

# IMO SD1 Series

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(0.4-110kW)



## CAUTION

Thank you for purchasing your IMO SD1 inverter.

- This product is designed to operate a three-phase induction motor. Read through this instruction manual and be familiar with the handling procedure for correct use.
- Improper handling might result in incorrect operation, a shortened life, or even a failure of this product as well as the motor.
- Deliver this manual to the end user of this product. Keep this manual in a safe place until this product is discarded.
- For optional accessories, refer to the instruction and installation manuals for that optional device.

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# 1 Safety Precautions









Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the inverter. Failure to follow these instructions may result in damage to the equipment, physical injury or even death. Electrical equipment should be installed, operated, service and maintained only by competent personnel. No responsibility is assumed by IMO Precision Controls Ltd for an consequences arising out of the use of this product.

## 1.1 Safety Definition





Danger:	Failure to follow the safety instructions in this manual may result in serious physical injury or even death.
Warning:	Failure to follow the safety instructions in this manual may result in damage to the equipment.
Competent Personnel:	People intending upon working on this device should be appropriately qualified in electrical safety, should be in receipt of the relevant safety certification and be familiar with all of the steps and requirements of installing, commissioning, operating and maintenance of the device.

## 1.2 Warning Symbols


The warning symbols alert you to the conditions which can result in serious injury or death and/or damage to the equipment, and provides advice on how to avoid potential danger. The following warning symbols are used in this manual:

Symbols	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may result if the relevant precautions are not taken	
 Warning	Warning	Physical injury or damage to the device(s) may result if the relevant precautions are not taken	
 Do Not Touch	Electrostatic Discharge	Damage to the printed circuit board may result if the relevant precautions are not taken	
 Heat	Excessive Heat	The exterior of the device(s) may become hot. Do not touch	
NOTE	NOTE	Physical injury may result if the relevant precautions are not taken	NOTE

## 1.3 Safety Guidelines

	<ul style="list-style-type: none"> <li>Only persons with the relevant qualifications and training are authorised to operate the device.</li> <li>Do not perform any wiring, inspection or component changes when the power supply is connected. Ensure the power supply is disconnected before wiring or any inspection takes place, and always wait for at least the appropriate designated time, or until the DC bus voltage is less than 36V. See table below for waiting times:</li> </ul> <table border="1" data-bbox="220 1736 1204 1904"> <thead> <tr> <th colspan="2">Inverter Module</th> <th>Minimum Waiting Time</th> </tr> </thead> <tbody> <tr> <td>1PH 200V</td> <td>0.4kW-2.2kW</td> <td>5 minutes</td> </tr> <tr> <td>3PH 200V</td> <td>0.4kW-7.5kW</td> <td>5 minutes</td> </tr> <tr> <td>3PH 380V</td> <td>0.75kW-110kW</td> <td>5 minutes</td> </tr> </tbody> </table>	Inverter Module		Minimum Waiting Time	1PH 200V	0.4kW-2.2kW	5 minutes	3PH 200V	0.4kW-7.5kW	5 minutes	3PH 380V	0.75kW-110kW	5 minutes
Inverter Module		Minimum Waiting Time											
1PH 200V	0.4kW-2.2kW	5 minutes											
3PH 200V	0.4kW-7.5kW	5 minutes											
3PH 380V	0.75kW-110kW	5 minutes											
	<ul style="list-style-type: none"> <li>Do not carry out any unauthorised refitting of the inverter; otherwise fire, electric shock or other serious injury may occur</li> </ul>												
	<ul style="list-style-type: none"> <li>The base of the heatsink may become hot during operation. To avoid burns and/or other injury, do not touch</li> </ul>												
	<ul style="list-style-type: none"> <li>The electrical parts and components used in the inverter are electrostatic. Take the appropriate precautions to avoid electrostatic discharge during operation</li> </ul>												


### 1.3.1 Delivery & Installation

	<ul style="list-style-type: none"> <li>• Ensure the inverter is installed on fire-retardant material and away from combustible materials</li> <li>• Connect the optional braking parts (braking resistors, braking units or feedback units) according to the wiring diagram</li> <li>• Do not work on, or operate the inverter if there is any damage to the inverter, or any component loss</li> <li>• Do not touch the inverter with wet tools or body parts, otherwise electric shock may result</li> </ul>
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**NOTE:**

- Select appropriate tools for moving and installing the inverter to ensure a safe and normal installation, avoiding physical injury or death. For physical safety, the installer should take the necessary precautions such as wearing protective shoes.
- Try to ensure the device(s) avoids any unnecessary physical shock or vibration during delivery and installation.
- Do not carry the inverter by its cover.
- Install away from children and public places.
- The inverter does not meet the requirements for low voltage protection (IEC 61800-5-1) if the altitude of the installation site is 2000m above sea level.
- The leakage current of the inverter may be above 3.5mA during operation. Ground with commonly accepted approved techniques and ensure the grounding resistor is less than 10Ω and the conductivity of the PE grounding conductor is the same as that of the phase conductor (with the same cross sectional area).
- R, S and T are the input terminals of the power supply, while U, V and W are the motor terminals. Please connect the input power cables and the motor cables correctly to avoid damage to the inverter.


### 1.3.2 Commissioning & Operating

	<ul style="list-style-type: none"> <li>• Disconnect all power supplies applied to the inverter before terminal wiring and wait the minimum designated time after disconnecting the power supply.</li> <li>• High voltage electricity is present inside the inverter during operation. Do not carry out any operation except for keypad settings whilst in operation.</li> <li>• The inverter may start up by itself when P01.21=1. Keep a suitable distance from the inverter and motor.</li> <li>• The inverter can not be used as an "Emergency Stop Device".</li> <li>• The inverter can not be used to brake the motor suddenly. A mechanical braking device should be installed.</li> </ul>
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**NOTE:**

- Do not switch the input power supply of the inverter On or Off frequently.
- For inverters that have been stored for a long time, check and fix capacitance and ensure it runs correctly before operation with motors. See Maintenance and Hardware Fault Diagnostics.
- Cover the front board before running, otherwise electric shock may result.


### 1.3.3 Maintenance & Replacement of Components

	<ul style="list-style-type: none"> <li>• Only competent personnel are authorised to perform maintenance, inspection and component replacement of the inverter.</li> <li>• Disconnect all power supplies to the inverter before terminal wiring. Wait for at least the designated time after disconnection.</li> <li>• Take the necessary measures to avoid screws, cables and other conductive materials from falling into the inverter during maintenance and component replacement.</li> </ul>
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**NOTE:**

- Please use the appropriate amount of torque to tighten screws.
- Keep the inverter, its parts and components away from combustible materials during maintenance and component replacement.
- Do not perform any isolation or pressure tests on the inverter, and do not measure the control circuit of the inverter using a megameter.

### 1.3.4 Commissioning & Operating

	<ul style="list-style-type: none"> <li>• The inverter contains heavy metals. At point of disposal, treat as industrial waste.</li> </ul>
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## 2 Product Overview

### 2.1 Quick Start-Up

#### 2.1.1 Unpacking Inspection

Check the following:

1. Remove SD1 from packaging and verify there is no damage.
2. Verify the specification of the inverter is as specified (see section 2.4). If not, contact your supplier.
3. Check to ensure that the accessories (including the Instruction Manual and Keypad) found inside the box are present and correct. If not, contact your supplier.
4. Verify that the inverter is compatible with mains supply voltage.

#### 2.1.2 Application

Check the following before initial use of the inverter:

1. Check the suitability of the load type to verify that there will be no overloading of the inverter during use.
2. Check the actual current of the motor is less than the rated current of the inverter.
3. Check the control accuracy of the load is within the specification of the inverter.
4. Ensure the incoming supply voltage is matched to the rated voltage of the inverter.

#### 2.1.3 Environment

Check the following before actual installation and usage of the inverter:

1. Check the ambient operating temperature of the inverter is below +40°C. Derate 1% for every additional 1°C above to a maximum temperature of 50°C (see Appendix A). <b>NOTE:</b> The ambient temperature refers to the air temperature inside the enclosure.
2. Check the ambient temperature of the inverter during operation is above -10°C. If not, consider additional heater. <b>NOTE:</b> The ambient temperature refers to the air temperature inside the enclosure.
3. Check the altitude of the installation site is below 1000m. Derate 1% for every additional 100m (see Appendix A).
4. Check the humidity of the installation site is below 90% and condensation is not present. If present, install anti-condensation heaters.
5. Ensure the drive is kept from direct sunlight and foreign objects can not enter the inverter. Use additional protective measures as required.
6. Check there is no conductive dust or flammable gas in the installation area. Use additional protective measures as required.

#### 2.1.4 Installation

Check the following after installation:

1. Check the input and output cables meet the load rating of the inverter (see Appendix C.3).
2. Check the inverter accessories are correctly installed. The installation cables should meet the specification of all ancillary components, including AC and DC reactors, input and output filters, braking units and braking resistors.
3. Check the inverter is installed on or near non-flammable materials and heat generating accessories, for example reactors and brake resistors, are away from flammable materials.
4. Check all control cables and power cables are run separately and the routing complies with EMC guidelines.
5. Check all grounding systems are properly grounded according to the requirements of the inverter.
6. Ensure the free space around the inverter is in accordance with the Instruction Manual.

7. Check the installation conforms to the Instruction Manual. The drive must be installed in an upright position.
8. Check the external connection terminals are fastened with the correct torque.
9. To avoid the risk of short circuit, check there are no screws, cables and other conductive items left in the inverter and refit all covers before use.

### 2.1.5 Basic Commissioning

Complete the basic commissioning as follows before operation:

1. Autotune. If possible, de-couple from the motor load to start dynamic autotune. Static autotune is also available.
2. Adjust the ACC/DEC time as required for the application.
3. Check the rotation direction is as required. If not, make the necessary changes to the motor or control wiring.
4. Set all control parameters as required before operation.

## 2.2 Product Specification

Function		Specification
Power Input	Input Voltage (V)	AC 1PH 200V (-15%)~240V (+10%) AC 3PH 200V (-15%)~240V (+10%) AC 3PH 380V (-15%)~440V (+10%)
	Input Current (A)	Refer to the rated value
	Input Frequency (Hz)	50Hz or 60Hz Allowed Range: 47~63Hz
Power Output	Output Voltage (V)	0~Input Voltage
	Output Current (A)	Refer to the rated value
	Output Power (kW)	Refer to the rated value
	Output Frequency (Hz)	0~400Hz
Technical Control Feature	Control Mode	SVPWM, SVC
	Motor	Asynchronous Motor
	Adjustable Speed Ratio	Asynchronous Motor 1:100 (SVC)
	Speed Control Accuracy	± 0.2% (SVC)
	Speed Fluctuation	± 0.3% (SVC)
	Torque Response	<20ms (SVC)
	Torque Control Accuracy	10%
	Starting Torque	0.5Hz/150% (SVC)
Overload Capability	150% of rated current: 1 minute 180% of rated current: 10 seconds 200% of rated current: 1 second	
Running Control Feature	Frequency Setting Method	Digital, analogue, pulse frequency, multi-step speed running, simple PLC, PID, MODBUS comms. Shift between the set combination and set channel.
	Auto-Adjustment of the Voltage	Automatic Voltage Regulation. Compensates for supply voltage transients
	Fault Protection	Provide comprehensive fault protection functions: Overcurrent, Overvoltage, Undervoltage, Overheating, Phase Loss, Overload etc.
	Start After Speed Tracking	Provides smooth ramping during start up

Function		Specification
Peripheral Interface	Analogue Input	1 (AI2) 0~10V/0~20mA and 1 (AI3) -10~10V
	Analogue Output	2 (AO1, AO2) 0~10V/0~20mA
	Digital Input	4 standard inputs, (Max. frequency: 1kHz) 1 high speed input, (Max. frequency: 50kHz)
	Digital Output	1 Y1 terminal output
	Relay Output	2 programmable relay outputs RO1A NO, RO1B NC, RO1C common terminal RO2A NO, RO2B NC, RO2C common terminal Contact capacity: 3A/250VAC
Others	Mounting Method	Wall and rail mountable
	Ambient Operating Temperature	-10~50°C, derate 1% for every additional 1°C when above 40°C
	DC Reactor	Standard internal DC reactor for the inverters (≥18.5kW)
	Installation Mode	Wall and rail installation of inverters (1PH/200V, 3PH/380V, ≤2.2kW and 3PH/200V, ≤0.75kW) Wall and flange installation of the inverters (3PH/380V, ≥4kW and 3PH/200V, ≥1.5kW)
	Braking Unit	Standard for inverters ≤37kW, optional for inverters of 45~110kW
	Protection Level	IP20 <b>Note:</b> Plastic cased inverter should be installed in a metal distribution cabinet, which conforms to IP20 (top surface conforms to IP3X)
	Cooling	Fan cooling
	Braking Unit	Built-in
	EMC Filter	Internal C3 filters for inverters 3PH/380V, ≥4kW and 3PH/200V, ≥1.5kW. Optional external filters to meet the requirement of IEC61800-3 C2, IEC61800-3 C3 For drives >4kW, if internal C3 filter is required, fit supplied jumper link to EMC/J10 observing all safety precautions
	Safety	All SD1 Inverters comply to CE and are marked accordingly STO function to SIL level 2/3 (see specification table for more details)

## 2.3 Name Plate

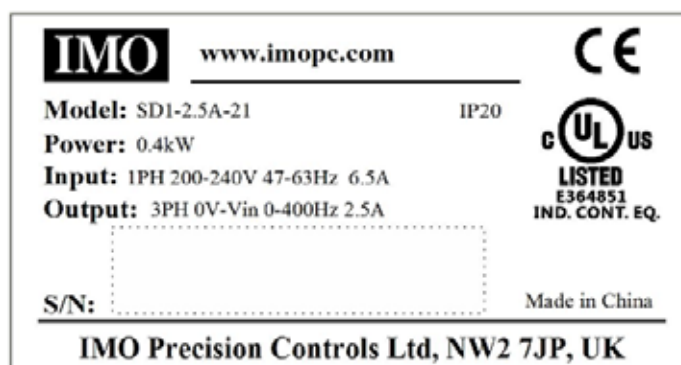


Figure 2-1: Name Plate

**NOTE:** This is the example for standard products. And the CE/IP20 will be marked according to the actual product.



## 2.4 Type Designation Key

The model designation contains information on the inverter. The user can find the model designation on the model designation label attached to the inverter or the simple name plate.

**SD1 - 2.5A - 21**  
1      2      3

*Figure 2-2: Product Type*

Key	No.	Detailed Description	Detailed Content
Product Abbreviation	❶	Product Abbreviation	SD1 = Series Name
Rated Power	❷	Rated Output Current	2.5A = 2.5Amps continuous rating
Voltage Degree	❸	Supply Voltage	21: AC 1PH 200V (-15%)~240V (+10%) 23: AC 3PH 200V (-15%)~240V (+10%) 43: AC 3PH 380V (-15%)~440V (+10%)

## 2.5 Rated Specifications

Model	Voltage Degree	Rated Output Power (kW)	Rated Input Current (A)	Rated Output Current (A)	Weight (kg)	STO Function
SD1-2.5A-21	Single phase 200V	0.4	6.5	2.5	0.9	SIL2
SD1-4.2A-21		0.75	9.3	4.2	0.9	SIL2
SD1-7.5A-21		1.5	15.7	7.5	1.2	SIL2
SD1-10A-21		2.2	24	10	1.2	SIL2
SD1-2.5A-23	Three phase 200V	0.4	3.7	2.5	1.0	SIL2
SD1-4.2A-23		0.75	5	4.2	1.0	SIL2
SD1-7.5A-23		1.5	7.7	7.5	3.1	SIL3
SD1-10A-23		2.2	11	10	3.1	SIL3
SD1-16A-23		4	17	16	3.1	SIL3
SD1-20A-23		5.5	21	20	5.58	SIL3
SD1-30A-23	7.5	31	30	5.83	SIL3	
SD1-2.5A-43	Three phase 380V	0.75	3.4	2.5	1.0	SIL2
SD1-4.2A-43		1.5	5.0	4.2	1.0	SIL2
SD1-5.5A-43		2.2	5.8	5.5	1.0	SIL2
SD1-9.5A-43		4	13.5	9.5	3.1	SIL3
SD1-14A-43		5.5	19.5	14	3.1	SIL3
SD1-18.5A-43		7.5	25	18.5	5.58	SIL3
SD1-25A-43		11	32	25	5.58	SIL3
SD1-32A-43		15	40	32	5.83	SIL3
SD1-38A-43		18.5	47	38	9.0	SIL3
SD1-45A-43		22	51	45	9.0	SIL3
SD1-60A-43		30	70	60	15.5	SIL3
SD1-75A-43		37	80	75	15.5	SIL3
SD1-92A-43		45	98	92	25	SIL3
SD1-115A-43		55	128	115	25	SIL3
SD1-150A-43		75	139	150	25	SIL3
SD1-180A-43		90	168	180	45	SIL3
SD1-215A-43	110	201	215	45	SIL3	

## 2.6 Construction Diagram

Below is the layout figure of the inverter (three phase 380V,  $\leq 2.2\text{kW}$ ). **NOTE:** Example below is the 0.75kW SD1

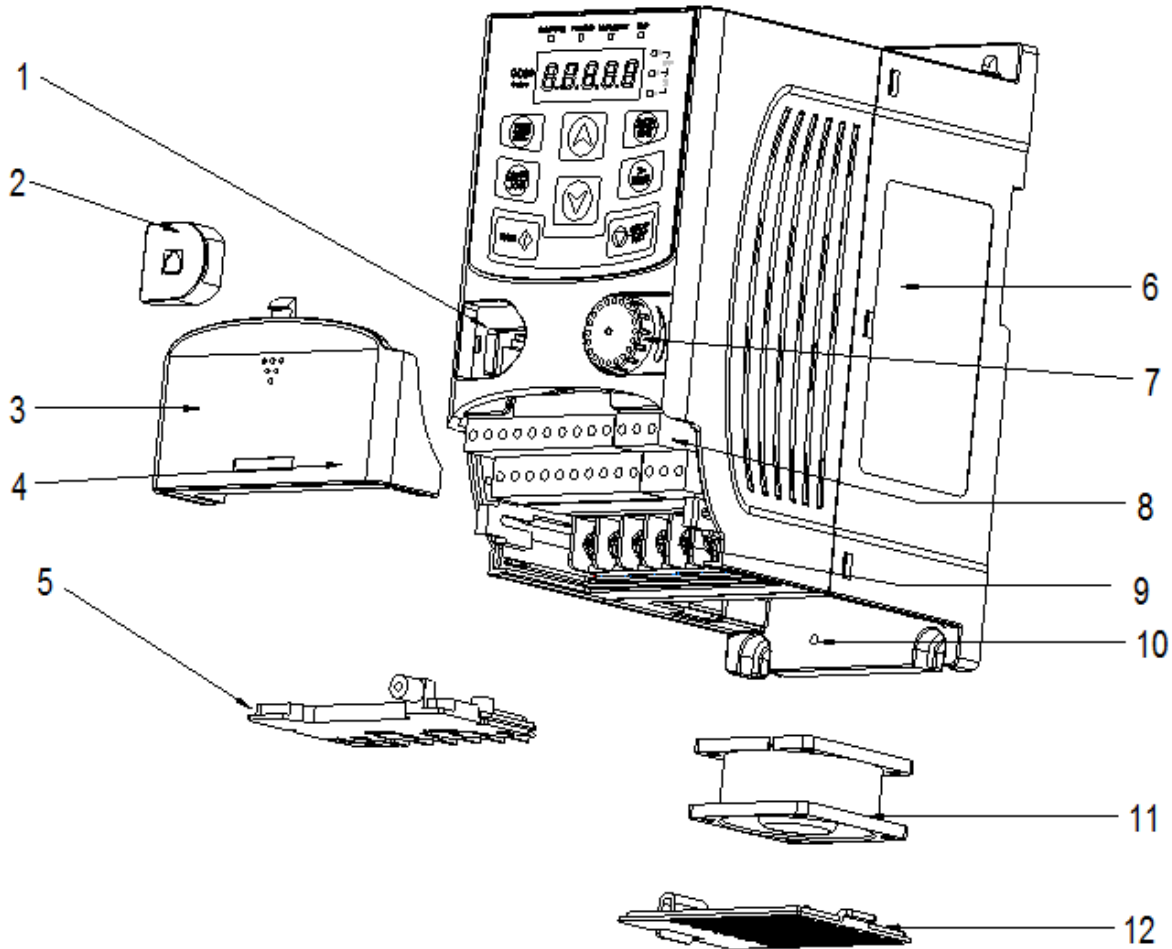


Figure 2-3: Product Construction (three phase 380V,  $\leq 2.2\text{kW}$ )

Serial No.	Name	Illustration
1	External Keypad Port	Connection for the external keypad
2	Port cover	Protects the external keypad port
3	Cover	Protects the internal parts and components
4	Hole for the sliding cover	Fix the sliding cover using a screw (provided in accessory bag)
5	Gland plate	Protect the inner components and fix the cables of the main circuit
6	Name plate	Refer to <b>section 2.3</b> for detailed information
7	Potentiometer	Refer to <b>section 4</b>
8	Control terminals	Refer to <b>section 3.2</b> for detailed information
9	Main circuit terminals	Refer to <b>section 3.2</b> for detailed information
10	Screw hole	Fix the fan cover using a screw (provided in accessory bag)
11	Cooling fan	Refer to <b>section 6</b> for detailed information
12	Fan cover	Protects the fan
13	Barcode	The same as the barcode on the name plate <b>NOTE:</b> The barcode is located under the removable cover.

**NOTE:** In above figure, the screws required for 4 and 10 are provided with packaging and specific installation depends on the requirements of customers.

Below is the layout figure of the inverter (three phase 380V,  $\leq 4\text{kW}$ ). NOTE: Example below is the 4kW SD1.

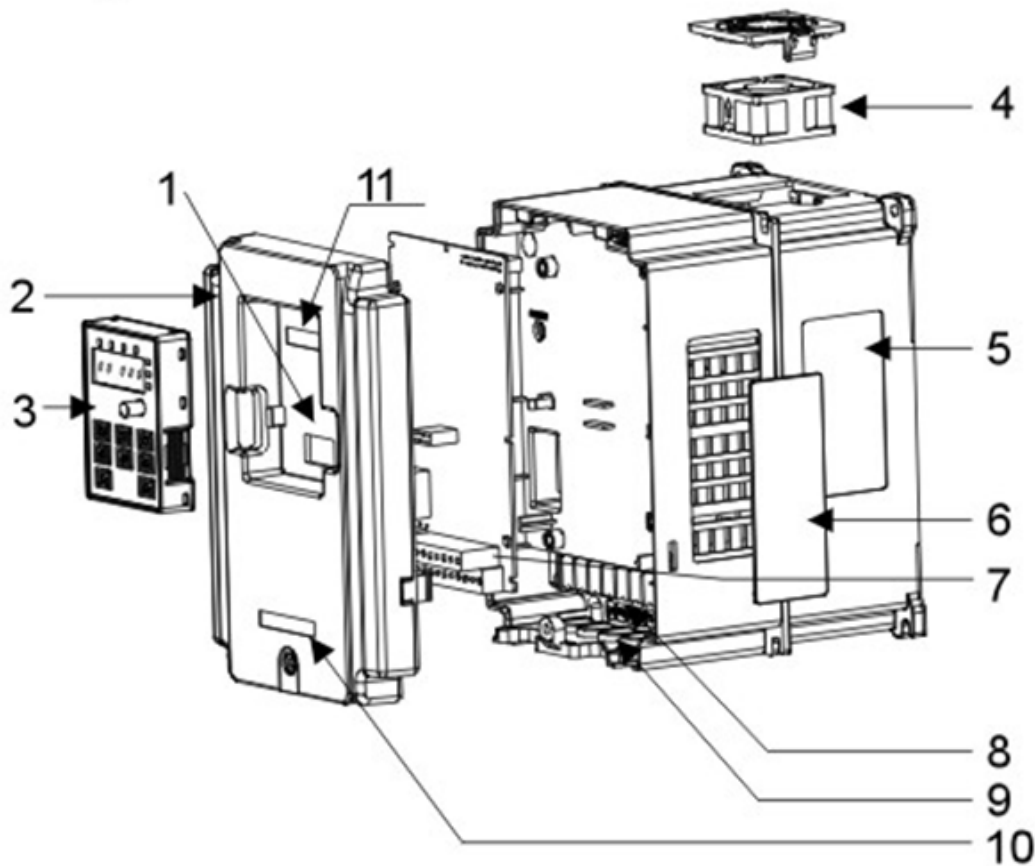



Figure 2-4: Product Construction (three phase 380V,  $\geq 4\text{kW}$ )

Serial No.	Name	Illustration
1	External Keypad Port	Connect the external keypad
2	Cover	Protects the internal parts and components
3	Keypad	Refer to the <b>section 4</b>
4	Cooling fan	See <b>section 6</b> for detailed information
5	Name plate	See <b>section 2.3</b> for detailed information
6	Side cooling vent cover	Optional cooling vent cover for higher IP protection. Derate appropriately if fitted
7	Control terminals	See <b>section 3.2</b> for detailed information
8	Main circuit terminals	See <b>section 3.2</b> for detailed information
9	Gland plate	Used to protect power and control cabling
10	Name plate	Refer to <b>section 2.4</b>
11	Barcode	The same as the barcode on the name plate

## 3 Installation Guidelines

This chapter explains the mechanical installation and electrical installation

	<ul style="list-style-type: none"> <li>• See section 1 for all safety precautions.</li> <li>• Only competent personnel are authorised to perform actions described in this chapter. Please follow the instructions in Safety Precautions. Ignoring these may cause damage to the equipment, physical injury or even death.</li> <li>• Ensure the power supply of the inverter is disconnected during this procedure. Please wait the required discharge time in accordance with the table in section 1.3.</li> <li>• The installation and wiring of the inverter should comply with local and national electrical code requirements and regulations at the installation site.</li> </ul>
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### 3.1 Mechanical Installation

#### 3.1.1 Installation Environment

To ensure full performance and the long term reliability of the inverter please adhere to the following:

Environment	Conditions
Environment Temperature	-10°C~+50°C, and the temperature changing rate is less than 0.5°C/minute. If the ambient temperature of the inverter is above 40°C, derate 1% for every additional 1°C. It is not recommended to use the inverter if the ambient temperature is above 50°C. To protect the integrity of the device, do not use the inverter in environment with frequent ambient temperature changes. Provide adequate cooling to maintain ambient temperature within specification when inverter is mounted inside an enclosure. Ensure the inverter is not operated below the minimum specified temperature.
Humidity	RH ≤90% Non-condensing
Storage temperature	-40°C~+70°C, with temperature changing rate less than 1°C/minute.
Running environment condition	The installation site of the inverter should: Not be near any electromagnetic radiation source and kept away from contaminative air, such as corrosive gas, oil mist and flammable gas; Ensure foreign objects, such as metal powder, dust, oil, water can not enter the inverter (do not install the inverter on the flammable materials such as wood); keep away from direct sunlight, oil mist, steam and vibration.
Altitude	Below 1000m Derate 1% for every additional 100m above 1000m
Vibration	≤ 5.8m/s <sup>2</sup> (0.6g)
Installation direction	The inverter should be installed on an upright position to ensure sufficient cooling effect.

