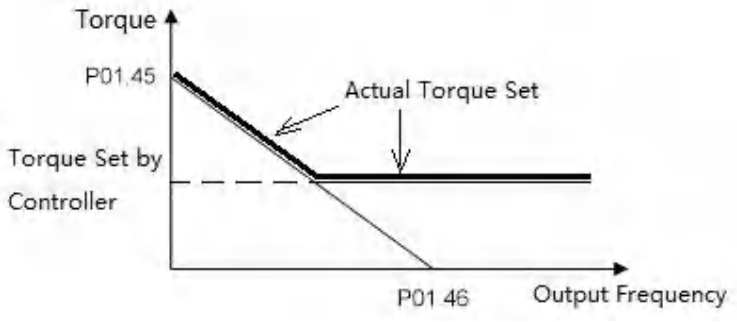
This time constant is used above 10% rated speed. Obtain quick control through a short damping time constant. However, if this value is too short, the control could become unstable.

Par. No.	Name	Range	Unit	Default
P01.44	Time Constant for Current Filter (PM)	0.001~1.000	s	0.5

To reduces the influence of high frequency ripple and system resonance in the calculation of control voltage, a current filter is necessary, without this filter, the ripples in the currents can distort the calculated voltage and affect the stability of the system.

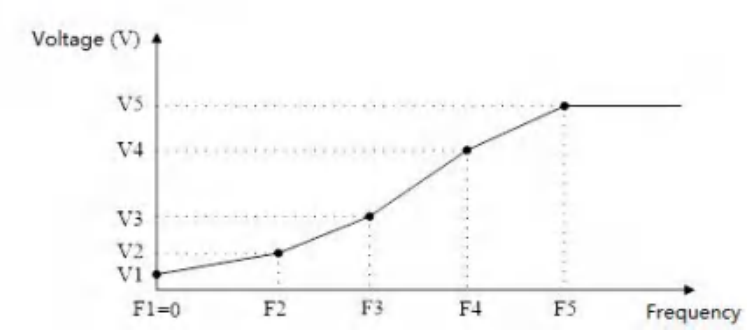
Par. No.	Name	Range	Unit	Default
P01.45	Min Torque at Torque Mode Start	-100~100	%	5
P01.46	Min Torque Cut Out Speed at Torque Mode Start	0.1~50.0	Hz	3.0

In torque control mode, the device may not start if the torque reference is too small due to the presence of static friction, so a minimum torque set at low speed is necessary to start the load. The below figure shows how the torque is set with these two parameters.

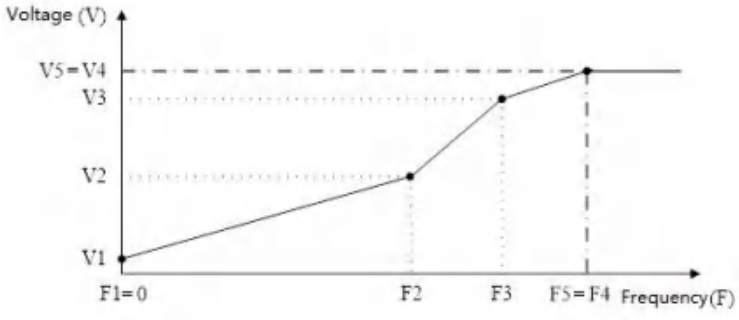


Par. No.	Name	Range	Unit	Default
P01.53/ P01.55/ P01.57/ P01.59/ P01.61	Voltage for V/F curve	0.0~999.9	V	*
P01.54/ P01.56/ P01.58/ P01.60/ P01.62	Frequency for V/F curve	0.0~590.0	Hz	*

P01.53~P01.62 are used to define the VF curve to achieve the best load performance for a special motor. The cure is defined as below:



P01.53/P01.55/P01.57/P01.59/P01.61 corresponds to V1~V5 and P01.54/P01.56/P01.58/P01.60/P01.62 corresponds to F1~F5. Below rules must be followed for the set: F1=0 and F1≤F2≤F3≤F4≤F5. If necessary, you can merge two or more points into one to simplify the VF curve, an example as below:



The default V/F curves are set as below.

220V Products:

Voltage	P01.53	P01.55	P01.57	P01.59	P01.61
	0.0	7.0	220.0	220.0	220.0
Frequency	P01.54	P01.56	P01.58	P01.60	P01.62
	0.0	0.5	50.0	50.0	50.0

380VProduct:

Voltage	P01.53	P01.55	P01.57	P01.59	P01.61
	0.0	12.0	380.0	380.0	380.0
Frequency	P01.54	P01.56	P01.58	P01.60	P01.62
	0.0	0.5	50.0	50.0	50.0

Note: The VF curve only work in VF control mode (P0.02=0). Two high voltage at low frequency could trigger the over current protection and damage the motor due to high current and temperature.

Par. No.	Name	Range	Unit	Default
P01.63	PM Start Method	0:Initial Position Detection (IPD) 1:Parking		1

Since the drive does not know the actual rotor position at start-up, a parking or an initial position detection (IPD) process is required. The initial position detection starts quickly and its time can generally be ignored.

For parking start, the parking time is determined by P01.87.

Note: For PM motor, at start the product will try to track the speed and angle of the motor. If it succeeds, it will start directly according to the motor speed and angle.

Par. No.	Name	Range	Unit	Default
*P01.64	IM Start Method	0:Direct Start 1:Fly start		0

If the IM motor is rotating, it cannot be controlled from 0Hz directly. Doing so will result in very high current damaging the product or fail to start. Enabling the fly start function (P01.64=1), the product will track the motor speed first and start with the speed tracked. If no rotating motor is found, the product will assume the motor is standstill and start the motor from 0 Hz.

When flying start is enabled, P01.70 Delay Time at Start and P01.71 Delay Function at Start is disabled.

Par. No.	Name	Range	Unit	Default
P01.67	Min Valid Speed Set	0.00~50.00	Hz	0.1

Only when the absolute value of the set speed is not less than P01.67, the product can be started. If a speed set of absolute value less than P01.67 is given, the product will treat it as a stop command and 0Hz speed set.

Note:

The product will ramp through the Min Valid Speed Set range still if a valid speed set is given, e.g., if 20Hz is set and P01.67 = 5.0, the product will ramp from 0Hz, through 1Hz, 2Hz … 5Hz to 20Hz..

P01.67 is only effective in speed mode and when the application macro is not enabled.

Par. No.	Name	Range	Unit	Default
P01.68	Bypass Frequency for IM Low Speed	0.0~20.0	Hz	0.0

P01.68 is used to avoid the motor running at low speed, neither forward nor reverse. That means, the absolute value of the motor speed will be controlled not less than the value set in P01.68. When P01.68 is set to 0, the function is disabled.

If a forward start command is given, the motor will jump to the speed as value of P01.68 first then ramp to the speed set (if the set speed is less than the value of P01.68, the motor will run the speed as value of P01.68).

If a reverse start command is given, the motor will jump to the speed as negative value of P01.68, similar as a forward start command

If a change direction command is given, e.g., speed set changes from 20Hz to -20Hz, the motor will ramp down from 20Hz to the speed as value of P01.68 first, then jump to the negative value of P01.68, then ramp up reversely to -20Hz.

If a zero-speed set is given with a start command, the motor will not run.

Note:

1. It is not recommended using P01.67 and P01.68 at the same time.

2. If both P01.68 and P01.84(DC brake cut in speed) are enabled (higher than 0), DC brake will only be active when P01.84 > P01.68.

Par. No.	Name	Range	Unit	Default
P01.70	Delay Time at Start	0.0~10.0	s	0.0
P01.71	Delay Function at Start	0:Free Coast 1:DC Hold		0

P01.70 enables a delay time from receiving the start command given to starting the motor. The drive begins with the start function selected in P01.71 during the P01.70 delay time first then start the motor as normal. Setting the delay time P01.70 to 0.0 disables P01.71 delay function. P01.71 delay function is described as below:

0: Coast, Motor coasts during the start delay time with all gate drive signals disabled;

1: DC Hold, energizes motor with a DC holding current (P01.72 DC Hold Current) during the start delay time;

Note: 1. The P01.70 Delay Time will not be included in the ramp up time.

2.When fly start is enabled (P01.64=1), the P01.71 Delay function will be disabled.

Par. No.	Name	Range	Unit	Default
P01.72	DC Hold Current	0~150	%	50

Enter a value for holding current as a percentage of the rated motor current set in P01.06 Rated Motor Current. Customer can use this parameter to either hold the motor (holding torque) or pre-heat the motor. This parameter is active if DC Hold has been selected in either P01.71 or P01.80. The difference is that, for P01.71 delay function as start, the DC hold current will only continue during P01.70 delay time, but for P01.80 Hold Function at Stop, the DC hold current will continue at stop until a start command is given.

Par. No.	Name	Range	Unit	Default
P01.79	Stop Method at Torque Control Mode	0:Stop with Torque Mode 1:Stop with Speed Mode		0

This parameter is used to set the stop mode in torque control mode:

0: Torque mode. When stop command is activated, the set torque is reduced to zero according to the ramp down time.

1: Speed mode. When stop command is activated, the set speed is reduced to zero according to the ramp down time.

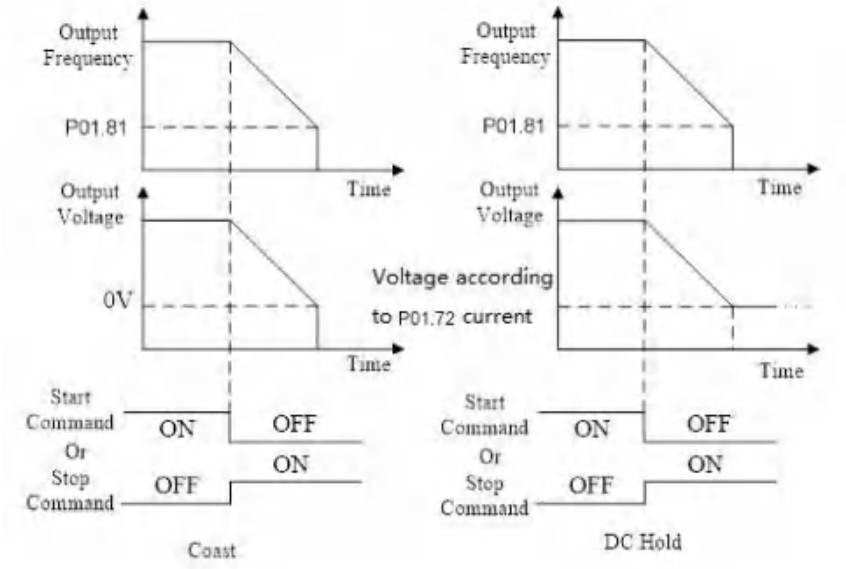
Par. No.	Name	Range	Unit	Default
P01.80	Function at Stop	0:Free Coast 1:DC hold		0
P01.81	Cut in Speed for Function at Stop	0.0~400.0	Hz	0.0

P01.80 Selects the function when stop command is given and the speed is ramped down to P01.81 Cut in Speed for Function at Stop.

0: Free Coast, disable the output of the product and the motor coasts;

1: DC hold, the motor is energized with a DC current as P01.72 DC Hold Current;

Diagram of Function at Stop is shown below:

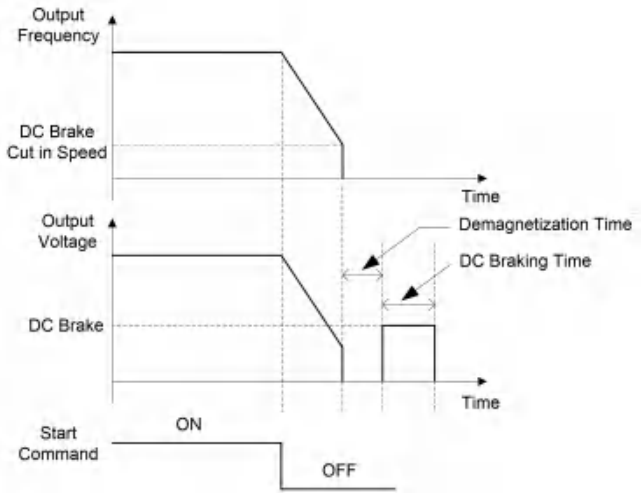


Note: If P01.81 > P01.84, the P01.80 function at stop will work and the DC brake function will not; if P01.81 < P01.84, the DC brake function will work. And the P01.80 function at stop will not.

Par. No.	Name	Range	Unit	Default
P01.82	DC Brake Current (IM)	0~150	%	50
P01.83	DC Brake Time (IM)	0.0~60.0	s	2
P01.84	DC Brake Cut in Speed (IM)	0.0~400.0	Hz	0.0
P01.85	Demagnetizing Rate at DC Cut in	0~100	%	100

DC brake is to apply a DC current on the motor to brake and hold the motor when motor speed ramps down to a low speed at stop command. P01.82 defines the DC brake current as a percentage of P01.06 Rated Motor Current. P01.83 defines how long time the DC current should be applied. P01.84 defines at which speed to start the DC brake current. Between normal ramp down and the DC brake current applied, a Demagnetizing period is necessary to avoid possible current spikes. P01.85 defines how fast the demagnetizing period will finished. Higher P01.85 value needs longer time for demagnetizing, means more time delay before the DC brake current is applied.

Diagram of DC Brake process is shown below:



Note: P01.85 also works for P01.80.

Par. No.	Name	Range	Unit	Default
P01.86	Parking Current (PM Start)	0~150	%	80
P01.87	Parking Time (PM Start)	0.1~60.0	s	3.0

This group of parameters are enabled when P01.63 PM Start Mode is equal to [1] Parking. P01.87 is used to determine the parking time. P01.86 is used to determine the current during the parking process. 100% corresponds to P01.06 rated motor current.

Par. No.	Name	Range	Unit	Default
P01.91	Brake Function	0:No Function 1:Resistor Brake 2:AC Brake		0

0: No function;

1: Resistor brake, use the resistor to consume surplus energy resulting from motor braking, and prevent the drive from trip due to over-voltage in the DC link;

2: AC brake, dissipate surplus energy in the motor core by applying higher voltage to the motor, and prevent the drive from trip due to over-voltage in the DC link. It is important to keep in mind that frequent use of this function will cause an increase in motor temperature;

Par. No.	Name	Range	Unit	Default
P01.92	Max AC Brake Current	0~150	%	100

Defines the maximum permissible current when using AC brake to avoid overheating of motor windings. 100% equals motor current set in P01.06.

Par. No.	Name	Range	Unit	Default
P01.93	AC Brake Gain	1.0~2.0		1.4

Enter AC brake reaction speed. A high value results in faster reaction.

Par. No.	Name	Range	Unit	Default
P01.94	Threshold Voltage for Brake Function	Grid Dependent	V	*

If P01.91 is set to 1, When the DC link voltage exceeds the value of P01.94, resistor brake starts to function and the energy will be rapidly consumed through brake resistor, if the DC link voltage drops back lower than P01.94, the resistor brake function stops.

The following table is the Resistor Brake Threshold Voltage's range and default value which depends on P01.01 Grid Type:

Grid Type	Set Range	Factory Defaults
200~240V	360~395V	385V
380~440V	680~780V	700V
440~480V	750~780V	770V

Par. No.	Name	Range	Unit	Default
P01.95	Resistor Brake Resistance	5~65535	Ω	*

Defines the resistance of the brake resistor.

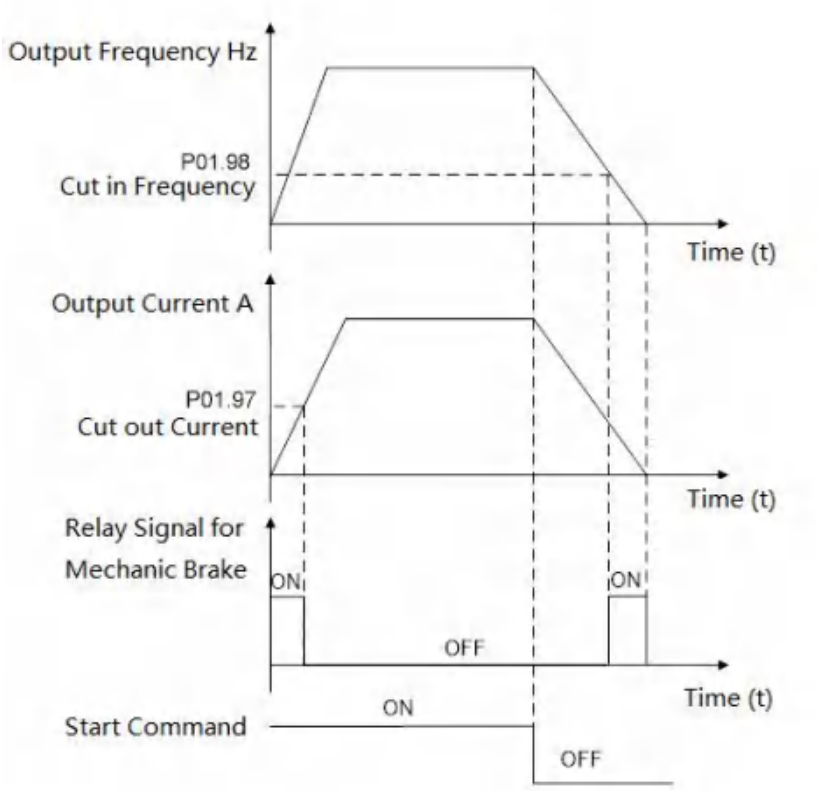
Par. No.	Name	Range	Unit	Default
P01.97	Mechanic brake cut out current	0.00~1200.00	A	0.00
P01.98	Mechanic brake cut in frequency	0.0~400.0	Hz	0.0

The function is used in applications like lift, elevator etc. in which a mechanic brake is necessary to avoid slip of motor at start or stop due to the load weight. With the right value set in P01.97 and P01.98 and the function of a relay output, the mechanic brake can be controlled as the demands of the application. First the mechanic brake function should be assigned to one relay output, taking Relay1 as an example, set P02.28 = 42. (Please refer to the parameter P02.28 ~ P02.33).

P01.97 works at start stage, when the output current reaches (higher than) the threshold value as in P01.97, the assigned relay gives an "OFF" signal to disable the mechanic brake (open).

P01.98 works at stop stage, when the output frequency reduces to (lower than) the threshold values as in P01.98, the assigned relay gives an "ON" signal to enable the mechanic brake (close).

The process of control is shown as in below figure:



2.4.3 Parameter Group 2: Digital Terminal Functions

Par. No.	Name	Range	Unit	Default
P02.00	DI Positive-Negative Logic Selection	0~65535		0
P02.02	DI Input Mode	0: NPN Input;1: PNP Input		0

P02.00 is used to control the digital input terminal positive or negative logic. Each digital input terminal corresponds to a weight. For example: if you want to set FWD and DI2 terminal as negative logic, set the P02.00 to 1 + 8 = 9

Terminal	DI4	DI3	DI2	DI1	FEV	FWD
Weight	32	16	8	4	2	1

P02.02 is used to select DI input mode. In NPN Mode, when the digital input selects positive logic, connecting the digital input terminal and GND terminal is ON state (active), disconnecting is OFF state (inactive); When the digital input selects negative logic, connecting the digital input terminal and GND terminal is OFF state (inactive), disconnecting is ON state (active). In PNP Mode, on the contrary.

Note: There are some digital input function is inverse. If the terminal logic is set as negative and the function of the terminal is inverse, then the function of the terminal is positive. For example: When P02.05 Terminal RUN is set to [4] Stop inverse, P02.00 is set to 1 (The logic of terminal RUN is negative), then connect the terminal RUN and GND, function "stop" is active, disconnect the terminal RUN and GND, function "stop" is inactive.

Par. No.	Name	Range	Unit	Default
P02.01	DO/Relay Positive-Negative Logic Selection	0~65535		0

This parameter is used to control the DO/Relay terminal positive or negative logic. Each DO/Relay terminal corresponds to weight. For example: If you want to set DO1 and Relay2 terminal as negative logic, set the P02.01 to 1 + 4 = 5

Terminal	Relay2	Relay1	DO1
Weight	4	2	1

Positive logic: When the selected function of DO/Relay terminals is activated, the DO/Relay terminal outputs ON signal, else outputs OFF signal.

Negative logic: When the selected function of DO/Relay terminals is activated, the DO/Relay terminal outputs OFF signal, else outputs ON signal.

Par. No.	Name	Range	Unit	Default
P02.03	Pulse Auto Start/Stop Function Enable	0: Disable 1: Enable		0

0:Disable

1:Enable. When a terminal function is set to “Pulse Run” (Terminal function 13 or 14) and this parameter is enabled, applying valid pulses on the terminal can start and stop the product alternately.

Par. No.	Name	Range	Unit	Default
P02.04	DI Filter Time	2~16	ms	4

It is used to set the software filter time of DI terminal status. If DI terminals are liable to interference and may cause malfunction, increase the value of this parameter to enhance the anti-interference capability. However, increase of DI filter time will reduce the response of DI terminals.

Par. No.	Name	Range	Unit	Default
P02.05	FWD Input Function Selection	0:No Function 1:Reset 2:Coast to Stop (Negative Logic) 3:Coast to Stop and Reset (Negative Logic) 4:Stop (Negative Logic) 10:Run 11:Forward/Reverse Selection 12:Run in Reverse Direction 13:Pulse run forward 14:Pulse run reverse 15:Forward Jog 16:Reverse Jog 17: Pulse stop 20:Forbid Forward 21:Forbid Reverse 22:Preset Value Command Bit 1 23:Preset Value Command Bit 2 24:Preset Value Command Bit 3 25:Preset Value Command Bit 4 26:Ramp Time Selection Bit 1 27:Ramp Time Selection Bit 2 30:Speed UP 31:Speed DOWN		10
P02.06	REV Input Function Selection			12
P02.07	DI Function Selection - Terminal D1			22
P02.08	DI Function Selection - Terminal D2			23
P02.09	DI Function Selection - Terminal D3			24
P02.10	DI Function Selection - Terminal D4			25

Par. No.	Name	Range	Unit	Default
		32:Counter A 34:Reset Counter A 35:Counter B 37:Rest Counter B 40:Pulse Input 41:Switch Set Source 42:Switch Speed Mode/Torque Mode 50:External Fault Input 51:Freeze PID output		

The parameters are used for selecting various functions in the drive. All digital inputs can be set to the following functions:

0: No function, no reaction to signals transmitted to the terminal;

1: Reset, reset the drive after a Trip/Alarm;

2: Coast to Stop (Negative Logic), disables output, leaving the motor coasting to stop. Terminal logic '0' => coasting stop;

3: Coast to Stop and Reset (Negative Logic), the drive resets leaving the motor coasting to stop. Terminal logic '0' => coasting stop;

4: Stop (Negative Logic), the drive stops according to selected ramp time. Terminal logic '0' => stop;

10: Run, run with a start a start/stop command. Terminal logic '1' = start, logic '0' = stop;

11: Forward/Reverse Selection, select the direction of motor shaft rotation. when start signal and running direction selection signal are active, the motor will start reverse; when start signal is active and running direction selection signal is inactive, the motor will start forward; when start signal is inactive, the motor will stop;

12: Run in Reverse Direction, start with a reverse direction;

13: Pulse run forward, run the motor in forward direction with a start command if a valid signal is applied for min. 4ms(signal from OFF to ON, and keep ON state at least 4MS). The motor stops when [4] Stop (Negative Logic) or [17] Pulse stop is activated;

14: Pulse run reverse, run the motor in reverse direction with a start command if a valid signal is applied for min. 4ms(signal from OFF to ON, and keep ON state at least 4MS). The motor stops when [4] Stop (Negative Logic) or [17] Pulse stop is activated;

15: Forward Jog, used for start in forward direction with jog speed, see P00.48;

16: Reverse Jog, used for start in reverse direction with jog speed, see P00.48;

17: Pulse stop, the motor will stop when a valid is applied for min. 4ms (signal from OFF to ON, and keep ON state at least 4MS).this function usually cooperate with [13] Pulse run forward or [14] Pulse run reverse.

20: Forbid Forward, when this signal is active, start forward will be forbidden, but start reverse will be allowed;

21: Forbid Reverse, when this signal is active, start reverse will be forbidden, but start forward will be allowed;

22: Preset Value Command Bit 1, The combination of four preset Value Command bits, Bit 1, bit2, bit3, bit4 enables a choice from one of the sixteen multi preset values (see P00.30~P00.45) according to the table below;

23: Preset Value Command Bit 2, same as [22];

24: Preset Value Command Bit 3, same as [22];

25: Preset Value Command Bit 4, same as [22];

Preset Value Command Bit 4	Preset Value Command Bit 3	Preset Value Command Bit 2	Preset Value Command Bit 1	Parameter selected
OFF	OFF	OFF	OFF	P00.30
OFF	OFF	OFF	ON	P00.31

Preset Value Command Bit 4	Preset Value Command Bit 3	Preset Value Command Bit 2	Preset Value Command Bit 1	Parameter selected
OFF	OFF	ON	OFF	P00.32
OFF	OFF	ON	ON	P00.33
OFF	ON	OFF	OFF	P00.34
OFF	ON	OFF	ON	P00.35
OFF	ON	ON	OFF	P00.36
OFF	ON	ON	ON	P00.37
ON	OFF	OFF	OFF	P00.38
ON	OFF	OFF	ON	P00.39
ON	OFF	ON	OFF	P00.40
ON	OFF	ON	ON	P00.41
ON	ON	OFF	OFF	P00.42
ON	ON	OFF	ON	P00.43
ON	ON	ON	OFF	P00.44
ON	ON	ON	ON	P00.45

26: Ramp Time Selection Bit 1;

27: Ramp Time Selection Bit 2;

The combination of 2 ramp time selection Bits, Bit1 and Bit2 enables a choice from one of the four type of ramp time setups, as described in below table.

The ramp time setups can be switched even during running status if the input of the DI terminal assigned with Ramp Time Selection function is changed.

Terminal of Ramp bit2	Terminal of Ramp bit1	Parameters selected
OFF	OFF	Ramp1 (P00.50 ~ P00.52)
OFF	ON	Ramp2 (P00.53 ~ P00.55)
ON	OFF	Ramp3 (P00.56 ~ P00.58)
ON	ON	Ramp4 (P00.59 ~ P00.61)

30: Speed Up, when the terminal is activated for less than P02.40 Value. the resulting reference will be increased by P00.46 Up/Down Value. If the terminal is activated for more than P02.40 Value, the resulting reference will ramp according to ramp 4 P00.60;

31: Speed Down, like [30] Up;

32: Counter A, to count the pulse number inputted into the terminal;

34: Reset counter A, to clear counter A to “0”;

35: Counter B, like [32] Counter A;

37: Reset counter B, to clear counter B to “0”;

40: Pulse input, select pulse input when using a pulse sequence as either reference or feedback. Scaling is done in par. group P02.5*, the function is available for P02.10 Terminal DI4 only;

41: Switch Set Source, this function is used P00.10 Reference Source Selection option [3]-[5].

42: Switch Speed Mode/Torque Mode, when P00.01 Configuration Mode is set to [2] Torque open loop, torque open loop and speed open loop can be switched via digital input terminal. The terminal is in the OFF state, it is torque open loop; The terminal is in the ON state, it is speed open loop;

50: External Fault Input, when terminal is in ON state, the drive will run as P02.21 specified.