#### NOTE:

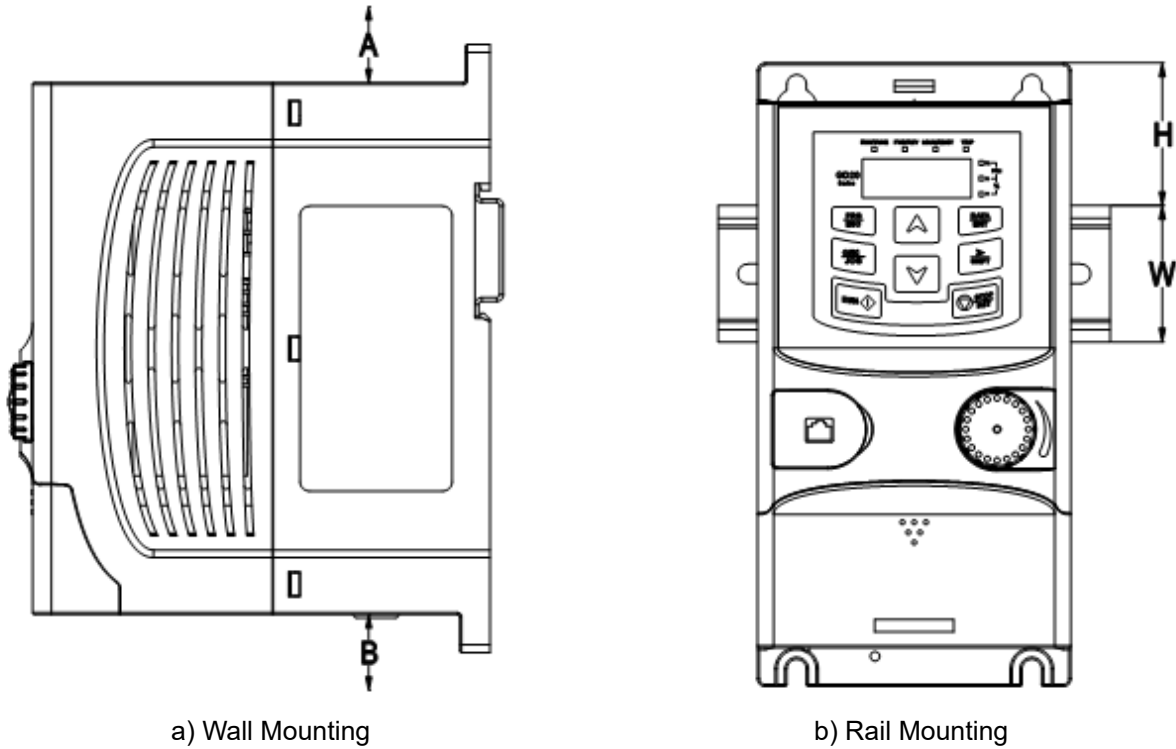
- SD1 series inverters should be installed in a clean and ventilated environment as per enclosure classification.
- Cooling air must be clean, free from corrosive materials and/or electrically conductive dust.

### 3.1.2 Installation

The inverter may be installed on any vertical surface or in a cabinet.

The inverter should be installed in the vertical upright position. Check the installation site per the requirements below. Refer to chapter Dimension Drawings in the appendix for frame details.

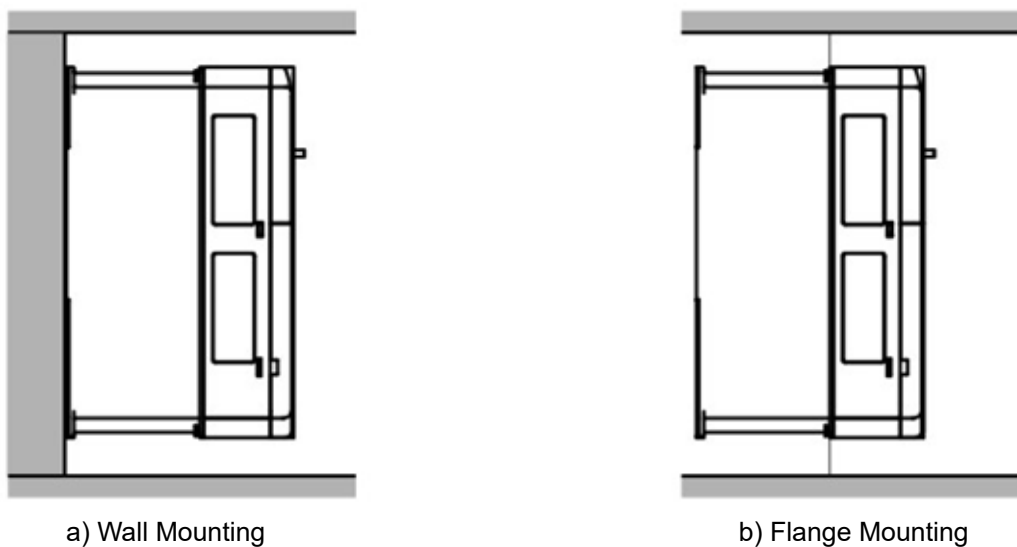
(1) Wall and rail mounting for the inverters (single phase 200V/three phase 380V,  $\leq 2.2\text{kW}$  and three phase 200V,  $\leq 0.75\text{kW}$ )



*Figure 3-1: Installation*

**NOTE:** the minimum space of A and B is 100mm (if H is 36.6mm and W is 35.0mm.)

(2) Wall and flange mounting for the inverters (three phase 380V,  $\geq 4\text{kW}$  and three phase 220V,  $\geq 1.5\text{kW}$ )



*Figure 3-2: Installation*



• Ensure the inverter is securely fitted so that it will not fall causing injury or damage.

### 3.2 Electrical Installation

#### 3.2.1 Installation

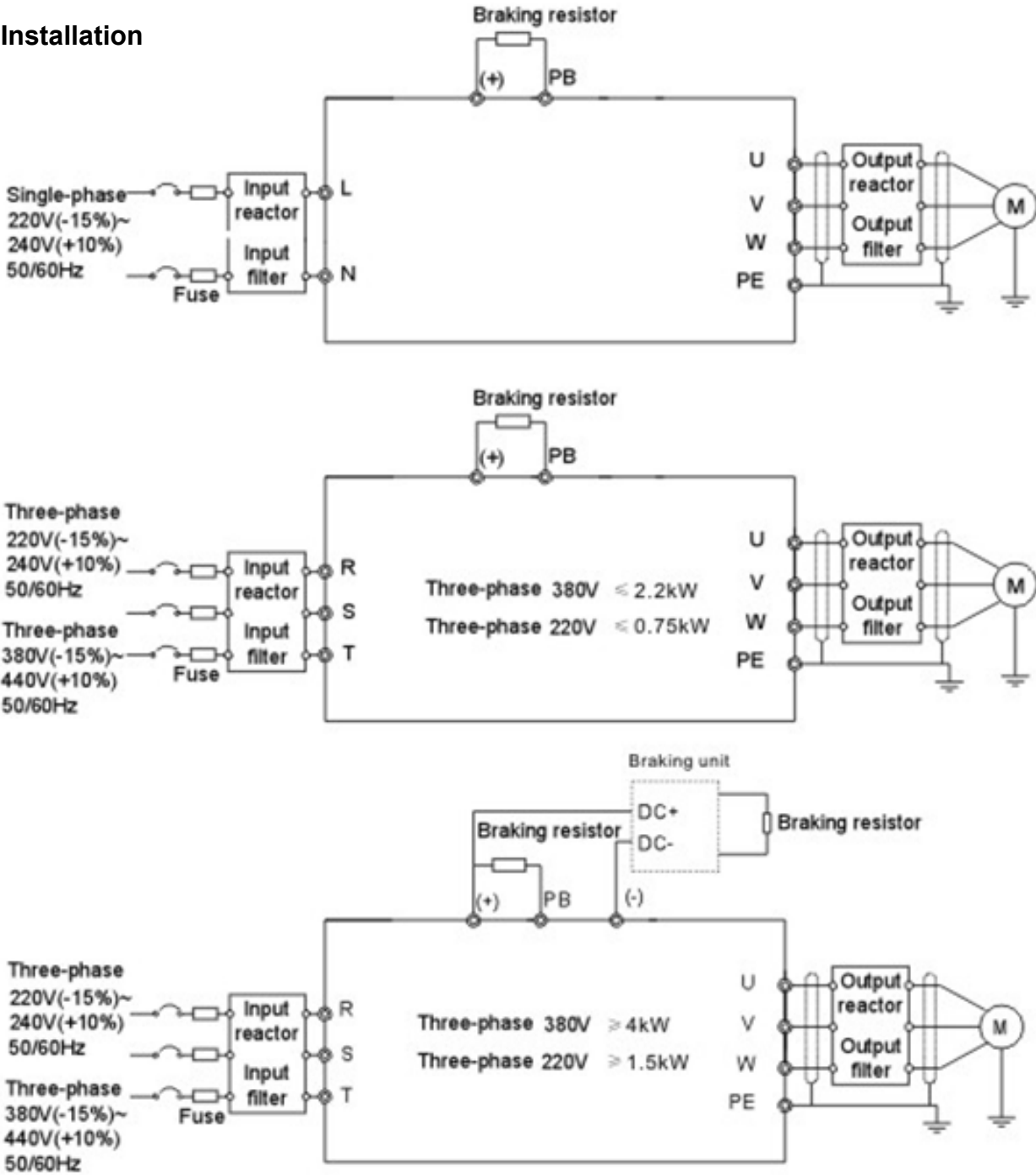


Figure 3-3: Connection diagram of main circuit

**NOTE:**

- Fuses, braking resistor, input reactor, input filter, output reactor, output filter are optional parts. Please refer to Appendix C for detailed information.
- Remove the yellow warning labels of PB, (+) and (-) on the terminals before connecting the braking resistor to ensure proper connection.

#### 3.2.2 Main Circuit Terminals



Figure 3-4: 1PH main circuit terminals (single phase)

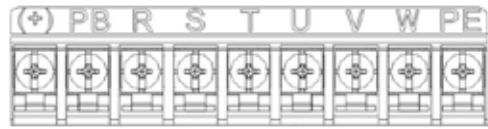


Figure 3-5: 3PH main circuit terminals (200V,  $\leq 0.75\text{kW}$ , and 380V,  $\leq 2.2\text{kW}$ )



Figure 3-6: 3PH main circuit terminals (200V,  $\leq 1.5\text{kW}$ , and 380V, 4-22kW)



Figure 3-7: 3PH main circuit terminals (30-37kW)



Figure 3-8: 3PH main circuit terminals (45-110kW)

Terminal	Function
L, N	Single phase AC input terminals which are connected to the power supply
R, S, T	Three phase AC input terminals which are connected to the power supply
PB, (+)	External dynamic braking resistor terminal
(+), (-)	Input terminal of the DBU or DC bus
U, V, W	Three phase AC output terminals which are connected to the motor
PE	Protective grounding material

**NOTE:**

- Do not use asymmetric motor cables. If there is a symmetrically grounding conductor in the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the inverter and motor ends.
- Route the motor cable, input power cable and control cables separately.

### 3.2.3 Wiring of Terminals in Main Circuit

1. Connect the grounding conductor of the input power cable to the ground terminal of the inverter (PE) using a ring type connector. Connect the phase conductors to L1, L2 and L3 terminals and fasten.
2. Strip the motor cable and connect the shield to the ground terminal of the inverter using a ring type connector. Connect the phase conductors to U, V and W terminals and fasten.
3. If required, connect the optional brake resistor with a shielded cable to the designated position by the same procedures in the previous step.
4. Secure all cables outside the inverter using suitable fasteners and strain relief.

### 3.2.4 Control Circuit Wiring Diagram

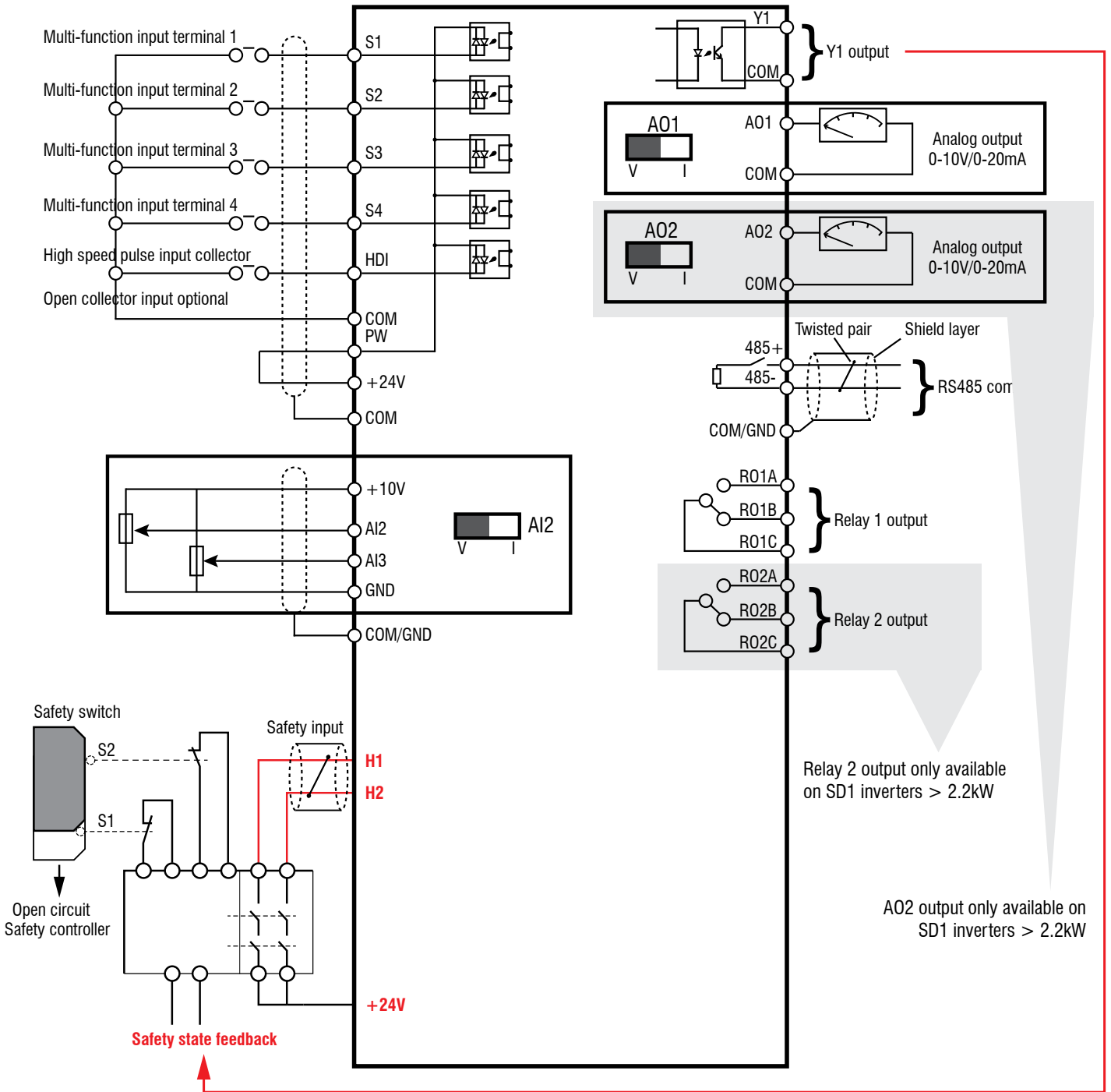


Figure 3-9: Wiring of control circuit

### 3.2.5 Control Circuit Terminals

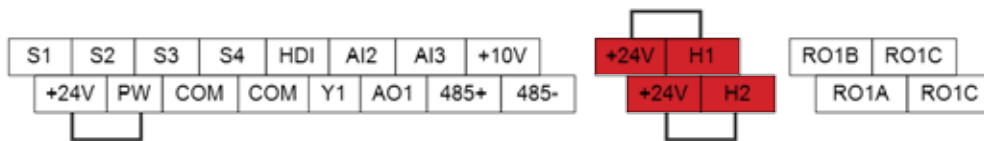


Figure 3-10: Connection terminal diagram for inverters  $\leq 2.2kW$

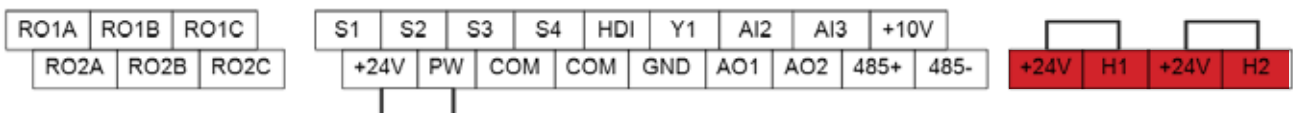


Figure 3-11: Connection terminal diagram for inverters  $\geq 4kW$



### 3.2.6 Control Circuit Definitions

Type	Terminal Name	Function Description	Technical Specifications	
Communication	485+	RS485 communications	RS485 communication interface	
	485-			
Digital Input/Output	S1	Digital Input	1. Internal impedance:3.3kΩ 2. 12~30V voltage input is available 3. These terminals are the dual-direction input 4. Max. input frequency:1kHz	
	S2			
	S3			
	S4			
	HDI	High Frequency Input Channel	Terminal for high frequency (pulse) input. Max. input frequency:50kHz Duty cycle:30%~70%	
	PW	Digital Power Supply	To provide the external digital power supply Voltage range: 12~30V	
24V Power Supply	Y1	Digital Output	Transistor output (Contact capacity: 50mA/30V)	
	+24V	24V Power Supply	Internal 24V±10% power supply. (maximum load 200mA) Used as an operation power supply for digital input and output or external sensor power supply	
COM				
Analogue Input/Output	+10V	External 10V Reference Power Supply	10V reference power supply for external potentiometer Max. output current: 50mA Potentiometer rating: 5kΩ above	
	A12	Analogue Input	1. Input range: AI2 voltage and current can be selected: 0~10V/0~20mA; AI3: -10V~+10V. 2. Input impedance: voltage input: 20kΩ; current input: 500Ω. 3. Voltage or current input can be set by dip switch. 4. Resolution: Minimum AI2/AI3 is 10mV/20mV when 10V corresponds to 50Hz.	
	A13			
	GND	Analogue Reference Ground	Analogue Reference Ground	
	AO1	Analogue Output	1. Output range:0~10V or 0~20mA 2. Voltage or current output is selected by jumpers or dip switch. 3. Deviation ±1%,25°C when full range. 4. Only AO1 for SD1 inverters ≤ 2.2kW.	
	AO2			<i>As above. Please note only AO2 for SD1 inverters &gt; 2.2kW.</i>
STO function input	24V-H1	STO input 1	1. Safety torque stop (STO) redundant input, externally connected to NC contact, STO acts when the contact is open, and the drive stops output; 2. The safe input signal cable should be shielded with max. length 25m. 3. When employing STO function, please disconnect the shorting link on the terminals shown in fig 3.10 and fig 3.11.	
	24V-H2	STO input 2		
Relay Output	RO1A	Relay 1 NO Contact	RO1 relay output, RO1A NO, RO1B NC, RO1C common terminal Contact capacity: 3A/250VAC Only RO1 for inverters ≤ 2.2kW (two contacts)	
	RO1B	Relay 1 NC Contact		
	RO1C	Relay 1 Common Contact		
	RO2A	Relay 2 NO Contact		RO2 relay output, RO2A NO, RO2B NC, RO2C common terminal Contact capacity: 3A/250VAC Please note only RO2 for SD1 inverters > 2.2kW.
	RO2B	Relay 2 NC Contact		
	RO2C	Relay 2 Common Contact		

### 3.2.7 Input/Output Signal Connection Figure

Use jumper link to set NPN mode or PNP mode and the internal or external power supply. The default setting is NPN internal mode.

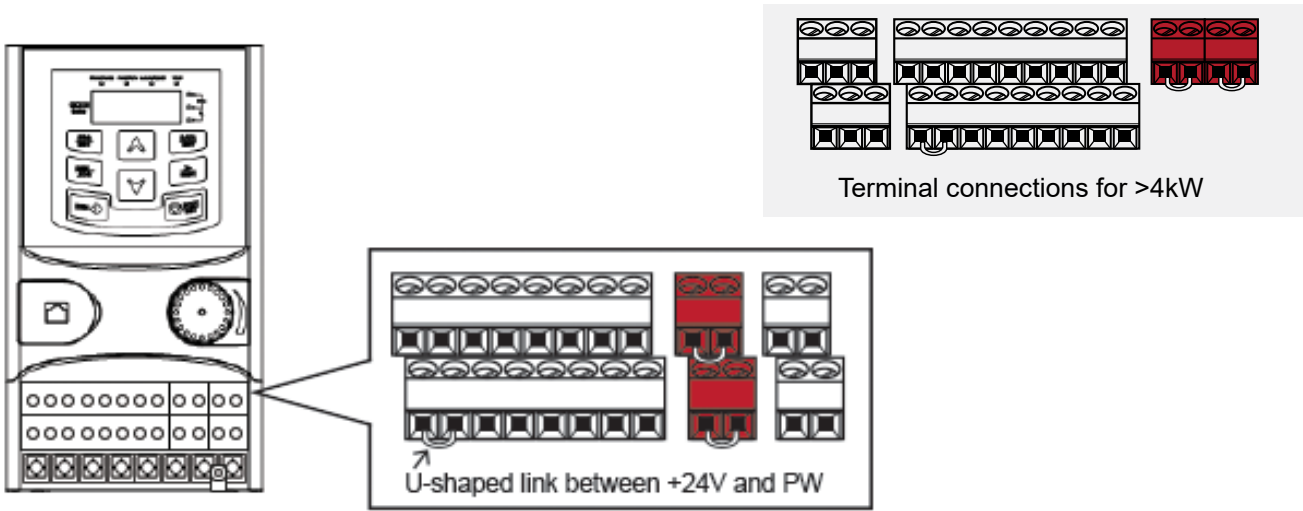


Figure 3-12: Jumper Link

If the signal is from NPN transistor, please set the jumper link between +24V and PW as below according to the used power supply.

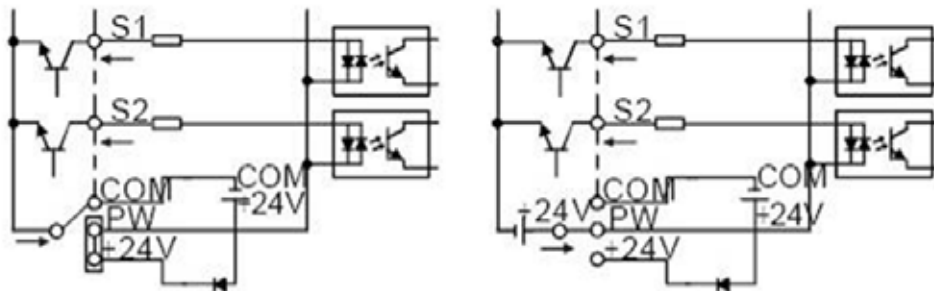


Figure 3-13: NPN modes

If the signal is from PNP transistor, please set the jumper link as below according to the used power supply.