51: Freeze PID output, the Process PID is temporarily stopped and the drive maintains the current frequency.

Par. No.	Name	Range	Unit	Default
P02.21	Action for DI as External Fault Input	0 ~ 8		0

The parameter is used for selecting actions when External alarm input is in ON state.

0:No action;

2:stop and warning, when External alarm input is in ON state,Drive will stop and report warning “u.76”;

3:Jog and warning, when External alarm input is in ON state,Drive will run in Jog speed and report warning “u.76”;

4:Running in Max speed and warning, when External alarm input is in ON state,Drive will run in Maximum speed and report warning “u.76”;

5:Alarm Fault and Trip to stop, when External alarm input is in ON state,Drive will report alarm “A.76” and trip to stop;

6:Only warning, when External alarm input is in ON state,Drive will report warning “u.76”;

7: Alarm Fault and Trip to coast stop, when External alarm input is in ON state,Drive will report alarm “A.76” and trip to coast stop;

8: Same as 7, but only valid at running stage.

Par. No.	Name	Range	Unit	Default
P02.22	DO Function Selection - Terminal DO1	0~48		0
P02.28	Relay Output Function Selection - RL1	Same as P02.22		10
P02.31	Relay Output Function Selection – RL2	Same as P02.22		0

Set the function which will trigger the Terminal DO or relay output.

Terminal DO1 is a programmable multiplex terminal, it can be a high-speed pulse output terminal, also available as a collector's digital output terminal. If P02.60 = 0, DO1 is as a collector's digital output terminal; If P02.60 is not set to 0, DO1 is as a high-speed pulse output terminal.

If terminal DO1 is as collector's digital output terminals, their output function options are the same as relay output P02.28/P02.31.

0: No operation;

1: Drive ready, the drive control card has received supply voltage;

2: Remote control ready, the drive is ready and is in Remote mode;

3: Drive ready/stop, the drive is ready and the drive is not running;

4: Drive running, the drive is running;

5: Drive running/No warning, the drive is running and no warning is present;

6: Run in current range/No warning, the drive is running within the programmed current ranges set in P05.09 and P05.10. No warnings are present;

7: Run on reference/No warning, the drive runs at reference speed without warnings;

8: Reverse, the drive runs in counter clockwise;

10: Alarm, the drive alarms;

11: Alarm or warning, an alarm or warning occurs;

12: Thermal warning, a thermal warning occurs;

13: Ready, no thermal warning, the drive is ready for operation and no over-temperature warning is present;

14: Remote ready, no thermal warning, the drive is ready for operation in Remote mode, and no over-temperature warning is present;

15: Bus OK, local bus communication is normal,The inverter outputs an ON signal when there is no interruption in the communication control word.

20: Out of current range, output current is outside the range set in P05.09 and P05.10;

21: Below current low, output current is lower than set in P05.09;
22: Above current high, output current is higher than set in P05.10;
23: Out of frequency range, output frequency is outside the range set in P05.11 and P05.12;
24: Below frequency low, output frequency is lower than set in P05.11;
25: Above frequency high, output frequency is higher than set in P05.12;
26: Out of feedback range, feedback is outside the range set in P05.15 and P05.16;
27: Below feedback low, feedback is lower than set in P05.15;
28: Above feedback high, feedback is higher than set in P05.16;
29: Out of reference range, reference is outside the range set in P05.13 and P05.14;
30: Below reference low, reference is lower than set in P05.13;
31: Above reference high, reference is higher than set in P05.14;
40: Drive in Local mode;
41: Drive in Remote mode;
42: Mech. brake control, enter mechanical brake control signal, see P01.97/P01.98;
43: External alarm, the digital input terminal function [50] external alarm input is active;
44: Unbalance warning, unbalance occurs;
47: Counter A reaches the threshold, the relay output ON signal;
48: Counter B reaches the threshold, the relay output ON signal;
49:Option Communication Card is Normal,When there is no interruption in the communication control word of the inverter, an ON signal is output;

Par. No.	Name	Range	Unit	Default
P02.29	Relay on Delay Time - RL1	0.00~600.00	s	0.00
P02.30	Relay off Delay Time - RL1	0.00~600.00	s	0.00
P02.32	Relay on Delay Time – RL2	0.00~600.00	s	0.00
P02.33	Relay off Delay Time – RL2	0.00~600.00	s	0.00

These parameters are used to set the relay output turn-on and turn-off delay time, E.g:
When the relay 1 function is satisfied, it delays P02.29 time, then outputs ON.
When the relay 1 function is not satisfied, it delays P02.30 time, then outputs OFF.

Par. No.	Name	Range	Unit	Default
P02.40	UP/DOWN Functional Initial Maintenance Time	2~60000	ms	4

Speed Up/Down, when the terminal is activated for less than P02.40 Value. the resulting reference will be increased by P00.46 Up/Down Value. If the terminal is activated for more than P02.40 Value, the resulting reference will ramp according to ramp 4 P00.60;

Par. No.	Name	Range	Unit	Default
P02.46	Save DI Counter Value at Power down	0:Save None 1:Save Counter A 2:Save Counter B 3:Save Both Counter A and B		0

This parameter is used to control whether counter A/B's value is saved at power down.

Par. No.	Name	Range	Unit	Default
P02.47	Counter A preset threshold	0~65535		65535
P02.48	Counter B preset threshold	0~65535		65535

When counter A/B accumulatively reaches the P02.47/P02.48 setpoint, the DO/RL terminal function set to 47/48 is valid. For example, P02.28=47, P02.47=2000, then relay 1 output is valid if counter A is greater than or equal to 2000. Please refer to parameter P02.22/P02.28/P02.31.

Par. No.	Name	0.00~99.99	Unit	Default
P02.50	Min Frequency for Pulse Input 1	0.00~99.99	kHz	0.00
P02.51	Max Frequency for Pulse Input 1	0.01~100.00	kHz	50.00
P02.52	Set Value/Feedback Value Versus Min Frequency for Pulse Input 1	-200.00~200.00	%	0.00
P02.53	Set Value/Feedback Value Versus Max Frequency for Pulse Input 1	-200.00~200.00	%	100.00
P02.54	Pulse input 1 Filter Time	1~1000	ms	100

Similar as using analogue voltage on analogue terminal, the customer can use pulse frequency on digital terminal to represent the target value set, e.g., the motor speed set. These parameters are used to define the relationship between the target value set and the input pulse frequency on digital terminal. The target value set can be calculated similar as the function of analog terminal, please refer to parameters P03.0x for analog input AI1.

Please be noted that only programmable DI terminal DI4 can be assigned with “pulse input” function. You can assign the function to DI4 by setting P02.10 = 40.

Par. No.	Name	Range	Unit	Default
P02.60	Pulse output 1 function selection	0 ~ 30		0

Terminal DO1(Pulse output 1) pulse output function are described as below:

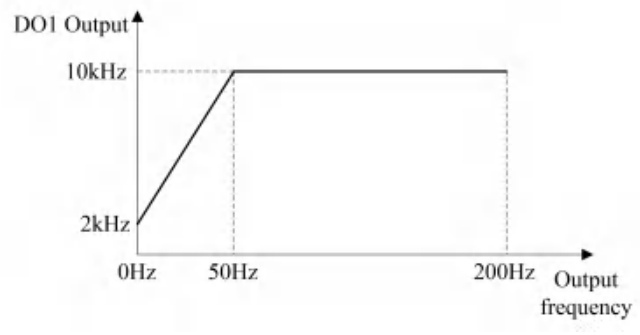
Option	Function	Scale
0	Digital output	DO1 is as a collector's digital output terminal
1	Output frequency	In torque open loop: 0% = 0, 100% = P05.08 In speed open loop mode: 0% = 0, 100% = P00.16
2	Output current	0% = 0, 100% = P09.16
3	Output Power	0% = 0, 100% = P01.03
4	Motor Speed	0% = 0, 100% = P01.07
5	Output voltage	0% = 0, 100% = P01.04
10	Set Value	If P00.15 = 0, then 0% = 0, 100% = P00.16; If P00.15 = 1, then 0% = -P00.16, 100% = P00.16;
11	Feedback	
13	Set Value from Bus	
14	Pulse input 1 input frequency	0% = P02.50, 100% = P02.51
15	Terminal AI1 input value	0% = P03.03 or P03.05;100% = P03.04 or P03.06

Option	Function	Scale
16	Terminal AI2 input value	0% = P03.12 or P03.14;100% = P03.13 or P03.15
20	DC link voltage	0% = 0V, 100% = 1000V
30	Output Torque	0% = 0N·m, 100% = P01.08

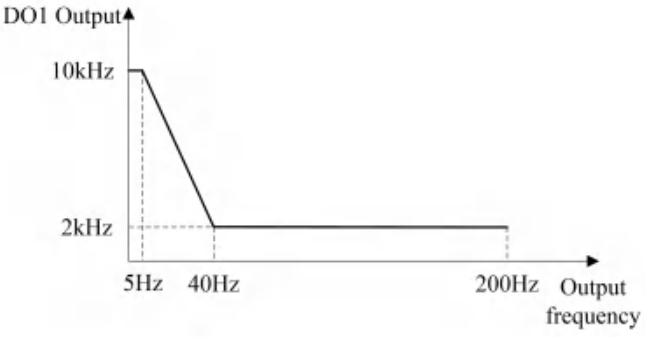
Par. No.	Name	Range	Unit	Default
P02.61	Min Frequency for Pulse Output 1	0.00~P02.62	kHz	0.00
P02.62	Max Frequency for Pulse Output 1	P02.61~100.00	kHz	50.00
P02.63	Function Value Versus Min Frequency for Pulse Output 1	0.00~200.00	%	0.00
P02.64	Function Value Versus Max Frequency for Pulse Output 1	0.00~200.00	%	100.00

P02.61 and P02.62 are used to set minimum and maximum frequency of the pulse output; P02.63 and P02.64 are used to set minimum and maximum value corresponding to minimum and maximum frequency.

For example: In speed open loop mode, Set P00.16 = 50.0, P02.60 = 1 (0% = 0Hz, 100% = 50Hz), P02.61 = 2kHz, P02.62 = 10kHz, if P02.63 = 0.00% (0Hz), P02.64 = 100.00% (50Hz), then the relationship between the output frequency and terminal DO1 pulse output frequency is shown below:



If P02.63 = 80.00% (40Hz), P02.64 = 10.00% (5Hz), then the relationship between the output frequency and DO1 pulse output frequency is shown below:



Par. No.	Name	Range	Unit	Default
P02.70	Encoder Resolution	1~32767		1024

This parameter is used to set the number of pulses per revolution of the encoder.

Par. No.	Name	Range	Unit	Default
P02.71	Encoder Rotation Direction	0: Forward; 1: Reverse		0

This parameter is used to set the phase sequence of the incremental encoder AB signal.

Par. No.	Name	Range	Unit	Default
P02.72	Encoder Frequency dividing Output Factor	1~255		1

1 stands for no crossover, the crossover output is invalid

2.4.4 Parameter Group 3: Analogue Terminal Functions

Par. No.	Name	Range	Unit	Default
P03.00	Signal Type - Terminal AI1	0:Analogue Voltage; 1:Analogue Current		0

Select the signal type to be presented on analogue input AI1.

0: Analogue Voltage, 0~10V voltage

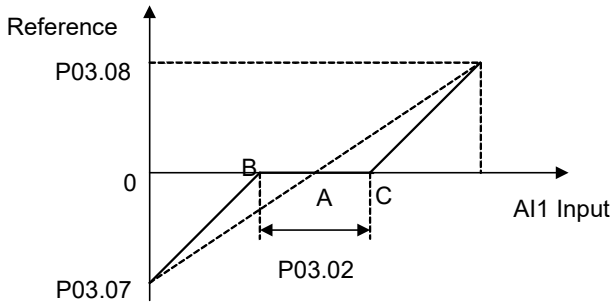
1: Analogue Current, 0~20mA current

Par. No.	Name	Range	Unit	Default
P03.01	Terminal AI1 Filter Time	0.01~10.00	s	0.01

Enter the terminal AI1 filter time. This is a first-order digital low pass filter for suppressing electrical noise in terminal AI1. A high time constant value improves dampening but also increases the time delay through the filter.

Par. No.	Name	Range	Unit	Default
P03.02	Zero Voltage Dead Band - Terminal AI1	0.0~20.00	V/mA	0.00

Set the dead-band of AI1 at 0 speed. When analog input AI1 ref. low and ref. high have opposite signs, there must be a set point that corresponding to an analogue value equals 0. In order to prevent the set point jitter at zero point due to analog interference, this parameter should be set properly.



Point A as shown in the figure is the analog value that corresponds to a setpoint that equals 0. It is calculated via analog low, high values and low, high reference values. After set terminal AI1 zero dead band, UAB=UAC=P03.02/2. If the AI1 input is between B and C, the AI1 reference is 0.

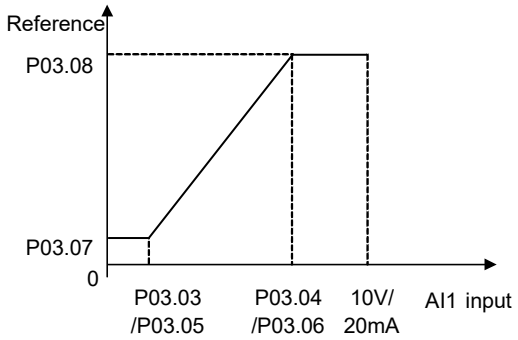
Par. No.	Name	Range	Unit	Default
P03.03	Min Input Voltage - Terminal AI1	0.00~P03.04	V	0.15
P03.04	Max Input Voltage - Terminal AI1	P03.03~10.00	V	10.00
P03.05	Min Input Current - Terminal AI1	0.00~P03.06	mA	0.15
P03.06	Max Input Current - Terminal AI1	P03.05~20.00	mA	20.00
P03.07	Set Value/Feedback Value Versus Min Input -Terminal AI1	-200.00~200.00	%	0.00

Par. No.	Name	Range	Unit	Default
P03.08	Set Value/Feedback Value Versus Max Input -Terminal AI1	-200.00~200.00	%	100.00

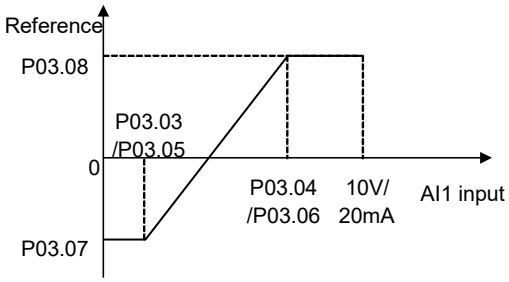
P03.03 is used to set min voltage input; P03.05 is used to set min current input; The min voltage and current analog input corresponds to the set/feedback value set in P03.07.

P03.04 is used to set max voltage input; P03.06 is used to set max current input; The max voltage and current analog input corresponds to the set/feedback value set in P03.08.

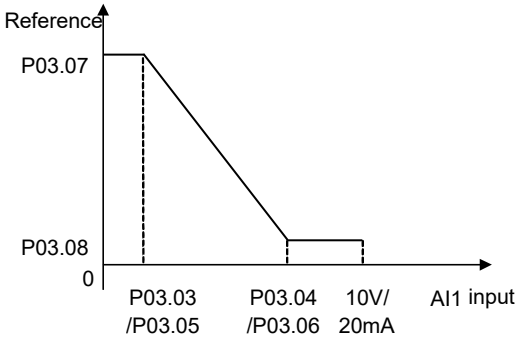
There are 4 kinds of curves between terminal AI1 input voltage/current and its corresponding set/feedback value:



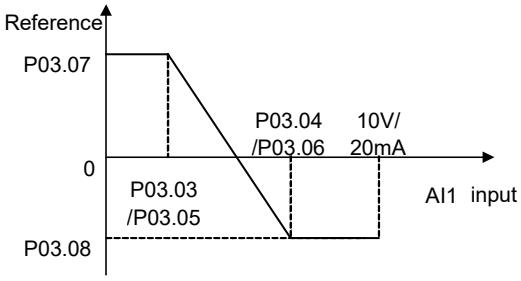
P03.07 < P03.08 and P03.07 >= 0



P03.07 < P03.08 and P03.07 < 0



P03.07 > P03.08 and P03.08 >= 0



P03.07 > P03.08 and P03.08 < 0

Terminal AI1 set/feedback value calculated as follows:

If P03.03 <= AI1 Input <= P03.04,

AI1 set/feedback Value = ((P03.08 - P03.07) ÷ (P03.04 - P03.03) × (AI1 input - P03.03) + P03.07) × P00.16;

If AI1 Input < P03.03, AI1 set/feedback Value = P03.07 × P00.16;

If AI1 Input > P03.04, AI1 set/feedback Value = P03.08 × P00.16;

Note: Above formulas are for voltage input. If it is a current input, P03.03 and P03.04 use P03.05 and P03.06 instead respectively.

Par. No.	Name	Range	Unit	Default
P03.09	Signal Type - Terminal AI2	0:Analogue Voltage 1:Analogue Current		1
P03.10	Terminal AI2 Filter Time	0.01~10.00	s	0.01
P03.11	Zero Voltage Dead Band - Terminal AI2	0.0~20.00	V/mA	0.00
P03.12	Min Input Voltage - Terminal AI2	0.00~P03.13	V	0.15
P03.13	Max Input Voltage - Terminal AI2	P03.12~10.00	V	10.00
P03.14	Min Input Current - Terminal AI2	0.00~P03.15	mA	0.15
P03.15	Max Input Current - Terminal AI2	P03.14~20.00	mA	20.00
P03.16	Set Value/Feedback Value Versus Min Input -Terminal AI2	-200.00~200.00	%	0.00
P03.17	Set Value/Feedback Value Versus Max Input -Terminal AI12	-200.00~200.00	%	100.00

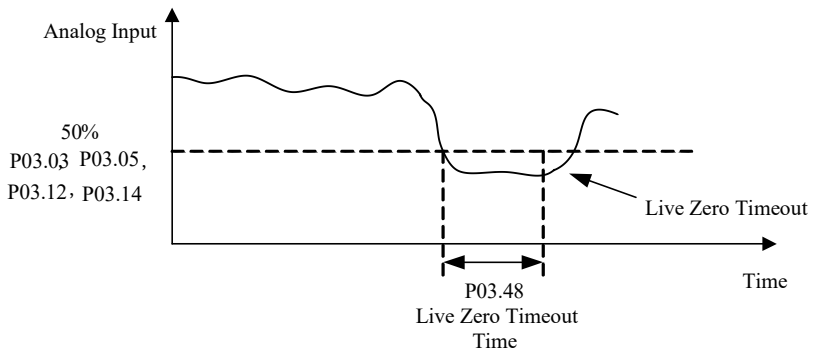
The usage of terminal AI2 is like terminal AI1.

Par. No.	Name	Range	Unit	Default
P03.48	Analogue Live Zero Timeout Time	1~99	s	10

Live Zero Time-out Function is used for analog input signal detection. To active the Live Zero Timeout Function, if voltage input is selected, then the low input voltage (P03.03, P03.12) settings must be greater than 1V; if current input is selected, the low input current (P03.05, P03.14) settings must be greater than 2mA or more. If the analog input signal is lower than 50% of the settings of parameters of P03.03, P03.05, P03.12, P03.14, and lasts longer than the settings of P03.48 Live Zero Timeout Time, this feature takes effect.

If the analog input signal is back to normal within the delay time, then reset the timer.

Diagram of Live Zero Timeout Function is shown below:



Par. No.	Name	Range	Unit	Default
P03.49	Live Zero Timeout Function	0:No Action 2:Stop and Warning 3:Jog and Warning 4:Run at Max Speed P05.03 and Warning 5:Alarm Fault and Trip to stop		0

Select the live zero time-out function.

0: No function;

2:Stop and warning,Drive stop and report warning “u.57”;

3:Jog and warning,Drive will run in Jog speed and report warning “u.57”;

4:Run at Max Speed P05.03 and Warning,Drive will run in P05.03 Maximum speed and report warning “u.57”;

5:Alarm Fault and Trip to stop,Drive will report alarm “A.57” and trip to stop.

Par. No.	Name	Range	Unit	Default
P03.50	Signal Type - Terminal AO1	0: 0-20mA 1: 4-20mA 3: 0-10V		3

Select the output signal type to be present on analog output AO1.

Par. No.	Name	Range	Unit	Default
P03.51	Output Function Selection- AO1	0~30		0

Select choices for the analog output AO1

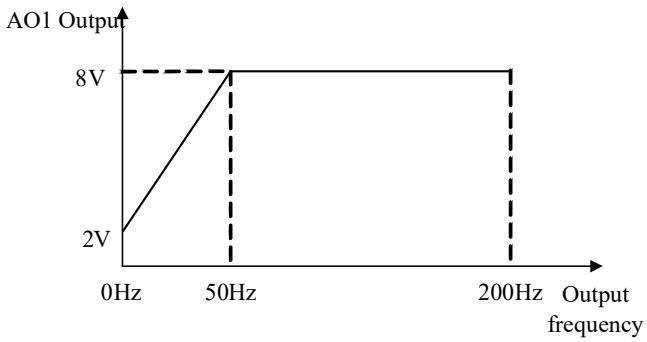
Option	Function	Scale
0	No function	
1	Output frequency	In torque open loop: 0% = 0, 100% = P05.08 In speed open loop mode: 0% = 0, 100% = P00.16
2	Output current	0% = 0, 100% = P09.16
3	Output Power	0% = 0, 100% = P01.03
4	Motor Speed	0% = 0, 100% = P01.07
5	Output voltage	0% = 0, 100% = P01.04
10	Set Value	If P00.15 = 0, then 0% = 0, 100% = P00.16; If P00.15 = 1, then 0% = -P00.16, 100% = P00.16;
11	Feedback Value	
13	Set Value from Bus control	
14	Pulse input 1 input frequency	0% = P02.50, 100% = P02.51
15	Terminal AI1 input value	0% = P03.03 or P03.05, 100% = P03.04 or P03.06
16	Terminal AI2 input value	0% = P03.12 or P03.14, 100% = P03.13 or P03.15

Option	Function	Scale
20	DC link voltage	0% = 0V, 100% = 1000V
30	Output Torque	0% = 0N·m, 100% = P01.08

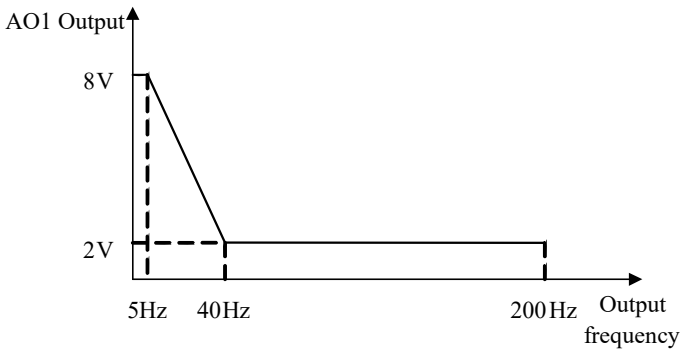
Par. No.	Name	Range	Unit	Default
P03.52	Value Versus Min Output - AO1	0.00~200.00	%	0.00
P03.53	Value Versus Max Output - AO1	0.00~200.00	%	100.00
P03.54	Min Output Voltage/Current - AO1	0.00~P03.55		0.00/4.00
P03.55	Max Output Voltage/Current - AO1	P03.54~10.00/20.00		10.00 /20.00

Scale minimum/maximum output of selected analog signal at terminal AO1 as percentage of minimum/maximum signal value.

For example: In speed open loop mode, set P00.16 = 50.0, P03.50 = 3 (0~10V), P03.50 = 1 (Output frequency 0% = 0.0Hz, 100% = 50.0Hz), P03.52 = 0.00% (0.0Hz), P03.53 =100.00% (50.0Hz), P03.54= 2V, P03.55 = 8V, the relationship between the output frequency and AO1 output is shown below:



If P03.52 = 80.00% (40Hz), P03.53 = 10.00% (5Hz), then the relationship between the output frequency and AO1 output is shown below:



Par. No.	Name	Range	Unit	Default
P03.68	Min Set Value from Keypad	-200.00~200.00	%	0.00
P03.69	Max Set Value from Keypad	-200.00~200.00	%	100.00

These parameters are used to set the minimum/maximum set value from Keypad Up/Down key or potentiometer.

Note:

1. In torque mode, when the torque source is set to the keyboard, the displayed value when adjusting the torque setpoint on the panel is in the unit of Nm. The maximum adjustable value is the set value of P01.08.

2. When the panel setpoint is the Process PID target value source (one of P00.11/P00.12/P00.13 is set to 21 and P04.01=30), the maximum range of the panel setting is the value of P04.02.

Par. No.	Name	Range	Unit	Default
P03.90	Enable Analogue Input as Digital Input	0:Keep as Analogue Inputs 1:Enable Analogue Inputs as Digital Inputs		0
P03.91	Function Selection for AI1 as DI	Same as P02.05		0
P03.92	Function Selection for AI2 as DI	Same as P02.05		0

In some cases, customers need more DI terminals but they do not need AI terminal. With these group of parameters, customers can use terminal AI1/AI2 as DI terminal. Please be aware of that, in SA710, AI1 and AI2 must be set to digital inputs or analogue inputs at the same time. When AI1/AI2 set to DI terminal, customers can config to NPN/PNP mode by parameter P02.02.

2.4.5 Parameter Group 4: Process PID and Other Controllers

Par. No.	Name	Range	Unit	Default
P04.00	Process PID Feedback Source	0:No function 1:Terminal AI1 2:Terminal AI2 5:Pulse input 1 20:Bus Communication 31:Inverter Output Current 32:Output Torque 33:DC Bus Voltage		0

Select source of feedback signal.

Par. No.	Name	Range	Unit	Default
P04.01	Process PID Set Source	0:No function 1:Terminal AI1 2:Terminal AI2 5:Pulse input 1 10:Preset value 0+UP/DOWN 11:Multi preset value 20:Bus communication 30:Keypad		0

Select process PID reference source.

0: No function;

1: Terminal AI1, use analogy input AI1 as reference source, see P03.0*;

2: Terminal AI2, use analogy input AI2 as reference source, see P03.1*;

5: Pulse input 1, use pulse input DI4 as reference source, see P02.5*;

10: Present value 0 + Up/Down, use present value 0 and Up/Down, see P00.30;

11: Multi present value, see P00.30~P00.45;

20: Bus communication, use bus reference as reference source;

30: Keypad, use Keypad Up/Down key or potentiometer as reference source, see P03.68/P03.69;

31:Inverter Output Current, 0-200% the inverter rated current corresponding feedback value 0-100%;

32: Output Torque, 0-200% the rated torque P01.08 corresponding feedback value 0-100%;

33: DC Bus Voltage, 0-1000V corresponding feedback value 0-100%;

Par. No.	Name	Range	Unit	Default
P04.02	Fiducial Value for Process PID Set/Feedback	0.0~3000.0		50.0

This parameter is set as the fiducial value of 100% set or feedback for process PID control.

Par. No.	Name	Range	Unit	Default
P04.04	Process PID Control Logic: Positive/Negative	0:Positive; 1:Negative		0

0: Positive, reduce/increase the PID output if the feedback value is larger/lower than set value;

1: Negative, reduce/increase the PID output if the feedback value is lower/larger than set value;

Par. No.	Name	Range	Unit	Default
P04.05	Process PID Anti Windup	0: Disable; 1: Enable		0

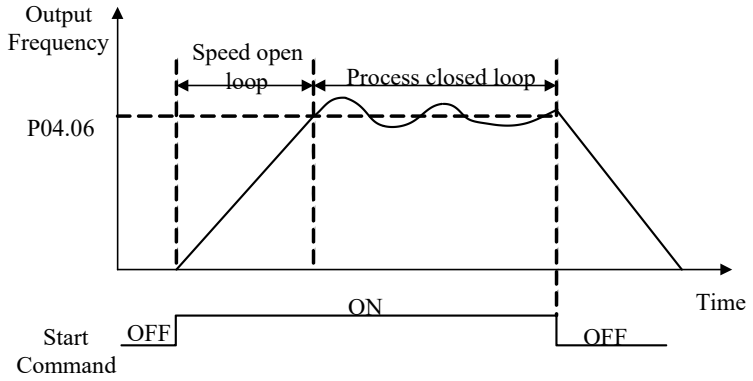
In case the PID output has reaches the limit but the error between set value and feedback value still exists in same sign, if the integrator continues to work then the result of integrator will be very high. It will take very long time for the PID controller to response to the error sign change e.g. from positive to negative. This ruins the control performance in a lot of application. Customer can use this function to avoid the problem.

0: Disable, continue regulation of a given error even when the PID output reaches to its limit;

1: Enable, ceases regulation of a given error when the PID output reaches to its limit;

Par. No.	Name	Range	Unit	Default
P04.06	Cut-in Frequency for Process PID Speed Mode	0.0~200.0	Hz	0.0

Given a start command, the product will ramp from 0 to P04.06 in speed open control first. When the speed reaches to P04.06, the control will switch over to Process PID control. The principle is described as below:



Par. No.	Name	Range	Unit	Default
P04.07	Proportional Gain - Process PID 1	0.00~10.00		0.30
P04.10	Proportional Gain - Process PID 2	0.00~10.00		0.30

The control output is the product of the proportional gain multiplies the error between the set value and the feedback value. A bigger Proportional Gain gives a faster control response, but it may lead to unstable oscillation of control.

Attention: This function is disabled when it is set to “0”.

Par. No.	Name	Range	Unit	Default
P04.08	Integration Time - Process PID 1	0.01~655.35	s	10.00
P04.11	Integration Time - Process PID 2	0.01~655.35	s	10.00

The integrator provides an increasing control output at a processive error between the set value and the feedback value. The Integration time is the time needed by the integrator to reach the same control output as the proportional gain with same constant error.

Note. If the Integration time is set to 655.35, the function is disabled.

Par. No.	Name	Range	Unit	Default
P04.09	Differential Time - Process PID 1	0.00~10.00	s	0.00
P04.12	Differential Time - Process PID 2	0.00~10.00	s	0.00

The differentiator does not react to a constant error, but provides a control output only when the error changes. The shorter the PID differentiation time, the function gives more control output with the same error change.

Note: If the differential time is set to 0.0, the function is disabled. Please use the Differential function carefully because it could amplify the impact of noise.

Par. No.	Name	Range	Unit	Default
P04.13	Process PID Differential Limit	1.0~50.0		5.0

Enter a limit for the differentiator output.

Par. No.	Name	Range	Unit	Default
P04.14	Error Tolerance Limit to Enable Process PID	0.0~200.0	%	0.1

When the error between the set value and feedback value is less than the set value of this parameter, the process PID control stops. The way how PID control stops or restarts is controlled by P04.15.

Par. No.	Name	Range	Unit	Default
P04.15	Process PID Out/In Mode to Error Tolerance	0: Mode 0; 1: Mode 1; 2: Mode 2		0

0: Mode 0, if the absolute value of the error >= P04.14, PID is enabled; if the absolute value of the deviation < P04.14, PID is disabled, PID output freezes;

1: Mode 1, if the absolute value of the error >= P04.14, PID is enabled. If error > 0, use error + P04.14 as error for PID calculation; If error < 0, use error - P04.14 as error for PID calculation; if the absolute value of the error < P04.14, PID is enabled as normal;

2: Mode 2, if the absolute value of the error >= P04.14, PID is enabled, but the output of I part is frozen; if the absolute value of the error < P04.14, PID is enabled as normal;

Par. No.	Name	Range	Unit	Default
P04.16	Process PID Error Bandwith 1	0.0~200.0	%	200
P04.17	Process PID Error Bandwith 2	0.0~200.0	%	200

The process PID error bandwith is used to select the PID parameters, P04.16 needs to be less than or equal to P04.17. When the error is less than or equal to P04.16, use the PID1 parameter (P04.07 to P04.09). when the

error is greater than P04.17, use the PID2 parameter (P04.10 to P04.12). When the error is between P04.16 and P04.17, the result of interpolating the PID1 parameter and the PID2 parameter is used as the PID parameter.

Par. No.	Name	Range	Unit	Default
P04.18	Process PID Output Low Limit	-100.00~100.00	%	0.00
P04.19	Process PID Output High Limit	-100.00~100.00	%	100.00

These parameters are used to set process PID controller output low/high limit, 100% corresponds to P05.03 in speed mode.

Par. No.	Name	Range	Unit	Default
P04.20	Process PID Upper Limit Source Selection	0~30		0

This parameter is used to set how the speed limit value is configured in PID control mode. When option [0] is selected, the speed upper limit is restricted by parameter P00.16. When selecting other options, please refer to the explanation of parameter P00.11.

Par. No.	Name	Range	Unit	Default
P04.22	Process PID Integration Output Low Limit	-100.00~100.00	%	0.00
P04.23	Process PID Integration Output High Limit	-100.00~100.00	%	100.00

This group of parameters are used to set the process PID controller Integration output high and low limits.

Par. No.	Name	Range	Unit	Default
P04.30	Speed PID Proportional Gain	0.000~1.000		0.010
P04.31	Speed PID Integration Time	2.0~2000.0	ms	8.0
P04.32	Speed PID Differentiation Time	0.0~200.0	s	30.0

Speed closed loop PID parameters.

Par. No.	Name	Range	Unit	Default
P04.33	Speed PID Differential Limit	1.000~20.000		5.000

Set a limit for the differentiator output.

Par. No.	Name	Range	Unit	Default
P04.34	Speed PID Speed Signal Filter Time	1.0~100.0		10.0

Set a time constant for the speed signal lowpass filter. Too long filter time reduce the dynamic performance.

Par. No.	Name	Range	Unit	Default
P04.40	Torque PI Proportional Gain	0~500	%	100
P04.41	Torque PI Integration Time	0.002~2.000	s	0.020

This parameter group is used to configure the parameters of torque open-loop PI control. It is only valid when the operation mode is torque open-loop (P00.01 = 2). The impact of the parameter value please refer to P04.07/P04.08

Par. No.	Name	Range	Unit	Default
P04.51	PM Current Limit Controller Feedforward Gain	0~400	%	100

This parameter, together with P04.52, P04.53 and P04.54, constitutes the current controller for the PM motor, which is enabled when the output current is higher than the P05.07 current upper limit. The dynamic response characteristics of the current controller can be adjusted by setting the feedforward gain, proportional coefficient and integration time of the current controller.

The dynamic response of the current controller can be accelerated by increasing the feedforward gain, proportional coefficient and decreasing the integration time. However, the feed-forward gain, too large proportion coefficient or too small integration time may make the current control unstable.

Par. No.	Name	Range	Unit	Default
P04.52	Proportional Gain - Current Limit Controller	0~500	%	100
P04.53	Integration Time - Current Limit Controller	0.000~2.000	s	0.020
P04.54	Filter Time - Current Limit Control	0.1~100.0	ms	10.0

The converter has a PI current controller that is enabled when the output current is above the P05.07 current upper limit. The current controller controls the output current by reducing the output frequency. The dynamic response characteristics of the current controller can be adjusted by setting the proportional coefficient and integration time of the current controller.

For induction motor, the current controller parameters include P04.52, P04.53, P04.54; For PM motor, current controller parameters include P04.51, P04.52, P04.53, and P04.54.

Par. No.	Name	Range	Unit	Default
P04.61	Isd PI Control Bandwidth	10~200	Hz	30
P04.62	Isd PI Control Damping Coefficient	1~200		100
P04.63	Isd Load Compensation Coefficient	0.1~1.0		0.5
P04.64	Isq PI Control Bandwidth	0.01~1.00	Hz	0.03
P04.65	Isq PI Control Damping Coefficient	1~200		1

This group of parameters are valid only when P00.02 is equal to [2] vector 2. They are current loop adjustment parameters for vector control, and generally do not need to be adjusted.

2.4.6 Parameter Group 5: Limitation, Protection and Failure Detection

Par. No.	Name	Range	Unit	Default
*P05.02	Motor Low Speed Limit	0.0~590.0	Hz	0.0
*P05.03	Motor High Speed Limit	0.0~590.0	Hz	65.0

P05.02 sets the low limit for Motor Speed. The Motor Low Speed Limit must not exceed the Motor Speed High Limit in P05.03. P05.03 sets the high limit for Motor Speed. The Motor High Speed Limit must exceed the Motor Low Speed Limit in P05.02. Please be noticed that, P05.02 and P05.03 are used to limit the set value.

Par. No.	Name	Range	Unit	Default
P05.04	Torque Limit at Motor Mode	0~1000	%	160
P05.05	Torque Limit at Generator Mode	0~1000	%	160

These parameters limit the torque on the shaft to protect the mechanical installation. 100% equals motor rated torque set in P01.06. If the motor torque is bigger than P05.04/P05.05, the product will report “u.51”.

Par. No.	Name	Range	Unit	Default
P05.06	Source Selection for Speed Limit at Torque Mode	0:No Function 1:Input From Terminal AI1 2:Input From Terminal AI2 5:Pulse Input 1 10:Preset Value 0 + UP/DOWN 11:Multi Preset Values 20:Bus Communication; 30:Keypad		0

This parameter is to select how to define the limit of the speed at torque control mode. If the parameter is set to [0], the speed limit value is defined by P05.08. For other options, please refer to P00.11

Par. No.	Name	Range	Unit	Default
P05.07	Max Current Limit	0~300	%	*

This parameter is used to set the output current limit, 100％ equals to P01.06 rated motor current. If the output current reaches the P05.07, the product will report u.50 warning and current limit controllers start to function with the controller set in P04.5*.

Par. No.	Name	Range	Unit	Default
*P05.08	Max Output Frequency Limit	0.0~590.0	Hz	65

This parameter is used to set the maximum output frequency of the frequency converter.

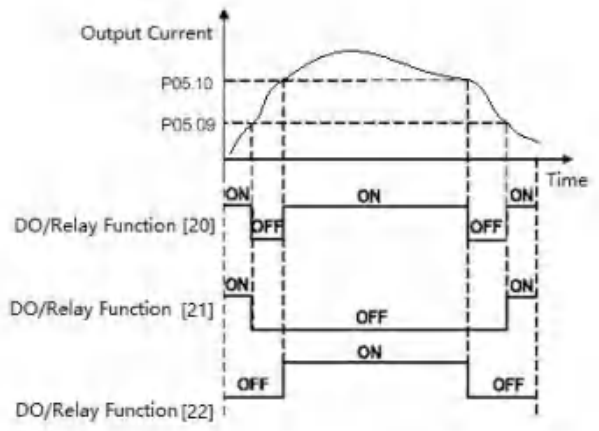
Note: Setting this parameter for an Induction motor may indirectly cause that the motor speed cannot reach the target value.

For example, P05.08=50Hz, the motor speed in generator state will not reach 50Hz due to the existence of slip.

Par. No.	Name	Range	Unit	Default
P05.09	Threshold for Low Current Warning	0.00~P09.16	A	0.00
P05.10	Threshold for High Current Warning	0.00~ P09.16	A	*

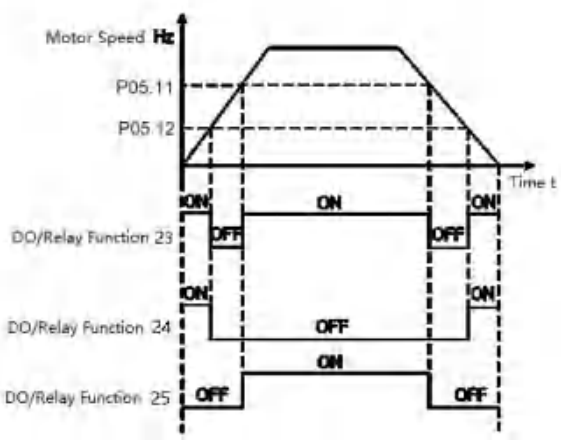
When the motor current falls below P05.09 or exceeds P05.10, a signal can be produced on relays or terminal DO. See [20] Out of current range, [21] Below current low and [22] Above current high in P02.22/28/31.

Diagram of Warning Current Low and Warning Current High are shown below:



Par. No.	Name	Range	Unit	Default
P05.11	Threshold for Low Speed Warning	0.0~590.0	Hz	0.0
P05.12	Threshold for High Speed Warning	0.1~590.0	Hz	65.0

When the motor frequency falls below P05.11 or exceeds P05.12, a signal can be produced on relays or terminal DO. See [23] Out of frequency range, [24] Below frequency low and [25] Above frequency high in P02.22/28/31. Diagram of Warning Frequency Low and Warning Frequency High are shown below:



Par. No.	Name	Range	Unit	Default
P05.13	Threshold for Low Set Value Warning	-200.00~200.00	%	0.00
P05.14	Threshold for High Set Value Warning	-200.00~200.00	%	100.00

When the actual set value falls below P05.13 or exceeds P05.14, a signal can be produced on relays or terminal DO. 100％ equals to value set in P00.16 in speed control mode, P01.08 in torque control mode. See functions [29], [30] and [31] in P02.20/31/40.

Note: These parameters work on the final set value decided by P00.11~P00.14, not on the set value for PID inputs.

Par. No.	Name	Range	Unit	Default
P05.15	Threshold for Low Feedback Warning	-200.00~200.00	%	0.00
P05.16	Threshold for High Feedback Warning	-200.00~200.00	%	100.00

When the feedback falls below P05.15 or exceeds P05.16, a signal can be produced on relays or terminal DO. 100% equals value set in P04.02. See function [26], [27] and [28] in P02.22/28/31.

Note: These parameters only work on the feedback for PID as selected by P04.00.

Par. No.	Name	Range	Unit	Default
*P05.17	Motor Phase Loss Protection	0:Disable 1:Low Sensitivity Detection 2:High Sensitivity Detection		1

If the parameter is set to 0, the motor phase loss protection is disabled. At this case, the motor can only be protected by over current protection if a motor phase loss failure happens. It may damage the motor and the customer could get a wrong information. Normally it’s not recommended to set the parameter to 0. But in case the power size of the inverter is much bigger than that of the motor and there is unbalance inside the motor, selecting [0] could avoid mis-reporting of failure.

Par. No.	Name	Range	Unit	Default
*P05.18	Enable Current Limit/Torque Limit Warning	0:Disable 1:Enable		1

This parameter is used to control whether the drive reports u.50/u.51 warning or not when the motor torque exceeds P05.04/P05.05 or the output current exceeds P05.07.

Note: Even if you select disable the warning, current limit/torque limit controller still works.

Par. No.	Name	Range	Unit	Default
P05.19	Motor Speed Feedback Loss Function	0:No Function 3:Jog and Warning 4:Run to Max Speed P05.03 and Warning 5:Alarm Fault and Trip to stop 11:Switch to Speed Sensor less Mode		5

In case a control mode with motor speed feedback is selected, this parameter is used to define the action when the speed feedback signal fails.

0: No function, the product will continue to run with the wrong speed feedback.

3: Jog and warning, the product will run with the jog speed and report warning u.61

4: Run to max speed, the product will run to max speed defined by P05.03 and report warning u.61

5: Alarm fault and trip to stop, the product will report alarm A.61 and trip to stop

11: Switch to speed sensor less mode, the product will switch to speed sensor less mode automatically and report warning u.61

Par. No.	Name	Range	Unit	Default
P05.20	Speed Error for Speed Feedback Loss Detection	1~6000	RPM	300
P05.21	Time for Speed Feedback Loss Detection	0.00~60.00	S	2

These parameters are used to determine how the product judge whether the speed feedback gets wrong. If the error between feedbacked speed and the set speed exceed P05.20 continuously for time longer than P05.21, the speed feedback loss function P05.19 will be triggered. Please consider the set of parameters P04.3* to avoid false actions.

Par. No.	Name	Range	Unit	Default
P05.22	Threshold for Communication with CU Timeout	0.10 ~ 60.00	S	1.00

If the Power Unit fails to get correct communication telegrams from the Control Unit continuously for time longer than P05.22, the action defined by P05.23 will be triggered.

Par. No.	Name	Range	Unit	Default
P05.23	Communication with CU Timeout Function	0:No Function 2:Stop and Warning 3:Jog and Warning 4:Run to Max Speed P05.03 and Warning		5

Par. No.	Name	Range	Unit	Default
		5:Alarm Fault and Trip to stop 6:Warning		

This parameter defines the action in case the Power Unit fails to get communication telegrams from the Control Unit for time longer than defined in P05.22.

0:No Function, the product will continue to run with the latest received commands

2:Stop and Warning, the product will stop and report warning u.03

3:Jog and Warning, the product will run with jog speed and report warning u.03

4:Run to Max Speed P05.03 and Warning, the product will run to the max speed P05.03 and report warning u.03

5:Alarm Fault and Trip to stop, the product will report alarm A.03 and trip to stop.

6:Warning, the product will continue to run with the latest received commands and report warning u.03

Par. No.	Name	Range	Unit	Default
P05.26	Motor Thermal Protection Function	0:No Function 1:ETR Warning 2:ETR Alarm Fault 3:ETR Warning for Self-cooled Motor 4:ETR Alarm Fault for Self-cooled Motor		0

The product can afford thermal protection function via a calculation (ETR = Electronic Terminal Relay) of the thermal load of the motor. The calculated thermal load is based on the motor current and motor speed according to the set in P05.27 and P05.28.

0: No function, there is no motor thermal protection;

1: ETR warning, if calculated thermal load exceeds the upper limit, the product reports warning.49

2: ETR alarm fault, if calculated thermal load exceeds the upper limit, the product reports alarm A.49 and trip to stop

3: ETR warning (Self-cooling mode)

4: ETR trip (Self-cooling mode)

[3] and [4] are similar as [1] and [2], but [3] and [4] are for motors without cooling fan. And the calculated thermal load increases faster, more sensitive to motor speed and it takes longer time to clear the calculated thermal load when the current of the motor drops.

Par. No.	Name	Range	Unit	Default
P05.27	Motor Overload Protection Time	0.1~60.0	min	2.0
P05.28	Threshold for Motor Overload Protection	100~160	%	150

When ETR function is used, if motor current exceeds P01.06 rated motor current * P05.28 Threshold for Motor Overload Protection for duration exceeding P05.27 motor overload protection time, the product will trigger motor overload warning or alarm as defined in P05.26.

Motor overload protection is based on an inverse time Integration calculation. The relationship between overload current and protection time (corresponding to P05.27) is described as below:

Motor current percent	Protection time (corresponding to P05.27)	Motor current percent	Protection time (corresponding to P05.27)
P05.28+0%	100%	P05.28+30%	20%
P05.28+6%	50%	P05.28+36%	18%

Motor current percent	Protection time (corresponding to P05.27)	Motor current percent	Protection time (corresponding to P05.27)
P05.28+12%	33%	P05.28+42%	17%
P05.28+18%	29%	P05.28+48%	16%
P05.28+24%	21%	P05.28+54%	14%

The table above assumes the motor runs at rated speed, below is the table for correction factor according to the motor speed (the real protection time should be divided by the correction factor).

Motor Speed (percent of P01.05)	Correction Factor	Motor Speed (percent of P01.05)	Correction Factor
0-12.5%	2.1	100%-112.5%	1
12.5%-25%	2.1	112.5%-125%	1.05
25%-37.5%	1.67	125%-137.5%	1.12
37.5%-50%	1.45	137.5%-150%	1.2
50%-62.5%	1.31	150%-162.5%	1.31
62.5%-75%	1.2	162.5%-175%	1.45
75%-87.5%	1.12	175%-187.5%	1.67
87.5%-100%	1.05	187.5%-Max.	2.1

For example, set P05.27 = 10, P05.28 = 120%, run at rated frequency, current is 132% rated motor current, protection time is 10 × 33% = 3.3 minutes. If the operating frequency is 30Hz (60% of rated frequency), the protection time is 3.3÷1.31 = 2.52 minutes.

Note: It is necessary to correctly set the P05.28 motor overload protection factor according to the actual overload capacity of the motor. If this parameter is set too large, it may happen that the motor is overloaded but the product cannot protect it in time!

Par. No.	Name	Range	Unit	Default
P05.29	Function at Mains Phase Loss	0:No Action 1:Only Waring 2:Trip to stop and Alarm Fault (Heavy Load) 3:Trip to stop and Alarm Fault (Mid Load) 4:Trip to stop and Alarm Fault (Light Load)		3

This parameter is used to select the action in case mains phase loss.

0: No action. The product will have no protection, it's not recommended normally

1: Only warning. The product will report warning u.26 in case mains phase loss with load applied and the product will continue to run.

2: Trip to stop and alarm fault (Heavy load). The product will report alarm A.26 and trip to stop. But the product can detect the mains phase loss only when the load is full and continues for certain period time (normally in minutes)

3: Trip to stop and alarm fault (Mid load). The product will report alarm A.26 and trip to stop. But the product can detect the mains phase loss only when certain percentage of rated load is applied (normally 30%~60%)

4: Trip to stop and alarm fault (Light load). The product will report alarm A.26 and trip to stop. In this option, the protection can be triggered very fast when the product starts to ramp the motor.

Par. No.	Name	Range	Unit	Default
P05.30	Alarm/Fault Lock Handling	0:Not Lock, Alarm/Fault Resettable without Re-Power On 1:Lock, Alarm/Fault Lock Resettable only after Re-Power On		1

In default setup, the locked alarms/faults (refer to 2.6.1) cannot be reset unless power-down and power-on cycle is implemented. In some special cases, customer wants to reset the locked alarms/faults with a power-down and power-up operation, then customer can set P05.30 to 0. Please be very careful to so and consider all the safety issues.

Par. No.	Name	Range	Unit	Default
P05.31	Delay Time to Alarm Current Limit Fault	0~60	S	60

When the output current reaches the current limit level set in P05.07, a warning u.50 is triggered. When the current limit warning has been continuously present for the period specified in this parameter, the product will trip to stop and report alarm A.50. If P05.31 = 60, the alarm and trip function is disabled.

Par. No.	Name	Range	Unit	Default
P05.32	Delay Time to Alarm Torque Limit Fault	0~60	S	60

When the output torque reaches the torque limit level set in P05.04/P05.05, a warning u.51 is triggered. When the torque limit warning has been continuously present for the period specified in this parameter, the product will trip to stop and report alarm A.51. If P05.32 = 60, the alarm and trip function is disabled.

Par. No.	Name	Range	Unit	Default
P05.33	Action at Warning	0:Trip to stop and Alarm Fault directly 1:Warning and Re-catch Motor after Failure Disappear		1

This parameter is to define the action when warning like over voltage, undervoltage and over current at which the product needs to coast the motor temporary but the failure can disappear and the product needs to recover the control of the motor.

0:Trip to stop and Alarm Fault directly, at failure, the warning will turn into alarm directly and trip to stop.

1:Warning and Re-catch Motor after Failure Disappear, at failure the product will report warning and coast the motor first, when the failure disappears, the product will try to re-control the motor.

Par. No.	Name	Range	Unit	Default
P05.34	Method to Re-catch Motor at Warning	0:Speed Track(IM/PM) and Angle Track (Fly start) 1:Direct Re-catch		0

This parameter defines how the product re-control the motor when P05.33 is set to [1]

0:Speed Track(IM/PM) and Angle Track (Fly start). The product will track the speed (for both IM and PM) and angle (only for PM) of the motor first and re-control the motor with the tracked speed/angle. If it fails to track the speed/angle, the it will start the motor form 0 speed.

1:Direct Re-catch. The product will assume there is no speed change in the motor during the coasted period, and re-control the motor based on the voltage command when the warning is triggered.

Note: [1] is only for IM motor. For PM motor, it will work as [0] no matter what is set in P05.34

Par. No.	Name	Range	Unit	Default
P05.60	Load loss detection function	0:Disable 1:Enable		0
P05.61	Load loss detection threshold	0.1~200.0%	%	5
P05.62	Load loss detection Filter Time	0.1~600.0	S	1

When P05.60=1, the load drop detection is switched on, and if the output current for a period of time during operation (set by P05.62) is less than the threshold value (rated current of P05.61* motor), the load drop fault of A.66 motor will be reported.

When the motor type is a PM motor, the default value for P05.61 is 0.1%. When the motor type is an IM motor, the default value for P05.61 is 5%.

2.4.7 Parameter Group 6: Keypad Operation and Display

Par. No.	Name	Range	Unit	Default
P06.03	Customer Defined Value for Min Speed	0.0~6553.5		0.00
P06.04	Customer Defined Value for Max Speed	0.0~6553.5		100.00

It is possible to customize a readout value in the product. Custom readout value is linear proportional to speed, it is stored in parameter P09.48.

The calculation of Custom Readout Value (P09.48) is shown below:

P09.48 = (P06.04 - P06.03) × P09.07 ÷ P00.16 + P06.03

P09.07 is the output frequency of the inverter, and P 0-16 is the upper limit of the motor frequency.

For example, the rated speed of motor is 1420rpm, the rated frequency is 50Hz and the deceleration ratio is 10:1. If the inverter is required to display the speed after deceleration, set P 0-16 = 50.0, P06.04 = 142.00.

Note: Custom defined value P09.48 can not be displayed on keyboard unless set the right value in P06.05, e.g., P06.05 =2048.

Par. No.	Name	Range	Unit	Default
P06.05	Keypad Display Option	0~8191		0

The Keypad is fixed to display the output frequency, reference and motor current (switchable by short press “ENTER” key). This parameter is used to show other physical variable (also install in parameters P09.*), each variable corresponds to a weight. For example, if you want to display the temperature and the terminal AI1 on Keypad. You can set P06.05 = 8 + 128 = 136

Below is the list of the weights for all physical variables.

Weight	Parameter Selected	Physical Variable
1	P09.06	Motor Voltage
2	P09.04	Motor Speed
4	P09.11	DC-Voltage
8	P09.13	Temperature
16	P09.20	Feedback Value
32	P09.45	Counter A
64	P09.46	Counter B
128	P09.24	AI1 Input
256	P09.26	AI2 Input
512	P09.35	Pulse Input1

Weight	Parameter Selected	Physical Variable
1024	P09.43	Pulse Output1
2048	P09.48	Variable Defined by Customer
4096	P09.05	Output Power

Par. No.	Name	Range	Unit	Default
P06.31	Local/Remote Mode Selection	0:Remote Mode; 1:Local Mode		0

0: Remote Mode, “RUN” key will be disabled and customers also can not stop the drive by pressing “STOP” key.