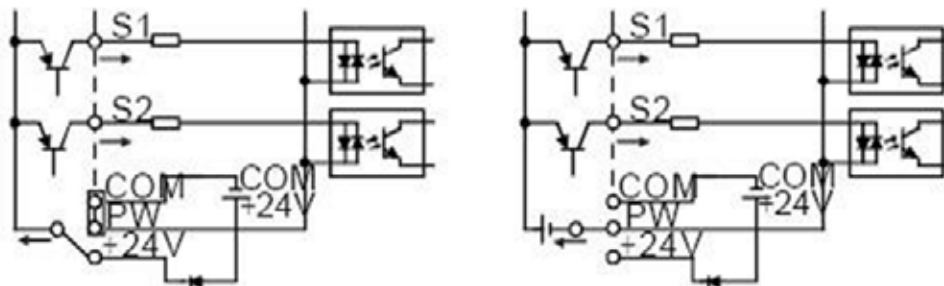


Figure 3-14: PNP modes

### 3.2.8 Internal C3 Filter Link

For drives >4kW, if internal C3 filter is required, fit supplied jumper link to EMC/J10 observing all safety precautions.

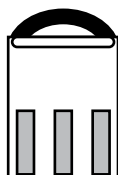


Figure 3-15: C3 Filter Jumper Link

### 3.3 STO (Safe Torque Off) Function Overview

Reference standards: IEC 61508-1, IEC 61508-2, IEC 61508-3, IEC 61508-4, IEC 62061, ISO 13849-1, IEC 61800-5-2  
 The STO function can be used where main power of the drive is on to prevent unexpected start. The function cuts off the drive signal to disable the drive output, thus preventing motor from unexpected start (refer to below figure). After enabling STO function, short-time operations and/or maintenance on non-electrical parts can be conducted.

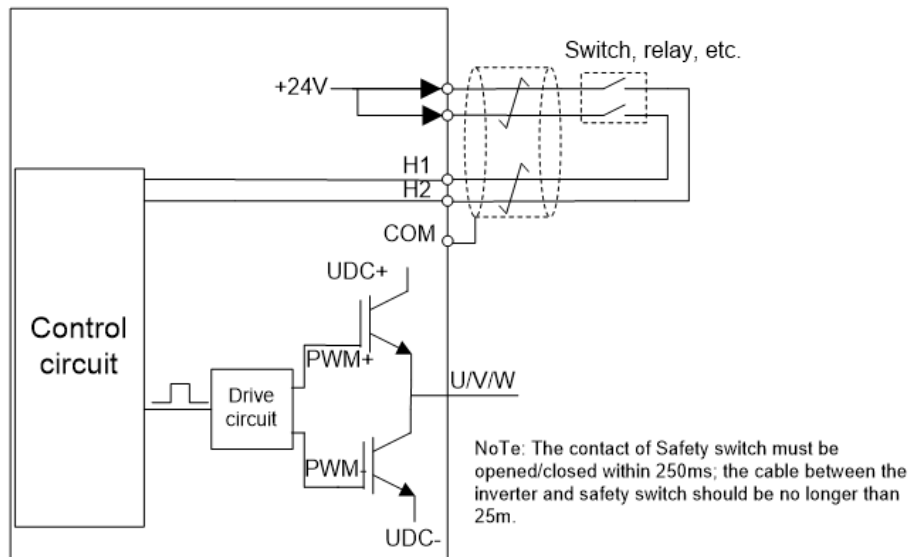


Figure 3-16: STO schematic

#### 3.3.1 Logic table for STO function

Input states and corresponding faults of STO function:

STO input state	Corresponding STO fault
H1, H2 opens simultaneously	Triggers STO function, the drive stops
H1, H2 closes simultaneously	Drive operates normally
Either H1 or H2 opens or closes	Trigger STL1/STL2/STL3 fault, fault code: 38: Safety circuit of channel 1 is abnormal (STL1) 39: Safety circuit of channel 2 is abnormal (STL2) 40: Channel H1 and H2 become abnormal simultaneously (STL3)

#### 3.3.2 Description of STO Channel Delay

STO channel trigger and indication delay time:

STO mode	STO trigger and indication delay <sup>1)2)</sup>
STO fault: STL1	Trigger delay<10ms Indication delay<280ms
STO fault: STL2	Trigger delay<10ms Indication delay<280ms
STO fault: STL3	Trigger delay<10ms Indication delay<280ms
STO fault: STO	Trigger delay<10ms Indication delay<100ms

<sup>1)</sup> STO trigger delay = the delay between triggering STO and cutting off drive output

<sup>2)</sup> STO indication delay= the delay between triggering STO and indicating STO output state

### 3.3.3 Pre-check for STO Installation

Before full operation of STO, please perform the checks from table below:

Actions	
<input type="checkbox"/>	Ensure drive can be run and stopped freely during commissioning.
<input type="checkbox"/>	Stop the drive (if running), switch input supply and isolate the drive from the power cable via the switch
<input type="checkbox"/>	Check STO circuit connection against circuit diagram.
<input type="checkbox"/>	Check the shield of STO input cable is connected to +24V reference GND COM
<input type="checkbox"/>	Power on
<input type="checkbox"/>	Test the operation of STO when the motor is stopped: <ul style="list-style-type: none"> <li>• Give a stop command to the drive (if running) and wait until the motor shaft is at standstill.</li> <li>• Activate STO function and give a start command to the drive, ensure the motor does not rotate.</li> <li>• De-activate STO circuit</li> </ul>
<input type="checkbox"/>	Restart the drive and check the motor runs normally
<input type="checkbox"/>	Test the operation of STO function when the motor is running: <ul style="list-style-type: none"> <li>• Start the drive and ensure the motor runs normally.</li> <li>• Activate STO circuit.</li> <li>• The drive reports STO fault, ensure the motor coasts to stop and stops rotation.</li> <li>• Re-activate STO circuit</li> </ul>
<input type="checkbox"/>	Start the drive and check the motor runs normally

### 3.3.4 Control Terminal Function (see table 3.2.6)

### 3.3.5 Control circuit showing STO function (see diagram 3.2.4)

### 3.3.6 Control Terminal Diagram (see diagram 3.2.5)

### 3.3.7 STO Function Parameter Table

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P06.01	Y1 output selection	0: Invalid	27	○
P06.03	Relay RO1 output selection	1: In operation .....	1	○
P06.04	Relay RO2 output selection	25: Reserved 26: DC bus voltage build-up is completed 27: STO action 28~30: Reserved	5	○
P07.27	Current fault type	0: No fault		●
P07.28	Type of the previous 1 fault	1: Inverter unit U phase protection (OUT1) .....		●
P07.29	Type of the previous 2 faults	35: Maladjustment fault (STo) 36: Underload fault (LL)		●
P07.30	Type of the previous 3 faults	37: Safety torque stop (STO)		●
P07.31	Type of the previous 4 faults	38: Channel 1 safety circuit is abnormal (STL1) 39: Channel 2 safety circuit is abnormal (STL2)		●
P07.32	Type of the previous 5 faults	40: Channel H1 and H2 become abnormal simultaneously (STL3) 41: Safety code FLASH CRC check fault (CrCE)		●
P11.16	Extension function selection	0x000~0x211 LED ones: Automatic frequency downgrade at voltage drop 0: Automatic frequency downgrade at voltage drop is invalid 1: Automatic frequency downgrade at voltage drop is valid LED tens: The second ACC/DEC time selection 0: The second ACC/DEC time detection selection is invalid 1: The second ACC/DEC time detection selection is valid, when the operation is above P08.36, ACC/DEC time is switched to the second ACC/DEC time LED hundreds: STO function selection 0: STO alarm locked Alarm lock means when STO appears, reset is a must after state recovery. 1: STO alarm unlocked STO alarm unlocked means when STO appears, STO alarm will disappear automatically after state recovery. <b>Note:</b> STL1~STL3 are fault lock and cannot be reset	0x100	○

### 3.3.8 STO Alarm

- When P11.16 is set to 1, the STO alarm is locked.

As shown in below fig 3-17, When H1 and H2 are 'OFF' during operation (safety function is required), the drive enters safety mode and stops output. STO alarm will only clear when reset is activated. External run command needs to be reset for the drive to run again.

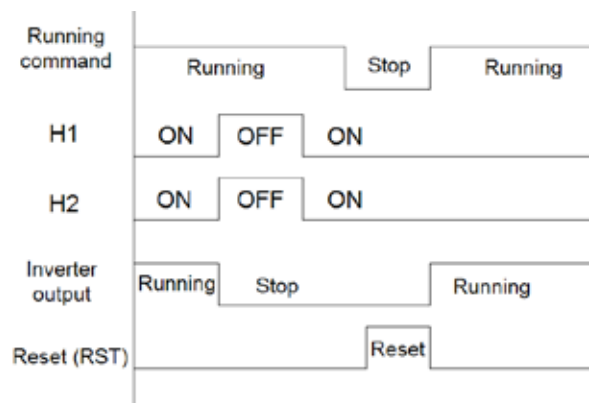


Figure 3-17

- 2. When the hundreds of P11.16 is set to 2, the STO alarm will not be locked. As shown in below Figure 3-18, alarm non-lock means when STO appears, the STO alarm will disappear automatically after state restoration, which requires no reset action. After reset of external running command, the inverter will execute run command again.

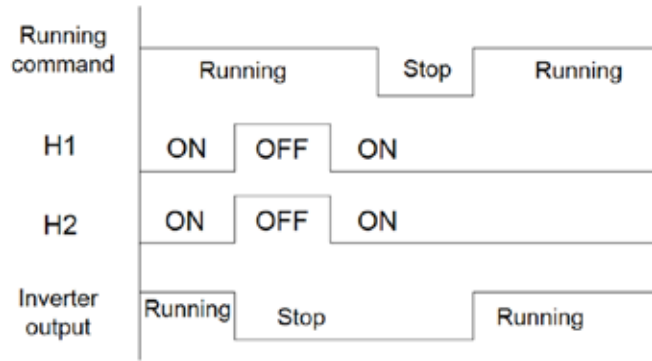


Figure 3-18

STL1 fault (the hundreds of P11.16 is set to 1)

As shown in below fig 3-19, when the hardware circuit of safety circuit H1 is OFF while that of H2 signal is ON, namely, when H1 is OFF during operation (safety function is activated), the drive enters safety mode and stops output, overriding any run signal. STL1 is displayed and alarm is locked, ignoring both run reset and trip reset until the cause of the fault is rectified.

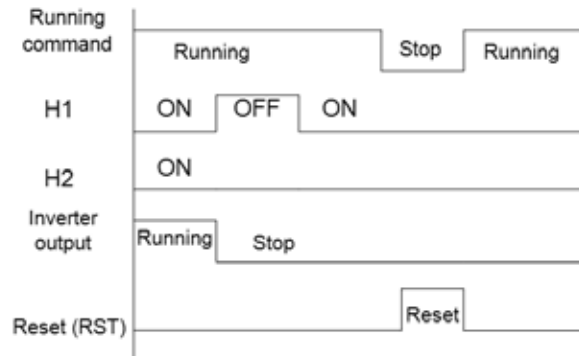


Figure 3-19

STL 2 fault (the hundreds of P11.16 is set to 1)

As shown in below fig 3-20, when the hardware circuit of safety circuit H1 is ON while that of H2 signal is OFF, namely, when H1 is ON during operation (safety function is required), the drive enters safety mode and stops output, overriding any run signal. STL2 is displayed and alarm is locked, ignoring both run reset and trip reset until the cause of the fault is rectified.

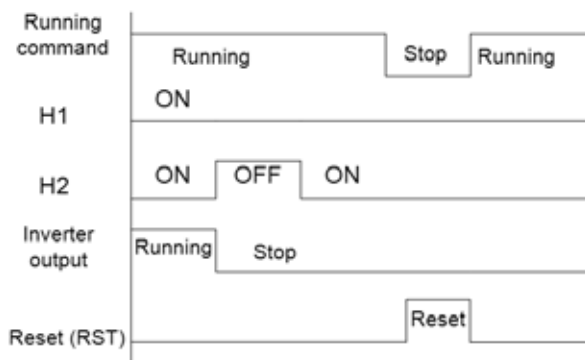


Figure 3-20

## 3.4 Layout Protection

### 3.4.1 Protect the Inverter and Input Power Cable in Short-Circuit Conditions

Protect the inverter and input power cables with fuses (shown below) in case of short circuit occurrence or thermal overload.

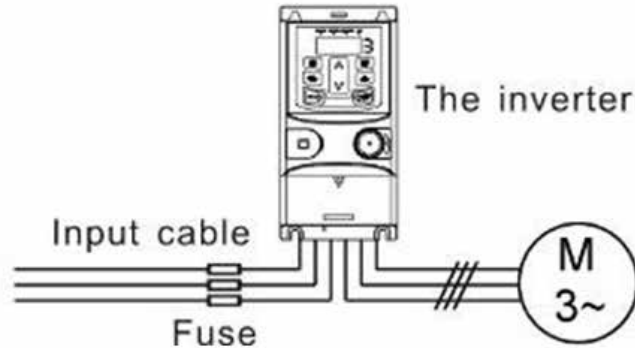


Figure 3-21: Fuse Configuration

**NOTE:** Select the fuse as specified in the manual. The fuse will protect the input power cable from damage in short-circuit conditions. It will protect the surrounding devices should the inverter have a short circuit condition.

### 3.4.2 Protecting the Motor and Motor Cables

The inverter protects the motor and motor cables in case of a short-circuit condition as long as the motor cable is specified according to the rated current of the inverter. No additional protection devices are required.



- If the inverter is connected to multiple motors, a separate thermal overload switch or a circuit breaker must be used for protecting each cable and motor. These devices may require a separate fuse to cut off the short-circuit current.

### 3.4.3 Implementing a Bypass Connection

It is necessary to set power frequency and variable frequency conversion circuits for the assurance of continuous normal work of the inverter if faults occur in some significant situations.

In some special situations, for example, if it is only used in soft start, the inverter can be converted into power frequency running after starting however some corresponding bypass should be added.



- Never connect the supply power to the inverter output terminals U, V and W. Power line voltage applied to the output can result in permanent damage to the inverter.

If frequent switching is required, employ mechanically connected switches or contactors to ensure the motor terminals are not connected to the AC power line and inverter output terminals simultaneously.

## 4 Keypad Operation

### 4.1 Keypad Introduction

The keypad is used to control SD1 series inverters, read the status data and adjust parameters.

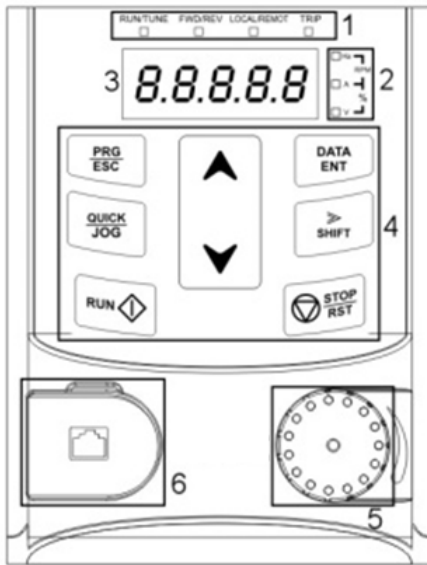


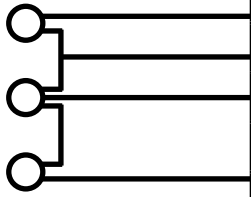
Figure 4-1: Fixed keypad











Figure 4-2: External keypad

#### NOTE:

1. The fixed keypad is standard for all inverters up to 2.2kW. External Keypad is supplied fitted to  $\geq 4$ kW inverters as standard.
2. Optional external keypad with copy function is available.

Serial No	Name	Description		
1	Status LED	RUN/TUNE	LED off means that the inverter is in the stopped state; LED flashing means the inverter is in the parameter autotune status; LED on means the inverter is running.	
		FWD/REV	FWD/REV LED LED off means the inverter is in forward rotation state; LED on means the inverter is in reverse rotation state	
		LOCAL/REMOT	LED for keypad operation, terminals operation and remote communication control LED off means that the inverter is in the keypad operation status; LED flashing means the inverter is in terminal operation status; LED on means the inverter is in remote communication control status.	
		TRIP	LED for faults LED on when the inverter is in fault status; LED off in normal status; LED flashing means the inverter is in the pre-alarm status.	
2	Unit LED	Refers to the current unit displayed		
			Hz	Frequency Unit
			RPM	Rotating Speed Unit
			A	Current Unit
			%	Percentage
	V	Voltage Unit		



Serial No	Name	Description			
3	Code Displaying Zone	5-figure LED display indicates various monitoring data and alarm code such as set frequency and output frequency.			
		Displayed Word	Corresponding Word	Displayed Word	Corresponding Word
		0	0	1	1
		2	2	3	3
		4	4	5	5
		6	6	7	7
		8	8	A	A
		B	B	C	C
		D	D	E	E
		F	F	H	H
		I	I	N	N
		O	O	P	P
		Q	Q	R	R
		S	S	T	T
		U	U	-	-
4	Buttons		Programming Key	1) Access programming mode 2) Exit	
			Entry Key	1) Enter the parameter subgroup 2) Confirm parameters	
			UP Key	Up	
			DOWN Key	Down	
			Right Shift Key	1) Monitor values 2) Move cursor right to select the displaying parameter in stopping and running mode.	
			Run Key	Enable run signal from keypad	
			Stop/Reset Key	1) Enable stop from keypad. Refer to P07.04 2) Reset alarm fault	
			Quick Key	The function of this key is programmed by function code P07.02.	
5	Analogue Potentiometer	AI1, When the external common keypad (without the function of parameter copy) is valid, the difference between the local keypad AI1 and the external keypad AI1 is: When the external keypad AI1 is set to the Min. value, the local keypad AI1 will be valid and P17.19 will be the voltage of the local keypad AI1; otherwise, the external keypad AI1 will be valid and P17.19 will be the voltage of the external keypad AI1. <b>Note:</b> If the external keypad AI1 is frequency reference source, adjust the local potentiometer AI1 to 0V/0mA before starting the inverter.			
6	Keypad Port	External keypad port. When the external copy keypad is connected, the local keypad LED is off; When the external standard keypad is connected, the local and external keypad LEDs are on. <b>Note:</b> Only the optional external copy keypad can store parameters.			

## 4.2 Keypad Display

The keypad display status of SD1 Series inverters is divided into stopped state, running state, function code editing state and fault alarm status, etc.

### 4.2.1 Stop Mode Parameter

When the inverter is in the stopped state, the keypad will display stopped parameters which is shown in figure 4-2.

In the stopped state, various parameters can be displayed. Select the parameters to be displayed by P07.07. See the instructions of P07.07 for the detailed definition of each parameter.

In the stopped state, there are 14 stopping parameters can be selected to be displayed. They are: set frequency, bus voltage, input terminals status, output terminals status, PID set value, PID feedback, torque set value, AI1, AI2, AI3, HDI, PLC and the current stage of preset speeds, pulse counting value, length value. P07.07 can select the parameter to be displayed by bit and **»/SHIFT** can shift the parameters from left to right, **QUICK/JOG**(P07.02=2) can shift the parameters from right to left.

### 4.2.2 Run Mode Parameters

After the inverter receives valid running command, the inverter will enter the running state and the keypad will display the running parameters. **RUN/TUNE** LED on the keypad is on, while the **FWD/REV** is determined by the current running direction which is shown as figure 4-2.

In the running state, there are 24 parameters can be selected to be displayed. They are: running frequency, set frequency, bus voltage, output voltage, output torque, PID given, PID feedback, input terminals state, output terminals state, torque set value, length value, PLC and the current stage of preset speeds, pulse counting value, AI1, AI2, AI3, HDI, percentage of motor overload, percentage of inverter overload, ramp given value, linear speed, AC input current. P07.05 and P07.06 can select the parameter to be displayed by bit and **»/SHIFT** can shift the parameters from left to right, **QUICK/JOG**(P07.02=2) can shift the parameters from right to left.

### 4.2.3 Fault Status

If the inverter detects a fault signal, it will enter the fault pre-alarm display status. The keypad will display the fault code by flashing. The **TRIP** LED on the keypad is on, and the fault reset can be operated by the **STOP/RST** on the keypad, control terminals or communication commands.

### 4.2.4 Function Codes Editing

In the stopped, running or fault state, press **PRG/ESC** to enter the editing state. The editing status is displayed on two levels of menu, and the order is: function code group/function code number → function code parameter, press **DATA/ENT** into the displayed status of function parameter. Press **DATA/ENT** to save the parameters or press **PRG/ESC** to escape.



Figure 4-2: Displayed Status

See section 5 for detailed function codes.

### 4.2.5 Function Codes Editing Example

The inverter has three levels menu, which are:

1. Group number of function code (first-level menu)
2. Tab of function code (second-level menu)
3. Set value of function code (third-level menu)



## 5 Function Code

The function parameters of SD1 Series inverters have been divided into 30 groups (P00~P29) according to the function, of which P18~P28 are reserved. Each function group contains certain function codes applying 3-level menus. For example, "P08.08" means the eighth function code in the P8 group function, P29 group is factory reserved. See table below:

For ease of function codes setting, the function menu is constructed in 3 levels: Group, sub group and data value setting. See table below:

Group	Sub Group	Description	Examples of Functions
P00	P00.00 – P00.18	Basic parameters	Run command type, Max frequency, ramp times
P01	P01.00 – P01.25	Start/Stop control	DC injection braking, coast to stop, delay start, auto restart
P02	P02.00 – P02.26	Motor 1 settings	Motor ratings, kW, Current, speed
P03	P03.00 – P03.27	Vector control	Torque vector control settings
P04	P04.00 – P04.33	V/F control	Torque boost, slip compensation, V/F curve
P05	P05.00 – P05.54	Input terminals	Set function of digital inputs S1-S4
P06	P06.00 – P06.26	Output terminals	Set function of relay, transistor and analogue outputs
P07	P07.00 – P07.56	Keypad/HMI settings	Set user password, quick key function and display
P08	P08.00 – P08.51	Enhanced functions	Jog, cooling fan and dynamic braking functions
P09	P09.00 – P09.16	PID control settings	PID, SV and feedback source settings
P10	P10.00 – P10.37	Pre-set speeds & PLC	Pre-set speed values & PLC selection
P11	P11.00 – P11.15	Protective functions	Set protective function trip/output levels
P13	P13.13 – P13.15	Control parameters of SM	Current braking settings
P14	P14.00 – P14.08	Comms settings	Baud rate, check bits and other MODBUS/RS485 settings
P17	P17.00 – P17.39	Monitoring	Monitor live values of inverter during operation
P29	Reserved	Reserved	

1. Below is the instruction of the function lists:

**The first column** "Function code": codes of function parameter group and parameters

**The second column** "Name": full name of function parameters

**The third column** "Detailed illustration of parameters": Detailed instruction of the function parameters

**The fourth column** "Default value": the original factory set value of the function parameter

**The fifth column** "Modify": the modifying character of function codes (the parameters can be modified or not and the modifying conditions), below are the instructions:

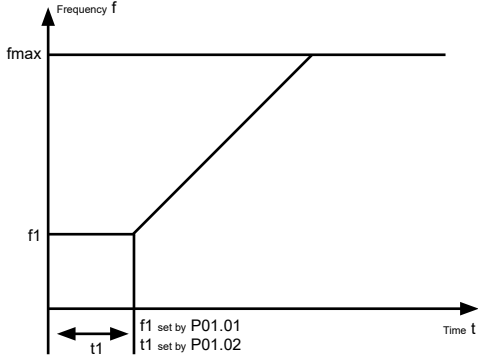
1. "○": indicates the set value of the parameter can be modified in stop and running state;
2. "⊙": indicates the set value of the parameter can not be modified in the running state;
3. "●": indicates the value of the parameter is the display value which can not be modified.