1: Local Mode. Customers can press “RUN” key to run the drive, press “STOP” key to stop the drive.

The reset function of “STOP” key is still valid no matter which mode be selected. Customers can press “STOP” key to reset the Alarm When the drive report unlocked Alarm.

Par. No.	Name	Range	Unit	Default
P06.32	Free key function Selection	0:Disabled; 1:Reverse RUN		0

0: Disabled, “Free” key is no function.

1: “Free” key defined as reverse Run function. Attention: This function is only valid in local mode.

Par. No.	Name	Range	Unit	Default
P06.34	Lock Keypad for Parameter Edit	0:Disabled; 1:Enabled and Lock		0

0: Disabled

1: Enabled and Lock, prevent unauthorized editing of parameters.

Attention:

1.If the Keyboard is locked and needs to be unlocked, please contact the manufacturer's technical service person.

2.This function is only to prevent parameter change via keyboard. It can not prevent the parameter change from bus communication.

Par. No.	Name	Range	Unit	Default
P06.35	Resolution for frequency set via keyboard	0:0.1; 1:1.0; 2:10	Hz	1

The parameter P06.35 is used to set Resolution for frequency set via keyboard and the default value is 1.0Hz.

Par. No.	Name	Range	Unit	Default
P06.50	Motor speed ratio	0.01~655.35		1.00

Motor actual speed monitoring parameter P09.04=current motor speed*P06.50

Par. No.	Name	Range	Unit	Default
*P06.51	Current Display Correction factor	0.01~655.35		1

Output current display = actual output current *P06.51.

Par. No.	Name	Range	Unit	Default
*P06.52	Power Display Correction factor	0.01~655.35		1

Output Power Display = Actual Output Power *P06.51.

2.4.8 Parameter Group 7: Auxiliary and Special Functions

Par. No.	Name	Range	Unit	Default
P07.00	Special Operation Function	0:No Function 9:Reset Parameters to Factory Defaults		0

0: No function

9: Reset parameters to factory defaults. Reset all the parameters except for information about the drive itself and the parameters recording running history plus communication parameters P00.80~P00.82 . And the operation procedure is :

Step1:Set parameter P07.00 = 9;

Step2:Power down the product fully and power on again, the keypad shows A.01

Step3:Press the “STOP” key to clear the A.01, then the parameters are reset.

Par. No.	Name	Range	Unit	Default
P07.01	Function at Re-Power	0 ~ 3		1

Selects the action upon reconnection of the drive to mains voltage after power down.

0:Resume with Set Value as Set before Re-power. Restart with the same local set value and the same start/stop settings as before the drive was powered down at local mode.

1:Not Run, but Keep Set Value as Set before Re-power. Keep to the stop status until a new start command at local mode is given. The set value set before the drive was powered down is saved and will be used if a new start command is given.

2:Not Run and Clear Set Value. Keep to stop status and clear the set value unit new commands are given.

3: Resume with commands and speed set value from Modbus communication,commands of terminal control (including pulse start-stop commands) and speed set values from keyboard saved before re-power.

Par. No.	Name	Range	Unit	Default
*P07.10	Min Switch Frequency	2~16:2~16 kHz	kHz	2

Limit the permissible minimal switching frequency also for temperature auto tuning functions

Par. No.	Name	Range	Unit	Default
*P07.11	Over Modulation Coefficient	90.0~105.5	%	100.0

Increase this parameter can increase the ability to output higher voltage with same mains voltage. But increase the ability could result in more harmonic voltage/current on the motor.

Par. No.	Name	Range	Unit	Default
*P07.12	DC-Link Voltage PWM Compensation Function	0:Compensate Average DC voltage 2:Compensate DC Ripple Voltage		0

When DC voltage changes, the PWM signals need compensation to apply the right voltage to the motor.

This parameter defines how the product compensate the voltage changes.

0:Compensate Average DC voltage. The product only compensates the changes of the average DC voltage discarding the rectifying ripple voltage.

2:Compensate DC Ripple Voltage. The product compensates the ripple voltage as well as the average voltage change. This function can reduce the harmonic torque but the effect will be limited if the mains voltage is too low.

Par. No.	Name	Range	Unit	Default
P07.13	DC-link Voltage PWM Compensation Disable at VF control	0:Disable 1:Enable		1

This function is used to disable the compensation function at VF control mode. Normally this is used to improve the ramp down capability by dissipating the braking energy in the motor. But doing so is risky to damage the motor in case the mains voltage is high.

Par. No.	Name	Range	Unit	Default
P07.14	Dead Time Compensation Adjustment Coefficient	0~200	%	100

This parameter is used to adjust the dead time compensation due to the tolerance between ideal dead time and real deadtime. 100% means compensate based on ideal dead time, lower than 100% means compensate less than the ideal dead time, higher than 100% means compensate more than the ideal dead time.

Par. No.	Name	Range	Unit	Default
P07.17	Max Frequency for Dead Time Compensation	20~590	Hz	*

From frequency P07.17 and higher, the deadtime compensation coefficient will drop to 0 and the deadtime compensation function is disabled. From 0Hz to P07.17, the deadtime compensation coefficient drops from P07.14 to 0 linearly.

Par. No.	Name	Range	Unit	Default
P07.26	Function at Mains Voltage Sag	0 ~ 6		0

This parameter defines the response when the mains voltage drops to the voltage set in P07.27.

0:No Function. It’s most likely the voltage will trigger the under-voltage limit very soon.

1:Passive Ramp Down. The product will control the motor frequency following the rotor speed so that no driving torque is applied by the product and the energy consumption is limited as little as possible. Without driving torque, the motor speed will decrease continuously until to 0Hz. If the mains voltage recovers back to above P07.27, the product will ramp the motor back to previous set speed.

2:Passive Ramp Down, Trip and Alarm. Similar as [1], the difference is that, if the frequency drops to 0Hz, the product will alarm a fault A.27 and Trip.

3:Coast and Fly start. The product will disable all the PWM output and coast the motor. When the mains voltage recovers back above P07.27, the product will ramp the motor back to previous set speed with a fly start function.

4:KEB Control. The product will drive the motor speed down actively so that the kinetic energy of the inertia will be converted back to the DC link. The DC link voltage will be controlled at the set value. In this way the product can run as long time as possible. In this option, the motor will decrease continuously until to 0Hz if the mains voltage does not recover. If the mains recover back to above P07.27, the product will ramp the motor back to previous set speed.

5:KEB Control, Trip and Alarm. Similar as [4]. The difference is that, with option [5] if the frequency drops to 0Hz,

the product will alarm a fault A.27 and Trip.

6:Trip to coast and Alarm. The product will report alarm A.27 and trip to coast.

Note: For option [1] to [5], the drive will report warning "A.36" while doing the selected operation. And if under voltage is triggered, the product will report warning u.24 and further report alarm A.24 and trip if the situation continues for enough time.

Par. No.	Name	Range	Unit	Default
P07.27	Threshold Triggering Mains Voltage Sag Function	100~220/380	V	*

This parameter defines the threshold voltage at which the selected function in P07.26 should be activated.

Note:

1. Do not set P07.27 too low or too high. Normally P07.27 should be with 0.7~0.85 of the rated mains voltage. The mains sag function is easy to fail with under voltage triggered if the threshold value is too low. If the threshold value is too high, the product may enter the function all the time.

2. If the product is supplied with a DC source, the threshold value will be P07.27 x 1.4.

Par. No.	Name	Range	Unit	Default
P07.28	KEB Control Gain	0 ~ 500	%	100

The control gain for option [4] and [5] of P07.26.

Par. No.	Name	Range	Unit	Default
P07.35	Interval to clear the number of times of alarm auto reset performed	0~6000	min	0

Interval to clear the number of times of performed alarm auto reset. This value being set to 0 means the number of times will not be cleared (function not valid). Please refer to P07.36

Par. No.	Name	Range	Unit	Default
P07.36	Method to Reset Alarm Fault	0:Reset by Command 1~10:Auto Reset for 1~10 Times 11:Auto Reset for Unlimited Times		0

Define how the alarm faults can be reset.

0: Reset by Command. The alarm faults can on be reset by a command, pressing the “STOP” key, the DI inputs or communication reset command

1~10: Auto reset for 1-10 times. The product can reset 1~10 times of alarm faults automatically after the alarms are triggered.

11: Auto Reset for Unlimited Times. The product will reset the alarm faults without limitation.

Note:

1. The product can only reset the alarm fault when the failure reason is cleared. Even if the product fails to reset the alarm fault, it will be counted in times.

2. This function works for locked alarm faults only if P05.30=0

3. The count of times will be cleared to 0 when the product is re-powered

4. This function does not work for warnings.

Par. No.	Name	Range	Unit	Default
P07.37	Alarm Auto Reset Waiting Time	0~600	s	10

Set the time interval from alarm faults to perform the automatic reset function. This parameter is active only when P07.12 set to [1] ~ [10].

Par. No.	Name	Range	Unit	Default
*P07.38	VT Function Level	40~90	%	90

Enter the level of motor magnetization at low speed. Selection of a low value reduces energy loss in the motor, but also reduces load capability, especially for start.

Par. No.	Name	Range	Unit	Default
*P07.39	Min Magneton at AEO	40~75	%	66

Enter the minimum magnetization must be ensured for AEO. Selection of a low value reduces energy loss in the motor, but can also reduce resistance to sudden load changes and it's easy to stall the motor.

Par. No.	Name	Range	Unit	Default
P07.40	Magneton Optimization Factor (PM)	-400 ~ 400	%	10

This parameter is used to optimize the balance of copper loss and iron loss in the motor so that to optimize the heat dissipation situation of the motor, but the total efficiency may not be optimized. Adjust P07.40, the motor current can also be changed. This parameter can be used to correct the error of the motor parameters too.

Note: The absolute value of this parameter should not be too high.

Par. No.	Name	Range	Unit	Default
P07.41	Control of cooling fan	0:On-off at Start/Stop 4:On-off according to temperature 5:Run at power on		0

0: Run the fan when the Frequency converter is running and stop the fan when the frequency converter is stopped;

4: Run the fan when the heat sink temperature is higher than designed temperature and stop the fan when the heat sink temperature is higher than the temperature.

5: Turn on the fan as soon as the product is powered on;

Note: Option 4/5 of P07.41 is only valid for products up to 90kW of SA710

Par. No.	Name	Range	Unit	Default
P07.46	Threshold Voltage for OVC Function	Grid Voltage Dependent	V	*

When the DC link voltage exceeds the value of P07.46, over-voltage control defined in P07.47 is activated.

The following table is the Over-voltage Control Threshold Voltage's range and default value depending on P01.01 Grid Type:

Grid Type	Range	Default
200~240V	360~395V	385V
380~440V	680~780V	710V
440~480V	750~780V	780V

This threshold should not be set below the DC voltage corresponding to the normal grid voltage range, e.g., if the grid voltage reaches 260V, then P07.46 should not be below 260 x 1.414 = 368Vdc. On the other hand, if P07.46 is set too high, there is a risk of overvoltage control failure.

Par. No.	Name	Range	Unit	Default
P07.47	OVC Function	0:Disable; 1:Enable with Mode 1; 2:Enable with Mode 2		0

Over-voltage control (OVC) can limit the voltage in DC link when ramp down the motor by limiting the ramp down speed. It is not suitable for application with continuous potential energy feedback, e.g., lift, elevators etc.

0: Disabled;

1: Mode 1. Control the DC voltage increase by limiting the ramp down speed.

2: Mode 2, usually for very fast deceleration;

Note: If the resistor brake threshold voltage is below the OVC threshold, the resistor brake will take effect first, and if the OVC control threshold is set below the resistance brake threshold, the OVC will take effect first.

Par. No.	Name	Range	Unit	Default
P07.48	OVC Integration Time	0.01~0.10	s	0.05
P07.49	OVC Proportional Gain	0~200	%	100

The parameters P07.48 and P07.49 are PI controller parameters for overvoltage control. The dynamic response of the overvoltage controller can be adjusted by setting different proportional gain and integration time. Increasing the proportional gain and decreasing the integration time can both accelerate the dynamic response of the over-voltage controller, but too much proportional gain or too little integration time may destabilize the over-voltage control. Normally, no adjustment is required.

Par. No.	Name	Range	Unit	Default
P07.50	Bypass Speed Start 1	0.0 ~ 590.0	Hz	0.0
P07.51	Bypass Speed End 1	0.0 ~ 590.0	Hz	0.0
P07.52	Bypass Speed Start 2	0.0 ~ 590.0	Hz	0.0
P07.53	Bypass Speed End 2	0.0 ~ 590.0	Hz	0.0
P07.54	Bypass Speed Start 3	0.0 ~ 590.0	Hz	0.0
P07.55	Bypass Speed End 3	0.0 ~ 590.0	Hz	0.0

These parameters are used to define 3 ranges of speed in which the motor should not stay to avoid the mechanical resonance. If the speed is set within the range, the set speed will be move to the closest start point or end point of the bypass speed range.

Par. No.	Name	Range	Unit	Default
P07.60	Delay time for restart after re-power	0.0~3600.0	s	0.0

This parameter is used to set when the operation command of the converter is valid at re-power, whether the converter should start to run automatically and the time delay to start after the product is re-powered.

When this parameter is set to 3600.0, even if the start command is valid when the converter is re-powered (e.g., the DI terminal for start control is closed at re-power), the product will not start. The running command must be cancelled once before the frequency converter can respond the start command again.

When this parameter is set to 0.0~3599.9, if the start command is valid when the converter is re-powered, the product will start after wait for a period of time of the value set in P07.60.

2.4.9 Parameter Group 8: Basic and Running Information

Par. No.	Name	Range	Unit	Default
P08.00	PU SW Version			

View the software version of the Power Unit.

Par. No.	Name	Range	Unit	Default
P08.01	CU Software Version			

View the software version of the Control Unit.

Par. No.	Name	Range	Unit	Default
P08.30	Total Days with Power On	0~9999	d	

View how many days the drive has been power on. This value can’t be reset.

Par. No.	Name	Range	Unit	Default
P08.31	Total Running Hours	0~60000	h	

View how many hours the motor has run. Reset the value to 0 by P08.37 Reset Running Hours Counter.

Par. No.	Name	Range	Unit	Default
P08.32	Total Energy Consumed	0~65535	kWh	

View the total power consumed. Reset the the value to 0 by P08.36 Reset Consumed Energy Counter.

Par. No.	Name	Range	Unit	Default
P08.33	Number of Power Ups	0~65535		

View the number of times the drive has been powered up. This parameter can’t be reset.

Par. No.	Name	Range	Unit	Default
P08.34	Number of Over-Temperatures	0~65535		

View the number of that how many over-temperature faults have occurred. This parameter can’t be reset.

Par. No.	Name	Range	Unit	Default
P08.35	Number of Over-Voltages	0~65535		

View the number of that how many over-voltage faults have occurred. This parameter can’t be reset.

Par. No.	Name	Range	Unit	Default
P08.36	Reset Consumed Energy Counter	0:Not Reset; 1:Reset		0

0: Not reset;

1: Reset. Reset the counter to zero (see P08.32);

Attention: This parameter can’t be set via bus communication.

Par. No.	Name	Range	Unit	Default
P08.37	Reset Running Hours Counter	0:Not Reset; 1:Reset		0

0: Not reset;

1: Reset, running hours counter is reset to zero (see P08.31);

Attention: This parameter can’t be set via bus communication.

Par. No.	Name	Range	Unit	Default
P08.39	Total Running Time	0~60000	h	

This parameter has the same function as P08.31, but P08.39 cannot be reset.

Par. No.	Name	Range	Unit	Default
P08.40~P08.49	Alarm Log			

These are the 10 latest occurred Alarm Log.

Par. No.	Name	Range	Unit	Default
P08.50~P08.59	Warning Log			

This is the 10 latest occurred Warning Log.

2.4.10 Parameter Group 9: Real Time Running Status Monitoring

Par. No.	Name	Range	Unit	Default
P09.00	Control Word	0~65535		
P09.01	Status Word	0~65535		
P09.02	Set Value	-4999.0~4999.0		
P09.04	Motor Speed	0~24000	rpm	
P09.05	Output Power	0.000~655.35	kW	
P09.06	Output Voltage	0.0~6553.5	V	
P09.07	Output Frequency	0.0~590.0	Hz	
P09.08	Output Current	0.00~655.35	A	
P09.09	Output Torque	-200.0~200.0	%	
P09.10	Motor Thermal Load Status	0~100	%	
P09.11	DC Link Voltage	0~65535	V	
P09.13	Heatsink or IGBT Temperature	-128~127	℃	
P09.14	Inverter Thermal Load Status	0~255	%	
P09.15	Nominal Inverter Current	0.0~6553.5	A	
P09.16	Max Inverter Current	0.0~6553.5	A	
P09.19	PID Set Value	-200.0~200.0	%	
P09.20	PID Feedback Value	-200.0~200.0		

Par. No.	Name	Range	Unit	Default
P09.21	PID Output	-200.0~200.0	%	

These parameters are used to view the running status of the product.

Par. No.	Name	Range	Unit	Default
P09.22	Digital Input	0~65535		

View the status of the digital input. Each digital input terminal corresponds to a weight, as shown in the following table. If the drive detects that the digital input terminal is valid, it has a weight, otherwise it does not, and the weight value is added to the parameter value.

For example: REV and DI2 are valid, P09.22 = 2 + 8 = 10.

Par. No.	Name
P09.23	AI1 Analogue Input Type
P09.24	AI1 Input Value
P09.25	AI2 Analogue Input Type
P09.26	AI2 Input Value

Terminal	DI4	DI3	DI2	DI1	REV	FWD
Weight	32	16	8	4	2	1

Par. No.	Name	Range	Unit	Default
P09.23	AI1 Analogue Input Type	0:0~10V;1:0~20mA		
P09.24	AI1 Input Value	0.00-20.00	V/mA	
P09.25	AI2 Analogue Input Type	0:0~10V;1:0~20mA		
P09.26	AI2 Input Value	0.00-20.00	V/mA	

Par. No.	Name	Range	Unit	Default
P09.34	Set Value by Pulse Input	-200.0~200.0	%	
P09.35	Frequency of Pulse Input	0.00~100.00	kHz	

Par. No.	Name	Range	Unit	Default
P09.37	Speed Feedback from Encoder			

View the Speed Feedback from Encoder in round per second. the motor frequency equals to the value multiplied by the number of motor pole pairs.

Par. No.	Name	Range	Unit	Default
P09.38	DO Output Status	0~255		

View the status of the digital output. Each digital output terminal corresponds to a weight, as shown in the following table. If a digital output terminal is valid, it has a weight, otherwise it does not, and the weight value is added to the parameter value. For example: DO1 is valid, P09.38 = 1.

Terminal	DO1
Weight	1

Par. No.	Name	Range	Unit	Default
P09.39	Relay Output Status	0~65535		

View the status of the relay output. Each relay output terminal corresponds to a weight, as shown in the following table. If a relay output terminal is valid, it has a weight, otherwise it does not, and the weight value is added to the parameter value. For example: Relay1 is valid, P09.39 = 1.

Terminal	Relay 2	Relay 1
Weight	2	1

Par. No.	Name	Range	Unit	Default
P09.40	AO1 output	0.00-20.00	V/mA	

Par. No.	Name	Range	Unit	Default
P09.43	Pulse Output Frequency	0.00~100.00	kHz	

Par. No.	Name	Range	Unit	Default
P09.45	Counter A Value	0~65535		
P09.46	Counter B Value	0~65535		
P09.47	Set Value from Bus Communication	-32768~32767		
P09.48	Variable Defined by Customer	0~6553.5		

2.4.11 Parameter Group 19: Simple PLC

Par. No.	Name	Range	Unit	Default
P19.00	SPLC control mode	0:Once running then keep running 1:Once running then stop 2:Cycle running		0

0:once running then keep running. it will keep running the last step speed after inverter finished all steps.

1:once running then stop.it will stop after inverter finished all steps.

2:cycle running, it will cycle again after inverter finished all steps.

Par. No.	Name	Range	Unit	Default
P19.01	SPLC store selection	0:No function 1:Save at Stop 2:Save at Power down		0

0:No function. do not save current running step and speed when inverter stop or power down.

1:save at Stop. it will save current running step and speed when inverter stop.

2:save at Power down. it will save current running step and speed when inverter power down or stop.

Attention: If inverter saved running step and speed, inverter will start running from saved step and speed when

inverter run again. If inverter do not save running step and speed, inverter will start running from step0 and speed 0HZ when inverter run again.

Par. No.	Name	Range	Unit	Default
P19.02	Clear SPLC Reset times	0:No action; 1:SPLC Reset times		0

When P19.02 is set to 1, the number of times of SPLC reset is cleared.

Par. No.	Name	Range	Unit	Default
P19.10~ P19.25	SPLC multi-speed0~ SPLC multi-speed15	-100.00%~100.00%	%	0

P19.10~P19.25: 16 steps speed ,0.00% is corresponding to 0HZ,100% is corresponding to P00.16

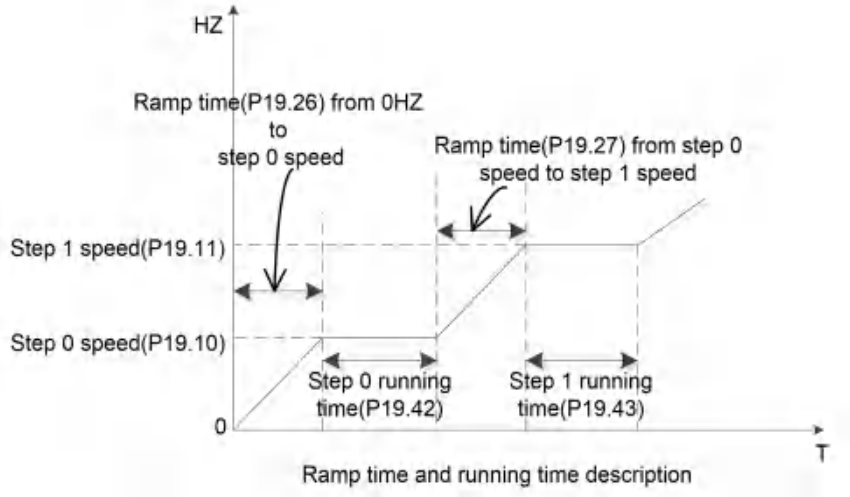
Par. No.	Name	Range	Unit	Default
P19.26~ P19.41	SPLC step 0 ramp time ~ SPLC step 15 ramp time	0.0~6000.0	S	0

P19.26~P19.41: 16 steps ramp time(the time from former step speed ramp to current step speed).Example: if P19.27(step 1 ramp time)=5S,

it means it need 5 seconds from step 0 speed(P19.10) ramp to step 1 speed(P19.11).

Par. No.	Name	Range	Unit	Default
P19.42~ P19.57	SPLC step 0 running time~ SPLC step 15 running time	0.0~6000.0	S	0

P19.42~P19.57:16 steps running time. please refer the picture below about the ramp time and running time detail description .



Ramp time and running time description

Attention: If step X ramp time and running time are 0S, then all steps after X will be disabled. Example: set P19.29(step3 ramp time)=0 and P19.45(step3 running time)=0,then from step3 to step15 will be disabled.

Par. No.	Name	Range	Unit	Default
P19.80	Average Speed	0~65535	RPM	

This parameter is Read only, it is used to monitor the one cycle average speed.

Par. No.	Name	Range	Unit	Default
P19.81	Current Running step	0~15		

This parameter is Read only, it is used to monitor the Current Running step.

Par. No.	Name	Range	Unit	Default
P19.82	Current Running step time	0.0~6553.5	S	

This parameter is Read only, it is used to monitor the Current Running step time.

Par. No.	Name	Range	Unit	Default
P19.83	SPLC Reset times	0~65535	S	

This parameter is Read only to monitor the number of times of SPLC Reset.

Attention: the steps to use the SPLC function:

a. Set P00.03=2 (enable SPLC function)
b. Set one DI terminal function (P02.05~P02.10)to 64
c. Set parameters Group 19 based on application request.
d. Ensure Drive is in remote mode, set DI terminal(which function set to 64) to active, then SPLC start running.

2.4.12 Parameter Group 20: Pump application

Par. No.	Name	Range	Unit	Default
P20.00	pump control mode	0:Pressure mode; 3:Solar-pump mode		0

0:Pressure close loop mode, it will automatically change relative parameters P00.11 = 21 (The main speed source is Process PID),P04.00=1 (the pressure feedback source is AI1,default is 0~10V voltage input),P04.01=11(set object pressure by P00.30)

3: Solar-pump drive mode, please refer to MPPT Solar Pump Application Commissioning Guide

Par. No.	Name	Range	Unit	Default
P20.01	minimum output frequency	0.00~P20.02	%	40
P20.02	maximum output frequency	P20.01~100.00	%	100

Running speed range: 0.00% is corresponding to 0Hz,100% is corresponding to P00.16.

Par. No.	Name	Range	Unit	Default
P20.60	Sleep enable selection	0:Disable; 1:Enable		0

0:sleep function disable

1:enable sleep function

Par. No.	Name	Range	Unit	Default
P20.61	Sleep frequency threshold	0.00~100.00	%	2

If output frequency < P20.01+P20.61,sleep frequency condition satisfied.

Par. No.	Name	Range	Unit	Default
P20.62	Sleep pressure threshold	0.00~100.00	%	2

If feedback pressure > object pressure - P20.62, sleep pressure condition satisfied.

Par. No.	Name	Range	Unit	Default
P20.63	Sleep detection time	0.0~300.0	S	10

If inverter satisfy sleep frequency and pressure condition more than detection time P20.63, then inverter will enter sleep state.

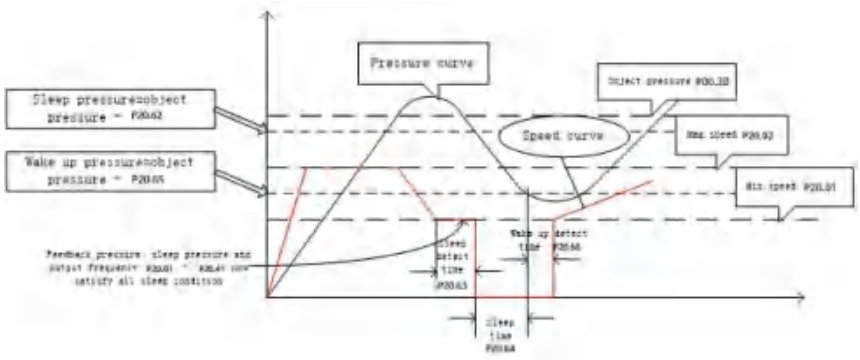
Par. No.	Name	Range	Unit	Default
P20.64	minimum sleep time	0.0~1800.0	S	300

When inverter enter sleep state, it will sleep at least time P20.64,then inverter will try to check wake up condition.

Par. No.	Name	Range	Unit	Default
P20.65	wake up pressure threshold	0.00~100.00	%	10
P20.66	wake up detection time	0.0~60.0	S	1

If feedback pressure < object pressure - P20.65 more than detection time P20.66,then inverter will wake up and run again.

About the detail speed and wake up logic, please refer the picture below:



Sleep and wake up description

Attention: pump application use steps:

a. Set P00.03=1 (enable Pump function).
b. Set one DI terminal function (P02.05~P02.10)to 64
c. Set parameters Group 20 based on application request. If customer want use sleep function, please set P20.60=1.
d. Ensure Drive is in remote mode, set DI terminal(which function set to 64) to active, then Pump function start running
e. Pressure unit description: all the pressure relative parameter (P00.30,P20.62,P20.65) units are percent(%),100%=the pressure sensor maximum feedback. Example : if the pressure sensor signal is 4~20MA,and the measure range is 0~1Mpa, first you need set AI2 as pressure feedback source(P04.00=2) and change AI2 input range(P03.14=4 and P03.15=20),then if you set P00.30=40%,it means the object pressure is 0.4Mpa.
f. About the sleep and wake up condition details, please refer picture above: only two sleep conditions(output frequency and feedback pressure) are satisfied, then sleep state can be active.

2.5 Application Quick Guide

Normally a Control Unit or a keypad is needed to achieve the applications together with Power Unit. Please refer to ‘Chapter 6: Application Quick Guide for SA710’

2.6 Fault Handling: Warning, Alarm and Error

2.6.1 List of the Faults

SA710 classify the Faults into 3 categories: Warning, Alarm and Error and they can be shown on the keypad with defined codes.

Warning is for faults close to design limit and parameter set limit, but with which the product can continue to work under a designed control or the product can suspend and recover automatically when the anomaly disappears. Customer can monitor the specific warning information via keypad or communication bus. On an LED keypad, the warning will be shown as ‘u.XX’. ‘u’ means warning, ‘XX’ represents the code of the fault. On an LCD keypad, the warning information will be shown in normal language.

Alarm is for faults which could damage the product or other equipment in short time so that the product must be disabled from the system immediately. When an alarm is triggered, a ‘reset’ operation must be taken by a command for keypad or from the upper controller before the product can run again. On an LED keypad, the alarm will be shown as ‘A.XX’. ‘A’ means alarm, ‘XX’ represents the code of the fault. On an LCD keypad, the alarm information will be shown in normal language. To eliminate some of the faults, customers must power down the product and do debug or test on part of the circuits. For this type of faults, SA710 afford lock function and when the fault is triggered it will be locked. The locked fault cannot be reset until a power down-power on cycle is operated and the reason for fault is cleared. This type of faults is called locked-fault. All locked-fault will be treated as ‘alarm’ as well. Customer can disable the lock function for some of the locked-fault by setting P05.30=0. Doing this, the customer must be very careful and be responsible for the safety.

Error is for mis operation from the customer, e.g. trying to change a parameter value via Keypad which is not allowed to change. An Error will be shown as ‘Er. XX’ on an LED keypad. The product will continue to run and the Error will not be logged.

Below is the list for all the faults.

Warning	Alarm	Error	Fault Name	Reason Description	Suggested Handling
	A.01		Factory Reset	Parameters reset to factory defaults without confirmation	Press "STOP “key to Confirm
	A.02*		Internal Fault		Contact our local support
u.03	A.03*		PU CU communication time out	PU Failed to communicate with CU	1. Power off, then confirm the installation between PU and CU 2. Contact our local support
	A.04*		Power Board 24V Error	Internal Hardware fault	1. Confirm no problem in external load to 24v 2. Contact our local support
	A05*		Gate drive voltage fault	Internal Hardware fault	
u.07	A.07*		Fan Fault	Too much dust on the fan or the fan is aged	Clean or replace the fan
u.08			Fan2 Fault	Too much dust on the fan or the fan is aged	Clean or replace the fan
	A.16*		Short Circuit	Short circuit between phases of motor	Check the motor cable and motor insulation status

Warning	Alarm	Error	Fault Name	Reason Description	Suggested Handling
u.17	A.17*		Earth fault	Flashover or short circuit between output phases and ground	1.Check cable or motor phase to ground insulation status 2.Replace cable or motor
u.19	A.19*		Brake resistor short-circuit	Brake resistor is short circuit(22kW and below)	Check the wire of brake resistor or Replace Brake resistor
u.20	A.20*		Brake transistor short-circuit	Brake transistor is damaged(22kW and below)	Contact our local support to repair
u.21	A.21*		Brake Detect	Brake resistor is not connected or working.	Check the Brake resistor or replace suitable Brake resistor
u.23	A.23		Over Current at low voltage	Over current due to that power supply voltage dips too much	Check the Power supply
u.24			Under Voltage	Power supply voltage dips too much, or high load to too low power supply voltage	Check the Power supply
u.25	A.25		Overload at low voltage	High load at continuous low power supply voltage	Check the Power supply
u.26	A.26*		Mains Phase Loss	Missing phase on supply side	1. Check the Power supply
u.27	A.27		KEB fault	KEB function triggered but failed to hold the DC voltage at power supply voltage drop, due to too less inertia or two long time for power supply voltage drop.	1. Check the Power supply 2. Set suitable KEB Threshold voltage
	A.28*		Motor phase U missing	1.motor phase imbalance 2.motor cable loose	Check the motor phase cable and motor.
	A.29*		Motor phase V missing		
	A.30*		Motor phase W missing		
u.36	A.36		Over Voltage	1.The input voltage is too high; 2.The motor works in generator mode; 3.The deceleration time is too short; 4.The braking unit and braking resistor are not installed.	1.Check the power supply 2.Use brake resistor or energy feedback unit to consume or use up the generate energy 3.Adjust relative parameters to avoid the motor working in generator mode
u.37	A.37		IGBT Over Temperature	Too high load or the cooling condition beyond the specification	1.Check the load 2.Check the cooling condition, include to clean the airduct or replace the fan

Warning	Alarm	Error	Fault Name	Reason Description	Suggested Handling
u.38	A.38		IGBT Temperature Sensor Error U		
u.39	A.39		IGBT Temperature Sensor Error V		Contact our local support to repair
u.40	A.40		IGBT Temperature Sensor Error W		
u.41	A.41		Rectifier Temperature High	Too high load or the cooling condition beyond the specification	1. Check the load 2. Check the cooling condition, include to clean the airduct or replace the fan
u.42	A.42		Rectifier Temperature Sensor Error		Contact our local support
u.43	A.43		Power Board Over Temperature	Too high load or too high ambient temperature	1. Check the load 2. Check the cooling condition, include to clean the airduct or replace the fan
u.45	A.45		Over Current	1. Motor parameters and/or motor control parameters are not set appropriately; 2. The power size of inverter is too small comparing to the motor or the load 3. The power supply voltage is too low; 4. The inverter failed to catch a spinning motor at fly	1. Adjust relevant parameters 2. Select inverter with higher power rating 3. Check the power supply voltage 4. Contact our local support
u.46	A.46		Drive Overload	1. Too heavy load or too low power supply voltage 2. The power size of inverter is too small comparing to the motor or the load 3. Motor parameters and/or motor control parameters are not set appropriately;	1. Correctly set relevant parameters especially the motor parameters 2. Select inverter with high power rating. 3. Contact the local distributor
u.48	A.48		Motor Over Temperature	1. Too heavy load on the motor 2. Cooling condition for the motor is not good enough 3. Thermistor for motor temperature sensing is not used correctly	1. Check selection/installation of the thermistor for motor temperature sensing 2. Check the cooling conditions for motor 3. Check the load versus rated power of the motor

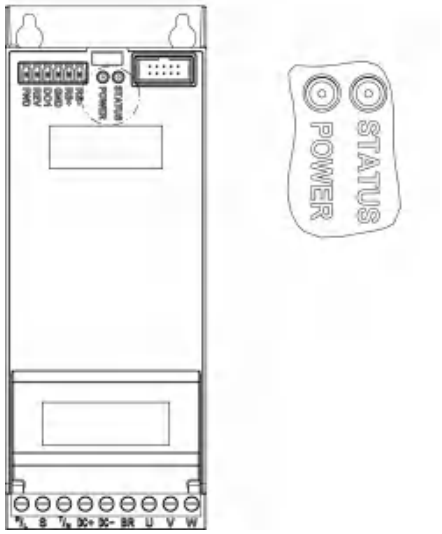
Warning	Alarm	Error	Fault Name	Reason Description	Suggested Handling
u.49	A.49		Motor Overload	1. Motor parameters and/or motor control parameters are not set appropriately; 2. Too heavy load on the motor	1. Correctly set relevant parameters especially the motor parameters 3. Check the load versus rated power of the motor
u.50	A.50		Current Limit	Current exceeds the parameter set max. current (P05.07) due to: 1.Too heavy load comparing to the power size of the inverter 2.Too fast ramp with inertia 3.Too low power supply voltage 4.Motor parameters and/or motor control parameters are not set appropriately;	Adjust P05.07 or try A.45 solution
u.51	A.51		Torque Limit	Torque exceeds the parameter set max. torque (P05.04/P05.05).	Adjust P05.04/P05.05 or try A.45 solution
u.57	A.57		Analogue input terminals Error	1. Wire connection problem 2. The parameters for AI1/AI2 live zero are not correctly set	1. Check the wire connection 2. Adjust the relevant parameter setup
u.61	A.61		Encoder Error	1. Encoder Wire connection problem 2. Encoder rotation direction is reverse 3.Parameter Encoder resolution P02.70 is incorrect 4.motor parameters or speed close loop PID parameters are not set appropriately 5.the value of Parameters P05.20 and P05.21 is too small	1. Check the encoder wire connection 2. Change Parameter P02.71 3. Correctly set P02.70 4. Adjust motor relative parameters or speed close loop PID parameters 5. Increase P05.20 and P05.21 appropriately
u.62	A.62		Local Bus Communication Timeout	Drive communication timeout (with external controller PC/PLC/HMI etc.) 1. External controller abnormal 2. RS485 communication line connection problem 3. communication Parameters(P00.8X)	1. Check external controller PC, PLC, HMI etc. 2. Check RS485 communication line connection 3. Correctly set communication parameters(P00.8X) 4. Wiring the communication cables correctly, including shielding and grounding

Warning	Alarm	Error	Fault Name	Reason Description	Suggested Handling
				incorrect. 4.EMC problem.	5. Contact our local support
u.63	A.63		Communication Expansion Card Communication Control Word Timeout	1. Abnormal operation of the host computer 2. Abnormal communication wiring 3. Incorrect communication parameter settings 4. EMC problem.	1. Check the host computer program 2. Check the communication connection cable 3. Correctly set communication parameters 4. Use shielded cables or seek technical support
u.66			Motor Loss	Motor cable connection or motor problems;	Check motor cable or motor phase
	A.69		Mechanic Brake Current Low	Actual motor current cannot exceed release brake current (P01.97~P01.98) within start delay time.	Correctly set mechanical brake parameters(P01.97~P01.98)
u.75			Drive License Timeout	Drive License Timeout function activated	Contact our local support
u.76	A.76		External alarm	DI terminals select external alarm function	Check external alarm source
		Er.90	CU communication Timeout	CU Failed to communicate with PU	1. Power off, then confirm the installation between PU and CU 2. Contact our local support
		Er.93	Parameter change disabled	1. They keypad was locked when changing the parameters 2. parameters over the range	1. Deblock the keypad 2. Set the parameters correctly
		Err	Parameter change disabled	The parameter cannot be changed when Drive running	Change the parameter after Drive stop
	A.99		AMA Error	Failed to finish the motor parameter auto tuning	Correctly set motor parameters according to motor nameplate

Note: The Alarms marked with '*' are locked-faults.

2.6.2 How to Get the Fault Info

For Power Unit PU00, the customer must get the fault information by connecting a keypad or installing a Control Unit with keypad (e.g. CU00/CU0H), or get the fault information via the RS485 on the Control Unit. However, PU01 can support more in addition to what PU00 does. AS shown below, PU01 affords a RS485 port which can be used for fault information as well as control. PU01 also has two LED lights to show the status of product.



The meaning of the PU01 LED lights is described as below:

LED Name	Color	Reponses	Meaning
POWER	Green	Always On	Powered and power supply ok
		Always Off	Not power, or problem in power supply
STATUS	RED	Always Off	Product is OK
		Flashing	Warning with Fault
		Always On	Alarm with Fault

2.7 Maintenance

The parts of product could be impacted by the environment temperature, humidity, vibration, salt mist, dust etc. Proper maintenance of the product during storage and running is important to keep the product from failure and life reduction.

2.7.1 Routine Inspection

Below items should are suggested for routing inspection:

Any abnormal sound from the motor during running?

Any abnormal vibration from the motor during running?

Is there any special change in the installation environment?

Are the cooling fans running ok?

Check the temperatures inside the product via the parameter group 9

Check the motor voltage, current and frequency

Is there any special dust, e.g. metal dust or corrosive liquid?

2.7.2 Maintenance

According to the application, customer can check the product at a regular interval, e.g. every 3~6 months to clear the hidden problem.

Items for Maintenance	Measures
Control terminals loose?	Fasten the screws with a torque-controlled screw driver if loose
Power terminals loose	Fasten the screws with a torque-controlled screw driver or socket wrench if loose

Items for Maintenance	Measures
PE terminals loose?	Fasten the screws with a torque-controlled screw driver or socket wrench if loose
Fixation of the product loose?	Fasten the screws with a torque-controlled screw driver or socket wrench if loose
Control wire or power cable worn?	Replace the wire or cable
Air duct blocked?	Clean the air duct
Fan speed too low or blocked?	Clean or replace the fan

Caution:

Please power off the product and wait for enough time to ensure safety before maintenance;

Avoid dropping any screws, wire lead and other metal materials inside the product, otherwise it could be damaged when power on;

It is forbidden to do any change inside the product.

2.7.3 Wearing parts

The wearing parts mainly include the cooling fan, DC capacitors and relays. The lifetime is very depending on the running environment and conditions. Good environments and operational maintenance can help to keep the life time of the product including: keeping the product in a low temperature environment, clean the air channels of both the product and the cabinet, check and clean the fan etc. Information for checking the main wearing parts is listed below. If possible, please replace the wearing part whenever abnormal case is found to avoid any further loss.

Parts	Life Time	Reason for EoL	Judging Methods
Cooling Fan	4 to 5 years	Wearing out of Bearing Aging of the blades Oil/dirt contamination or foreign body obstruction	Visual inspection (no rip on the blades, speed in normal range) No abnormal sound during running
Aluminum Electrolytic Capacitor	4 to 5 years	High temperature Low grid voltage or unbalance Heavy load	Check the capacitance Check the insulation impedance Visual inspection (No liquid out, no deformation, no open on the exhaust valve)
Relays	50 to 100 thousand of times	Operate frequently often Impact from dirt or corrosive gas on the contactors	Whether the resistance across the contactors is in the right range at open and close status

2.7.4 The storage and transportation of product

The product should be stored inside the package before installation. Below items are demanded for storage:

In a dust free and dry environment;

Storage temperature: -25℃~65℃;

Storage humidity: 5%-95% and no condensing;

Storage in environment without corrosive gas or liquid;

Put on shelf away from the ground with package;

Transportation ambient temperature: -25℃~70℃;

Transportation ambient humidity: below 95%

Caution: It’s inadvisable to store the product for longtime due to electrolytic capacitors inside. If you DO need to store the product for long time please follow bellow rules:

Power the product every 6 months for more than 5 hours in a special way

Power the product before the first time running in a special way

The special way to power the product means to power the product with a voltage and current controlled supply and increase the voltage slowly, normally with a voltage regulator.

Power the product directly to high voltage after long time storage could explode the electrolytic capacitors.

2.7.5 Scrapping of the product

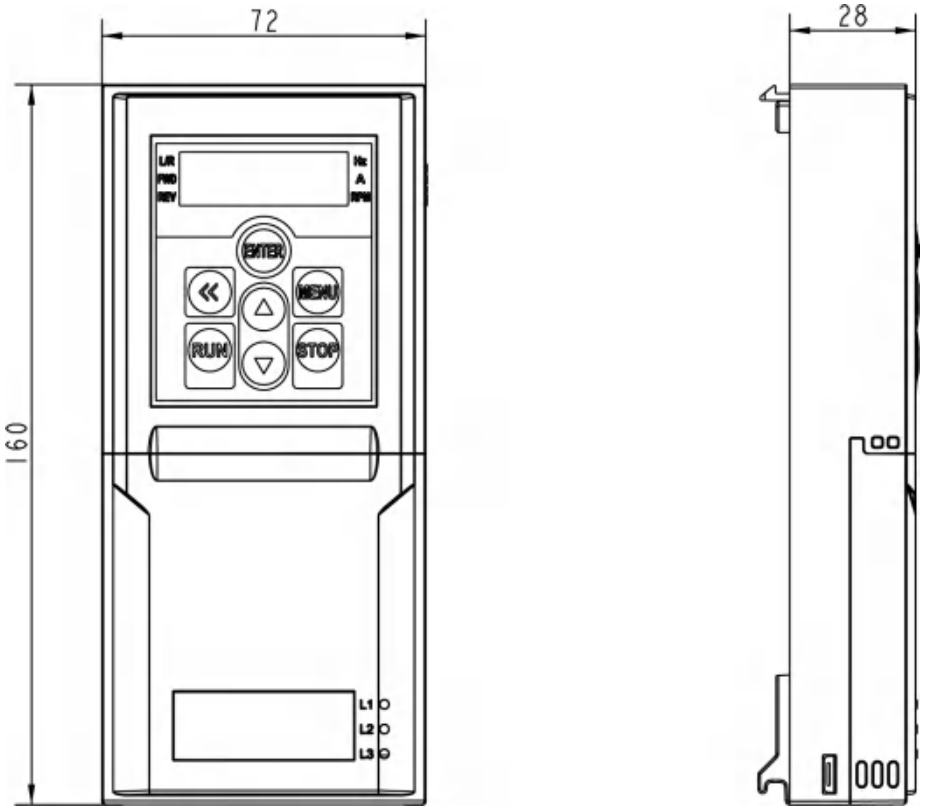
Materials used in the product are recyclable to save resource and protect the environment. For example, the package material is biodegradable and recyclable. All the metal parts can be recycled as well as the plastic and rubber. Scrapping the Printed Circuit Board and electrolytic capacitor should follow standards IEC62635. All the handling for scrapping of the product should follow the local regulations.

Chapter 3 Operation Instruction for SA710 Control Unit

3.1 Mechanic and Electric Installation

3.1.1 Outline Dimensions

▼ CU00/CU0H/CU0L SIZE



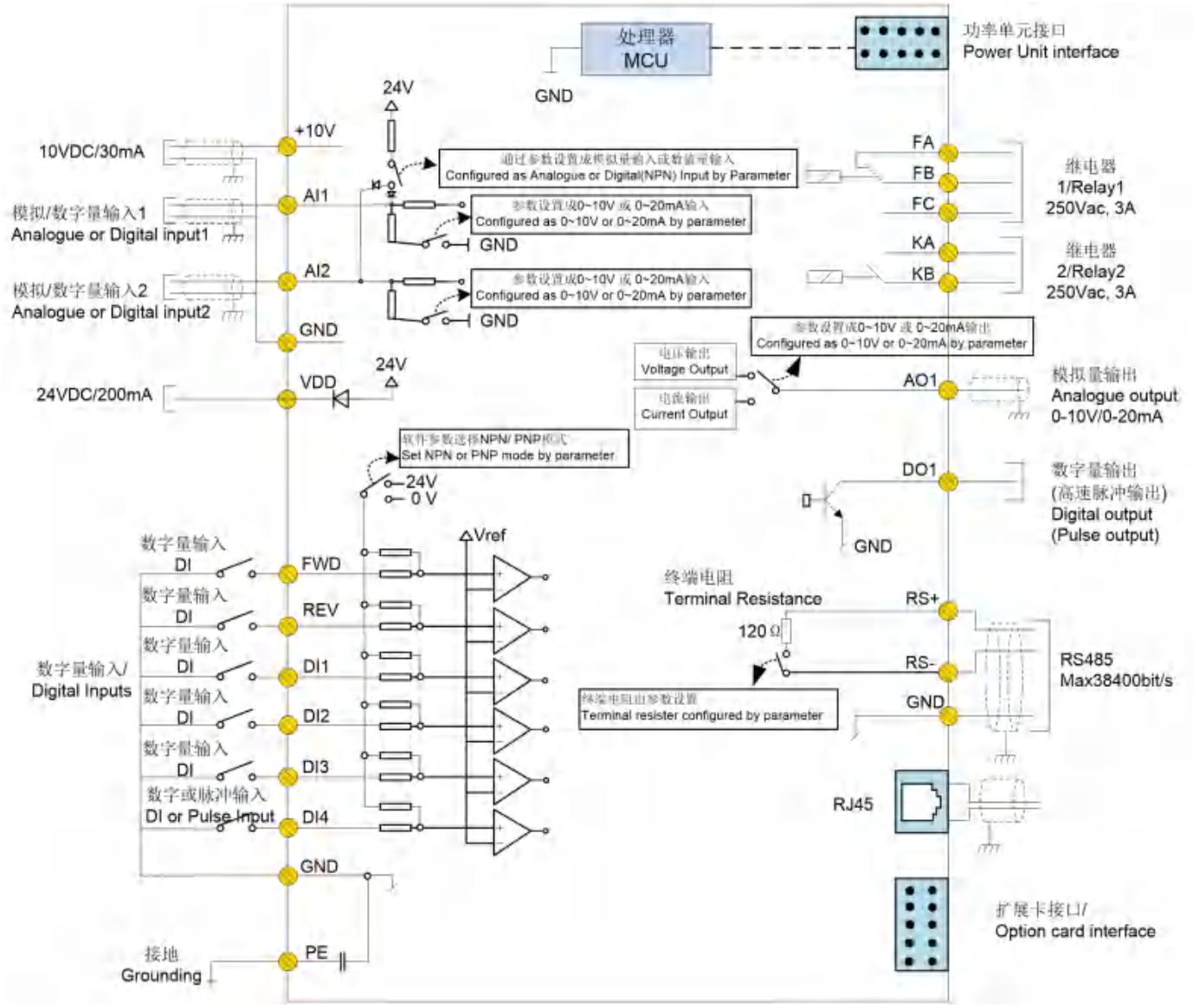
3.1.2 Install to and Dismount from the Power Unit

Please refer to 1.6.2. Please make sure that the bottom of the Control Unit has been clipped into the Power Unit slot before rotate the CU.

3.1.3 Control terminals of Control Unit

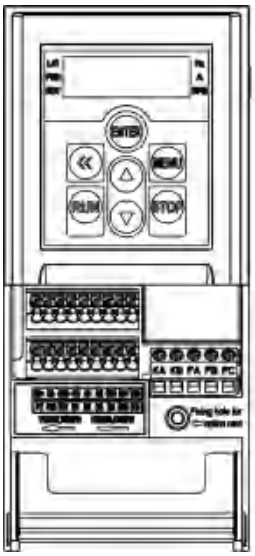
3.1.3.1 Electrical Diagram of Control Unit

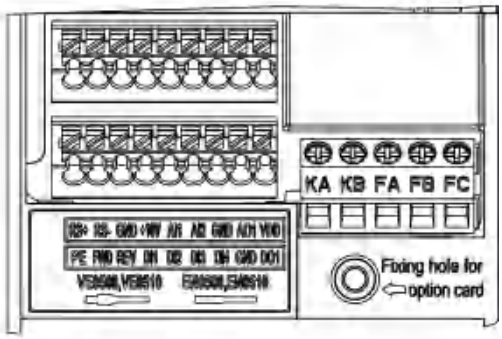
▼ The electrical diagram of CU00/CU0H/CU0L:



3.1.3.2 Specification of the terminals:

▼ CU00/CU0H/CU0L:





Specification of the terminals:

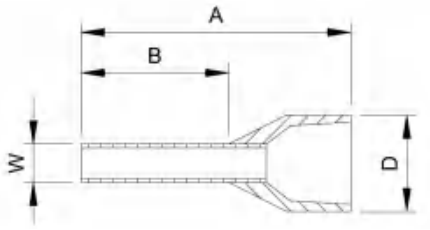
Name	Function	Specification
FWD, REV, DI1, DI2, DI3, DI4	Digital inputs	Input type: NPN PNP Input Voltage: 0~30V; Input Impedance: 3.6KΩ; DI4 can be configured as pulse input
DI4	Pulse Input	Frequency Range: 0.00~100.00kHz; Power Supply Range: 24V ± 20%; Duty Cycle Range: 40%~60%;
DO1	Digital Output	Output type: Open Collector; Output Current: 0~40mA; Output Voltage: 0~30V; Can be configured as pulse output: Load Capacity: Resistive>1kΩ, capacitive <10nf; Frequency Range: 0.00~100.00kHz; Duty Cycle Range: 40%~60%;
RS+, RS-	RS485 Communication	Max Baud Rate: 38400bit/s; Configurable termination resistor, open in default
FA-FB-FC(Relay1) KA-KB(Relay2)	Relay Output	Resistive Load: 250VAC 3A/30VDC 3A; Inductive Load: 250VAC 0.2A/24VDC 0.1A (cosφ=0.4); FA-FB-FC(Relay1),FB is the common contact ,FA/FB is the normally closed contacts,FB/FC is the normally Open contacts; KA-KB(Relay2) is the normally Open contacts;
AI1, AI2	Analogue Inputs	Configurable as analogue voltage inputs, analogue current inputs as well as digital inputs. 1．As Analogue Voltage Inputs: Input Impedance: 10kΩ; Input Voltage Range: 0~10V; 2．As Analogue Current Inputs: Input Impedance: ≤500Ω; Input Current Range: 0~20mA; 3．As Digital Inputs: a) Input Type: NPN PNP b) Input Impedance: 10kΩ; c) Input Voltage Range: 0-30V
AO1	Analogue Output	Configurable as analogue voltage output or current output Output Range: 0~10V or 0~20mA; Load Capacity: As Voltage Output: Impedance > 500Ω;

Name	Function	Specification
		As Current Output: Impedance < 500Ω;
VDD	24V Power Supply	Max 200mA
+10V	10V signal power supply	Max 30mA
GND	Signal Ground	
PE	Safety Ground	
Other Terminals:		
Connector for Option Card		Support one option card of different types, at the bottom of the Control Unit
Connect for External Keypad		RJ45 for external keypad, at the top of right side of the Control Unit

3.1.3.3 Guidance for Connecting Wires

Except for the relay outputs, Spring-Clip terminals are used for all the control signals.

Tope type terminal is recommended for the control wires with specification as below:



A	B	D(max)	W
14	8	3.5	1.4

Units:mm

Wire diameter specification:

Type	Minimal Diameter	Maximal Diameter
Single Conductor	0.52mm^2	0.82 mm^2
Multi-folded Wire	0.52mm^2	0.82 mm^2
Connector Lug	0.52mm^2	0.52mm^2

Push the wire tube into the terminal directly and the wire will be clamped automatically by the terminal spring;

To remove the wire, use a slot type screwdriver to push down the lock on the terminal then the wire will be released. The specification for the head of the screwdriver: Thickness 0.4mm, width 2.5mm;

Ideal length for the wire stripping is 9mm.