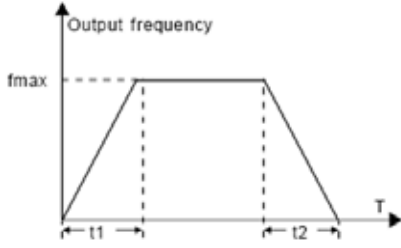
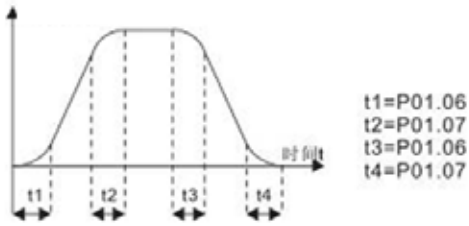
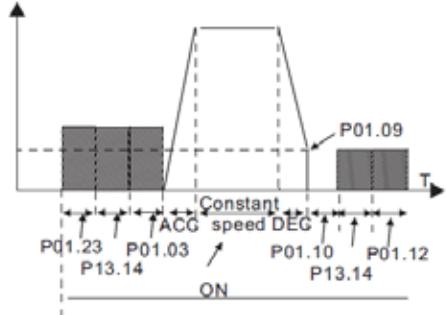
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
<b>P00 Group: Basic Function Group</b>				
P00.00	Speed control mode	0: SVC 0 No encoders required. Suitable in applications which require low frequency, high torque for high accuracy of rotating speed and torque control. Relative to mode 1, it is more suitable for the applications which need low power. 1: SVC 1 Suitable in high performance applications with the advantage of high accuracy of rotating speed and torque. Encoder not required. 2: SVPWM control Suitable in applications which do not require high control accuracy, such as pump and fan applications.	1	⊙

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P00.01	Run command channel	<p>Selects the run command method of the inverter.            Settings include: start, stop, forward/reverse rotation, jog and fault reset.            0: Keypad running command method ("LOCAL/REMOT" light off)            Run command control by <b>RUN</b>, <b>STOP/RST</b> on the keypad.            Set the multi-function key <b>QUICK/JOG</b> to <b>FWD/REVC</b> shifting function (P07.02=3) to change the run direction; press <b>RUN</b> and <b>STOP/RST</b> simultaneously in running state for coast to stop.            1: Terminal run command method ("LOCAL/REMOT" flashing)            Run command control for forward rotation, reverse rotation and forward jog and reverse jog by digital inputs S1-S4            2: Communication running command method ("LOCAL/REMOT" on);            The running command is controlled via communication.</p>	0	○
P00.03	Max. output frequency	<p>This parameter is used to set the maximum output frequency of the inverter. Frequency setting, acceleration and deceleration times are directly related to this parameter.            Setting range: P00.04~400.00Hz</p>	50.00Hz	⊙
P00.04	Frequency high limit	<p>Sets the high frequency limit which is lower than or equal to the maximum frequency.            Setting range: P00.05~P00.03 (Max. output frequency)</p>	50.00Hz	⊙
P00.05	Frequency low limit	<p>Sets the low frequency limit.            The inverter runs at the lower limit frequency if the set frequency is lower than the lower limit.            Note: Max. output frequency ≥ high limit frequency ≥ Low limit frequency            Setting range: 0.00Hz~P00.04 (high limit of the running frequency)</p>	0.00Hz	⊙
P00.06	"A" frequency command selection	<p><b>Note:</b> "A" frequency and "B" frequency can not set to the same frequency input method. The frequency source can be set by P00.09.            0: Keypad data setting            Modify the value of function code P00.10 (set the frequency by keypad) to modify the frequency by the keypad.            1: Analogue AI1 setting (corresponding keypad potentiometer)            2: Analogue AI2 setting (corresponding terminal AI2)            3: Analogue AI3 setting (corresponding terminal AI3)            Set the frequency by analogue input terminals. SD1 Series inverters provide 3 channels analogue input terminals as the standard configuration, of which AI1 is adjusting through analogue potentiometer, while AI2 is the voltage/current option (0~10V/0~20mA) which can be selected by jumpers; while AI3 is voltage input (-10V~+10V).  <b>Note:</b> when analogue AI2 select 0~20mA input, the corresponding voltage of 20mA is 10V. 100.0% of the analogue input setting corresponds to the maximum frequency (function code P00.03) in forward direction and -100.0% corresponds to the maximum frequency in reverse direction (function code P00.03)            4: High-speed pulse HDI setting            The frequency is set by high-speed pulse terminals. SD1 Series inverters provide 1 high speed pulse input as the standard configuration. The pulse frequency range is 0.00~50.00kHz. 100.0% of the high-speed pulse input setting corresponds to the maximum frequency in forward direction (function code P00.03) and -100.0% corresponds to the maximum frequency in reverse direction (function code P00.03).  <b>Note:</b> The pulse setting can only be input by multi-function terminals HDI. Set P05.00 (HDI input selection) to high speed pulse input, and set P05.49 (HDI high speed pulse input function selection) to frequency setting input.            5: Simple PLC program setting            The inverter runs at simple PLC program mode when P00.06=5 or P00.07=5. Set P10 (simple PLC and multi-step speed control) to select the running frequency running direction, ACC/DEC time and the keeping time of corresponding stage. See the function description of P10 for detailed information.            6: Multi-step speed running setting            The inverter runs at multi-step speed mode when P00.06=6 or P00.07=6. Set P05 to select the current running step, and set P10.nn to select the current running frequency.            The multi-step speed has the priority when P00.06 or P00.07 does not equal to 6, but the setting stage can only be the 1~15 stage. The setting</p>	0	○
P00.07	"B" frequency command selection	<p> <b>Note:</b> when analogue AI2 select 0~20mA input, the corresponding voltage of 20mA is 10V. 100.0% of the analogue input setting corresponds to the maximum frequency (function code P00.03) in forward direction and -100.0% corresponds to the maximum frequency in reverse direction (function code P00.03)            4: High-speed pulse HDI setting            The frequency is set by high-speed pulse terminals. SD1 Series inverters provide 1 high speed pulse input as the standard configuration. The pulse frequency range is 0.00~50.00kHz. 100.0% of the high-speed pulse input setting corresponds to the maximum frequency in forward direction (function code P00.03) and -100.0% corresponds to the maximum frequency in reverse direction (function code P00.03).  <b>Note:</b> The pulse setting can only be input by multi-function terminals HDI. Set P05.00 (HDI input selection) to high speed pulse input, and set P05.49 (HDI high speed pulse input function selection) to frequency setting input.            5: Simple PLC program setting            The inverter runs at simple PLC program mode when P00.06=5 or P00.07=5. Set P10 (simple PLC and multi-step speed control) to select the running frequency running direction, ACC/DEC time and the keeping time of corresponding stage. See the function description of P10 for detailed information.            6: Multi-step speed running setting            The inverter runs at multi-step speed mode when P00.06=6 or P00.07=6. Set P05 to select the current running step, and set P10.nn to select the current running frequency.            The multi-step speed has the priority when P00.06 or P00.07 does not equal to 6, but the setting stage can only be the 1~15 stage. The setting</p>	2	○

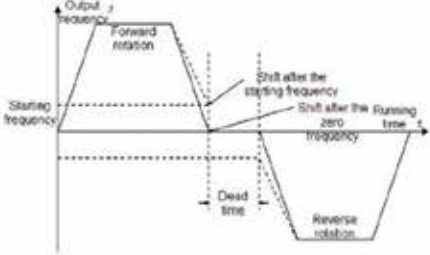
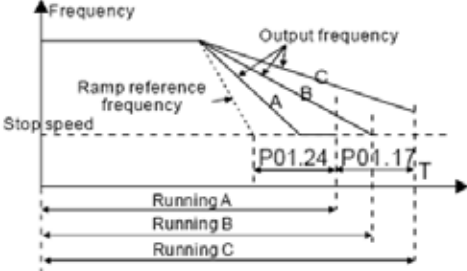
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify																						
cont.		Stage is 1~15 if P00.06 or P00.07 equals to 6. 7: PID control setting The running mode of the inverter is process PID control when P00.06=7 or P00.07=7. It is necessary to set P09. The running frequency of the inverter is the value after PID effect. See P09 for the detailed information of the preset source, preset value and feedback source of PID. 8: MODBUS communication setting The frequency is set by MODBUS communication. See P14.nn for detailed information. 9~11: Reserved																								
P00.08	B frequency command reference selection	0: Maximum output frequency, 100% of B frequency setting corresponds to the maximum output frequency 1: A frequency command, 100% of B frequency setting corresponds to the maximum output frequency. Select this setting if it needs to adjust on the base of A frequency command.	0	○																						
P00.09	Combination of setting source	0: Sets A as frequency command 1: Sets B as frequency command 2: Sets A + B as frequency command 3: Sets A – B as frequency command 4: Sets highest value of A & B as frequency command 5: Sets lowest value of A & B as frequency command <b>Note:</b> The combination setting can be switched by P05 (terminal function)	0	○																						
P00.10	Keypad set frequency	Sets the initial frequency value for A & B when in keypad control. Setting range: 0.00 Hz~P00.03 (the max. frequency)	50.00Hz	○																						
P00.11	ACC time 1	ACC1: Time (secs) to ramp up to max. frequency (P00.03) from 0Hz DEC1: Time (secs) to down from max. frequency (P00.03) to 0Hz (SD1 Series inverters have four groups of ACC/DEC time which can be selected by P05. The factory default ACC/DEC time of the inverter is the first group.) Setting range of P00.11 and P00.12:0.0~3600.0s	Depends on model	○																						
P00.12	DEC time 1																									
P00.13	Running direction selection	0: The inverter runs in the forward direction. FWD/REV indicator is off. 1: The inverter runs in the reverse direction. FWD/REV indicator is on. The motor rotation direction can be changed by <b>QUICK/JOG</b> on the keypad. Refer to parameter P07.02. <b>Note:</b> Factory reset returns motor direction to default. Check direction of motor is correct before running after reset. 2: Forward run only. Prevents motor running in reverse direction.	0	○																						
P00.14	Carrier frequency setting	Relationship table of the motor type and carrier frequency: <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Carrier Frequency</th> <th>RFI Noise</th> <th>Earth Leakage</th> <th>Heat Generation</th> </tr> </thead> <tbody> <tr> <td>1 kHz</td> <td>High</td> <td>Low</td> <td>Low</td> </tr> <tr> <td>4 kHz</td> <td style="text-align: center;">↑ ↓</td> <td style="text-align: center;">↑ ↓</td> <td style="text-align: center;">↑ ↓</td> </tr> <tr> <td>8 kHz</td> <td>Low</td> <td>High</td> <td>High</td> </tr> </tbody> </table> <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Motor Type</th> <th>Factory Setting of Carrier Frequency</th> </tr> </thead> <tbody> <tr> <td>0.4~11kW</td> <td>8kHz</td> </tr> <tr> <td>15~110kW</td> <td>4kHz</td> </tr> </tbody> </table> High carrier frequency provides ideal current waveform, low current harmonic wave and motor noise. However, high carrier frequency increases the losses, inverter temperature and the impact to the output capacity. Earth leakage and electrical magnetic interference will also increase. Output derating required for higher carrier frequency. Too low carrier frequency will cause unstable running, lower torque and current surge. The default factory setting is optimum for most conditions. Derate 10% for each additional 1Kz above default setting. Setting range:1.0~15.0kHz	Carrier Frequency	RFI Noise	Earth Leakage	Heat Generation	1 kHz	High	Low	Low	4 kHz	↑ ↓	↑ ↓	↑ ↓	8 kHz	Low	High	High	Motor Type	Factory Setting of Carrier Frequency	0.4~11kW	8kHz	15~110kW	4kHz	Depends on model	○
Carrier Frequency	RFI Noise	Earth Leakage	Heat Generation																							
1 kHz	High	Low	Low																							
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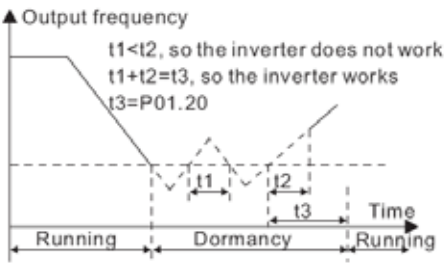
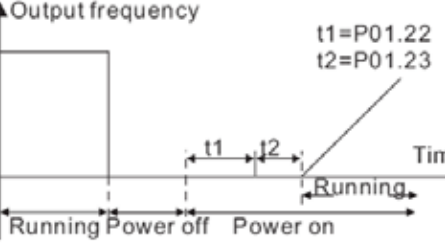


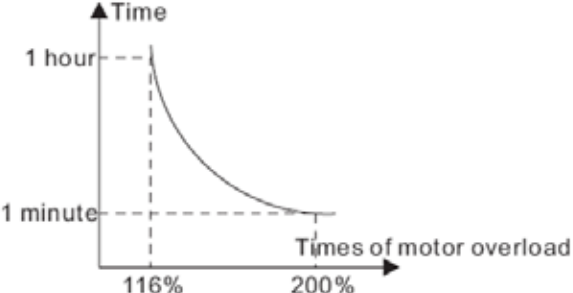
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P00.15	Motor parameter autotune	0: No operation 1: Rotation autotuning (motor de-coupled from load) Comprehensive motor parameter autotune It is recommended to use rotation autotuning when high control accuracy is needed. 2: Static autotune 1 (full autotune); When the motor can not be de-coupled from the load. The autotuning for the motor parameter will impact the control performance. 3: Static autotune 2 (autotune part parameters); when the current motor is motor 1, autotune P02.06, P02.07, P02.08	0	⊙
P00.16	AVR function selection	0: Invalid 1: Valid during the whole procedure The auto-adjusting function of the inverter can reduce the instability on the output voltage of the inverter in case of bus voltage fluctuation.	1	○
P00.18	Factory reset	0: No operation 1: Restore the default value 2: Clear fault records 3: Lock all function codes <b>Note:</b> The function code will restore to 0 after completing the reset. Restoring to the default value will cancel the user password, please use this function with caution.	0	⊙
<b>P01 Group: Start-up and Stop Control</b>				
P01.00	Start mode	0: Start-up from starting frequency P01.01 1: Start-up after DC braking: start the motor from the starting frequency after DC braking (set the parameter P01.03 and P01.04). It is suitable in the cases where reverse rotation may occur due to low inertia load during starting. 2: Start after speed tracking 1 3: Start after speed tracking 2 The direction and speed will be tracked automatically for the smooth starting of the motor. Suitable for applications with reverse rotation when starting a heavy load. This function is only available for the inverters $\geq 4\text{kW}$ .	0	⊙
P01.01	Starting frequency of start-up	Starting frequency at start up. See P01.02 for detailed information. Setting range: 0.00~50.00Hz	0.50Hz	⊙
P01.02	Delay time of the starting frequency	Set correct starting frequency to increase the torque of the inverter during starting. During the delay time the inverter will not run to set frequency until the starting frequency has been reached. The starting frequency is not limited in the lower limit frequency.  Setting range: 0.0~50.0s	0.0s	⊙
P01.03	Braking current before starting	The inverter performs DC braking at the braking current set before starting and accelerate after the DC braking time. If the DC braking time is set to 0, the DC braking is invalid.	0.0%	⊙
P01.04	Braking time before starting	Higher braking current create higher braking torque. The DC braking Current is a percentage of the inverter rated current. Setting range of P01.03: 0.0~100.0% Setting range of P01.04: 0.00~50.00s	0.0s	⊙

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P01.05	ACC/DEC selection	<p>Acceleration and deceleration modes 0: Linear type The output frequency increases or decreases linearly.</p>  <p>1: S curve, the output frequency will increase or decrease according to the S curve S curve is generally used on the applications of gradual starting and stopping, such as elevators.</p>  <p>t1=P01.06 t2=P01.07 t3=P01.06 t4=P01.07</p>	0	⊙
P01.06	ACC time of the first step of S curve	0.0~50.0s	0.1s	⊙
P01.07	DEC time of the final step of S curve		0.1s	⊙
P01.08	Stopping method	0: Ramp to stop: Inverter decelerates the motor to stop at the pre-set deceleration time. 1: Coast to stop: Inverter output inhibited and motor coasts to stop. stopping time determined by inertia of load	0	○
P01.09	DC braking start frequency	Starting frequency of DC braking determined by P01.09.	0.0Hz	○
P01.10	DC braking delay time	Delay time before DC braking: Inverters inhibits the output before starting DC braking. After this delay time, the DC braking will be started to prevent over-current fault caused by DC braking at high speed.	0.00s	○
P01.11	DC braking current	DC braking current: the value of P01.11. Higher braking current creates higher braking torque. The DC braking current is a percentage of the inverter rated current.	0.0%	○
P01.12	DC braking time	<p>DC braking invalid if P01.12 set to 0.</p>  <p>Setting range of P01.09: 0.00Hz~P00.03 (the Max. frequency) Setting range of P01.10: 0.00~50.00s Setting range of P01.11: 0.0~100.0% Setting range of P01.12: 0.00~50.00s</p>	0.00s	○



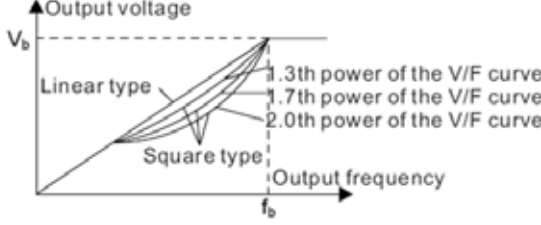
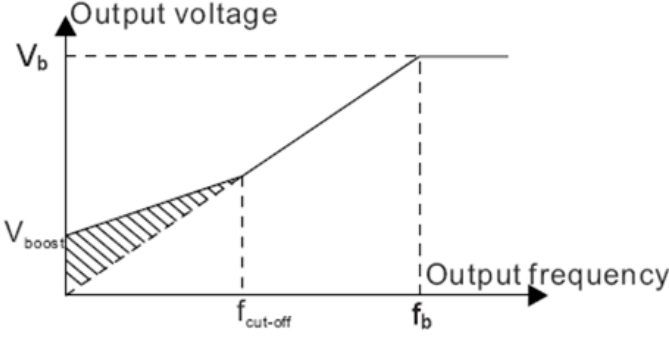
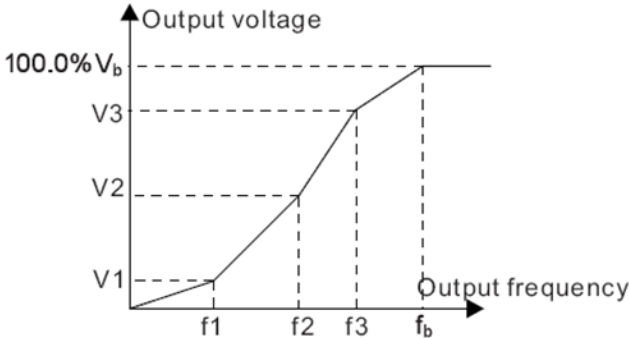
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P01.13	Delay time of FWD/REV rotation	<p>Sets a delay time when switching FWD/REV rotation. Set the switching action by P01.14, which is as the table below:</p>  <p>Setting range: 0.0~3600.0s</p>	0.0s	○
P01.14	Switching action between FWD/REV rotation	<p>Set the threshold point of the inverter:</p> <p>0: Switch after zero frequency            1: Switch after the starting frequency            2: Switch after the speed reach P01.15 and delay for P01.24</p>	0	⊙
P01.15	Stopping speed	0.00~100.00Hz	0.50Hz	⊙
P01.16	Detection of stopping speed	<p>0: Detect at the setting speed            1: Detect at the feedback speed (only valid for vector control)</p>	1	⊙
P01.17	Detection time of feedback speed	<p>When P01.16=1, the actual output frequency of the inverter is less than or equal to P01.15 and is detected during the time set by P01.17, the inverter will stop; otherwise, the inverter stops in the time set by P01.24.</p>  <p>Setting range: 0.00~100.00s (only valid when P01.16=1)</p>	0.50s	⊙
P01.18	Terminal running protection on power-up	<p>When the run command method is the terminal control, the system will detect the status of the run terminal during power-up.</p> <p>0: If terminal run command is detected on power-up, the inverter will not run until the command is cleared and re-instigated            1: If terminal run command is detected on power-up, the inverter will run automatically.</p> <p><b>Note:</b> Function setting 1: should be selected with caution.</p>	0	○
P01.19	Hibernation function setting	<p>This function code determines the running status of the inverter when the set frequency is lower than the lower-limit.</p> <p>0: Run at the lower-limit frequency            1: Stop            2: Hibernation</p> <p>The inverter will coast to stop when the set frequency is lower than the lower-limit. If the set frequency remains above the lower limit and lasts for the time set by P01.20, the inverter will return to the running state automatically.</p>	0	○
P01.20	Hibernation delay time	<p>This function code determines the hibernation delay time. When the running frequency of the inverter is lower than the lower limit, the inverter will stop to stand by.</p> <p>When the set frequency remains above the lower limit and it lasts for the time set by P01.20, the inverter will run automatically.</p>	0.0s	○

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
cont		 <p>Setting range: 0.0~3600.0s (valid when P01.19=2)</p>		
P01.21	Auto restart after power off	This function sets the restart operation after power off 0: Disabled 1: Enabled, if the starting criteria is met, the inverter will run automatically after waiting for the time defined by P01.22.	0	○
P01.22	Autostart delay time	The function sets the auto restart delay time.  <p>Setting range: 0.0~3600.0s (valid when P01.21=1)</p>	1.0s	○
P01.23	Start delay time	The function determines the brake release after run command is given, and the inverter is in a stand-by status and waits for the delay time set by P01.23 Setting range: 0.0~60.0s	0.0s	○
P01.24	Delay of the stopping speed	Setting range: 0.0~100.0s	0.0s	○
P01.25	0Hz output	Select the 0Hz output of the inverter. 0: Output without voltage 1: Output with voltage 2: Output at the DC braking current	0	○
<b>P02 Group: Motor 1</b>				
P02.01	Rated power of asynchronous motor	0.1~3000.0kW	Depends on model	⊙
P02.02	Rated frequency of asynchronous motor	0.01Hz~P00.03	50.00Hz	⊙
P02.03	Rated speed of asynchronous motor	1~36000rpm	Depends on model	⊙
P02.04	Rated voltage of asynchronous motor	0~1200V	Depends on model	⊙
P02.05	Rated current of asynchronous motor	0.8~6000.0A	Depends on model	⊙
P02.06	Stator resistance of asynchronous motor	0.001~65.535Ω	Depends on model	○

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P02.07	Rotor resistance of asynchronous motor	0.001~65.535Ω	Depends on model	<input type="radio"/>
P02.08	Leakage inductance of asynchronous motor	0.1~6553.5mH	Depends on model	<input type="radio"/>
P02.09	Mutual inductance of asynchronous motor	0.1~6553.5mH	Depends on model	<input type="radio"/>
P02.10	Non-load current of asynchronous motor	0.1~6553.5A	Depends on model	<input type="radio"/>
P02.11	Magnetic saturation coefficient 1 for iron core of AM1	0.0~100.0%	80.0%	<input checked="" type="radio"/>
P02.12	Magnetic saturation coefficient 2 for iron core of AM1	0.0~100.0%	68.0%	<input checked="" type="radio"/>
P02.13	Magnetic saturation coefficient 3 for iron core of AM1	0.0~100.0%	57.0%	<input checked="" type="radio"/>
P02.14	Magnetic saturation coefficient 4 for iron core of AM1	0.0~100.0%	40.0%	<input checked="" type="radio"/>
P02.26	Motor overload protection selection	0: No protection 1: Standard motor (with low speed compensation). Because the heat-releasing effect of the standard motors will be less, the corresponding electric heat protection will be adjusted accordingly. The low speed compensation characteristic mentioned here means reducing the threshold of the overload protection of the motor whose running frequency is below 30Hz. 2: Frequency conversion motor (without low speed compensation). Because the heat-releasing of specific motors is not impacted by the rotation speed, it is not necessary to adjust the protection value during low-speed running.	2	<input checked="" type="radio"/>
P02.27	Motor overload protection coefficient	<p>Duration of motor overload <math>M = I_{out} / (I_n * K)</math>  <math>I_n</math> is the rated current of the motor, <math>I_{out}</math> is the output current of the inverter and <math>K</math> is the motor protection coefficient.            So, the higher the value of <math>K</math>, the smaller the value of <math>M</math>. When <math>M = 116\%</math>, the fault will be reported after 1 hour, when <math>M = 200\%</math>, the fault will be reported after 1 minute, when <math>M \geq 400\%</math>, the fault will be reported instantly.</p>  <p>Setting range: 20.0%~120.0%</p>	100.0%	<input type="radio"/>

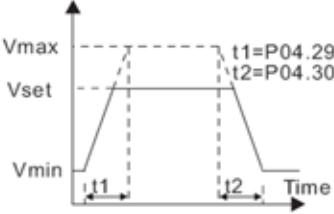
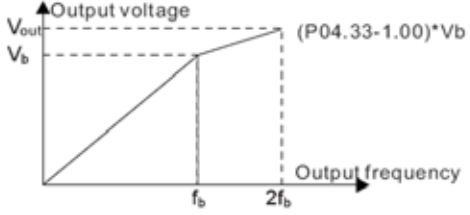
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P02.28	Correction coefficient of motor 1 power	Correct the power displaying of motor 1. Only impact the displaying value other than the control performance of the inverter. Setting range: 0.00~3.00	1.00	○
<b>P03 Group: Vector Control</b>				
P03.00	Speed loop proportional gain1	<p>The parameters P03.00~P03.05 only apply to vector control mode. Below the switching frequency 1 (P03.02), the speed loop PI parameters are: P03.00 and P03.01. Above the switching frequency 2 (P03.05), the speed loop PI parameters are: P03.03 and P03.04. PI parameters are gained according to the linear change of two groups of parameters. As shown as below:</p>	20.0	○
P03.01	Speed loop integral time1		0.200s	○
P03.02	Low switching frequency		5.00Hz	○
P03.03	Speed loop proportional gain 2		20.0	○
P03.04	Speed loop integral time 2		0.200s	○
P03.05	High switching frequency		PI has a close relationship with the inertia of the system. Adjust on the base of PI according to different loads to meet various demands. The setting range of P03.00 and P03.03: 0~200.0 The setting range of P03.01 and P03.04: 0.000~10.000s The setting range of P03.02: 0.00Hz~P00.05 The setting range of P03.05: P03.02~P00.03	10.00Hz
P03.06	Speed loop output filter	0~8 (corresponds to 0~2 <sup>8</sup> /10ms)	0	○
P03.07	Compensation coefficient of vector control electromotion slip	Slip compensation coefficient is used to adjust the slip frequency of the vector control and improve the speed control accuracy. Adjusting the parameter correctly can give steady state speed stability Setting range:50%~200%	100%	○
P03.08	Compensation coefficient of vector control brake slip		100%	○
P03.09	Current loop percentage coefficient P	<b>Note:</b> These two parameters adjust the PI adjustment parameter of the current loop which affects the dynamic response speed and control accuracy directly. Generally, users do not need to change the default value; Only apply to the vector control mode without PG 0 (P00.00=0). Setting range:0~65535	1000	○
P03.10	Current loop integral coefficient I		1000	○
P03.11	Torque setting method	Torque setting options: 0: Torque control is invalid 1: Keypad setting torque(P03.12) 2: Analogue AI1 setting torque 3: Analogue AI2 setting torque 4: Analogue AI3 setting torque 5: Pulse frequency HDI setting torque 6: Multi-step torque setting 7: MODBUS communication setting torque 8~10: Reserved <b>Note:</b> Setting mode 2~7, 100% corresponds to 3 times of the motor rated current	0	○
P03.12	Keypad setting torque	Setting range: -300.0%~300.0% (motor rated current)	50.0%	○
P03.13	Torque given filter time	0.000~10.000s	0.100s	○