Screw fasten terminals are used for relay output:

Please select the right screwdriver to fasten the terminals. If a slot type screwdriver is used, below specification is recommended: head width 3.5mm, head thickness 0.6mm;

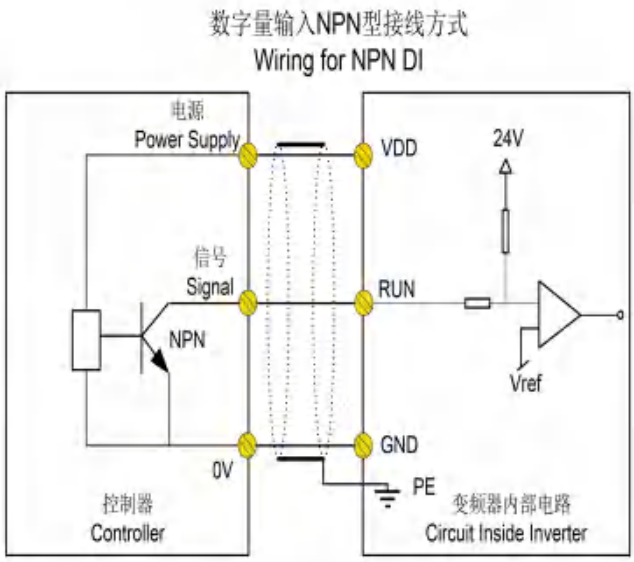
Ideal length fir wire stripping is 6~7mm;

Diameter specification for wires:0.4~1.0mm^2, Torque specification for fastening the terminal: 0.4 N·m;

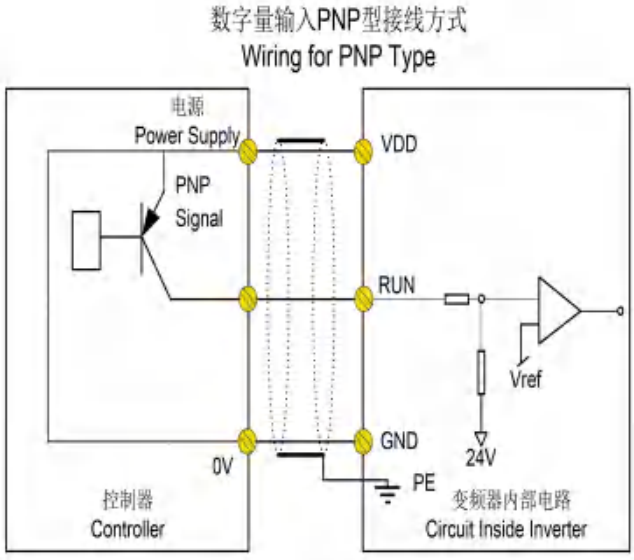
3.1.3.4 Electrical connection for Digital Inputs

SA710 Control Unit CU00/CU0H/CU0L supports both NPN and PNP inputs.

For NPN inputs, below connection is recommended:

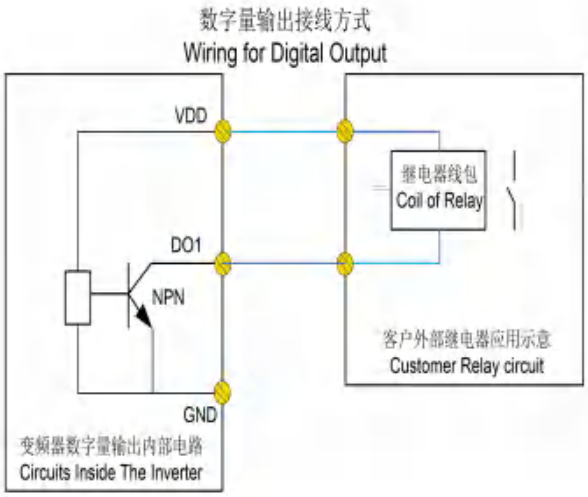


For PNP inputs, below connection is recommended:



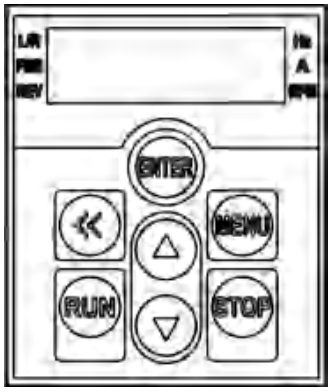
3.1.3.5 Electrical connection for Digital Outputs

Below connection is recommended to use Digital output to drive relay:



3.2 Keypad Operation Guidance

The keypad built in CU00/CU0H/CU0L can be used for parameter set/read, control and monitoring etc. Below shows the appearance of the keypad.



CU00/CU0H/CU0L

The product has two different running modes: Local Mode and Remote Mode.

- Local Mode: The product is controlled by keypad, including start/stop and target frequency set etc.
- Remote Mode: The product is controlled by I/O terminals or communication Bus, keypad is only for monitoring and parameter setup.
- Description of the lights on keypad

L/R Light: To indicate the mode of the product, Always On --- Remote Mode, Flashing --- Local Mode.

FWD、REV Lights:

FWD	REV	Status
On	Off	Running in Forward Direction
Off	On	Running in Reverse Direction
Off	Off	Stopped

Hz、A Lights: To indicate the physical meaning and units of the data displayed, please refer to 3.2.2.

- Display

Total 5 Digits of LED to show the set value, output frequency and running data, warnings and alarms etc.

- CU00/CU0H/CU0L keypad Keys:

Key Name	Function
<<	in home display, Press to switch the physical variables shown; in parameter number selection, Press to switch the digit place of the parameter number to be modified; in parameter value modification, Press to switch the digit place of parameter value to be modified
STOP	Press to control the product stop when product is in Local Mode or reset the fault (if there is alarm)
▲	Press to increase the numerical value of parameter or parameter number
▼	Press to decrease the numerical value of parameter or parameter number
MENU	Press to enter the menu for parameter setup or exit the menu
ENTER	Press to confirm the parameter number selection and enter the parameter value displaying/modification, or Press to confirm the parameter value and back to the Parameter number selection menu.
RUN	Press to control the product run when product is in Local Mode.

3.2.1 How to Set Parameter

For example:

1) Take change the parameter P01.06 rated motor current to 9.6A;

2) From home display, press the “MENU” key to enter the parameter number selection.

3) Press the “<<” key to select the digit place of parameter number you want to change and Press “▲” or “▼” key (CU0B: turn the potential meter) to adjust the parameter number to “P01.06”

4) Press the “ENTER” key (CU0B: press the potential meter) to confirm the parameter number selection and enter the parameter value

5) Press the “<<” key to select the digit place of parameter value you want to change and Press “▲” or “▼” key (CU0B: turn the potential meter) to adjust the parameter value to “9.6”

6) Press the “ENTER” key (CU0B: press the potential meter) to confirm the parameter value input and back to the parameter number selection, parameter number “P01.07” will be shown.

Repeat the operation steps 2 to 5 if more parameters need to be changed. Press the “MENU” key back to the home display

Notes:

Long Press the “▲” or “▼” key can speed up the change of numeric value;

In parameter number selection or parameter value modification, if no operation for certain period, the keypad will jump back to the home display automatically

3.2.2 Monitor the Product Status

In the default setup, the keypad will only show one of the motor frequencies, set value and motor current in home display (switchable by “<<” key). If more physical variables need to be shown in the home display, you can set the parameter P06.05. You can use the “<<” key to switch and select one of the variables defined in P06.05 and show it in the home display.

Blow table shows the meaning and how them will be shown for the main physical variables which can be defined in P06.05.

Physical Variable	Monitoring Parameter	Indication Character	LED lights Status
Output Frequency	P09.07	T	“Hz” Always On
Set Value	P09.02	N/A	“Hz” Always On "A" Always ON
Motor Current	P09.08	A	"A" Always On
Motor Voltage	P09.06	N/A	“Hz” Always On “RPM” Always On
Motor Speed	P09.04	N/A	“RPM” Always On
DC Voltage	P09.11	N/A	"A" Always On “RPM” Always On
Inverter Temperature	P09.13	N/A	“RPM” Flashing
Feedback Value	P09.20	N/A	“Hz” Always On “RPM” Flashing
Analogue Inputs	P09.24 or P09.26	N/A	“Hz” Flashing “RPM” Flashing

3.2.3 Check the Fault Log (Warning or Alarm Log)

The keypad will show the fault code when any fault is triggered. The product can log 10 latest warnings and 10 latest alarms. You can check the latest warning information via parameters P08.40~P08.49 and alarms via parameters P08.50~P08.59.

3.2.4 Comparison Table for Character Displaying

3.3 Control Unit Application Quick Guide and Notes

Control Unit needs to work together with Power Unit to achieve the main applications, please refer to “Chapter 6 SA710 Basic Application Guide”.

Notes:

For CU00/CU0L, when the product is powered on, the CPU will scan whether an option card is installed first. If yes, then external keypad cannot work, if not, an external keypad can be connected and works at any time. If both an option card and an external keypad are installed at power on, the product may not work properly.

CU0H supports an option card and an external keypad at the same time.

NEVER install or remove an option card when the product is powered on, but you can connect and disconnect an external keypad when the product is powered on.

Chapter 4 Instruction for other Options of SA710

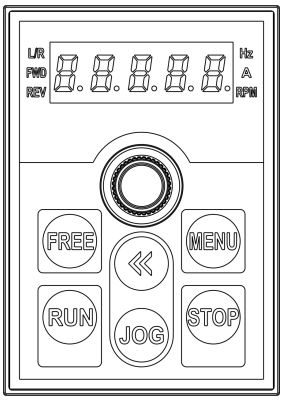
4.1 External Keypad KP01

4.1.1 KP01 connect to Control Unit/Power Unit description

Keypad KP01 is quite similar as the built-in keypad of CU00/CU0H/CU0L. KP01 can be connected to Control Unit CU00/CU0H/CU0L via the RJ45 connector with standard internet cable (refer to 1.6.3), it can also be connected to CU01 via standard internet cable or installed on CU03 directly. KP01 can also be connected to Power Units via the 10 PIN connector with standard IDC 2.54mm 10Pin flat cable (refer to 1.6.1.1). Customer can buy the cable from us or from a third party.

4.1.2 Keypad Operation Guidance

KP01 can be used for parameter set/read, control and monitoring etc. Below shows the appearance of the keypad.



The incremental digital potential meter has three functions: Increase value, decrease value, confirm value (same as the “ENTER” key in CU00/CU0H)

- Description of the lights on keypad

L/R Light: To indicate the mode of the product, Always On --- Remote Mode, Flashing --- Local Mode.

FWD、REV Lights:

FWD	REV	Status
On	Off	Running in Forward Direction
Off	On	Running in Reverse Direction
Off	Off	Stopped

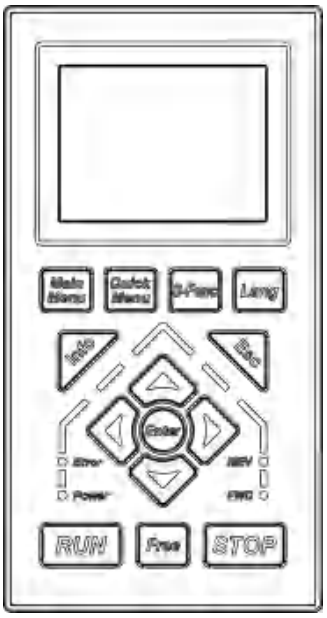
Hz、A Lights: To indicate the physical meaning and units of the data displayed, please refer to 3.2.2.

- Display :Total 5 Digits of LED to show the set value, output frequency and running data, warnings and alarms etc.
- Keypad Keys

Key Name	Function
<<	in home display, Press to switch the physical variables shown; in parameter number selection, Press to switch the digit place of the parameter number to be modified; in parameter value modification, Press to switch the digit place of parameter value to be modified
STOP	Press to control the product stop when product is in Local Mode or reset the fault (if there is alarm)
MENU	Press to enter the menu for parameter setup or exit the menu
RUN	Press to control the product run when product is in Local Mode.

Key Name	Function
JOG	Press to control the product run with jog speed when product is in Local Mode.
FREE	Customer can define the function by parameter (now this key is invalid, please refer update description in the future).
	Clockwise rotation to increase the numerical value of parameter or parameter number
	Anticlockwise rotation to decrease the numerical value of parameter or parameter number
	Press to confirm the parameter number selection and enter the parameter value displaying/modification, or Press to confirm the parameter value and back to the Parameter number selection menu.

4.2 External Keypad KP02



KP02 is, larger size and more display information (using LCD multi-line screen) than KP01,added USB / Wifi / real-time clock and other functions. Its main functions are as follows:

- Support simultaneously monitoring of multiple configurable parameters, And status bar that can display common information and status;
- support access to all parameters of inverter, And added the quick parameters, Allows users to create custom order and quantity parameter tables;
- Support text display in multiple languages, For example, a text description of the parameter options, Description of fault cause and handling countermeasures, etc.;
- Support USB update firmware, import and export parameter copy file and import customized startup logo;
- Support remote control of inverter through WIFI;
- Support more detailed historical alarm / warning record, Record contains the timestamp of fault and the value of critical parameters;
- Support parameter copy, and parameter copy files support import / export through U disk;
- Supports free keys with configurable functions;

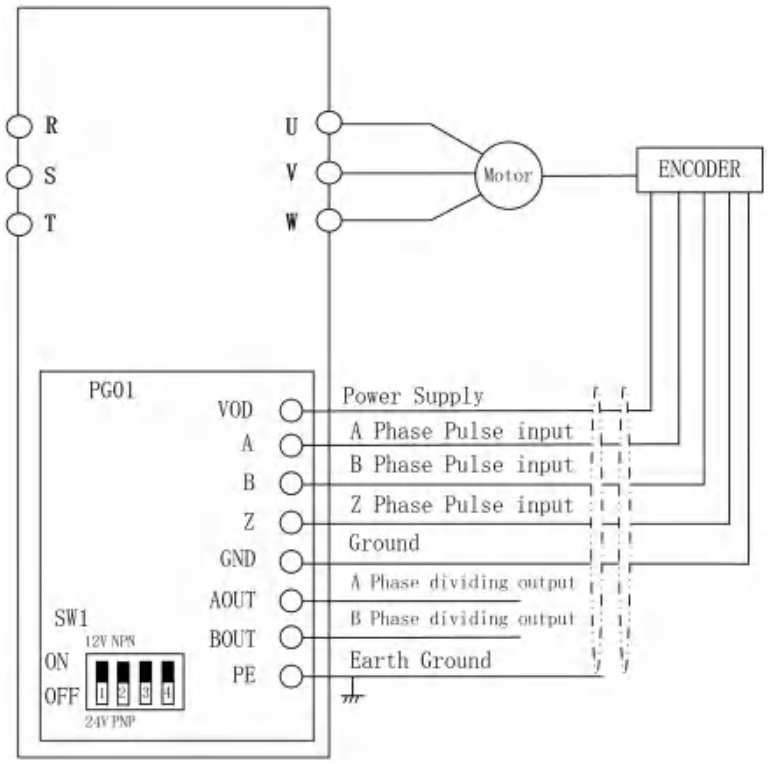
It maintains compatibility with various power units and control units, The same electrical and protocol;
interfaces are used. Refer to the KP02 operator manual for further details.

4.3 Speed Sensor Option Cards

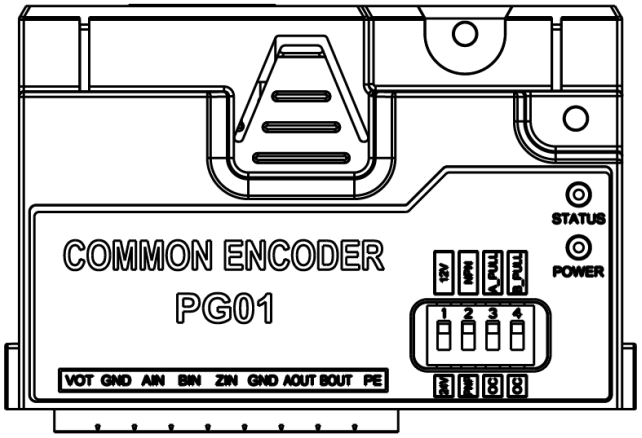
SA710 Control Units support different types of PG cards, please refer to 1.3.2. More information will be will be available after released.

4.3.1 PG01 Common Mode Encoder

▼ Electrical Diagram:



▼ Appearance and specifications:

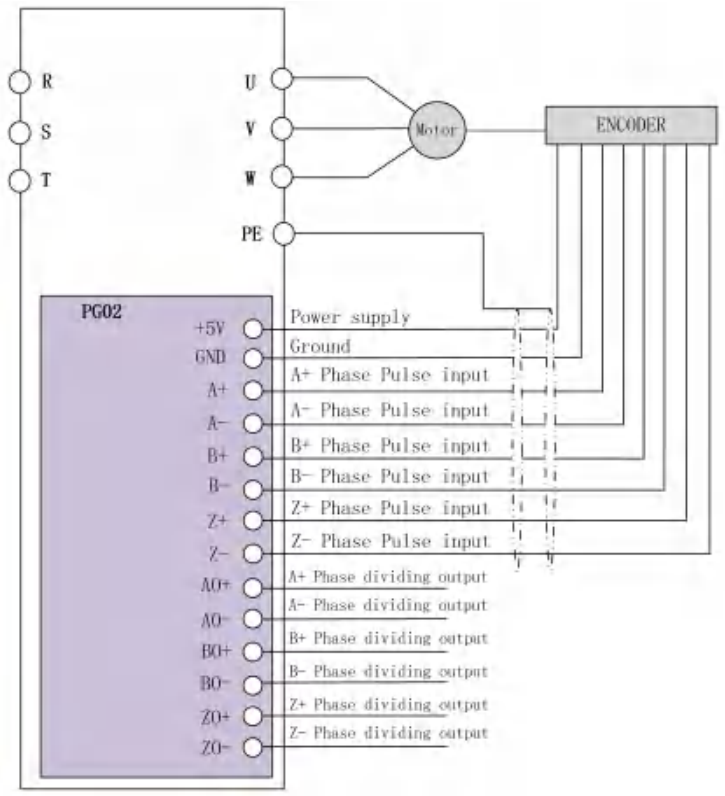


Terminal name	Function	Specification
AIN/BIN/ZIN	Pulse Input Signal	Maximum input signal 50KHz; Acceptable encoder input type: Push-pull output type; Voltage output type; Open collector output type;
AO/BO	Frequency division output signal	The frequency output division set by parameter, the arbitrary frequency division range is 0~255.

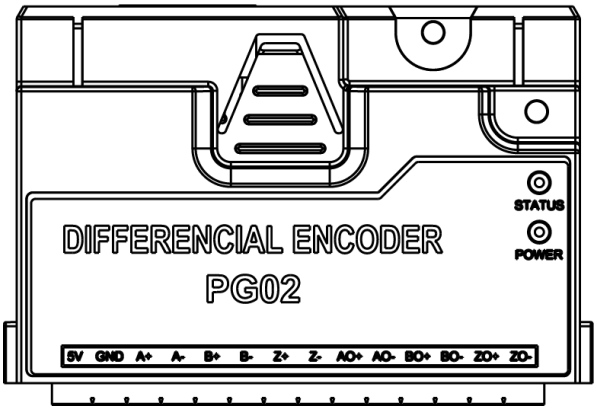
Terminal name	Function	Specification
VOD	Encoder power supply	Select 12V or 24V through the DIP switch, the default is 24V; Power output accuracy:24V(12V) +/-10%; Maximum output current 150mA;
GND	Internal power ground	
PE	Safety Ground	
DIP switch SW1	SW-1 Power selection switch	OFF:24V default ON:12V
	SW-2 Encoder mode selector switch	OFF:(Push-pull type、Voltage type) default ON: (Push-pull type、Open collector type)
	SW-3 Frequency division output A phase pull-up selection	OFF: No pull-up, open collector output default ON: Pull up to VOD
	SW-4 Frequency division output A phase pull-up selection	OFF: No pull-up, open collector output default ON: Pull up to VOD·
Status light		Description
STATUS	Fault status indicator	Red light is always on: fault Red light is off: normal or not powered
POWER	Power Indicator	The green light is always on: Power indication is normal The green light is off: the power is off or the power is abnormal.

4.3.2 PG02 Differential Mode Encoder

▼ Electrical Diagram:



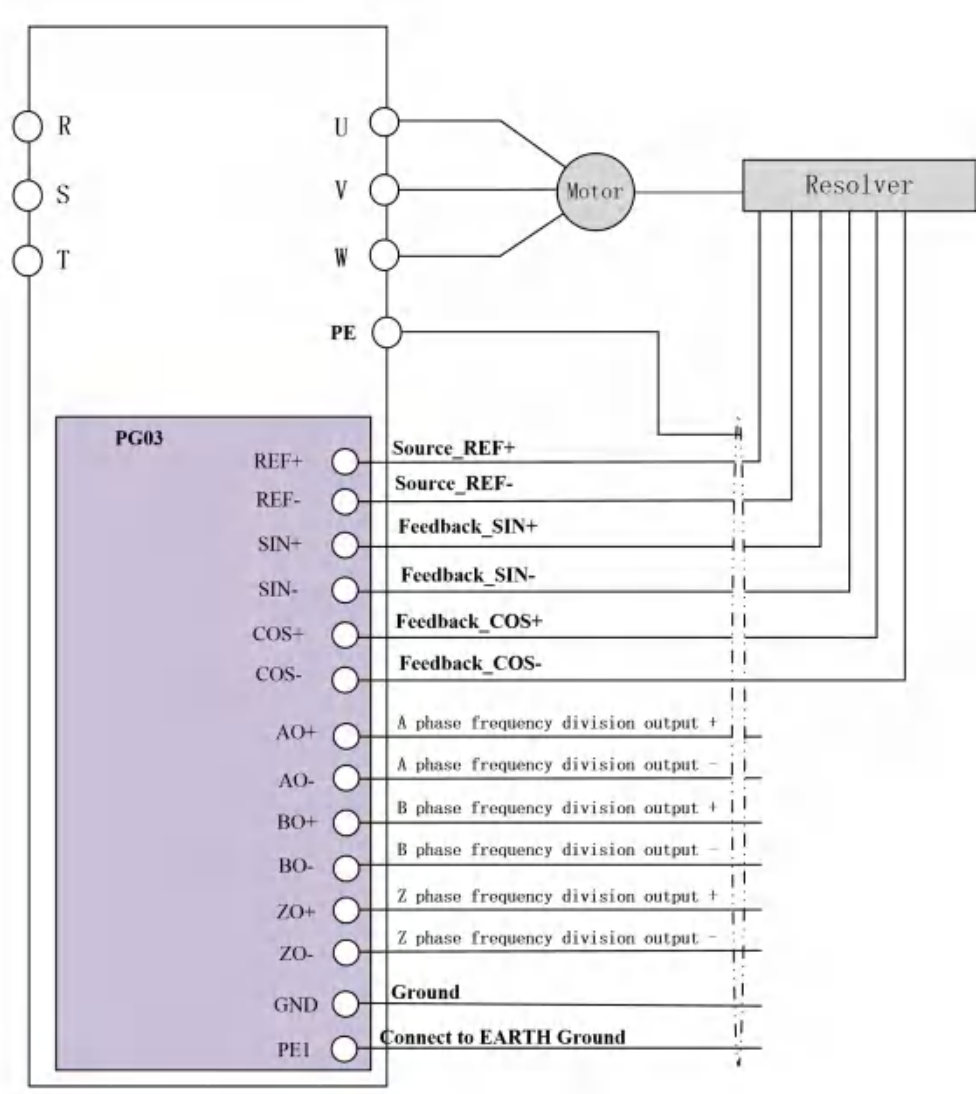
▼ Appearance and specifications:



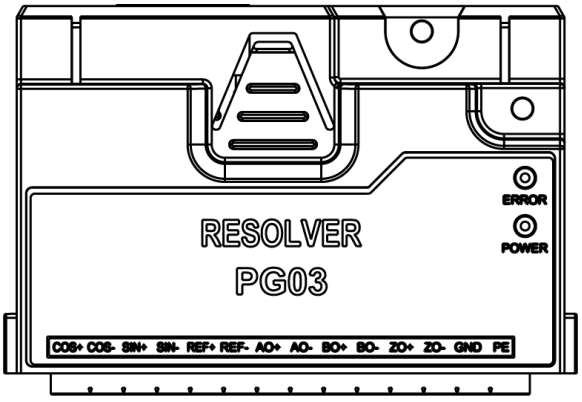
Terminal name	Function	Specification
A+/A-/B+/B-/Z+/Z-	Pulse input signal	Maximum input signal 200kHz; Acceptable encoder input model: Differential incremental encoder input;
AO+/AO-/BO+/BO-/ZO+/ZO-	Frequency division output signal	The frequency division output coefficient is set by software parameters, frequency division range is 1-255.
VOD	Encoder power supply	5V power output;+/- 4%; Power supply accuracy:5V+/- 4%; Maximum output current 150mA;
GND	Internal power ground	
PE	Safety Ground	
Status light		Description
STATUS	Fault status indicator	Red light is always on: fault Red light is off: normal or not powered
POWER	Power Indicator	The green light is always on: Power indication is normal The green light is off: the power is off or the power is abnormal.

4.3.3 Resolver AD-PG03

▼ PG03 Wiring diagram



▼ Appearance and specifications:



Terminal name	Function	Specification
REF+/REF-	Resolver Source	Resolver input voltage:VRMS:7V Resolver input frequency:10KHz/20KHz Resolution:12bit
SIN+/SIN- COS+/COS-	Resolver input signal	

Terminal name	Function	Specification
AO+/AO-/BO+/BO-/ ZO+/ZO-	Frequency division output	Frequency division output signal type: Differential output. Amplitude:5V; Frequency division coefficient:1
GND	Internal Ground	
PE	Connect to earth Ground	
Status light		Description
STATUS	Fault status indicator	Red light is always on:communication between the PG03 and CU is abnormal Red light twinkle:internal fault of the PG card Red light is off: normal or power is off
POWER	Power Indicator	The green light is always on: Power indication is normal The green light is off: the power is off or the power is abnormal.

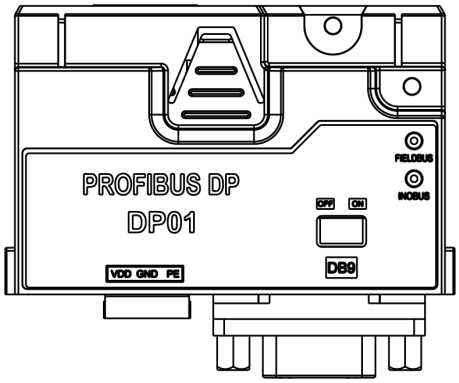
Note: in using of AD-PG03 should be set P02.70=1

4.3.4 Parameters for Speed Sensor Cards (PG01/PG02/PG03)

Parameter Number	Parameter Name	Value Range	Unit	Default Value
P02.70	Encoder resolution	0~4096		1024
P02.71	Encoder rotation direction	0:clockwise 1:anticlockwise		0
P02.72	Encoder Frequency dividing Output Factor	1~255		1
P02.74	Frequency Selection for Excitation Source (resolver)	0:10 1: 10.87 2: 11.63 3: 12.82 4: 13.89 5: 15.63 6: 17.24 7: 20	kHz	0
P05.19	Motor Speed Feedback Loss Function	0:invalid 3:jog operation 4: speed limit operation 5:Failure and trip 11:open loop operation		5
P05.20	Motor speed feedback interrupt detection threshold	1 ~ 600	rpm	300
P05.21	Motor speed feedback interrupt detection time	0.00 ~ 60.00	s	0.05
P09.37	Speed Feedback from Encoder			

4.4 Bus Communication Option Cards DP01/PN01/ET01/MT01/IO01

4.4.1 ProfiBus DP Option Card - DP01



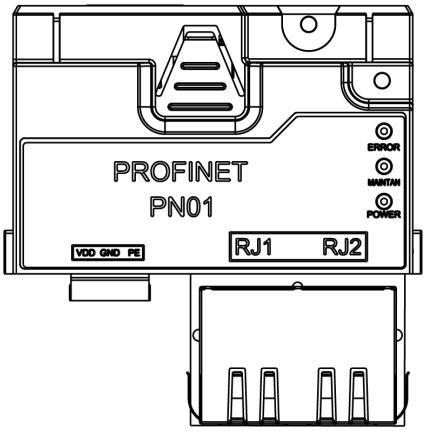
Features:

- Automatically identify the bus baud rate, baud rate range: 9.6 kbps~12Mbps;
- Maximal 32 nodes (including host) can be connected to the bus without repeaters; A maximum of 122 nodes (31 nodes per segment + 1 repeater) are supported with repeaters;
- Compliance with EMC standard EN 61800-3:2004;
- Supports data exchange of both DPV0 and DPV1 with the master station;

The DP01 affords two status indicators to monitor the communication status and a switch to select the termination resistor on the bus. The functions are shown as in below table.

Led/Switch	Status	Description
INOBUS	Green light always on	Communication with CU is OK
	Red light always on	Connection with CU is on establishment or failS
FIELDBUS	Green light always on	Bus communication is OK
	Red light always on	Bus communication failS
Switch for termination resistor selection	ON	Terminal resistor ON
	OFF	Terminal Resistor OFF, Default

4.4.2 ProfiNet Option Card – PN01



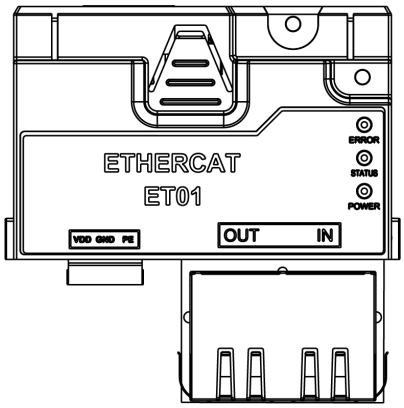
Features:

- Baud rate reaches 100 Mbit/s, supports IO and RT communication;
- Supports all types of topology: chain, bus, tree or star.
- Installed directly on the option card slot of CU, no external power supply is needed and easy to install.

The PN01 card affords three status indicators to monitor the status of the option card. The functions are shown in the table below:

Led	Status	Description
ERROR	Red light always ON	Option Cards Fault
	Red light OFF	Normal Communication
MAINTAN	Red light always on	Option Cards Fault
	Red light OFF	Normal Communication
POWER	Green light always on	Option Cards Power supply is OK
	Green light OFF	Option Cards power supply abnormal or inverter not powered up

4.4.3 EtherCAT- ET01



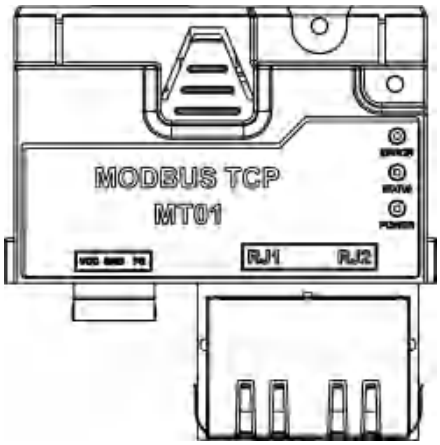
Features:

- The bus communication rate reaches 100Mbit/s, the communication cycle is short, and it supports process data communication and mailbox communication;
- Networking supports linear topology connection;
- Installed directly on the option card slot of CU, no external power supply is needed and easy to install.

The ET01 card affords three status indicators to monitor the status of the option card. The functions are shown in the table below:

Status light	Color	Description
ERROR	Red light always on	Fieldbus Communication Failure
	Red light blinking	Communication Failure Between ET01 Card and Control Unit
	Red light off	ET01 Card is Normal
STATUS	Green light always on	Bus Network Communication Normal
	Green light blinking	ET01 Card is in Pro-OP State
	Green light off	Fieldbus Communication Failure
POWER	Green light always on	ET01 Power Supply Normal
	Green light off	ET01 Power Supply Abnormal or Not Powered

4.4.4 ModbusTCP -MT01



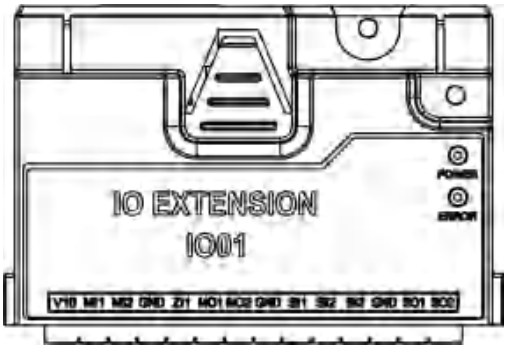
Features:

- The bus communication rate reaches 100Mbit/s, and the communication cycle is short;
- Flexible networking topology, MT01 supports a variety of types of topologies: bus type, tree type or star type, etc.;
- Support 0x03, 0x06 and 0x10 function codes;
- Support up to 6 clients at the same time.

The MT01 card affords three status indicators to monitor the status of the option card. The functions are shown in the table below:

Indicator light	Color	Status description
ERROR	Red light is always on	ModbusTCP communication error
	Red light is flashing	Internal fault
	Red light is off	Communication is normal
STATUS	Green light is always on	Communication messages in progress
	Green light is flahing	Communication messages in progress
	Gtenn light is off	No communication message transmission
POWER	Green light is always on	The expansion card is powered on normally
	Green light is off	The power supply of the expansion card is abnormal or the inverter is not powered on

4.4.5 IO Extension Option Card - IO01

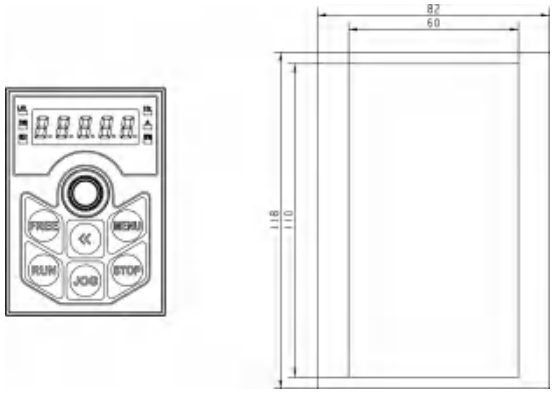


Features:

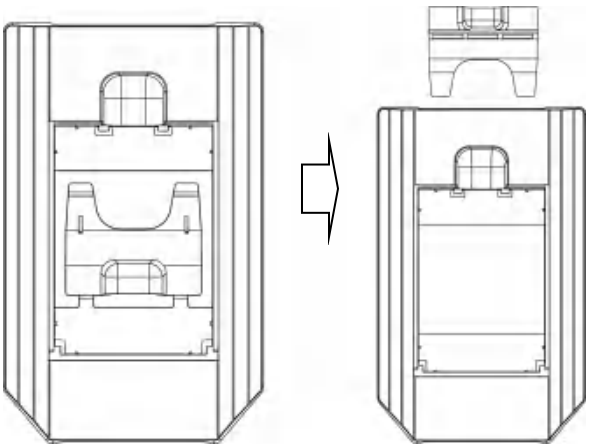
- Digital input: 3, supports PNP and NPN;
- Digital output: 2, OC output;
- Analog input: 2, 1 for -10V~+10V input, 1 for 0~10V/0~20mA input;

- Resistance input: 1, supports 0~400 ohm resistance input;
- Analog output: 2, 1 for 0~10V output; 1 for 0~20mA output;
- Analogue supply: +10V, Maximum output current 10mA;

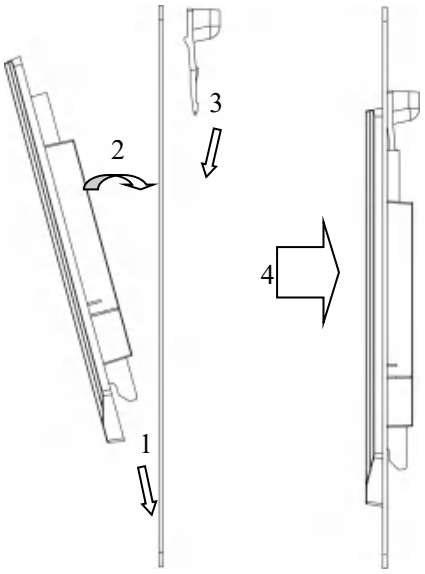
4.5 External keypad installation



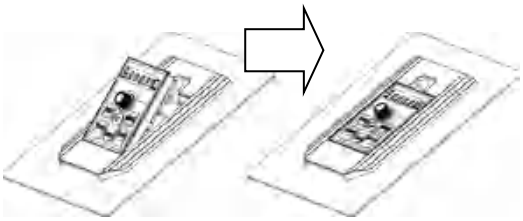
Step 1, Recommend: 60x115mm
(Width: 60mm-82mm,
Length: 110mm-118mm,
Thickness: 1mm-2mm)



Step 2, Prepare: separate the external support part into a support part and a lock part.

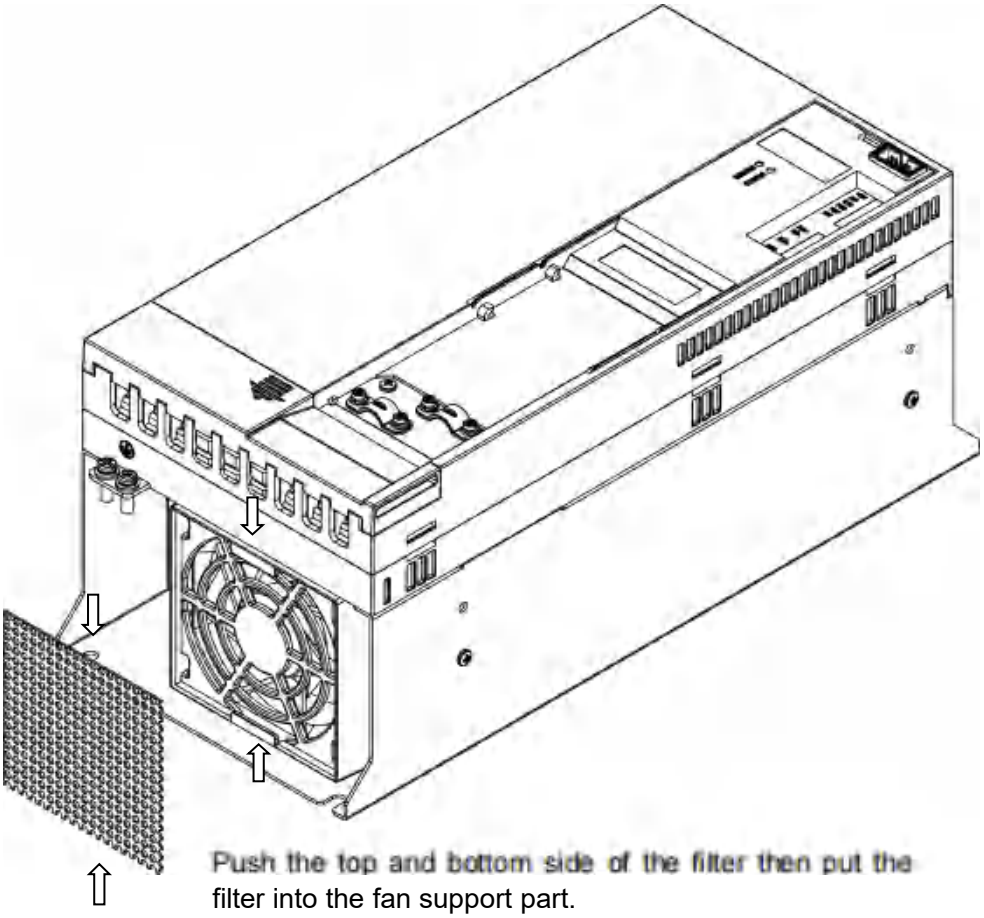


Step 3: Install the external support part
1,Clip the bottom of the support part into the bracket of the cabinet;
2,Turn the support part flat;
3,Install the lock part form the back side of the cabinet plate;
4,Push the lock part until a “Click”.



Step 4: Install the Keypad
1,Clip the bottom of the Keypad into the bracket of the support part;
2,Turn the Keypad until a “Click”.

4.6 11-22kW fan filter installation



Push the top and bottom side of the filter then put the filter into the fan support part.

4.7 Other Options

Products of SA710 11Kw ~ 90kW can achieve panel-through mounting with panel through options. Products up to 22kW can use the options of decoupling plate to achieve better EMC handling of the control wires and power cables. Please contact us for more details.

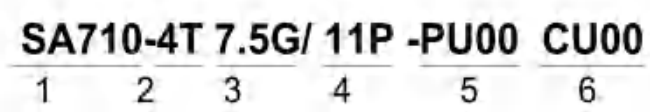
Chapter 5 Operation Instruction for SA710 Combination Type

By installing a Control Unit to a Power Unit, different combination types of product can be achieved to fulfil different application demands. Here only the standard type (combination of PU00 and CU00/CU0H) is described, other combination type will follow similar logic.

5.1 Nameplate for Combination Type

Item	Description
1	Type code
2	Power input specification
3	Power output specification
4	Sales number
5	Bar code
6	Order number
7	Certification logo: RoHS CE UL WEEE etc.
8	Warning information
9	QC Pass
10	Country of origin
11	Voltage/Power
12	QR code

Description of the Type Code:



NO		Description
1	SA710	SA710 series
2	4T	Line in votage,4T: 3 phase 400V; 3phase220V or single phase 220V
3	7.5G	Rated Power,7.5: 7.5kw, G: Heavy load;
4	11P	11: 11kw, P: Light load;For Models not supporting dual rating, it will be null;
5	PU00	The type of Power Unit
6	CU00/CU0H	The Type of Control Unit

Note:1.(“/” and “-” are not counted in the number of digits)

5.2 Specification and Function for Combination Type

A combination type will have all the functions and follow all the specifications of the modules used including Power Unit and Control Unit, except for functions listed as below:

- The DI/DO/RS485 on the Power Unit will not be available anymore. Only control terminals and communication ports on Control Unit will work.
- The LED lights on Power Unit for status monitoring will be invisible (covered by Control Unit)
- The 10 Pin IDC connector on Powered Unit is occupied by connection to Control Unit, Keypad can only be connected to the Control Unit.

5.3 Safety Instruction for Combination Type

Safety demands for a combination type should follow the safety demands of the Power Unit which is installed into the combination type (refer to 2.1)

Note: Do NOT plug or remove the Control Unit from the Power Unit when the product is powered on.

5.4 Installation and Wiring for Combination Type

Except for 25mm increase in the depth, installation of a combination type should follow the demands as for the Power Unit (refer to 2.2)

5.5 Operation for Combination Type

Keypad Operation of a combination type follows the Control Unit or Keypad built into the combination type.

Except for the customer defined parameters, all the parameters are the same as parameters of the Power Unit built into the combination type.

5.6 Maintenance

Please refer to 2.7.

Chapter 6 SA710 Basic Application Guide

Power Unit should be combined with a Control Unit or keypad together to achieve most of the applications described here.

6.1 Control with Keypad

Ensure the product is working in Local Mode (L/R light flashing), or set P06.31=1 to switch to Local Mode.

Adjust the set frequency by pressing the "▲" or "▼" key (CU0B: Turn the potential meter).

Press the "RUN" key to start the motor, and adjust the motor speed by pressing the "▲" or "▼" key (CU0B: Turn the potential meter).

Press the "STOP" key to stop the motor.

Note: In Local Mode, the product only receives commands from the keypad. Normally Local Mode is for system debugging.

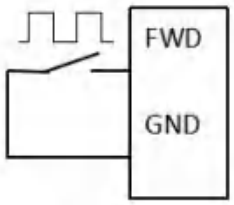
6.2 Control with Terminals

First ensure the product is working in Remote Mode (L/R light always ON). If not, switch the product to the Remote Mode by set P06.31=0. The product is default in Remote Mode.

6.2.1 Start-stop control

6.2.1.1 Single-wire pulse start/stop

Enable the Pulse Auto Start/Stop Function by set P02.03=1 first then define a terminal function to Pulse Run (DI function 13 or 14). With below wiring, the single wire pulse start/stop function can be achieved.



Wiring

Parameter	Value
P02. 03	1
P02. 05	13 or 14

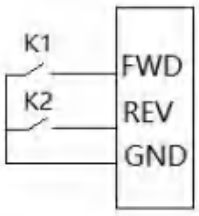
Parameters

Input	Status	Command
⎍	Stopped	Start
⎍	Running	Stop

Actions

6.2.1.2 Two-wires mode 1 (factory default)

The DI terminal FWD is default to forward run function, and the DI terminal REV is default to reverse run function. You can achieve the two wires start/stop function by Wiring and parameters set as below.



Wiring

Parameter	Value
P02.05	10
P02.06	12

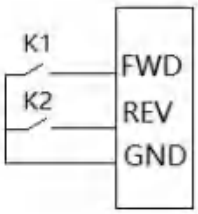
Parameters

K1	K2	Command
Open	Open	Stop
Close	Open	Forward Run
Open	Close	Reverse Run
Close	Close	Stop

Actions

6.2.1.3 Two-wires mode 2

In this mode, the FWD terminal is to start/stop the motor, the REV terminal is to control the running direction. The function can work with Wiring and parameters set as below.



Wiring

Parameter	Value
P02.05	10
P02.06	11

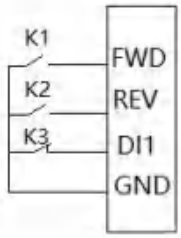
Parameters

K1	K2	Command
Open	Open	Stop
Close	Open	Forward Run
Open	Close	Stop
Close	Close	Reverse Run

Actions

6.2.1.4 Three-wire mode 1

The DI terminals FWD and REV are used to start the motor by pulse for different direction, the DI1 terminal is used to stop the motor. The function can be achieved by wiring and parameter set as below.



Wiring

Parameter	Value	Function
P02.05	13	Pulse forward run
P02.06	14	Pulse reverse run
P02.07	4	Stop

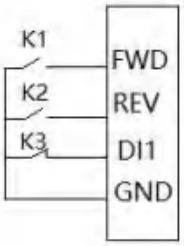
Parameters

K1	K2	K3	Command
X	X	Open	Stop
⎍	X	Close	Forward Run
X	⎍	Close	Reverse Run

Actions

6.2.1.5 Three-wires mode 2

The DI terminal FWD is used to start the motor by pulse, DI terminal REV is used to control the motor direction, DI terminal DI1 is used to stop the motor. The function can be achieved by wiring and parameters set as below.



Wiring

Parameter	Value	Function
P02.05	13	Pulse forward run
P02.06	11	Motor direction
P02.07	4	Stop

Parameters

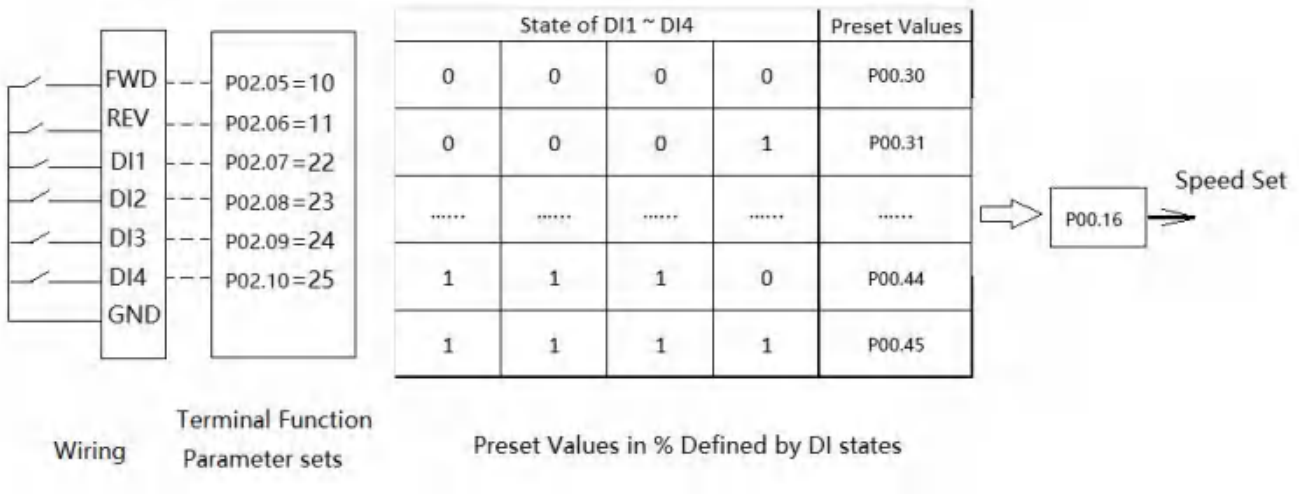
K1	K2	K3	Command
X	X	Open	Stop
⎍	Open	Close	Forward Run
⎍	Close	Close	Reverse Run

Actions

6.2.2 Target Speed Set

- In remote mode, both analogue input AI1 and bus communication are default for speed set. By applying an 0 ~ 10V on terminal AI1 and/or controlling command from the bus communication can adjust the speed set. Please refer to the appendix A for more details about bus communication control.
- Use pulse input for speed set: Define the main speed set source as pulse input (P00.11 = 5), and define the terminal function of DI4 to pulse input (P02.10 = 40), then you can adjust the speed set by applying different frequency of pulse on DI4. Using pulse input for speed set has the advantages of good accuracy and robust to EMC noise.
- Multi preset value control by DI terminal function

In some application, the motor only needs to run at several fixed speed. You can use DI terminal function to control the motor speed at different preset value. Below is an example of 16 preset speed controlled by 4 DI terminals.

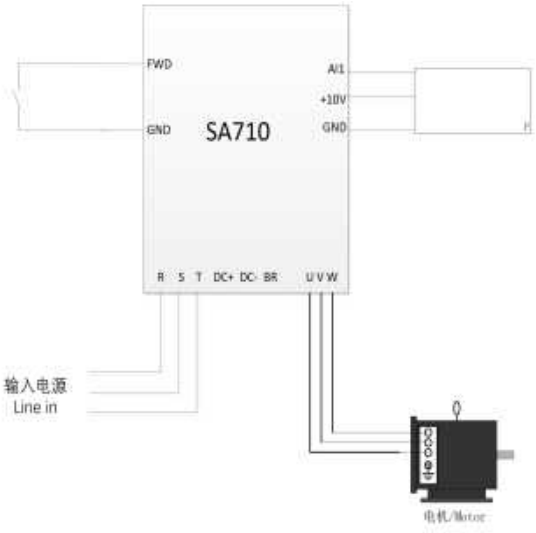


In the figure above, DI terminals FWD and REV are set in two-wire system, and the function of DI1-DI4 is set as multi speed set selection. The speed set is calculated according to the selected preset value in % by the states of 4 DIs, e.g., if state DI1~DI4 is 1111, then the 16th value preset in parameter P00.45 is selected. The speed set is the product of the selected preset value time P00.16. Please be noted that, maximal 4 DIs used for selecting the preset value. Less than 4 DI can also be used to select preset value. In this case, the state of the missing terminal can be treated as 0.

6.3 Application of Process PID Control

Process PID control is used to control a target, e.g., temperature, pressure etc., with close loop function by controlling the error between the set value and feedback value. It only works in remote mode.

1) Set parameter P00.11=21 (main speed set source is assigned to process PID) to enable the process PID control
2) Select the process PID feedback source by parameter P04.00 (default is invalid). For example, if the process PID feedback source is terminal AI1, then P04.00 is set to 1. P03.00 can be used to define the signal on AI1 as voltage or current input
3) Select the set value source of the process PID by parameter P04.01 (default is invalid). For example, if P04.01 = 11, the PID control set value source is assigned to DI terminal selected preset value.
4) Select close loop control logic by parameter P04.04, positive or negative according to the application demands. The default set is positive close loop.
5) P04.07 he P04.08 can be used to adjust the control response of the PID process, P04.07 for proportional gain and P04.08 for integration time.
6) A simple example of wiring for Process PID control is shown as below. In this set up, the AI1 is the feedback.



6.4 Typical Application of Constant-Pressure Water Supply

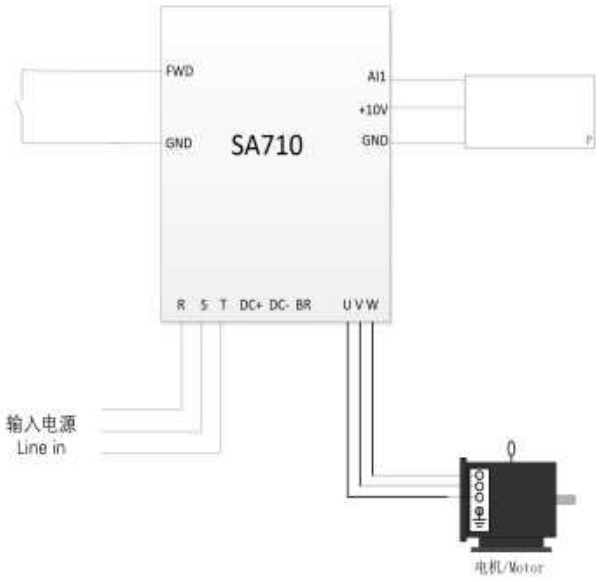
SA710 afford application macro for constant-pressure water supply. It can only be enabled in remote mode. For conventional constant pressure water supply applications, the remote pressure gauge is usually used as the feedback source and DI terminal is used for start/stop the motor. Refer Please refer to below step to use the application macro.

- Set parameter P00.03=1 to enable the application macro. When the application macro is enabled, the following parameters will change automatically:

Parameter	Name	Description
P00.30=30%	Target Pressure Set	For example, if the pressure gauge is 0~10Mpa, the target pressure corresponding to P00.30=30% is 3Mpa.
P03.04=7V	AI1 maximum input voltage (upper limit voltage of remote pressure gauge)	When the macro is enabled, terminal AI1 is set as pressure feedback source and the upper limit voltage of remote pressure gauge is set as 7V automatically.

- Press the start button to run directly. If the PID response can not meet the requirements, please adjust the PID parameters P04.07/P04.08.

A typical wiring set up is shown as below.