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: keypad setting upper-limit frequency (P03.16 sets P03.14, P03.17 sets P03.15) 1: Analogue AI1 setting upper-limit frequency 2: Analogue AI2 setting upper-limit frequency 3: Analogue AI3 setting upper-limit frequency 4: Pulse frequency HDI setting upper-limit frequency 5: Multi-step setting upper-limit frequency 6: MODBUS communication setting upper-limit frequency 7~9: Reserved <b>Note:</b> setting method 1~9, 100% corresponds to the maximum frequency	0	○
P03.15	Setting source of reverse rotation upper-limit frequency in torque control		0	○
P03.16	Torque control forward rotation upper-limit frequency keypad defined value	This function is used to set the upper limit of the frequency. P03.16 sets the value of P03.14; P03.17 sets the value of P03.15. Setting range:0.00 Hz~P00.03 (the Max. output frequency)	50.00 Hz	○
P03.17	Torque control reverse rotation upper-limit frequency keypad defined value		50.00 Hz	○
P03.18	Upper-limit setting of driving torque	This function code is used to select the driving and braking torque upper-limit setting source selection. 0: Keypad setting upper-limit frequency (P03.20 sets P03.18 and P03.21 sets P03.19) 1: Analogue AI1 setting upper-limit torque 2: Analogue AI2 setting upper-limit torque 3: Analogue AI3 setting upper-limit torque 4: Pulse frequency HDI setting upper-limit torque 5: MODBUS communication setting upper-limit torque 6~8: Reserved <b>Note:</b> Setting mode 1~8, 100% corresponds to three times of the motor current.	0	○
P03.19	Upper-limit setting of braking torque		0	○
P03.20	Electromotion torque upper-limit keypad setting	The function code is used to set the limit of the torque. Setting range:0.0~300.0% (motor rated current)	180.0%	○
P03.21	Braking torque upper-limit keypad setting		180.0%	○
P03.22	Weakening coefficient in constant power zone	The usage of motor in weakening control. Function code P03.22 and P03.23 are effective at constant power. The motor will enter into the weakening state when the motor runs at rated speed. Change the weakening curve by modifying the weakening control coefficient. The bigger the weakening control coefficient is, the steeper the weak curve is. Setting range of P03.22:0.1~2.0 Setting range of P03.23:10%~100%	0.3	○
P03.23	The lowest weakening point in constant power zone		20%	○
P03.24	Max. voltage limit	P03.24 set the Max. Voltage of the inverter, which is dependent on the site supply voltage Setting range:0.0~120.0%	100.0%	⊙
P03.25	Pre-exciting time	Pre-activate the motor when the inverter starts up. Build up a magnetic field inside the motor to improve the torque performance during the starting process. Setting time:0.000~10.000s	0.300s	○
P03.26	Weakening proportional gain	0~8000	1200	○

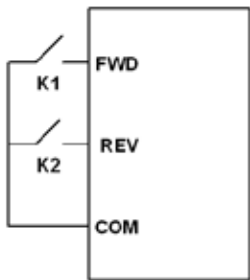
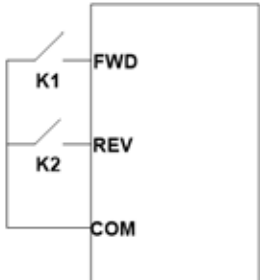
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P03.27	Speed display selection in vector control	0: Display the actual value 1: Display the setting value	0	<input type="radio"/>
<b>P04 Group: SVPWM Control</b>				
P04.00	V/F curve setting	<p>These function codes define the V/F curve of SD1 Series motor 1 to meet the need of different loads.</p> <p>0: Straight line V/F curve; applying to the constant torque load 1: Multi-point V/F curve 2: 1.3th power low torque V/F curve 3: 1.7th power low torque V/F curve 4: 2.0th power low torque V/F curve</p> <p>Curves 2~4 apply to the torque loads such as fans and water pumps. Users can adjust according to the features of the loads to get the best performance.</p> <p>5: Customized V/F (V/F separation); in this mode, V can be separated from F and F can be adjusted through the frequency given channel set by P00.06 or the voltage given channel set by P04.27 to change the characteristic of the curve.</p> <p>Note: <math>V_b</math> in the below picture is the motor rated voltage and <math>f_b</math> is the motor rated frequency.</p> 	0	<input type="radio"/>
P04.01	Torque boost	Torque boost applies a higher voltage to motor at start up to create high starting torque. Set the voltage level in P04.01 and the cut of point in P04.02. At the cut off point the voltage will return to the linear V/F level. Setting P04.01 to 0.0 selects auto torque boost	0.0%	<input type="radio"/>
P04.02	Torque boost cut off point	 <p>The setting range of P04.01:0.0%:(automatic) 0.1%~10.0% The setting range of P04.02:0.0%~50.0%</p>	20.0%	<input type="radio"/>
P04.03	V/F frequency point 1		0.00Hz	<input type="radio"/>
P04.04	V/F voltage point 1		0.0%	<input type="radio"/>
P04.05	V/F frequency point 2		0.00Hz	<input type="radio"/>
P04.06	V/F voltage point 2		0.0%	<input type="radio"/>
When P04.00 =1, the user can set V//F curve through P04.03~P04.08.				

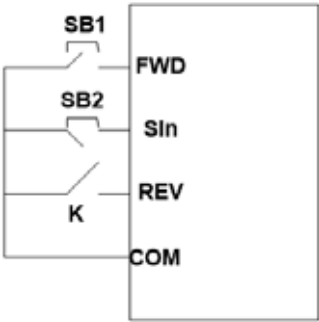
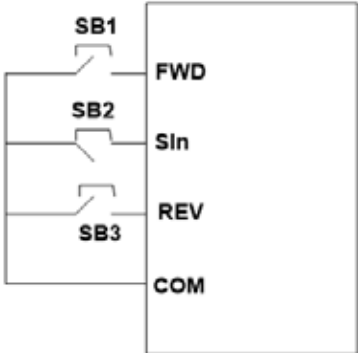
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P04.07	V/F frequency point 3	V/F is generally set according to the load of the motor. <b>Note:</b> $V1 < V2 < V3$ , $f1 < f2 < f3$ . Too high low frequency voltage will heat the motor excessively or damage. Overcurrent stall or overcurrent protection may occur.	0.00Hz	<input type="radio"/>
P04.08	V/F voltage point 3	The setting range of P04.03: 0.00Hz~P04.05 The setting range of P04.04, P04.06 and P04.08: 0.0%~110.0% (rated motor voltage) The setting range of P04.05: P04.03~ P04.07 The setting range of P04.07: P04.05~P02.02 (rated motor voltage frequency)	0.0%	<input type="radio"/>
P04.09	V/F slip compensation gain	Slip compensation is used to correct motor rotational speed lost under load. The slip compensation value can be calculated using the formula below: $\Delta f = f_b \cdot n \cdot p / 60$ Of which, $f_b$ is the rated frequency of the motor, its function code is P02.02; $n$ is the rated rotating speed of the motor and its function code is P02.03; $p$ is the pole pair of the motor. 100.0% corresponds to the rated slip frequency $\Delta f$ . Setting range: 0.0~200.0%	100%	<input type="radio"/>
P04.10	Low frequency vibration control factor	In the SVPWM control mode, current fluctuation may occur to the motor on certain frequencies, especially large power motors. The motor may run unstably or overcurrent may occur. These conditions can be rectified by adjusting these parameters.  The setting range of P04.10: 0~100 The setting range of P04.11: 0~100 The setting range of P04.12: 0.00Hz~P00.03(the Max. frequency)	10	<input type="radio"/>
P04.11	High frequency vibration control factor		10	<input type="radio"/>
P04.12	Vibration control threshold		30.00Hz	<input type="radio"/>
P04.26	Energy-saving operation selection	0: No operation 1: Automatic energy-saving operation Motor on the light load conditions, automatically adjusts the output voltage to save energy	0	<input checked="" type="radio"/>
P04.27	Voltage Setting channel	Select the output setting method at V/F curve separation. 0: Keypad setting voltage: the output voltage is determined by P04.28. 1: AI1 setting voltage 2: AI2 setting voltage 3: AI3 setting voltage 4: HDI setting voltage 5: Multi-step speed setting voltage; 6: PID setting voltage; 7: MODBUS communication setting voltage; 8~10: Reversed <b>Note:</b> 100% corresponds to the rated voltage of the motor.	0	<input type="radio"/>
P04.28	Keypad setting voltage	The function code is the voltage digital set value when the voltage setting method is selected as "keypad selection" The setting range: 0.0%~100.0%	100.0%	<input type="radio"/>
P04.29	Voltage increasing time	Voltage increasing time is the time when the inverter accelerates from minimum output voltage to maximum output voltage.	5.0s	<input type="radio"/>
P04.30	Voltage decreasing time	Voltage decreasing time is the time when the inverter decelerates from the maximum output voltage to the minimum output voltage. Setting range: 0.0~3600.0s	5.0s	<input type="radio"/>

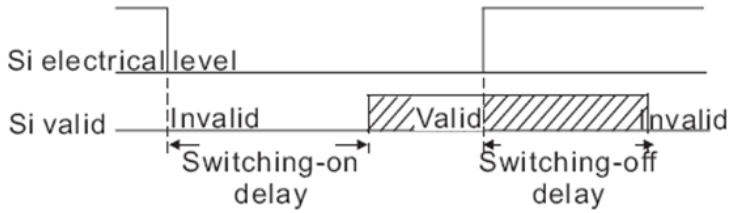
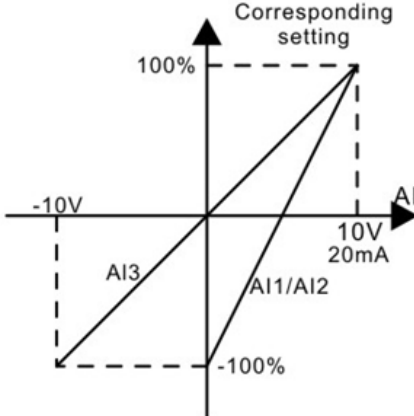


Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P04.31	Maximum output voltage	Set the upper and lower limit of the output voltage. The setting range of P04.31: P04.32~100.0% (the rated voltage of the motor)	100.0%	⊙
P04.32	Minimum output voltage	The setting range of P04.32:0.0%~ P04.31 (the rated voltage of the motor) 	0.0%	⊙
P04.33	Weakening coefficient in constant power zone	Adjust the output voltage of the inverter in SVPWM mode when weakening. <b>Note:</b> Invalid in the constant torque mode.  The setting range of P04.33:1.00~1.30	1.00	○
<b>P05 Group: Input Terminals</b>				
P05.00	HDI input selection	0: HDI is high pulse input. See P05.49~P05.54 1: HDI is switch input	0	⊙
P05.01	S1 terminals function selection	Note: S1~S4, HDI are the upper terminals on the control board and P05.12 can be used to set the function of S5~S8	1	⊙
P05.02	S2 terminals function selection	0: No function 1: Forward rotation operation 2: Reverse rotation operation	4	⊙
P05.03	S3 terminals function selection	3: 3-wire control operation 4: Forward jog 5: Reverse jog	7	⊙
P05.04	S4 terminals function selection	6: Coast to stop 7: Fault reset	0	⊙
P05.05	S5 terminals function selection	8: Operation pause 9: External fault input	0	⊙
P05.06	S6 terminals function selection	10: Increasing frequency setting (UP) 11: Decreasing frequency setting (DOWN)	0	⊙
P05.07	S7 terminals function selection	12: Cancel the frequency change setting 13: Shift between A setting and B setting	0	⊙
P05.08	S8 terminals function selection	14: Shift between combination setting and A setting 15: Shift between combination setting and B setting	0	⊙
P05.09	HDI terminals function selection	16: Preset speed terminal 1 17: Preset speed terminal 2 18: Preset speed terminal 3 19: Preset speed terminal 4 20: Preset speed pause 21: ACC/DEC time 1 22: ACC/DEC time 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Traverse Pause (stop at current frequency) 27: Traverse reset (return to centre frequency) 28: Counter reset 29: Torque control prohibition 30: ACC/DEC prohibition 31: Counter trigger 32: Reserved	0	⊙



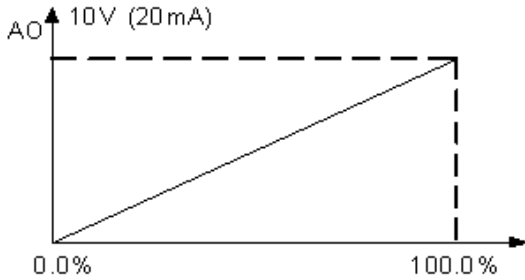
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify																														
cont		33: Cancel frequency 34: DC brake 35: Reserved 36: Shift the command to the keypad 37: Shift the command to the terminals 38: Shift the command to the communication 39: Pre-magnetized command 40: Clear the power 41: Keep the power 42~60: Reserved 61: PID pole switching 62~63: Reserved																																
P05.10	Polarity selection of the input terminals	The function code is used to set the polarity of the input terminals. Set the bit to 0, the input terminal is anode. Set the bit to 1, the input terminal is cathode. <table border="1" style="margin: 10px auto;"> <tr> <td>BIT8</td><td>BIT7</td><td>BIT6</td><td>BIT5</td><td>BIT4</td></tr> <tr> <td>HDI</td><td>S8</td><td>S7</td><td>S6</td><td>S5</td></tr> <tr> <td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td><td></td></tr> <tr> <td>S4</td><td>S3</td><td>S2</td><td>S1</td><td></td></tr> </table> The setting range:0x000~0x1FF	BIT8	BIT7	BIT6	BIT5	BIT4	HDI	S8	S7	S6	S5	BIT3	BIT2	BIT1	BIT0		S4	S3	S2	S1		0x000	○										
BIT8	BIT7	BIT6	BIT5	BIT4																														
HDI	S8	S7	S6	S5																														
BIT3	BIT2	BIT1	BIT0																															
S4	S3	S2	S1																															
P05.11	Switch filter time	Set the sample filter time of S1~S4 and HDI terminals. If there is interference present, increase this parameter. 0.000~1.000s	0.010s	○																														
P05.12	Virtual terminals setting	0x000~0x1FF (0: Disabled, 1: Enabled) BIT0: S1 virtual terminal BIT1: S2 virtual terminal BIT2: S3 virtual terminal BIT3: S4 virtual terminal BIT4: S5 virtual terminal BIT5: S6 virtual terminal BIT6: S7 virtual terminal BIT7: S8 virtual terminal BIT8: HDI virtual terminal	0x000	◎																														
P05.13	Terminals control running mode	Set the operation mode of the terminals control 0:2-wire control 1, comply the enable with the direction. This mode is widely used. It determines the rotation direction by the defined FWD and REV terminals command. <div style="display: flex; justify-content: space-around; align-items: center;">  <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>FWD</th><th>REV</th><th>Running command</th></tr> </thead> <tbody> <tr> <td>OFF</td><td>OFF</td><td>Stopping</td></tr> <tr> <td>ON</td><td>OFF</td><td>Forward running</td></tr> <tr> <td>OFF</td><td>ON</td><td>Reverse running</td></tr> <tr> <td>ON</td><td>ON</td><td>Hold on</td></tr> </tbody> </table> </div> <p>1:2-wire control 2; Separate the enable from the direction. FWD defined by this mode is the enabling ones. The direction depends on the status of the defined REV.</p> <div style="display: flex; justify-content: space-around; align-items: center;">  <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>FWD</th><th>REV</th><th>Running command</th></tr> </thead> <tbody> <tr> <td>OFF</td><td>OFF</td><td>Stopping</td></tr> <tr> <td>ON</td><td>OFF</td><td>Forward running</td></tr> <tr> <td>OFF</td><td>ON</td><td>Stopping</td></tr> <tr> <td>ON</td><td>ON</td><td>Reverse running</td></tr> </tbody> </table> </div>	FWD	REV	Running command	OFF	OFF	Stopping	ON	OFF	Forward running	OFF	ON	Reverse running	ON	ON	Hold on	FWD	REV	Running command	OFF	OFF	Stopping	ON	OFF	Forward running	OFF	ON	Stopping	ON	ON	Reverse running	0	◎
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Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify																																										
cont		<p>2:3-wire control 1; Sin is the enabling terminal on this mode, and the running command is caused by FWD and the direction is controlled by REV. Sin is natural closed.</p>  <p>The direction control is as below during operation:</p> <table border="1" data-bbox="453 752 1214 1055"> <thead> <tr> <th>Sin</th> <th>REV</th> <th>Previous Direction</th> <th>Current Direction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">ON</td> <td rowspan="2">OFF → ON</td> <td>Forward</td> <td>Reverse</td> </tr> <tr> <td>Reverse</td> <td>Forward</td> </tr> <tr> <td rowspan="2">ON</td> <td rowspan="2">ON → OFF</td> <td>Reverse</td> <td>Forward</td> </tr> <tr> <td>Forward</td> <td>Reverse</td> </tr> <tr> <td rowspan="2">ON → OFF</td> <td>ON</td> <td colspan="2" rowspan="2">Decelerate to Stop</td> </tr> <tr> <td>OFF</td> </tr> </tbody> </table> <p>3:3-wire control 2; Sin is the enabling terminal on this mode, and the running command is caused by SB1 or SB3 and both control the running direction. NC SB2 generates the stop command.</p>  <table border="1" data-bbox="453 1646 1214 1917"> <thead> <tr> <th>Sin</th> <th>FWD</th> <th>REV</th> <th>Direction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">ON</td> <td rowspan="2">OFF → ON</td> <td>ON</td> <td>Forward</td> </tr> <tr> <td>OFF</td> <td>Reverse</td> </tr> <tr> <td rowspan="2">ON</td> <td>ON</td> <td rowspan="2">OFF → ON</td> <td>Forward</td> </tr> <tr> <td>OFF</td> <td>Reverse</td> </tr> <tr> <td rowspan="2">ON → OFF</td> <td></td> <td colspan="2" rowspan="2">Decelerate to Stop</td> </tr> <tr> <td></td> </tr> </tbody> </table> <p><b>Note:</b> for the 2-wire running mode, when FWD/REV terminal is valid, the inverter stops because of the stopping command from other sources, even the control terminal FWD/REV keeps valid; the inverter won't work when the stopping command is cancelled. Only when FWD/REV is relaunched, the inverter can start again. For example, the valid STOP/RST stop when PLC signal cycles stop, fixed-length stop and terminal control (see P07.04).</p>	Sin	REV	Previous Direction	Current Direction	ON	OFF → ON	Forward	Reverse	Reverse	Forward	ON	ON → OFF	Reverse	Forward	Forward	Reverse	ON → OFF	ON	Decelerate to Stop		OFF	Sin	FWD	REV	Direction	ON	OFF → ON	ON	Forward	OFF	Reverse	ON	ON	OFF → ON	Forward	OFF	Reverse	ON → OFF		Decelerate to Stop			0	⊙
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Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify	
P05.14	S1 terminal switching on delay time	<p>Sets the switching delay time of programmable digital inputs.</p> 	0.000s	<input type="radio"/>	
P05.15	S1 terminal switching off delay time		0.000s	<input type="radio"/>	
P05.16	S2 terminal switching on delay time		0.000s	<input type="radio"/>	
P05.17	S2 terminal switching off delay time		0.000s	<input type="radio"/>	
P05.18	S3 terminal switching on delay time		0.000s	<input type="radio"/>	
P05.19	S3 terminal switching off delay time		0.000s	<input type="radio"/>	
P05.20	S4 terminal switching on delay time		Setting range:0.000~50.000s	0.000s	<input type="radio"/>
P05.21	S4 terminal switching off delay time			0.000s	<input type="radio"/>
P05.30	HDI terminal switching on delay time			0.000s	<input type="radio"/>
P05.31	HDI terminal switching off delay time			0.000s	<input type="radio"/>
P05.32	Lower limit of AI1		<p>AI1 is set by the analogue potentiometer, AI2 is set by control terminal AI2 and AI3 is set by control terminal AI3. The function code defines the relationship between the analogue input voltage and its corresponding set value. If the analogue input voltage beyond the set minimum or maximum input value, the inverter will count at the minimum or maximum one.</p> <p>When the analogue input is the current input, the corresponding voltage of 0~20mA is 0~10V.</p> <p>In different cases, the corresponding rated value of 100.0% is different. See the application for detailed information. The figure below illustrates different applications:</p> 	0.00V	<input type="radio"/>
P05.33	Corresponding setting of the lower limit of AI1	0.0%		<input type="radio"/>	
P05.34	Upper limit of AI1	10.00V		<input type="radio"/>	
P05.35	Corresponding setting of the upper limit of AI1	100%		<input type="radio"/>	
P05.36	AI1 input filter time	0.100s		<input type="radio"/>	
P05.37	Lower limit of AI2	0.00V		<input type="radio"/>	
P05.38	Corresponding setting of the lower limit of AI2	0.0%		<input type="radio"/>	
P05.39	Upper limit of AI2	10.00V		<input type="radio"/>	
P05.40	Corresponding setting of the upper limit of AI2	100.0%		<input type="radio"/>	
P05.41	AI2 input filter time	0.100s		<input type="radio"/>	
P05.42	Lower limit of AI3	Input filter time: this parameter is used to adjust the sensitivity of the analogue input. Increasing the value correctly can reduce the interference of the analogue input, but reduces the sensitivity of the analogue input.		-10.00V	<input type="radio"/>

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P05.43	Corresponding setting of the lower limit of AI3	<p><b>Note:</b> AI1 supports 0~10V input and AI2 supports 0~10V or 0~20mA input, when AI2 selects 0~20mA input, the corresponding voltage of 20mA is 10V. AI3 can support the output of -10V~+10V.</p> <p>The setting range of P05.32:0.00V~P05.34</p> <p>The setting range of P05.33: -100.0%~100.0%</p> <p>The setting range of P05.34: P05.32~10.00V</p> <p>The setting range of P05.35: -100.0%~100.0%</p> <p>The setting range of P05.36:0.000s~10.000s</p> <p>The setting range of P05.37:0.00V~P05.39</p> <p>The setting range of P05.38: -100.0%~100.0%</p> <p>The setting range of P05.39: P05.37~10.00V</p> <p>The setting range of P05.40: -100.0%~100.0%</p> <p>The setting range of P05.41:0.000s~10.000s</p> <p>The setting range of P05.42: -10.00V~P05.44</p> <p>The setting range of P05.43: -100.0%~100.0%</p> <p>The setting range of P05.44: P05.42~P05.46</p> <p>The setting range of P05.45: -100.0%~100.0%</p> <p>The setting range of P05.46: P05.44~10.00V</p> <p>The setting range of P05.48:0.000s~10.000s</p>	-100.0%	○
P05.44	Middle value of AI3		0.00V	○
P05.45	Corresponding middle setting of AI3		0.0%	○
P05.46	Upper limit of AI3		10.00V	○
P05.47	Corresponding setting of the upper limit of AI3		100.0%	○
P05.48	AI3 input filter time		0.100s	○
P05.50	Lower limit frequency of HDI	0.000kHz~P05.52	0.000kHz	○
P05.51	Corresponding setting of HDI low frequency setting	-100.0%~100.0%	0.0%	○
P05.52	Upper limit frequency of HDI	P05.50~50.000kHz	50.000kHz	○
P05.53	Corresponding setting of upper limit frequency of HDI	-100.0%~100.0%	100.0%	○
P05.54	HDI frequency input filter time	0.000s~10.000s	0.100s	○
<b>P06 Group: Output Terminals</b>				
P06.01	Y1 output selection	0: Invalid	0	
P06.03	Relay RO1 output selection	1: In operation 2: Forward rotation operation 3: Reverse rotation operation 4: Jog operation	1	○
P06.04	Relay RO2 output selection	5: The inverter fault 6: Frequency degree level FDT1 7: Frequency degree level FDT2 8: Frequency arrival 9: Zero speed running 10: Upper limit frequency arrival 11: Lower limit frequency arrival 12: Ready for operation 13: Pre-magnetizing 14: Overload pre-alarm 15: Underload pre-alarm 16: Completion of simple PLC stage 17: Completion of simple PLC cycle 18: Setting count value arrival 19: Defined count value arrival 20: External fault valid 21: Reserved 22: Running time arrival 23: MODBUS communication virtual terminals output 24~25: Reserved 26: Establishment of DC bus voltage 27~30: Reserved	5	○

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify																																																																																					
P06.05	Polarity selection of output terminals	<p>The function code is used to set the polarity of the output terminal.</p> <p><input type="checkbox"/> Positive Logic      <input type="checkbox"/> Negative Logic</p> <table border="1"> <thead> <tr> <th>Setting</th> <th>RO2</th> <th>RO1</th> <th>Y2</th> <th>Y1</th> </tr> </thead> <tbody> <tr><td>0</td><td></td><td></td><td></td><td></td></tr> <tr><td>1</td><td></td><td></td><td></td><td></td></tr> <tr><td>2</td><td></td><td></td><td></td><td></td></tr> <tr><td>3</td><td></td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td></tr> <tr><td>A</td><td></td><td></td><td></td><td></td></tr> <tr><td>B</td><td></td><td></td><td></td><td></td></tr> <tr><td>C</td><td></td><td></td><td></td><td></td></tr> <tr><td>D</td><td></td><td></td><td></td><td></td></tr> <tr><td>E</td><td></td><td></td><td></td><td></td></tr> <tr><td>F</td><td></td><td></td><td></td><td></td></tr> </tbody> </table> <p>Setting range: 0~F</p>	Setting	RO2	RO1	Y2	Y1	0					1					2					3					4					5					6					7					8					9					A					B					C					D					E					F					0	○
Setting	RO2	RO1	Y2	Y1																																																																																					
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P06.06	Y1 open delay time	Setting range: 0.000~50.000s	0.000s	○																																																																																					
P06.07	Y1C off delay time	Setting range: 0.000~50.000s	0.000s	○																																																																																					
P06.10	RO1 switching on delay time	<p>Sets the switching delay time of programmable relays</p>	0.000s	○																																																																																					
P06.11	RO1 switching off delay time		0.000s	○																																																																																					
P06.12	RO2 switching on delay time		0.000s	○																																																																																					
P06.13	RO2 switching off delay time		0.000s	○																																																																																					
P06.14	AO1 output selection		<p>The setting range :0.000~50.000s</p> <p><b>Note:</b> P06.08 and P06.08 are valid only when P06.00=1.</p>	0.000s	○																																																																																				
P06.15	AO2 output selection	<p>0: Running frequency                      1: Setting frequency                      2: Ramp reference frequency                      3: Running rotation speed                      4: Output current (relative to 2 times of the rated current of the inverter)                      5: Output current (relative to 2 times of the rated current of the motor)                      6: Output voltage                      7: Output power                      8: Set torque value                      9: Output torque                      10: Analogue AI1 input value                      11: Analogue AI2 input value                      12: Analogue AI3 input value                      13: High speed pulse HDI input value                      14: MODBUS communication set value 1                      15: MODBUS communication set value 2                      16~21: Reserved                      22: Torque current (corresponds to 3 times of the rated current of the motor)                      23: Ramp reference frequency (with sign)                      24~30: Reserved</p>	0	○																																																																																					
P06.17	Lower limit of AO1 output	<p>Sets the minimum, maximum and filter times for Analogue outputs</p> <p>When the analogue output is set for current, 1mA equals to 0.5V.</p>	0.0%	○																																																																																					
P06.18	Corresponding AO1 output to the lower limit	<p>In different cases, the corresponding analogue output of 100% of the output value is different. Please refer to each application for detailed information.</p>	0.00V	○																																																																																					

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P06.19	Upper limit of AO1 output	 <p>Setting range of P06.17: -100.0%~ P06.19            Setting range of P06.18:0.00V~10.00V            Setting range of P06.19: P06.17~100.0%            Setting range of P06.20:0.00V~10.00V            Setting range of P06.21:0.000s~10.000s            Setting range of P06.22: -100.0%~ P06.24            Setting range of P06.23:0.00V~10.00V            Setting range of P06.24: P06.22~100.0%            Setting range of P06.25:0.00V~10.00V            Setting range of P06.26:0.000s~10.000s</p>	100.0%	<input type="radio"/>
P06.20	Corresponding AO1 output to the upper limit		10.00V	<input type="radio"/>
P06.21	AO1 output filter time		100%	<input type="radio"/>
P06.22	Lower limit of AO2 output		0.100s	<input type="radio"/>
P06.23	Corresponding AO2 output to the lower limit		0.00V	<input type="radio"/>
P06.24	Upper limit of AO2 output		100.0%	<input type="radio"/>
P06.25	Corresponding AO2 output to the upper limit		10.00V	<input type="radio"/>
P06.26	AO2 output filter time		0.000s	<input type="radio"/>
<b>P07 Group: Human Machine Interfaces</b>				
P07.00	User's password	0~65535 SD1 Series inverters provide password protection function. P07.00 is used to set the password. Entering P07.00 displays "00000". change this value to a password of your choice. Exiting will automatically activate password. On the next power cycle password, will be required to access parameters. Pressing <b>PRG/ESC</b> will display "0.0.0.0", enter password to access parameters. To cancel password, enter the password to access parameters. Set P07.00 to "00000" and save with <b>DATA/ENT</b> this will cancel password function. <b>Note:</b> Restoring to the default value can clear the password, please use it with caution.	0.100s	<input type="radio"/>
P07.01	Parameter copy	0: No operation 1: Upload the inverter parameters to keypad 2: Download the keypad parameters to inverter (including motor parameters) 3: Download the keypad parameters to inverter (excluding the motor parameters) 4: Download the keypad parameters to inverter (only for the motor parameters) <b>Note:</b> The parameter display will return to 0 after copying. P07.29 is not included in copying.	0	<input checked="" type="radio"/>
P07.02	Key function selection	Ones: <b>QUICK/JOG</b> key function 0: Null 1: Jog 2: Switch display status via shift key 3: Switch between FWD/REV rotation 4: Clear UP/DOWN setting 5: Coast to stop 6: Switch running command ref. mode in order 7: Quick commission mode (based on non-default parameter) tens: 0: keys unlocked 1: Lock all keys 2: Lock part of the keys (lock <b>PRG/ESC</b> key only)	0x01	<input checked="" type="radio"/>
P07.03	<b>QUICK/JOG</b> the shifting sequence of running command	When P07.02=6, set the switching sequence of run command method 0: Keypad control→terminals control →communication control 1: Keypad control←→terminals control 2: Keypad control←→communication control 3: Terminals control←→communication control	0	<input type="radio"/>

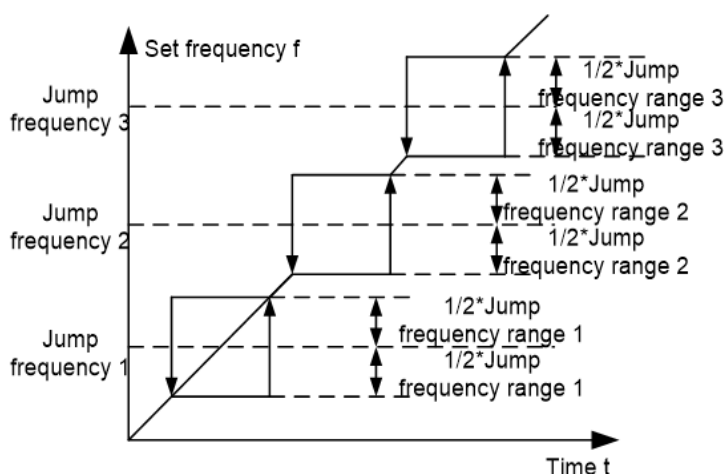
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P07.04	<b>STOP/RST</b> stop function	Select the stop function by <b>STOP/RST</b> . <b>STOP/RST</b> is effective in any state for the keypad reset. 0: Valid for the keypad control 1: Valid for keypad and terminals control 2: Valid for keypad and communication control 3: Valid for all control modes	0	○
P07.05	Displayed parameters 1 of running status	0x0000~0xFFFF BIT0: running frequency (Hz on) BIT1: set frequency (Hz flashing) BIT2: bus voltage (Hz on) BIT3: output voltage (V on) BIT4: output current (A on) BIT5: running rotation speed (rpm on) BIT6: output power (% on) BIT7: output torque (% on) BIT8: PID reference (% flashing) BIT9: PID feedback value (% on) BIT10: input terminals status BIT11: output terminals status BIT12: torque set value (% on) BIT13: pulse counter value BIT14: reserved BIT15: PLC and the current step of multi-step speed	0x03FF	○
P07.06	Displayed parameters 2 of running status	0x0000~0xFFFF BIT0: analogue AI1 value (V on) BIT1: analogue AI2 value (V on) BIT2: analogue AI3 value (V on) BIT3: high speed pulse HDI frequency BIT4: motor overload percentage (% on) BIT5: the inverter overload percentage (% on) BIT6: ramp frequency given value (Hz on) BIT7: linear speed BIT8: AC inlet current (A on) BIT9~15: reserved	0x0000	○
P07.07	The parameter selection of the stop status	0x0000~0xFFFF BIT0: set frequency (Hz on, frequency flashing slowly) BIT1: bus voltage (V on) BIT2: input terminals status BIT3: output terminals status BIT4: PID reference (% flashing) BIT5: PID feedback value (% flashing) BIT6: torque reference (% flashing) BIT7: analogue AI1 value (V on) BIT8: analogue AI2 value (V on) BIT9: analogue AI3 value (V on) BIT10: high speed pulse HDI frequency BIT11: PLC and the current step of multi-step speed BIT12: pulse counters BIT13~BIT15: reserved	0x00FF	○
P07.08	Frequency display coefficient	0.01~10.00 Displayed frequency=running frequency x P07.08	1.00	○
P07.09	Speed display coefficient	0.1~999.9% Mechanical rotation speed =120*displayed running frequency x P07.09/ motor pole pairs	100.0%	○
P07.10	Linear speed displayed coefficient	0.1~999.9% Linear speed= Mechanical rotation speed x P07.10	1.0%	○
P07.11	Rectifier bridge module temperature	-20.0~120.0°C		●
P07.12	Converting module temperature	-20.0~120.0°C		●
P07.13	Software version	1.00~655.35		●

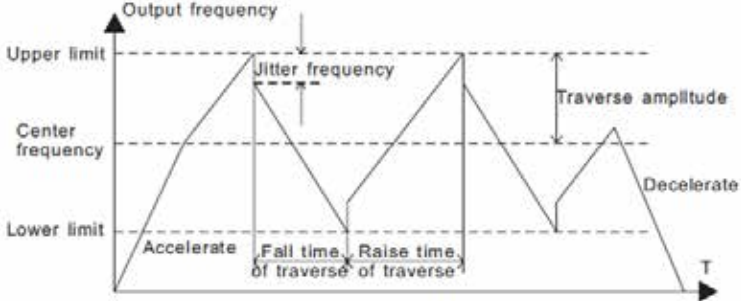



Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P07.14	Local accumulative running time	0~65535h		●
P07.15	High bit of power consumption	Display the power used by the inverter. The power consumption of the inverter =P07.15*1000+P07.16		●
P07.16	Low bit of power consumption	Setting range of P07.15: 0~65535 kWh (*1000) Setting range of P07.16: 0.0~999.9 kWh		●
P07.17	Reserved	Reserved		●
P07.18	The rated power of the inverter	0.4~3000.0kW		●
P07.19	The rated voltage of the inverter	50~1200V		●
P07.20	The rated current of the inverter	0.1~6000.0A		●
P07.21	Factory bar code 1	0x0000~0xFFFF		●
P07.22	Factory bar code 2	0x0000~0xFFFF		●
P07.23	Factory bar code 3	0x0000~0xFFFF		●
P07.24	Factory bar code 4	0x0000~0xFFFF		●
P07.25	Factory bar code 5	0x0000~0xFFFF		●
P07.26	Factory bar code 6	0x0000~0xFFFF		●
P07.27	Current fault type	0: No fault		●
P07.28	Previous fault type	1: OUT1 2: OUT2		●
P07.29	Previous 2 fault type	3: OUT3 4: OC1		●
P07.30	Previous 3 fault type	5: OC2 6: OC3		●
P07.31	Previous 4 fault type	7: OV1 8: OV2 9: OV3 10: UV		●
P07.32	Previous 5 fault type	11: Motor overload (OL1) 12: The inverter overload (OL2) 13: Input side phase loss (SPI) 14: Output side phase loss (SPO) 15: Overheat of the rectifier module (OH1) 16: Overheat fault of the inverter module (OH2) 17: External fault (EF) 18: RS485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor antotune fault (tE) 21: EEPROM operation fault (EEP) 22: PID response offline fault (PIDE) 23: bCE 24: Running time arrival (END) 25: Electrical overload (OL3) 26: PCE 27: UPE 28: DNE 29~31: Reserved 32: ETH1 33: ETH2 34: Speed deviation fault (dEu) 35: Maladjustment (STo) 36: Underload fault (LL) 37: Safety torque stop (STO) 38: Channel 1 is abnormal (STL1) 39: Channel 2 is abnormal (STL2) 40: Channel H1 and H2 become abnormal simultaneously (STL3) 41: Safety code FLASH CRC check fault (CrCE)		●

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P07.33	Current fault running frequency		0.00Hz	●
P07.34	Ramp reference frequency at current fault		0.00Hz	●
P07.35	Output voltage at the current fault		0V	●
P07.36	Output current at the current fault		0.0A	●
P07.37	Current bus voltage at the current fault		0.0V	●
P07.38	The Max. temperature at the current fault		0.0°C	●
P07.39	Input terminals status at the current fault		0	●
P07.40	Output terminals status at the current fault		0	●
P07.41	Reference frequency at previous fault		0.00Hz	●
P07.42	Ramp reference frequency at previous fault		0.00Hz	●
P07.43	Output voltage at previous fault		0V	●
P07.44	The output current at previous fault		0.0A	●
P07.45	Bus voltage at previous fault		0.0V	●
P07.46	The Max. temperature at previous fault		0.0°C	●
P07.47	Input terminals status at previous fault		0	●
P07.48	Output terminals status at previous fault		0	●
P07.49	Reference frequency at previous 2 faults		0.00Hz	●
P07.50	Ramp reference frequency at previous 2 faults		0.00Hz	●
P07.51	Output voltage at previous 2 faults		0V	●
P07.52	Output current at previous 2 faults		0.0A	●

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P07.53	Bus voltage at previous 2 faults		0.0V	●
P07.54	Max. temperature at previous 2 faults		0.0°C	●
P07.55	Input terminals status at previous 2 faults		0	●
P07.56	Output terminals status at previous 2 faults		0	●
<b>P08 Group: Enhanced Functions</b>				
P08.00	ACC time 2	Refer to P00.11 and P00.12 for detailed definition. SD1 Series define four groups of ACC/DEC times which can be selected by P5 group. The first group of ACC/DEC times is factory default. Setting range:0.0~3600.0s	Depends on model	●
P08.01	DEC time 2		Depends on model	●
P08.02	ACC time 3		Depends on model	●
P08.03	DEC time 3		Depends on model	●
P08.04	ACC time 4		Depends on model	●
P08.05	DEC time 4		Depends on model	●
P08.06	Jog frequency	Sets the reference frequency for jog. Setting range: 0.00Hz ~P00.03 (the Max. frequency)	5.00Hz	○
P08.07	Jog ACC time	Sets jog acceleration time to max frequency (P00.03) from 0Hz	Depend on model	○
P08.08	Jog DEC time	Sets jog deceleration time from max (P00.03) to 0Hz Setting range:0.0~3600.0s	Depend on model	○
P08.09	Jump frequency 1	Allows 3 frequency jump values to be set to avoid mechanical resonance. Function invalid when all jump settings are "0" (default).	0.00Hz	○
P08.10	Jump frequency range 1		0.00Hz	○
P08.11	Jump frequency 2		0.00Hz	○
P08.12	Jump frequency range 2		0.00Hz	○
P08.13	Jump frequency 3		0.00Hz	○
P08.14	Jump frequency range 3	Setting range: 0.00~P00.03 (the Max. frequency)	0.00Hz	○



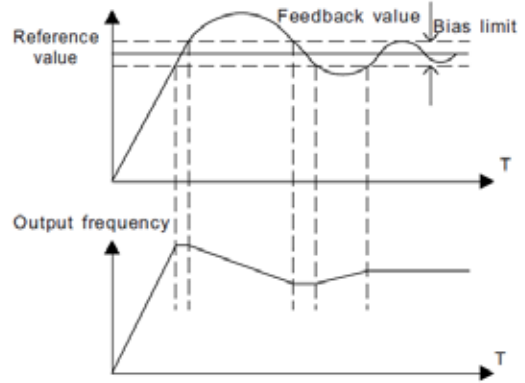
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P08.15	Traverse range	This function applies to the industries where traverse and convolution function are required such as textile and chemical fibre. The traverse function means that the output frequency of the inverter is fluctuated with the set frequency as its centre. The route of the running frequency is illustrated as below, of which the traverse is set by P08.15 and when P08.15 is set as 0, the traverse is 0 with no function.	0.0%	<input type="radio"/>
P08.16	Sudden jump frequency range		5.0s	<input type="radio"/>
P08.17	Traverse boost time		0V	<input type="radio"/>
P08.18	Traverse declining time	 <p>Traverse range: The traverse running is limited by upper and low frequency. The traverse range relative to the centre frequency: traverse range <math>AW = \text{centre frequency} \times \text{traverse range P08.15}</math>. Sudden jump frequency = traverse range <math>AW \times \text{sudden jump frequency ranges P08.16}</math>. When run at the traverse frequency, the value which is relative to the sudden jump frequency. The raising time of the traverse frequency: The time from the lowest point to the highest one. The declining time of the traverse frequency: The time from the highest point to the lowest one. The setting range of P08.15: 0.0~100.0% (relative to the set frequency) The setting range of P08.16: 0.0~50.0% (relative to the traverse range) The setting range of P08.17: 0.1~3600.0s The setting range of P08.18: 0.1~3600.0s</p>	5.0s	<input type="radio"/>
P08.25	Setting counting value	The counter works by the input pulse signals of the HDI terminals. When the counter achieves a fixed number, the multi-function output terminals will output the signal of "fixed counting number arrival" and the counter go on working; when the counter achieves a setting number, the multi-function output terminals will output the signal of "setting counting number arrival", the counter will clear all numbers and stop to recount before the next pulse.	0	<input type="radio"/>
P08.26	Given counting value	The setting counting value P08.26 should be no more than the setting counting value P08.25. The function is illustrated as below:  <p>Setting range of P08.25: P08.26~65535 Setting range of P08.26: 0~P08.25</p>	0	<input type="radio"/>
P08.27	Drive running timer	When the accumulative running time reaches the set time, the multi-function digital output terminals will output the signal of "running time arrival". Setting range: 0~65535min	0m	<input type="radio"/>
P08.28	Time of fault reset	Set the fault reset time by selecting this function. If the reset time exceeds this set value, the inverter will stop for the fault and wait to be cleared. Setting range of P08.28: 0~10	0	<input type="radio"/>
P08.29	Interval time of automatic fault reset	The interval between the time when the fault occurs and the time when the reset action occurs. Setting range of P08.29: 0.1~100.0s	1.0s	<input type="radio"/>

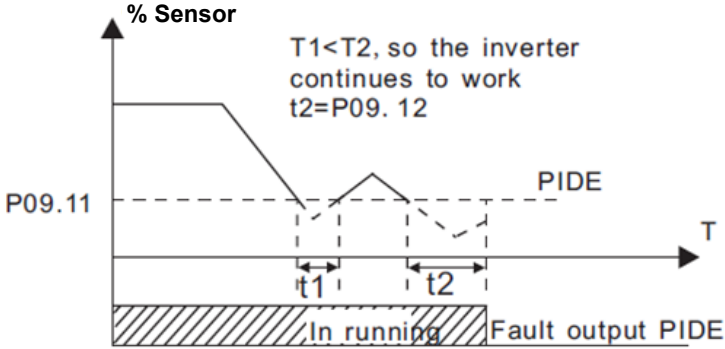
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify						
P08.30	Frequency decreasing ratio in drop control	The output frequency of the inverter changes as the load. And it is mainly used to balance the power when several inverters drive one load. Setting range: -50.00Hz~50.00Hz	0.0V	<input type="radio"/>						
P08.32	FDT1 frequency detection level	Sets the frequency detection level for digital outputs. When FDT detection level is reached, or exceeded the digital output switches on. When frequency drops below the FDT retention the output is switched off. Below is the waveform diagram:    Setting range of P08.32: 0.00Hz~P00.03 (the Max. frequency) Setting range of P08.33 and P08.35: 0.0~100.0% Setting range of P08.34: 0.00Hz~P00.03 (the Max. frequency)	50.00Hz	<input type="radio"/>						
P08.33	FDT1 retention detection level		5.0%	<input type="radio"/>						
P08.34	FDT2 frequency detection level		50.00Hz	<input type="radio"/>						
P08.35	FDT2 retention detection level		5.0%	<input type="radio"/>						
P08.36	Frequency arrival detection level	When the output frequency is within or above the range of the set frequency, the digital output switches on. See the diagram below for detailed information:    Setting range:0.00Hz~P00.03 (the Max. frequency)	0.00Hz	<input type="radio"/>						
P08.37	Energy Braking enable	This parameter is used to control the internal braking unit. 0: Disabled 1: Enabled <b>Note:</b> Only applied to internal braking unit.	0	<input type="radio"/>						
P08.38	Energy braking threshold voltage	Setting range: 200.0~2000.0V To prevent setting the value too high, set per recommended setting range in table below: Note: Default settings are optimum, caution required if changes are made.  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Voltage</td> <td>220V</td> <td>380V</td> </tr> <tr> <td>Range</td> <td>375~400V</td> <td>685~750V</td> </tr> </table>	Voltage	220V	380V	Range	375~400V	685~750V	220V voltage: 380.0V	<input type="radio"/>
Voltage	220V	380V								
Range	375~400V	685~750V								
			380V voltage: 700.0V							

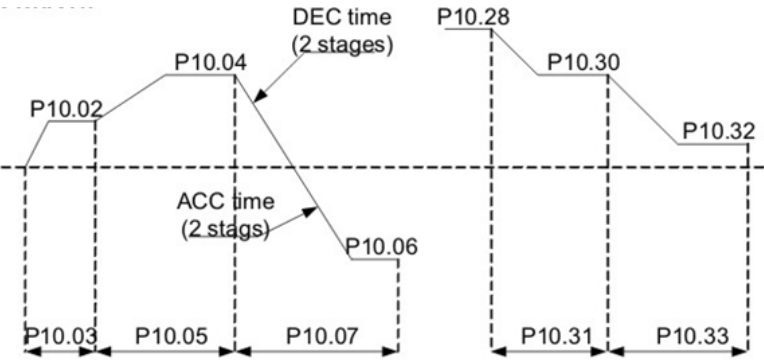
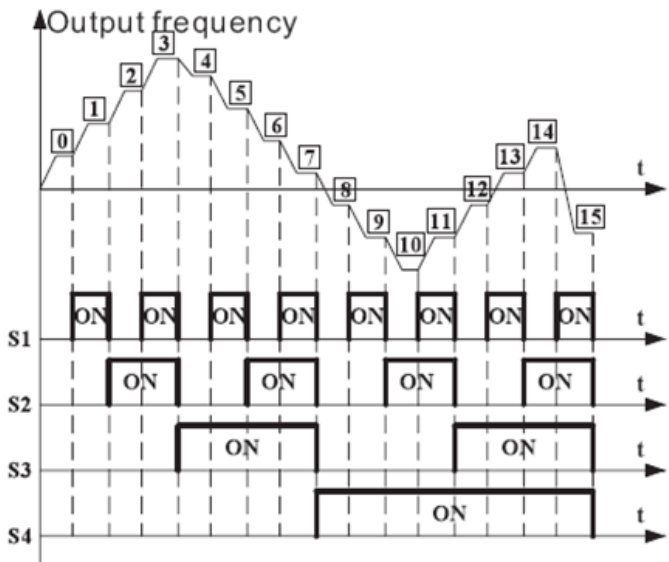
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P08.39	Cooling fan running mode	0: Fan runs according to drive temperature. 1: Fan runs continuously	0	○
P08.40	PWM selection	0x000~0x0021 LED ones: PWM mode selection 0: PWM mode 1, three-phase modulation and two-modulation 1: PWM mode 2, three-phase modulation LED tens: low-speed carrier frequency limit mode 0: Low-speed carrier frequency limit mode 1, the carrier frequency will limit to 1k or 2k if it exceeds 2k at low speed 1: Low-speed carrier frequency limit mode 2, the carrier frequency will limit to 4k if it exceeds 4k at low speed 2: No limit	0x01	⊙
P08.41	Over commission selection	LED ones 0: Invalid 1: Valid LED tens (for factory commissioning) 0: Light overcommission; in zone 1 1: Heavy overcommission; in zone 2 The default value of the inverters of 1PH 200V/3PH 380V ( $\leq 2.2\text{kW}$ ) and 3PH 200V ( $\leq 0.75\text{kW}$ ) is 00; The default value of the inverters of 3PH 380V ( $\geq 4\text{kW}$ ) and 3PH 200V ( $\geq 1.5\text{kW}$ ) is 01.	0x00	⊙
			0x01	
P08.42	Keypad data control setting	0x0000~0x1223 LED ones: frequency enable selection 0: Both $\wedge/\vee$ keys and analogue potentiometer adjustments are valid 1: Only $\wedge/\vee$ keys adjustment is valid 2: Only analogue potentiometer adjustments are valid 3: Neither $\wedge/\vee$ keys nor digital potentiometer adjustments are valid LED tens: frequency control selection 0: Only valid when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed when multi-step speed has the priority LED hundreds: action selection during stopping 0: Setting is valid 1: Valid during running, cleared after stopping 2: Valid during running, cleared after receiving the stop command LED thousands: $\wedge/\vee$ keys and analogue potentiometer integral function 0: The Integral function is valid 1: The Integral function is invalid	0x0000	○
P08.43	Integral ratio of the keypad potentiometer	0.01~10.00s	0.10s	○
P08.44	UP/DOWN terminals control setting	0x00~0x221 LED ones: frequency control selection 0: UP/DOWN terminals setting valid 1: UP/DOWN terminals setting valid LED tens: frequency control selection 0: Only valid when P00.06=0 or P00.07=0 1: All frequency types are valid 2: When the multi-step has priority, it is invalid to the multi-step LED hundreds: action selection when stop 0: Setting valid 1: Valid during running, clear after stop 2: Valid during running, clear after receiving the stop commands	0x000	○
P08.45	UP terminals frequency changing ratio	0.01~50.00s	0.50 s	○
P08.46	DOWN terminals frequency changing ratio	0.01~50.00s	0.50 s	○