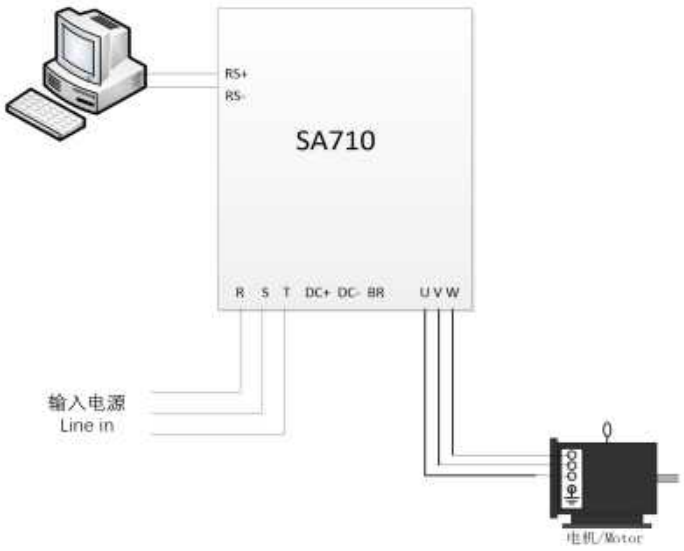


6.5 Simple instruction for using Modbus communication

Only in remote mode, the frequency converter can be controlled through Modbus communication. Below are the key points to use the Modbus communication control.

- First, please check the parameters P00.80~P 0-82 to be consistent with the communication settings of host computer. P00.80 is the slave address of the frequency converter (default value is 1). Parameter P00.81 is the communication baud rate (default value is 9600). P00.82 is the communication data format, which defaults to even-check bits and one stop bit. These three parameters can also be changed according to the communication parameters of the host computer. The communication parameters of the host computer and the frequency converter must be set to the same.
- Writing command in register address 9999 to start/stop the frequency converter, and writing value in register address 10000 to control the output frequency of the converter. Please refer to Appendix A for the detailed instructions.

A typical wiring set up is shown as below:



6.6 PM motor control

Please follow the below steps to run the PM motor control.

1) Sett basic motor parameters

Set motor parameters according to motor nameplate according to the order as shown in below table.

Par. No.	Name	Range	Unit	Default
*P01.02	Motor Type	0:Induction Motor 1:SPM 2:IPM without Saturation 3:IPM with Saturation		0
*P01.06	Rated Motor Current	Depending on motor data	A	*
*P01.07	Rated Motor Speed	100~24000	rpm	*
*P01.08	Rated Motor Torque	0.1~6553.5	N·m	*
*P01.24	Number of Motor Poles	2~100	P	*
*P01.25	BEMF at Rated Speed for PM	0~9000	V	*

Note: Please confirm the type of motor (SPM or IPM) with the motor manufacturer first and then set the parameter P01.02. If you can not confirm the type of synchronous motor, set P01.02=3. In addition, running a PM motor does not need to set parameters of rated power, rated voltage and rated frequency. Please set the motor parameters in sequence strictly accordance with the above list.

2) Run motor parameter tuning

Set parameter P01.13=2 (static full parameter tuning) and run the motor parameter tuning function (please refer to 6.11)

3) Start and stop the converter.

Same as for induction motor, the frequency converter can be start and stop via keyboard, DI terminal or bus communication

4) Key Issues

a. Set the proper control method for starting the PM motor

Par. No.	Name	Range	Unit	Default
P01.63	PM Start Method	0:Initial Position Detection (IPD); 1:DC Parking		1
P01.86	Parking Current (PM Start)	0~150	%	80
P01.87	Parking Time (PM Start)	0.1~60.0	s	3.0

Two types of start mode can be selected via parameter P01.63. Only DC Parking is recommended for starting an SPM motor (P01.63=1). P01.86 can be used to set the DC parking current and P01.87 to set the parking time. IPD function (P01.63=0) can be selected to start a IPM motor which can detect the position of the motor rotor automatically to avoid a reverse running at start. Please be aware of that, using DC parking function to start a PM motor could lead to a reverse turning at beginning. The maximal reversed angle could be maximal to 180 degree electric angle.

b. Set control parameters for high start torque

For applications demanding high start torque, vibration of motor or failure could happen during the start phase. In this case, first check whether the motor parameters are set correctly. If the parameters are checked OK, adjusting below parameter can help to increase the start torque.

Par. No.	Name	Range	Unit	Comments
P01.36	Min Motor Current at Low Speed	0~120	%	Increasing this parameter will increase the starting torque at low speed

6.7 Speed Close Loop Control of Induction Motor

Please follow the below steps to run speed close loop control for an induction motor.

1) Set motor parameters

Relevant parameters: P01.03~P01.07

Operating requirements: Please set motor parameters P01.03~P01.07 strictly according to motor nameplate.

Attention: In case of improper information or information missing on nameplate, please contact the motor manufacturer to confirm the correct motor parameters. If the motor manufacturer can not provide the complete and correct parameters, please set the 4 basic motor parameters: rated power (P01.03), rated voltage (P01.04), rated frequency (P01.05) and rated current (P01.06). These four parameters are good enough to get good performance.

2) Motor parameter tuning

Set parameter P01.13=2 (static full parameter tuning) and run the motor parameter tuning function (please refer to 6.11)

3) Set the resolution of the encoder and the direction of rotation (relevant parameters P02.70/P02.71).

4) Check whether the feedback value of the encoder is correct by running the motor idling with open loop control. (For example, forward run the motor at 5Hz, check if value of P09.37 is ok in both the value and sign. If the sign is not correct (that means the feedback is negative), set parameter P02.71=1 to change the sign of the encoder counting. If P09.37 deviates from the reasonable value too much, (e.g., for a 4-pole motors running at 5Hz idling, P09.37 is about 2.5), check whether the resolution of the parameter P02.70 encoder is set correctly.

5) Select control mode P-01=1 (close-loop control with speed sensor)

6) Adjust Speed Close Loop PI Related Parameters if necessary.

Par. No.	Name	Range	Unit	Default
P04.30	Speed PID Proportional Gain	0.000~1.000		0.010
P04.31	Speed PID Integration Time	2.0~2000.0	ms	8.0
P04.32	Speed PID Differential Time	0.0~200.0	s	30.0

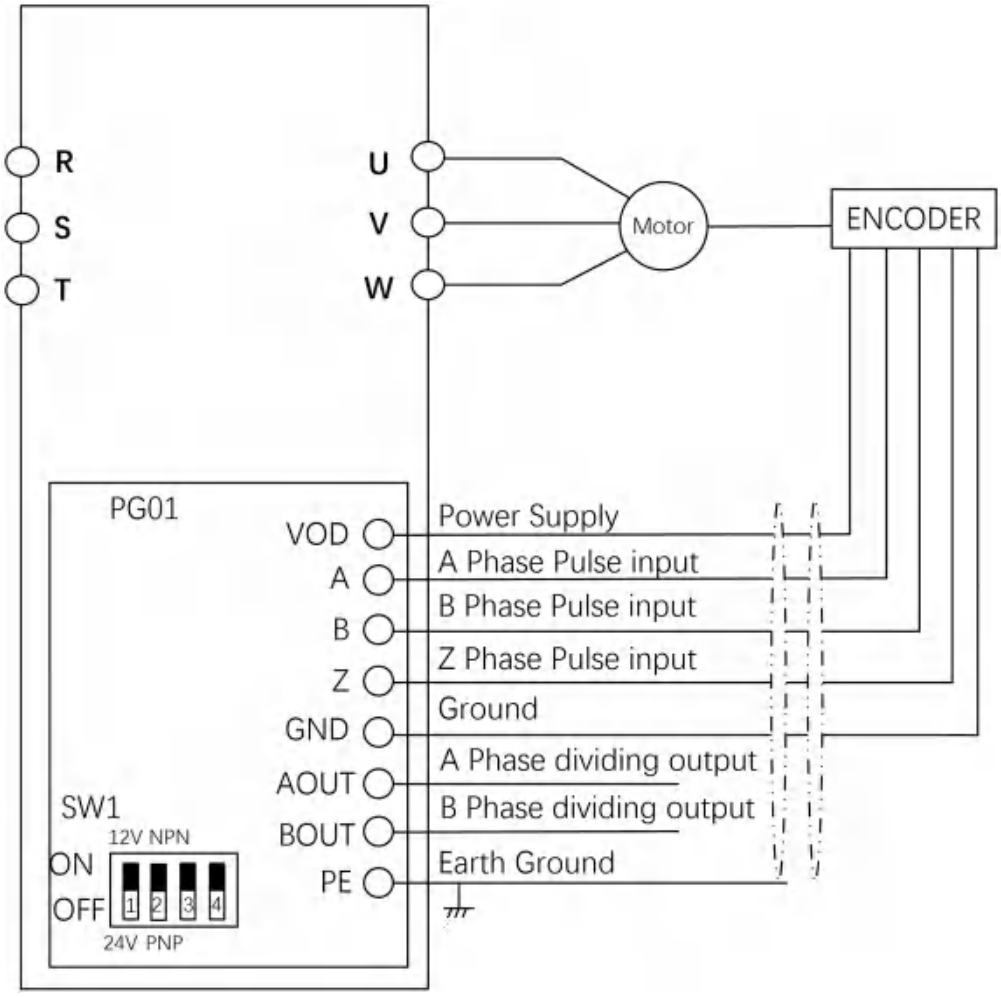
Par. No.	Name	Range	Unit	Default
P04.33	Speed PID Differential Limit	1.000~20.000		5.000
P04.34	Speed PID filtering time	1.0~100.0		10.0

7) Set the Motor Speed Feedback Loss Function to get the right response in case of any failure in the speed sensor.

Please set the following parameters according to the application demands.

Par. No.	Name	Range	Unit	Default
P05.19	Motor Speed Feedback Loss Function	0:No Function 3:Jog and Warning 4:Run to Max Speed P05.03 and Warning 5:Alarm Fault and Trip to stop 11:Switch to Speed Sensor less Mode		5
P05.20	Speed Error Threshold for Speed Feedback Loss Detection	1 ~ 600	rpm	300
P05.21	Time for Speed Feedback Loss Detection	0.00 ~ 60.00	s	0.05

8) An example for the wiring of speed close loop control set up is shown as below (taking the encoder option card PG01 as an example, PG01 supports incremental common mode encoders):



6.8 Open Loop Torque Control for Induction Motor

Please follow below steps to set up the open loop torque control for induction motor.

1) Set parameters

Relevant parameters: P01.03~P01.07

Operating requirements: Please set motor parameters P01.03~P01.07 strictly according to motor nameplate.

Attention: In case of improper information or information missing on nameplate, please contact the motor manufacturer to confirm the correct motor parameters. If the motor manufacturer can not provide the complete and correct parameters, please set the 4 basic motor parameters: rated power (P01.03), rated voltage (P01.04), rated frequency (P01.05) and rated current (P01.06). These four parameters are good enough to get good performance.

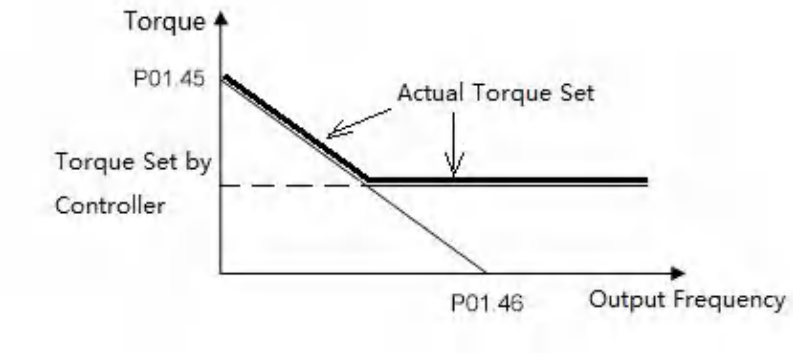
2) Run motor parameter tuning

Set parameter P01.13=2 (static full parameter tuning) and run the motor parameter tuning function (please refer to 6.11)

3) Set torque control related functions according to the application demands

a. Minimal Torque Function

Par. No.	Name	Range	Unit	Default
P01.45	Min Torque at Torque Mode Start	-100~100	%	5
P01.46	Min Torque Cut Out Speed at Torque Mode Start	0.1~50.0	Hz	3.0



b. Torque Control PI Function

Par. No.	Name	Range	Unit	Default
P04.40	Torque Control PI Proportional Gain	0~500	%	100
P04.41	Torque Control PI Integration Time	0.002~2.000	s	0.020

c. Torque Control Speed Limitation Function

Par. No.	Name	Range	Unit	Default
P05.06	Speed Limit Source Selection in Torque Mode	0~30		0

4) Commission

- Target Torque Set. In local mode, the target torque can be set directly via the UP/DOWN key. (Setting to 1.2 via the UP/DOWN key, for example, means that the target torque is 1.2 N.m.). In remote mode, the target torque set source can be selected via parameter P00.13, e.g., setting P00.13=1 means the that target torque is given by analogue input on terminal AI1, then AI1 input 0~10V corresponds to 0%~100% rated torque. Rated torque is the value of parameter P01.08.
- Start and stop the converter. Same as in speed control mode, the frequency converter can be start and stop via keyboard, DI terminal or bus communication.

6.9 Reset the parameters to Factory Defaults

Set parameter P07.00 = 9;

Power down the product fully and power on again, the keypad shows A.01

Press the “STOP” key to clear the A.01, then the parameters are reset to factory defaults except for the parameter group 8 and group 9.

6.10 Reset the Faults (Alarms)

For non-locked faults, press “STOP” key to reset the fault.

For locked faults:

If parameter P05.30 = 0, press “STOP” to reset the fault;

If parameter P05.30 =1, you need to power off and power on the product first, then press “STOP” key to reset the fault.

You can also set a DI terminal function to reset fault (set one of the parameters from P02.05 to P02.10 equals 1), and use DI signal to reset the fault.

6.11 Motor Parameters Auto Tuning

Ensure that the frequency converter is stopped and the motor is stationary;

Set motor parameters according to motor nameplate;

Set parameter P01.13 = 1 or 2;

When keyboard alternately displays PUSH and RUN, press RUN key to start motor parameter auto tuning.

During tuning, the keyboard displays '-At-'. Do not do any operation during the parameter tuning;

Wait until keyboard alternately displays “PUSH” and “Ent”, then press ENTER (CU0B: Press incremental potentiometer) and finish the motor parameter auto tuning process.

Appendix A. Modbus Communication Guidance

The SA710 drive provide RS485 communication interface. It adopts international standard Modbus communication protocol to perform master-slave communication. The user can realize centralized control through PC/PLC to adapt specific application requirements.

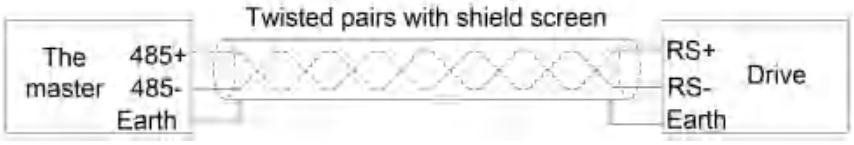
1. Application Mode

1.1 Interface Mode

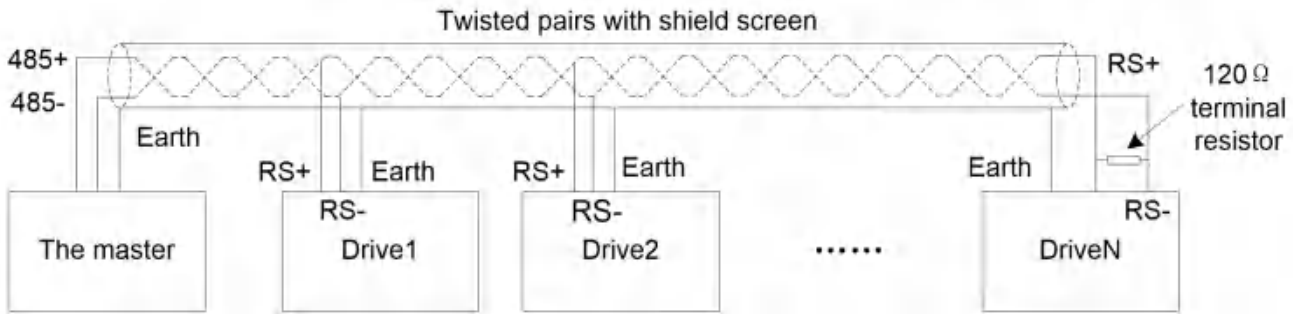
The communication interface is RS485. RS485 works on semi duplex and its data signal applies differential transmission which is called balance transmission too.

1.2 Networking Mode

The drive has two networking modes: single master/multiple slaves networking and single master/single slave networking.



▲ Single master/single slave networking diagram



▲ Single master/multiple slaves networking diagram

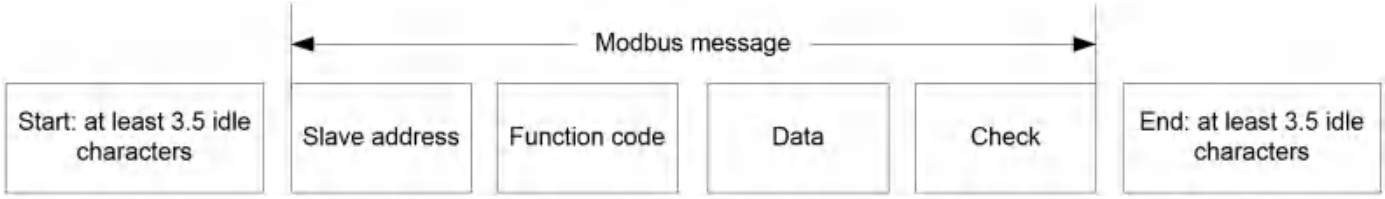
Specification:

- No matter which mode, the drive is used as a slave in communication. When master sends commands using broadcast address, the slave does not respond;
- It is recommended to use shield cables in multiple connection. The basic parameter of the devices, such as baud rate and digital check bit in RS485 should be the same as slave device's and there should be no repeated addresses in slave devices.

2. Protocol Format

Modbus protocol only support RTU mode.

RTU data frame format is shown as the figure below:



Specification:

Start	At least 3.5 idle characters
Slave address	Address:0-127(0 is broadcast address)
Function code	Modbus function code

Start	At least 3.5 idle characters
Data (N-1)	2 * N data
Data (N-2)	
…	
Data 0	
CRC CHK high-8-bit	CRC check
CRC CHK low-8-bit	
End	at least 3.5 idle characters

3. Function Code

Function code supported by SA710 drive Modbus protocol are as shown in the table below:

Function code	Description	Meaning
0x03	Read Holding Registers	Read drive functional parameters and running status parameters
0x06	Preset Single Register	Over-write individual drive functional parameters
0x10	Preset Multiple Regs	Over-write multiple Registers

4. Register Address Definition

All the following register addresses are started from 0.

4.1 The Rules of Register Address of the Parameter Number

The parameters can be mapping to register address. The rules of register address of the parameter number are shown below:

Register address = PNU – 1

For example:

The register address of P00.30 is 30 - 1 = 29 (0x001D)

The register address of P09.11 is 911 - 1 = 910(0x038E)

Attention:

Parameters Group 8 and 9 are Read-only.

The Drive don’t support write or read multiple parameters at a time.

4.2 Other Register Addresses Specification

In addition to parameter is mapped to Modbus registers, there are some additional registers within the drive which can be used to control the drive, monitor the drive's status. These registers can support write or read maximum 10 registers at a time.

Register address	Specification	R/W
9999*	Control command	W
10000*	Frequency command	W
10099*	State	R
10100*	Warning/Alarm code	R
10101	Output frequency (0~Fmax, unit: 0.1Hz)	R
10102	Output current (unit: 0.01A)	R
10103	Output voltage (unit: 1V)	R

Register address	Specification	R/W
10104	Output power (unit: 0.01kW)	R
10105	Motor speed (unit: 1rpm)	R
10106	DC bus voltage (unit: 1V)	R
10107	Reference	R
10108	Process PID Feedback	R

- * Reg. 9999 specification

Bit	Specification
Bit 7~0(run/stop control etc.)	0x00: No function 0x01: Run forward 0x02: Reverse 0x03: Jog 0x04: Jog reverse 0x05: Stop 0x06: Coast 0x07: Reset
Bit 11~8(Preset value select)	0000B:P00.30(Preset Value 0) 0001B: P00.31(Preset Value1) … 1111B: P00.45(Preset Value 15)
Bit 13~12(Ramp time select)	00B: Ramp 1 01B: Ramp 2 10B: Ramp 3 11B: Ramp 4
Bit 14	Reserved
Bit 15	1B: Enable Bit8~13 function 0B: Disable Bit8~13 function

- * Reg. 10000 specification

When using communication to control the drive, you can set the frequency directly by writing register 10000 . The register value is in the range of 0.00 ~ P05.08, unit 0.01Hz.

- * Reg. 10099 specification

Bit	Specification
Bit 0	0B: None;1B: Warning
Bit 1	0B: None;1B: Alarm
Bit 3~2	00B: Stop 01B: Run forward 10B: Reverse 11B: Reserved
Bit 7~4	Reserved
Bit 11~8	0000B: Using Preset Value 0 0001B: Using Preset Value 1 … 1111B: Using Preset Value 15
Bit 15~12	Reserved

- * Reg. 10100specification

Register 10100 is used to read the drive warning/alarm code. For example: When the drive occurs A.48 alarm, the value of register 10100 is 48. When the drive occurs u.24 warning, the value of register 10100 is 24.

5. Communication ratio values

The Communication data is expressed by hexadecimal in actual application and there is no radix point in hexadecimal. For example, if you want to set P05.08 = 61.5, 61.5 can be magnified by 10 times into 615. So hex 0x0267 (615) can be used to express 61.5.

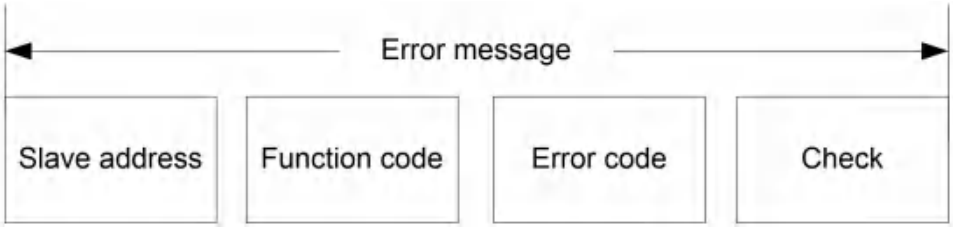
A non-integer can be timed by a multiple to get an integer and the integer can be called communication ratio values.

The communication ratio values are referred to the radix point of the setting range of default value in the functional parameter list. If there are radix point n, then the communication ratio value m is 10^n.

6. Error message

There may be errors in the communication process, for example, some parameters are read-only, but the PC/PLC sends a written directive, the drive will return an error message.

Error message data frame format is shown as the figure below:



Error message function code = requirements function code + 0x80

Error code	Specification
0x01	Function code error, the drive does not support this kind of function code.
0x02	The register address is invalid.
0x03	The value exceeds the upper limit of the parameter
0x04	Operation error.

7. Examples

7.1 Read Holding Registers (0x03)

7.1.1 Read Motor speed

Read parameter P09.04(Reg 903) to get the Motor speed.

Transmit: 01 03 03 87 00 01 34 67 (Hexadecimal)

Receive: 01 03 02 05 DC BA 8D (Hexadecimal)

Transmit data specification:

Field	Description
01	Address
03	Function
03 87	Register address: 903(0x0387)
00 01	The number of read registers is 1

Receive data specification:

Field	Description
01	Address
03	Function
02	The byte number of received data
05 DC	0x05DC converts to decimal number is 1500. So, the value of P09.04 is 1500RPM

7.1.2 Read Drive Status, warning/alarm code and output frequency

Read multiple Registers 10099、10100、10101 to get all information.

Transmit: 01 03 27 73 00 03 FE A4 (Hexadecimal)

Receive: 01 03 06 00 04 00 00 01 F4 D0 A2 (Hexadecimal)

Transmit data specification:

Field	Description
01	Address
03	Function
2773	Register address: 10099(0x2773)
00 03	The number of read registers is 3
FE A4	CRC check

Receive data specification:

Field	Description
01	Address
03	Function
06	The byte number of received data
00 04 00 00 01 F4	The value of Reg. 10099 is 0x0004. Note: Bit 0 is 0B, that is No warning; Bit 1 is 0B, that is No Alarm; Bit 3~2 is 01B, that is Run forward; Bit 11~8 is 0000B, that is Using Preset Value 0; The value of Reg. 10100 is 0x0000(0). The drive doesn’t have warning/ alarm, so it is 0. The value of Reg. 10101 is 0x01F4(500). So, the drive output frequency is 500/10=50.0Hz.

7.2 Write Single Register (0x06)

Set motor rated speed to 1430RPM.

Write P01.07(Reg 106) =1430.

Transmit: 01 06 00 6A 05 96 2A E8 (Hexadecimal)

Receive: 01 06 00 6A 05 96 2A E8 (Hexadecimal)

Transmit data specification:

Field	Description
01	Address
06	Function
00 6A	Register address of P01.07 is :107-1= 106(0x006A)
05 96	The value wants to set to P01.07 is 0x0596(1430)

Receive data specification:

Field	Description
01	Address
06	Function
00 6A	Register address of P01.07 is :107-1= 106(0x006A)
05 96	The value of P01.07 is 0x0596(1430)

7.3 Write Multiple Registers (0x10)

Start the drive and set Drive output frequency.

Write register 9999 to control the drive running and write register 10000 to set the drive output frequency.

Transmit: 01 10 27 0F 00 02 04 00 01 09 C4 5A 1D (Hexadecimal)

Receive: 01 10 27 0F 00 02 7B 7F (Hexadecimal)

Transmit data specification:

Field	Description
01	Address
10	Function
27 0F	Register address: 9999(0x270F)
00 02	The number of write registers is 2
04	The byte number of write data is 4
00 01 09 C4	Reg. 9999= 0x0001 Note: Bit 7~0 is 0x01, that is Run forward; Bit 11~8 is 0000B, that is Using Preset Value 0; Bit 13~12 is 00B, that is Using ramp 1; Bit 15 is 0B, that is Disable bit 13~8; Reg. 10000= 0x09C4(2500, So the Reference frequency is 2500 / 100 = 25.00Hz)

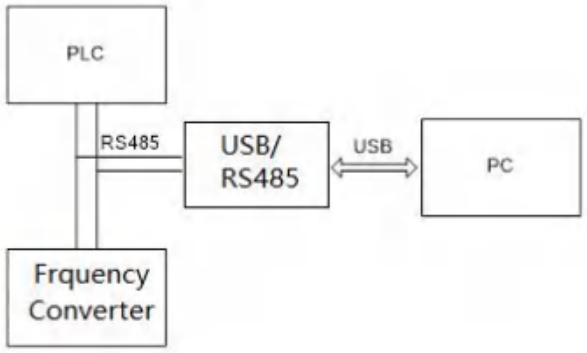
Receive data specification:

Field	Description
01	Address
10	Function
27 0F	Register address: 9999(0x270F)
00 02	The number of write registers is 2
01	Address

8. Debugging

Most customers use specialized or packed communication app or function afforded by the supplier of PLC or touch screen. when there is communication failure, it's difficult to judge whether it's the host's issue or the frequency converter's issue. In this case, you can use the PC software tool like "serial debugging assistant" (which is free to download from internet) to help the diagnosis.

First please connect the system as blow figure. Normally a PC does not have RS485 port, you can use a transfer module to connect the PC. With the PC SW tool like "serial debugging assistant", you can monitor the details of the message sent from the host and the message replied from the frequency converter.



▲ Wiring for Modbus Debugging

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