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P08.47	Action selection at power loss	0x000~0x111 LED ones: Action selection when power off. 0: Save when power off 1: Clear when power off LED tens: Action selection when MODBUS set frequency off 0: Save when power off 1: Clear when power off LED hundreds: The action selection when other frequency set frequency off 0: Save when power off 1: Clear when power off	0x000	○
P08.48	High bit of original power consumption	This parameter is used to set the original value of the power consumption. The original value of the power consumption =P08.48*1000+ P08.49 Setting range of P08.48: 0~59999 kWh (k) Setting range of P08.49:0.0~999.9 kWh	0 kWh	○
P08.49	Low bit of original power consumption		0.0 kWh	○
P08.50	Magnetic flux braking coefficient	This function code is used to enable magnetic flux. 0: Invalid. 100~150: Higher coefficient value gives greater braking torque. This inverter can slow down the motor by increasing the magnetic flux. The energy generated by the motor during braking can be transformed into heat energy by increasing the magnetic flux. The inverter monitors the status of the motor continuously even during the magnetic flux period. The magnetic flux can be used to brake the motor and speed changes. Other advantages include: Rapid braking after at stop command. Cooling is more efficient. The current of the stator rather than the rotor increases during magnetic flux braking, while the cooling of the stator is more effective than the rotor.	0	○
P08.51	Input power factor of the inverter	This function code is used to adjust the displayed current of the AC input side. Setting range:0.00~1.00	0.56	○
<b>P09 Group: PID control</b>				
P09.00	PID reference source	When the frequency command selection (P00.06, P00.07) is 7 or the voltage setting channel selection (P04.27) is 6, the running mode of the inverter is in PID control. This parameter determines the set point during PID control. 0: Keypad digital given (P09.01) 1: Analogue channel AI1 given 2: Analogue channel AI2 given 3: Analogue channel AI3 set 4: High speed pulse HDI set 5: Preset speed set 6: MODBUS communication set 7~9: Reserved The setting target of PID control is relative, 100% of the setting equals to 100% of the response of the controlled system. The system is calculated according to the relative value (0~100.0%). <b>Note:</b> Preset speed setting is selected by P10	0	○
P09.01	Keypad PID preset	When P09.00=0, set the parameter whose basic value is the feedback value of the system. The setting range: -100.0%~100.0%	0.0%	○
P09.02	PID feedback source	Select the PID source by the parameter. 0: Analogue input AI1 feedback 1: Analogue input AI2 feedback 2: Analogue input AI3 feedback	0	○

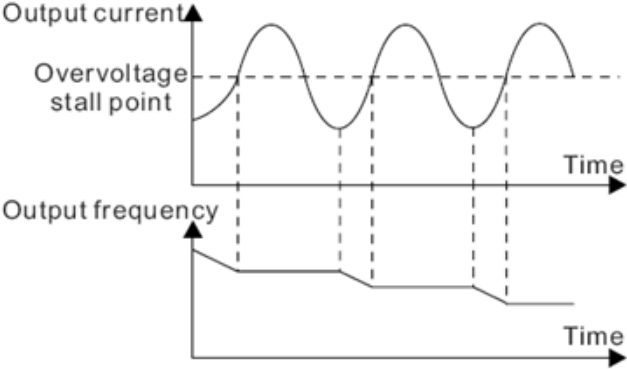


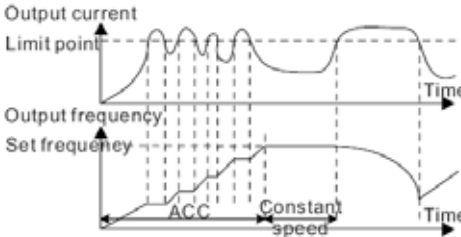
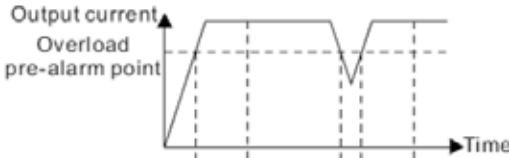
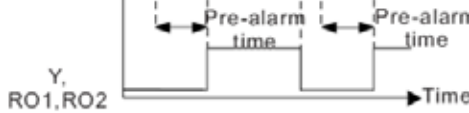
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
cont		3: High speed HDI feedback 4: MODBUS communication feedback 5~7: Reserved <b>Note:</b> The reference source and the feedback source can not coincide, otherwise, PID can not control effectively.		
P09.03	PID output feature	0: PID output is positive: when the feedback signal exceeds the PID reference value, the output frequency of the inverter will decrease to balance the PID. For example, the strain PID control during wrapup 1: PID output is negative: When the feedback signal is stronger than the PID reference value, the output frequency of the inverter will increase to balance the PID. For example, the strain PID control during wrapdown.	0	○
P09.04	Proportional gain (Kp)	The function is applied to the proportional gain P of PID input. P determines the strength of the whole PID adjuster. The parameter of 100 means that when the offset of PID feedback and given value is 100%, the adjusting range of PID adjuster is the Max. frequency (ignoring integral function and differential function). The setting range:0.00~100.00	1.00	○
P09.05	Integral time(Ti)	This parameter determines the speed of PID adjuster to carry out integral adjustment on the deviation of PID feedback and reference. When the deviation of PID feedback and reference is 100%, the integral adjuster works continuously after the time (ignoring the proportional effect and differential effect) to achieve the Max. Frequency (P00.03) or the Max. Voltage (P04.31). Shorter the integral time, stronger is the adjustment Setting range: 0.00~10.00s	0.10s	○
P09.06	Differential time(Td)	This parameter determines the strength of the change ratio when PID adjuster carries out integral adjustment on the deviation of PID feedback and reference. If the PID feedback changes 100% during the time, the adjustment of integral adjuster (ignoring the proportional effect and differential effect) is the Max. Frequency (P00.03) or the Max. Voltage (P04.31). Longer the integral time, stronger is the adjustment. Setting range: 0.00~10.00s	0.00s	○
P09.07	Sampling cycle (T)	This parameter refers to the sampling cycle of the feedback. The modulator calculates in each sampling cycle. The longer the sampling cycle, the slower the response is. Setting range: 0.001~10.000s	0.100 s	○
P09.08	PID control deviation limit	The output of PID system is relative to the maximum deviation of the closed loop reference. As shown in the diagram below, PID adjuster stops working during the deviation limit. Set the function correctly to adjust the accuracy and stability of the system.  Setting range:0.0~100.0%	0.0%	○
P09.09	Output upper limit of PID	These parameters are used to set the upper and lower limit of the PID adjuster output. 100.0 % corresponds to Max. Frequency or the Max. Voltage of (P04.31)	100.0%	○
P09.10	Output lower limit of PID	Setting range of P09.09: P09.10~100.0% Setting range of P09.10: -100.0%~P09.09	0.0%	○

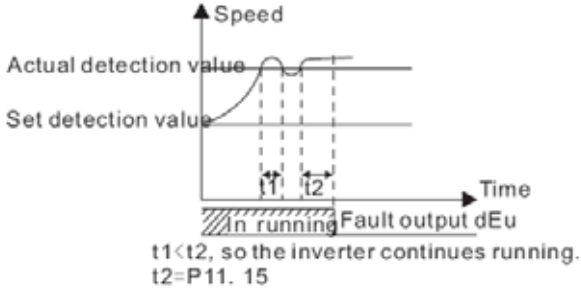
Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P09.11	Feedback offline detection value	Sets the PID feedback offline detection value, when the detection value is smaller than or equal to the feedback offline detection value, and the lasting time exceeds the set value in P09.12, the inverter will report "PID feedback offline fault" and the keypad will display PIDE.	0.0%	○
P09.12	Feedback offline detection time	 <p>Setting range of P09.11: 0.0~100.0% Setting range of P09.12: 0.0~3600.0s</p>	1.0s	○
P09.13	PID adjustment selection	<p>0x00~0x11 LED ones: 0: Keep on integral adjustment when the frequency achieves the upper and low limit; the integration shows the change between the reference and the feedback unless it reaches the internal integral limit. When the trend between the reference and the feedback changes, it needs more time to offset the impact of continuous working and the integration will change with the trend. 1: Stop integral adjustment when the frequency reaches the upper and low limit. If the integration keeps stable, and the trend between the reference and the feedback changes, the integration will change with the trend quickly.</p> <p>LED tens: 0: The same with the setting direction; if the output of PID adjustment is different from the current running direction, the internal will output 0 forcedly. 1: Opposite to the setting direction</p> <p>LED hundreds: 0: Limit to the maximum frequency 1: Limit to A frequency</p> <p>LED thousands: 0: A+B frequency, buffer ACC/DEC is invalid for the main reference A frequency source 1: A+B frequency, buffer ACC/DEC is valid for the main reference A frequency source and the ACC/DEC is determined by time 4 of P08.04</p>	0x0001	○
P09.14	Proportional gain at low frequency (Kp)	0.00~100.00	1.00	○
P09.15	PID command of ACC/DEC time	0.0~1000.0s	0.0s	○
P09.16	PID output filter time	0.000~10.000s	0.000s	○
<b>P10 Group: Simple PLC and Multi-step Speed Control</b>				
P10.00	Simple PLC means	<p>0: Stop after one cycle. The inverter requires new run command after completing the cycle. 1: Run at the final value after one cycle. The drive will give signal and continue to run at last frequency. 2: Cycle running. The inverter will continue to run until receiving a stop command.</p>	0	○
P10.01	Simple PLC memory selection	<p>0: Power loss without memory 1: Power loss memory; PLC record the running state and frequency at power loss.</p>	0	○

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify																																													
P10.02	Multi-step speed 0	100.0% of the frequency setting corresponds to the Max. Frequency P00.03.	0.0%	<input type="radio"/>																																													
P10.03	The running time of stage 0	When selecting simple PLC running, set P10.02~P10.33 to define the running frequency and direction of all stages. <b>Note:</b> The symbol of multi-step determines the running direction of simple PLC. The negative value means reverse rotation.	0.0s	<input type="radio"/>																																													
P10.04	Multi-step speed 1	 <p>Preset speeds are in the range of --fmax~fmax and it can be selected by the combination of Preset terminals 1~4, corresponding to the speed 0 to speed 15.</p>  <p>When S1=S2=S3=S4=OFF, the frequency input method is selected via code P00.06 or P00.07. Preset speeds take priority over all other input reference methods. 16 preset speeds can be set via the combination code of S1, S2, S3, and S4. The start-up and stopping of preset speed running is determined by function code P00.06, the relationship between S1, S2, S3, S4 terminals and preset speed is as follows:</p> <table border="1" data-bbox="454 1881 1204 2116"> <tr> <td>S1</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>S2</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>S3</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>S4</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Preset-Speed</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table>	S1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	S2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	S3	OFF	OFF	OFF	OFF	ON	ON	ON	ON	S4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Preset-Speed	0	1	2	3	4	5	6	7	0.0%	<input type="radio"/>
S1	OFF		ON	OFF	ON	OFF	ON	OFF	ON																																								
S2	OFF		OFF	ON	ON	OFF	OFF	ON	ON																																								
S3	OFF		OFF	OFF	OFF	ON	ON	ON	ON																																								
S4	OFF		OFF	OFF	OFF	OFF	OFF	OFF	OFF																																								
Preset-Speed	0		1	2	3	4	5	6	7																																								
P10.05	The running time of stage 1		0.0s	<input type="radio"/>																																													
P10.06	Multi-step speed 2		0.0%	<input type="radio"/>																																													
P10.07	The running time of stage 2		0.0s	<input type="radio"/>																																													
P10.08	Multi-step speed 3		0.0%	<input type="radio"/>																																													
P10.09	The running time of stage 3		0.0s	<input type="radio"/>																																													
P10.10	Multi-step speed 4		0.0%	<input type="radio"/>																																													
P10.11	The running time of stage 4		0.0s	<input type="radio"/>																																													
P10.12	Multi-step speed 5		0.0%	<input type="radio"/>																																													
P10.13	The running time of stage 5		0.0s	<input type="radio"/>																																													
P10.14	Multi-step speed 6		0.0%	<input type="radio"/>																																													
P10.15	The running time of stage 6	0.0s	<input type="radio"/>																																														
P10.16	Multi-step speed 7	0.0%	<input type="radio"/>																																														
P10.17	The running time of stage 7	0.0s	<input type="radio"/>																																														
P10.18	Multi-step speed 8	0.0%	<input type="radio"/>																																														
P10.19	The running time of stage 8	0.0s	<input type="radio"/>																																														
P10.20	Multi-step speed 9	0.0%	<input type="radio"/>																																														
P10.21	The running time of stage 9	0.0s	<input type="radio"/>																																														
P10.22	Multi-step speed 10	0.0%	<input type="radio"/>																																														
P10.23	The running time of stage 10	0.0s	<input type="radio"/>																																														
P10.24	Multi-step speed 11	0.0%	<input type="radio"/>																																														
P10.25	The running time of stage 11	0.0s	<input type="radio"/>																																														
P10.26	Multi-step speed 12	0.0%	<input type="radio"/>																																														

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify																																																																																																																			
P10.27	The running time of stage 12	<table border="1"> <tr><td>S1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr> <tr><td>S2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr> <tr><td>S3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr> <tr><td>S4</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr> <tr><td>Preset-Speed</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr> </table> <p>Setting range of P10. (2n, 1&lt;n&lt;17): -100.0~100.0% Setting range of P10. (2n+1, 1&lt;n&lt;17):0.0~6553.5s(min)</p> <p><b>Note:</b> preset speeds can be set using any combination of digital inputs S1~S5. The table above is example only.</p>	S1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	S2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	S3	OFF	OFF	OFF	OFF	ON	ON	ON	ON	S4	ON	ON	ON	ON	ON	ON	ON	ON	Preset-Speed	8	9	10	11	12	13	14	15	0.0s	<input type="radio"/>																																																																						
S1	OFF		ON	OFF	ON	OFF	ON	OFF	ON																																																																																																														
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S3	OFF		OFF	OFF	OFF	ON	ON	ON	ON																																																																																																														
S4	ON		ON	ON	ON	ON	ON	ON	ON																																																																																																														
Preset-Speed	8		9	10	11	12	13	14	15																																																																																																														
P10.28	Multi-step speed 13		0.0%	<input type="radio"/>																																																																																																																			
P10.29	The running time of stage 13		0.0s	<input type="radio"/>																																																																																																																			
P10.30	Multi-step speed 14	0.0%	<input type="radio"/>																																																																																																																				
P10.31	The running time of stage 14	0.0s	<input type="radio"/>																																																																																																																				
P10.32	Multi-step speed 15	0.0%	<input type="radio"/>																																																																																																																				
P10.33	The running time of stage 15	0.0s	<input type="radio"/>																																																																																																																				
P10.34	Simple PLC 0~7 stage ACC/DEC time selection	Below is the detailed instruction:	0x0000	<input type="radio"/>																																																																																																																			
P10.35	Simple PLC 8~15 stage ACC/DEC time selection	<table border="1"> <thead> <tr> <th>Function code</th> <th colspan="2">Binary bit</th> <th>Step</th> <th>ACC/DEC 0</th> <th>ACC/DEC 1</th> <th>ACC/DEC 2</th> <th>ACC/DEC 3</th> </tr> </thead> <tbody> <tr> <td rowspan="7">P10.34</td> <td>BIT1</td> <td>BIT0</td> <td>0</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT3</td> <td>BIT2</td> <td>1</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT5</td> <td>BIT4</td> <td>2</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT7</td> <td>BIT6</td> <td>3</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT9</td> <td>BIT8</td> <td>4</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT11</td> <td>BIT10</td> <td>5</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT13</td> <td>BIT12</td> <td>6</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td rowspan="7">P10.35</td> <td>BIT1</td> <td>BIT0</td> <td>8</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT3</td> <td>BIT2</td> <td>9</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT5</td> <td>BIT4</td> <td>10</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT7</td> <td>BIT6</td> <td>11</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT9</td> <td>BIT8</td> <td>12</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT11</td> <td>BIT10</td> <td>13</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT13</td> <td>BIT12</td> <td>14</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> <tr> <td>BIT15</td> <td>BIT14</td> <td>15</td> <td>00</td> <td>01</td> <td>10</td> <td>11</td> </tr> </tbody> </table> <p>After the users select the corresponding ACC/DEC time, the combining 16 binary bit will change into decimal bit, and then set the corresponding function codes. Setting range: -0x0000~0xFFFF</p>	Function code	Binary bit		Step	ACC/DEC 0	ACC/DEC 1	ACC/DEC 2	ACC/DEC 3	P10.34	BIT1	BIT0	0	00	01	10	11	BIT3	BIT2	1	00	01	10	11	BIT5	BIT4	2	00	01	10	11	BIT7	BIT6	3	00	01	10	11	BIT9	BIT8	4	00	01	10	11	BIT11	BIT10	5	00	01	10	11	BIT13	BIT12	6	00	01	10	11	P10.35	BIT1	BIT0	8	00	01	10	11	BIT3	BIT2	9	00	01	10	11	BIT5	BIT4	10	00	01	10	11	BIT7	BIT6	11	00	01	10	11	BIT9	BIT8	12	00	01	10	11	BIT11	BIT10	13	00	01	10	11	BIT13	BIT12	14	00	01	10	11	BIT15	BIT14	15	00	01	10	11	0x0000	<input type="radio"/>
Function code	Binary bit		Step	ACC/DEC 0	ACC/DEC 1	ACC/DEC 2	ACC/DEC 3																																																																																																																
P10.34	BIT1	BIT0	0	00	01	10	11																																																																																																																
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BIT15	BIT14	15	00	01	10	11																																																																																																																	
P10.36	PLC restart mode	0: Restart from the first stage; stop during running (cause by the stop command, fault or power loss), run from the first stage after restart. 1: Continue to run from the stop frequency; stop during running (cause by stop command and fault), the inverter will record the running time automatically, enter the state after restart and continue running at the setting frequency.	0	<input checked="" type="radio"/>																																																																																																																			
P10.37	Multi-step time unit selection	0: Seconds; the running time of all stages is counted by seconds 1: Minutes; the running time of all stages is counted by minutes	0	<input checked="" type="radio"/>																																																																																																																			

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify								
<b>P11 Group: Protective Parameters</b>												
P11.00	Phase loss protection	0x00~0x11 LED ones: 0: Input phase loss software protection disable 1: Input phase loss software protection enable LED tens: 0: Output phase loss protection disable 1: Output phase loss protection enable LED hundreds: 0: Input phase loss hardware protection disable 1: Input phase loss hardware protection enable	0x10	○								
P11.01	Frequency reduction at instantaneous power loss	0: Enabled 1: Disabled	0	○								
P11.02	Frequency reduction at instantaneous power loss	Setting range: 0.00Hz/s~P00.03 (the Max. frequency) After the power loss of the grid, the bus voltage drops to the instantaneous frequency-reduction point, the inverter begins to decrease the running frequency at P11.02 allowing the inverter to regenerate power. The regenerated power can maintain the bus voltage to ensure a rated running of the inverter until the recovery of power. <table border="1" data-bbox="459 945 1206 1052"> <tr> <td>Voltage degree</td> <td>220V</td> <td>380V</td> <td>660V</td> </tr> <tr> <td>Frequency-decreasing point at sudden power loss</td> <td>260V</td> <td>460V</td> <td>800V</td> </tr> </table> <b>Note:</b> 1. Adjust the parameter correctly to avoid stopping caused by inverter protection during the switching of the grid. 2. Prohibit the input phase loss protection to enable this function.	Voltage degree	220V	380V	660V	Frequency-decreasing point at sudden power loss	260V	460V	800V	10.00 Hz/s	○
Voltage degree	220V	380V	660V									
Frequency-decreasing point at sudden power loss	260V	460V	800V									
P11.03	Overvoltage stall protection	0: Disabled 1: Enabled 	1	○								
P11.04	Overvoltage stall voltage protection	120~150%(standard bus voltage) (380V)	136%	○								
		120~150%(standard bus voltage) (200V)	115%									
P11.05	Current limit action	When actual increasing ratio is less than the ratio of output frequency during acceleration of large load. It is necessary to take measures to avoid overcurrent fault and inverter trip.	0x01	○								
P11.06	Automatic current limit level	During the running of the inverter, this function will detect the output current and compare it with the limit level defined in P11.06. If it exceeds the level, the inverter will run at stable frequency during acceleration, or the inverter will derate to run at constant speed. If it exceeds the level continuously, the output frequency will continue to decrease to the lower limit. If the output current is detected to be lower than the limit level, the inverter will accelerate to run.	G: 160.0%	○								
P11.07	The decreasing ratio during current limit		10.00 Hz/s	○								

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
cont		 <p>Setting range of P11.05:            0: current limit invalid            1: current limit valid            2: current limit is invalid during constant speed            Setting range of P11.05:0x00~0x12            Setting range of P11.06:50.0~200.0%            Setting range of P11.07:0.00~50.00Hz/s</p>		
P11.08	Overload pre-alarm of the motor/ inverter	The output current of the inverter or motor is above P11.09 for longer than detection time P11.10, overload pre-alarm will be output.	0x000	○
P11.09	Overload pre-alarm test level		150%	○
P11.10	Overload pre-alarm detection time	 <p>Setting range: 0x000~0x131            Enable and define the overload pre-alarm of the inverter or motor.            LED ones:            0: Overload pre-alarm of motor, comply with the rated current of the motor            1: Overload pre-alarm of inverter, comply with the rated current of the inverter            LED tens:            0: The inverter continues to run after underload pre-alarm            1: The inverter continues to run after underload pre-alarm and stops after overload fault            2: The inverter continues to run after overload pre-alarm and stops after underload fault            3: The inverter stops when overloading or underloading.            LED hundreds:            0: Continuous detection            1: Detection during running            Setting range of P11.09: P11.11~200%            Setting range of P11.10: 0.1~3600.0s</p>	1.0s	○
P11.11	Detection level of the underload pre-alarm	If the inverter current or the output current is lower than P11.11, and exceeds detection time P11.12, the inverter will output underload pre-alarm.	50%	○
P11.12	Detection time of the underload pre-alarm	Setting range of P11.11: 0~P11.09 Setting range of P11.12: 0.1~3600.0s	1.0s	○
P11.13	Output terminal action selection during fault	Select the action of fault output terminals on undervoltage and fault reset. 0x00~0x11 LED ones: 0: Action under fault undervoltage 1: No action under fault undervoltage LED tens: 0: Action during the automatic reset 1: No action during the automatic reset	0x00	○

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P11.14	Speed deviation detection	0.0~50.0% Set the speed deviation detection time.	10.0%	○
P11.15	Speed deviation detection time	<p>This parameter is used to set the speed deviation detection time.</p>  <p>Setting range of P11.15: 0.0~10.0s</p>	0.5s	○
P11.16	Automatic frequency-decreasing at voltage drop	<p>0x000~0x111</p> <p>LED ones: Automatic frequency downgrade at voltage drop 0: Automatic frequency downgrade at voltage drop is invalid 1: Automatic frequency downgrade at voltage drop is valid</p> <p>LED tens: The second ACC/DEC time selection 0: The second ACC/DEC time detection selection is invalid 1: The second ACC/DEC time detection selection is valid, when the operation is above P08.36, ACC/DEC time is switched to the second ACC/DEC time</p> <p>LED hundreds: STO function selection 0: STO alarm locked Alarm lock means when STO appears, reset is a must after state recovery. 1: STO alarm unlocked STO alarm unlocked means when STO appears, STO alarm will disappear automatically after state recovery.</p> <p><b>Note:</b> STL1~STL3 are fault lock and cannot be reset</p>	0x00	○
<b>P13 Group: Control parameters of SM</b>				
P13.13	Braking current of short circuit	After the inverter starts, when P01.00=0, set P13.14 to non-zero value and begin short circuit braking.	0.0%	○
P13.14	Braking retention time of starting	After the inverter stops, when the operation frequency is less than P01.09, set P13.15 to non-zero value and begin stopping short-circuit braking and then DC braking.	0.00s	○
P13.15	Braking retention time of stopping	Setting range of P13.13: 0.0~150.0%(inverters) Setting range of P13.14: 0.00~50.00s	0.00s	○
<b>P14 Group: Serial Communication</b>				
P14.00	Local communication address	<p>The setting range:1~247</p> <p>When the master is writing the frame, the communication address of the slave is set to 0; the broadcast address is the communication address. All slaves on the MODBUS fieldbus can receive the frame, but the slave doesn't answer.</p> <p>The communication address of the drive is unique in the communication net. This is the fundamental for the point to point communication between the upper monitor and the drive.</p> <p><b>Note:</b> The address of the slave cannot set to 0.</p>	1	○
P14.01	Communication baud ratio	<p>Set the digital transmission speed between the upper monitor and the inverter.</p> <p>0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS</p> <p><b>Note:</b> The baud rate between the upper monitor and the inverter must be the same. Otherwise, the communication is not applied. Higher baud rate increases communication speed.</p>	4	○



Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P14.02	Digital bit checkout	The data format between the upper monitor and the inverter must be the same or communication error will occur. 0: No check (N,8,1) for RTU 1: Even check (E,8,1) for RTU 2: Odd check (O,8,1) for RTU 3: No check (N,8,2) for RTU 4: Even check (E,8,2) for RTU 5: Odd check (O,8,2) for RTU 6: No check (N,7,1) for ASCII 7: Even check (E,7,1) for ASCII 8: Odd check (O,7,1) for ASCII 9: No check (N,7,2) for ASCII 10: Even check (E,7,2) for ASCII 11: Odd check (O,7,2) for ASCII 12: No check (N,8,1) for ASCII 13: Even check (E,8,1) for ASCII 14: Odd check (O,8,1) for ASCII 15: No check (N,8,2) for ASCII 16: Even check (E,8,2) for ASCII 17: Odd check (O,8,2) for ASCII	1	○
P14.03	Communication answer delay	0~200ms It means the interval time between the interval time when the drive receives the data and sent it to the upper monitor. If the answer delay is shorter than the system processing time, then the answer delay time is the system processing time, if the answer delay is longer than the system processing time, then after the system deal with the data, waits until achieving the answer delay time to send the data to the upper monitor.	5	○
P14.04	Communication overtime fault time	0.0(invalid),0.1~60.0s When the function code is set as 0.0, the communication overtime parameter is invalid. When the function code is set as non-zero, if the interval time between two communications exceeds the communication overtime, the system will report "485 communication faults" (CE).	0.0s	○
P14.05	Transmission fault processing	0: Alarm and stop freely 1: No alarm and continue to run 2: No alarm and stop according to the stop means (only under the communication control) 3: No alarm & stop according to the stop means (under all control modes)	0	○
P14.06	Communication processing	0x00~0x11 LED ones: 0: Write with response: the inverter will respond to all reading and writing commands of the upper monitor. 1: Write without response: the inverter only responds to the reading command other than the writing command of the drive. The communication efficiency can be increased by this method. LED tens:(reserved) 0: Communication encrypting valid 1: Communication encrypting invalid	0x00	○
P14.07	Reserved			●
P14.08	Reserved			●
<b>P17 Group: Monitoring Function</b>				
P17.00	Setting frequency	Display current set frequency of the inverter Range: 0.00Hz~P00.03		●
P17.01	Output frequency	Display current output frequency of the inverter Range: 0.00Hz~P00.03		●
P17.02	Ramp reference frequency	Display current ramp reference frequency of the inverter Range: 0.00Hz~P00.03		●
P17.03	Output voltage	Display current output voltage of the inverter Range: 0~1200V		●

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P17.04	Output current	Display current output current of the inverter Range: 0.0~5000.0A		●
P17.05	Motor speed	Display the rotation speed of the motor. Range: 0~65535RPM		●
P17.06	Torque current	Display current torque current of the inverter Range: 0.0~5000.0A		●
P17.07	Magnetized current	Display current magnetized current of the inverter Range: 0.0~5000.0A		●
P17.08	Motor power	Display current power of the motor. Setting range: -300.0%~300.0% (the rated current of the motor)		●
P17.09	Output torque	Display the current output torque of the inverter. Range: -250.0~250.0%		●
P17.10	The motor frequency evaluation	Evaluate the motor rotor frequency on open loop vector Range: 0.00~ P00.03		●
P17.11	DC bus voltage	Display current DC bus voltage of the inverter Range: 0.0~2000.0V		●
P17.12	Switch input terminals status	Display current Switch input terminals status of the inverter Range: 0000~00FF		●
P17.13	Switch output terminals status	Display current Switch output terminals status of the inverter Range: 0000~000F		●
P17.14	Digital adjustment	Display the adjustment through the keypad of the inverter. Range: 0.00Hz~P00.03		●
P17.15	Torque reference	Display the torque reference, the percentage to the current rated torque of the motor. Setting range: -300.0%~300.0% (the rated current of the motor)		●
P17.16	Linear speed	Display the current linear speed of the inverter. Range: 0~65535		●
P17.17	Reserved			●
P17.18	Counting value	Display the current counting number of the inverter. Range: 0~65535		●
P17.19	AI1 input voltage	Display analogue AI1 input signal Range: 0.00~10.00V		●
P17.20	AI2 input voltage	Display analogue AI2 input signal Range: 0.00~10.00V		●
P17.21	AI3 input voltage	Display analogue AI2 input signal Range: -10.00~10.00V		●
P17.22	HDI input frequency	Display HDI input frequency Range: 0.00~50.00kHz		●
P17.23	PID reference value	Display PID reference value Range: -100.0~100.0%		●
P17.24	PID feedback value	Display PID feedback value Range: -100.0~100.0%		●
P17.25	Power factor of the motor	Display the current power factor of the motor. Range: -1.00~1.00		●
P17.26	Current running time	Display the current running time of the inverter. Range:0~65535min		●
P17.27	Simple PLC and the current stage of the multi-step speed	Display simple PLC and the current stage of the multi-step speed Range: 0~15		●

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P17.28	ASR controller output	The percentage of the rated torque of the relative motor, display ASR controller output Range: -300.0%~300.0% (the rated motor current)		●
P17.29	Reserved			●
P17.30	Reserved			●
P17.31	Reserved			●
P17.32	Magnetic flux linkage	Display the magnetic flux linkage of the motor. Range: 0.0%~200.0%		●
P17.33	Exciting current reference	Display the exciting current reference in the vector control mode. Range: -3000.0~3000.0A		●
P17.34	Torque current reference	Display the torque current reference in the vector control mode. Range: -3000.0~3000.0A		●
P17.35	AC input current	Display the input current in AC side. Range: 0.0~5000.0A		●
P17.36	Output torque	Display the output torque. Positive value is in the driving torque state, and negative value is in the braking torque state. Range: -3000.0Nm~3000.0Nm		●
P17.37	Motor overload counting	0~100 (OL1 when 100)		●
P17.38	PID output	Display PID output -100.00~100.00%		●
P17.39	Reserved			●

## 6 Fault Finding

### 6.1 Maintenance Intervals

If installed in an appropriate environment, the inverter requires very little maintenance. The table lists the routine maintenance intervals recommended by IMO.

Checking Part	Checking Item	Checking Method	Criteria	
Ambient environment	Check the ambient temperature, humidity and vibration and ensure there is no dust, gas, oil fog and water drop.	Visual examination and instrument test	Conforming to the manual	
	Ensure there are no tools or other foreign or dangerous objects	Visual examination	There are no tools or dangerous objects.	
Voltage	Ensure the main circuit and control circuit are normal.	Measurement by multi-meter	Conforming to the manual	
Keypad	Ensure the display is clear and legible	Visual examination	The characters are displayed normally.	
	Ensure the characters are displayed correctly	Visual examination	Conforming to the manual	
Main Circuit	Commonly Used	Ensure screws are tightened securely	Tighten to correct torque	NA
		Ensure there is no distortion, cracks, damage or discolouration caused by overheating and aging to the machine and insulator.	Visual examination	NA
		Ensure there is no dust or dirt	Visual examination	<b>Note:</b> Discolouration of copperwork is normal and does not represent a fault.


Checking Part		Checking Item	Checking Method	Criteria
cont	Conductor leads	Ensure there is no distortion or discolouration of the conductors caused by overheating.	Visual examination	NA
		Ensure that there are no cracks or discolouration of the protective layers.	Visual examination	NA
	Terminals seat	Ensure there is no leakage	Visual examination	NA
	Filter capacitors	Ensure there is no weeping, discolouration, cracks and case expansion.	Visual examination	NA
		Ensure the safety valve is in the right place.	Estimate the usage time according to the maintenance or measure the static capacity.	NA
		If necessary, measure the static capacity.	Measure the capacity by instruments.	The static capacity is above or equal to the original value *0.85.
	Resistors	Ensure there is no damage caused by overheating.	Smelling and visual examination	NA
		Ensure the resistor is not open circuit.	Visual examination. measure with multi-meter.	The resistors are in $\pm 10\%$ of the standard value.
	Transformers and reactors	Ensure there is no abnormal vibration, noise or aroma.	Listening, smelling and visual examination.	NA
	Electromagnetic contactors and relays	Ensure there is no vibration noise where drive is installed.	Listen.	NA
		Ensure the contactor is in good working condition.	Visual examination	NA
	Control Circuit	PCB and plugs	Ensure there are no loose screws and contacts.	Tighten to correct torque
Ensure there is no aroma or discolouration.			Smell and visual examination	NA
Ensure there are no cracks, damage distortion or rust.			Visual examination	NA
Ensure there is no leakage or distortion of the capacitors.			Visual examination or estimate the usage time according to the maintenance information	NA
Cooling System	Cooling Fan	Estimate whether there is abnormal noise and vibration.	Listening and Visual examination or rotate manually.	Stable rotation
		Check fan is secure in housing.	Tighten if loose.	NA
		Ensure there is no discolouration caused by overheating.	Visual examination or estimate the usage time according to the maintenance information.	NA
	Ventilation duct	Check for debris or foreign object in the cooling fan air vent.	Visual examination.	NA

### 6.1.1 Cooling Fan

The inverter's cooling fan has a minimum life span of 25,000 operating hours. The actual life span depends on the inverter usage and ambient temperature.

The operating hours can be found through P07.14 (accumulative hours of the inverter).

Fan failure can be predicted by the increasing noise from the fan bearings. If the inverter is operated in a critical part of a process, fan replacement is recommended once these symptoms appear. Replacement fans are available from IMO.

	<p>• <b>Read and follow the instructions in chapter Safety Precautions. Ignoring the instructions would cause physical injury, death or damage to the equipment.</b></p>
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1. Stop the inverter and disconnect it from the AC power source and wait for minimum time designated on the inverter.
2. Lever the fan holder off the drive frame with a screwdriver and lift the hinged fan holder slightly upward from its front edge.
3. Disconnect the fan cable. Remove the installation bracket.
4. Installation is opposite of removal procedure. Pay attention the air direction of the inverter and the fan as the figure below

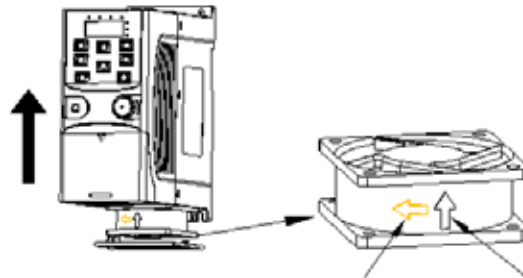


Figure 6-1: Fan installation of the inverters 1PH, 200V, ≤2.2kW

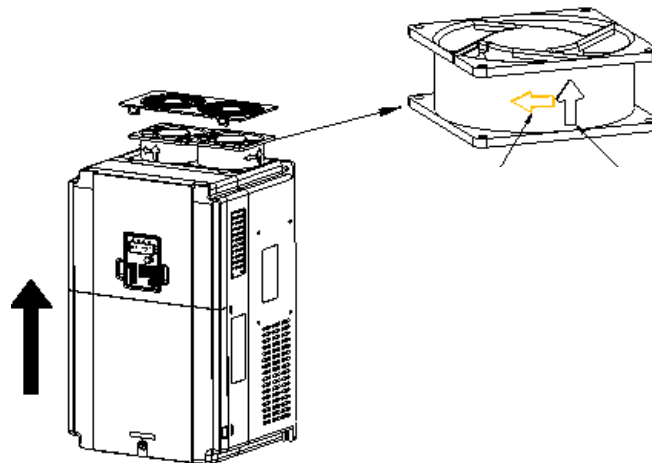


Figure 6-1: Fan installation of the inverters 3PH, 380V, ≥4kW

### 6.1.2 Capacitors

#### Reforming the capacitors

The DC bus capacitors must be reformed according to the instruction below if the inverter has been stored for a long period. The storage time is counted from the date of manufacture.

Time	Operational Principle
Storage time less than 1 year	Operation without charging
Storage time 1-2 years	Connect with the power for 1 hour before first ON command
Storage time 2-3 years	Use power surge to charge for the inverter <ul style="list-style-type: none"> <li>• Add 25% rated voltage for 30 minutes</li> <li>• Add 50% rated voltage for 30 minutes</li> <li>• Add 75% rated voltage for 30 minutes</li> <li>• Add 100% rated voltage for 30 minutes</li> </ul>
Storage time over 3 years	Use power surge to charge for the inverter <ul style="list-style-type: none"> <li>• Add 25% rated voltage for 2 hours</li> <li>• Add 50% rated voltage for 2 hours</li> <li>• Add 75% rated voltage for 2 hours</li> <li>• Add 100% rated voltage for 2 hours</li> </ul>

The method of using power surge to charge for the inverter:

Correct selection of power surge depends on the supply power of the inverter. Single phase 200V AC/2A power surge applied to the inverter with single/three-phase 200V AC as its input voltage. The inverter with single/three-phase 200V AC as its input voltage can apply Single phase 200V AC/2A power surge (L+ to R and N to S or T). All DC bus capacitors charge at the same time because there is one rectifier.

High-voltage inverter needs enough voltage (for example, 380V) during charging. The small capacitor power (2A is sufficient) can be used because the capacitor nearly does not require current when charging.

### Change electrolytic capacitors



- Read and follow the instructions in chapter Safety Precautions. Ignoring the instructions may cause physical injury, death or damage to the equipment.

Change electrolytic capacitors if the working hours of electrolytic capacitors in the inverter are above 35000. Please contact IMO for detailed instruction.

### 6.1.3 Power Cable



- Read and follow the instructions in chapter Safety Precautions. Ignoring the instructions may cause physical injury, death or damage to the equipment.

1. Stop the drive and disconnect it from the power line. Wait for the minimum time designated on the inverter.
2. Check the tightness of the power cable connections.
3. Restore power.

## 6.2 Fault Solution



- Only competent personnel are authorised to maintain the inverter. Read the safety instructions in chapter Safety precautions before working on the inverter.

### 6.2.1 Alarm and Fault Indications

Fault is indicated by LEDs. See Operation Procedure. When **TRIP** light is on, an alarm or fault message on the panel display indicates abnormal inverter status. Using the information given in this chapter, most alarm and fault cause can be identified and corrected. If not, contact IMO.

### 6.2.2 How to Reset

The inverter can be reset by pressing the keypad key **STOP/RST**, through digital input, or by power cycling. When the fault has been cleared, the motor can be restarted.

### 6.2.3 Fault Instruction and Solution

Do as the following after the inverter fault:

1. Check the keypad functions correctly.
2. If no fault found check group P07 and the corresponding parameter fault code to confirm the trip status.
3. Check the following table for possible cause and solutions.
4. Perform appropriate actions the remedy the fault
5. Reset or power cycle the drive. Ensure it is safe to run the drive before operating.

Fault Code	Fault Type	Possible Cause	Solutions
OUt1	IGBT Ph-U fault	<ul style="list-style-type: none"> <li>• Acceleration time too short</li> <li>• IGBT module fault</li> <li>• Misaction caused by interference</li> <li>• The connection of motor cables loose or incorrect</li> <li>• Grounding poor connection.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase Acc time</li> <li>• Change the power unit</li> <li>• Check the power cables</li> <li>• Inspect external equipment and eliminate interference</li> </ul>
OUt2	IGBT Ph-V fault		
OUt3	IGBT Ph-W fault		

Fault Code	Fault Type	Possible Cause	Solutions
OC1	Over-current during acceleration	1. Acceleration or deceleration is too fast. 2. Supply voltage too low 3. The power of the inverter is too low. 4. Load transients are abnormal. 5. Short circuit or output phase loss. 6. Strong external interference. 7. Overvoltage stall protection is not open.	1. Increase the ACC time 2. Check the input power 3. Select inverter with a larger power 4. Check if load is short circuit (grounding short circuit or the wire short circuit) or the rotation is not smooth. 5. Check the output configuration. 6. Check if there is strong interference. 7. Check the settings of relative function codes.
OC2	Over-current during deceleration		
OC3	Over-current at constant speed		
OV1	Over-voltage during acceleration	1. Input voltage is abnormal. 2. Voltage regeneration. 3. No braking components. 4. Braking energy is not open	1. Check the input power 2. Check if the DEC time of the load is too short or the inverter starts during rotation 3. Install braking components. 4. Check the setting of relative function codes.
OV2	Over-voltage during deceleration		
OV3	Over-voltage at constant speed		
UV	DC bus Under-voltage	1. Supply voltage too low. 2. Overvoltage stall protection is not open.	1. Check the input power of the supply line. 2. Check the setting of relative function codes.
OL1	Motor overload	1. Supply voltage too low. 2. Overload current setting incorrect. 3. Motor stall or load transients are too strong	1. Check the input supply voltage 2. Reset to the rated current of the motor 3. Check the load and adjust the torque level
OL2	Inverter overload	1. Acceleration time too short. 2. Reset the rotating motor 3. Supply voltage too low. 4. Load too high. 5. Closed loop vector control, incorrect setting	1. Increase the ACC time 2. Avoid the restarting after stopping. 3. Check the power of the supply line 4. Select higher rated inverter. 5. Select correct size motor.
OL3	Electrical overload	The inverter will report overload pre-alarm according to the set value.	Check the load and the overload pre-alarm point.
SPI	Input phase loss	Phase loss or fluctuation of input R, S, T	1. Check input power 2. Check installation distribution
SPO	Output phase loss	U, V, W phase loss input (or serious asymmetrical three phase of the load)	1. Check the output distribution 2. Check the motor and cable
OH1	Rectify overheat	1. Air duct jam or fan damage 2. Ambient temperature is too high. 3. Running time in overload is too long.	1. Refer to the overcurrent solution 2. Clear blocked air vent or change the fan 3. Reduce the ambient temperature 4. Check and reconnect 5. Change the power 6. Change the power unit 7. Change the main control panel
OH2	IGBT overheat		
EF	External fault	SI External fault trip operated.	Check the external device connected to input S1~S4
CE	Communication error	1. Baud rate setting is incorrect. 2. Wiring fault. 3. Communication address is incorrect. 4. RFI noise.	1. Set correct baud rate 2. Check the communication connection wiring. 3. Set correct communication address. 4. Check earthing connections and cable screening.
ItE	Current detection fault	1. Poor connection of control board. 2. Assistant power is bad 3. Board components failure. 4. The modifying circuit is abnormal.	1. Check the connector and re connect. 2. Change the board 3. Change the main control panel



Fault Code	Fault Type	Possible Cause	Solutions
tE	Autotuning fault	1. Mismatch between inverter and motor ratings. 2. The rated parameter of the motor does not match the motor rating. 3. The offset between the parameters from autotune and the standard parameter is too large. 4. Autotune overtime	1. Change the inverter mode 2. Set the rated parameter according to the motor name plate 3. Remove motor load. 4. Check the motor connection and set the parameter. 5. Check if the upper limit frequency is above 2/3 of the rated frequency.
EEP	EEPROM fault	1. Error of controlling the write and read of the parameters 2. Damage to EEPROM	1. Press STOP/RST to reset 2. Change the main control board.
PIDE	PID feedback fault	1. PID feedback offline 2. PID feedback source disappear	1. Check the PID feedback signal 2. Check the PID feedback source
bCE	Braking unit fault	1. Braking circuit fault or damaged cabling. 2. insufficient capacity of external braking resistor.	1. Check the braking unit and install correct cabling 2. Increase the braking resistor capacity.
END	Time reach of factory setting	The actual running time of the inverter is above the internal setting running time.	Reset required. Return to IMO for reset.
PCE	Keypad communication error	Keypad poor connection or offline. Keypad cable is too long or RFI noise. Part of the communication circuits of the keypad or main board are faulty	Check keypad cable and ensure good connection. Check the environment and eliminate the RFI source; Change hardware and contact IMO
UPE	Parameter upload error	Keypad poor connection or offline; Keypad cable is too long or RFI noise. Part of the communication circuits of the keypad or main board faulty	Check the environment and eliminate the RFI source. Change hardware and contact IMO
DNE	Parameter download error	Keypad poor connection or offline. Keypad cable is too long and there is strong RFI noise. Data storage error in keypad	Check the environment and eliminate the RFI source; Change hardware and contact IMO Backup data in the keypad again
ETH1	Grounding shortcut fault 1	1. Output of the inverter is short circuit with ground 2. Fault in the current detection circuit 3. Motor power and inverter power settings mismatched.	1. Check connection of motor 2. Change the board 3. Change the main control panel 4. Reset the correct motor parameter
ETH2	Grounding shortcut fault 2		
LL	Electronic underload fault	Inverter will report the underload pre-alarm according to the set value.	Check the load and the underload pre-alarm point.
STO	Safe torque off	STO function operates normally	
STL1	Channel H1 abnormal	Fault or internal hardware circuit fault occurred to H1 channel	
STL2	Channel H2 abnormal	Fault or internal hardware circuit fault occurred to H2 channel	
STL3	Channel H1 and H2 abnormal simultaneously	Fault or internal hardware circuit fault occurred to H1 and H2 channels simultaneously	
CrCE	Safe code FLASH CRC check fault	Error occurred to STO safe code FLASH CRC check	

## 6.2.4 Other Status

Fault Code	Fault Type	Possible Cause	Solutions
PoFF	System power off	System power off or low DC voltage	Check the supply voltage

## 7 Communication Protocol

### 7.1 Modbus Protocol Introduction

Modbus protocol is a software protocol and common language which is applied in the electrical controllers. With this protocol, the controller can communicate with other devices via network (the channel of signal transmission or the physical layer, such as RS485), and with this industrial standard, the controlling devices of different manufacturers can be connected to an industrial network for the convenience of being monitored.

There are two transmission modes for Modbus protocol: ASCII mode and RTU (Remote Terminal Units) mode. On one Modbus network, all devices should select same transmission mode and their basic parameters, such as baud rate, digital bit, check bit, and stopping bit should be identical.

Modbus network is a controlling network with single-master and multiple slaves, which means that there is only one device performs as the master and the others are the slaves on one Modbus network. The master means the device which has active talking right to send a message to Modbus network for the controlling and inquiring to other devices. The slave means the passive device which sends data message to the Modbus network only after receiving the controlling or inquiring message (command) from the master (response). After the master sends message, there is a period of time for the controlled or inquired slaves to respond, which ensure there is only one slave sends message to the master at a time for the avoidance of singles impact.

Generally, the user can set PC, PLC, IPC and HMI as the masters to realize central control. Setting certain device as the master is a promise other than setting by a bottom or a switch or the device has a special message format. For example, when the upper monitor is running, if the operator clicks sending command bottom, the upper monitor can send command message actively even it can not receive the message from other devices. In this case, the upper monitor is the master. And if the designer makes the inverter send the data only after receiving the command, then the inverter is the slave.

The master can communicate with any single slave or with all slaves. For the single-visiting command, the slave should feedback a response message; for the broadcasting message from the master, the slave does not need to feedback the response message.

### 7.2 Application of the Inverter

The Modbus protocol of the inverter is RTU mode and the physical connection is 2-wire RS485.

#### 7.2.1 2-Wire RS485

The interface of 2-wire RS485 works on semi-duplex and its data signal applies differential transmission which is called balance transmission, too. It uses twisted pairs, one of which is defined as A (+) and the other is defined as B (-). Generally, if the positive electrical level between sending drive A and B is between +2~+6V, it is logic "1", if the electrical level is among -2V~-6V; it is logic "0".

485+ on the terminal board corresponds to A and 485- to B.

Communication baud rate means the binary bit number in one second. The unit is bit/s (bps). The higher the baud rate is, the quicker the transmission speed is and the weaker the anti-interference is. If the twisted pairs of 0.56mm (24AWG) is applied as the communication cables, the Max. Transmission distance is as below:

Baud Rate	Max. Transmission Distance	Baud Rate	Max. Transmission Distance	Baud Rate	Max. Transmission Distance	Baud Rate	Max. Transmission Distance
2400 BPS	1800m	4800 BPS	1200m	9600 BPS	800m	19200 BPS	600m

It is recommended to use shielded cables and make the shield layer the ground.

In the cases with less devices and shorter distance, it is recommended to use 120Ω terminating resistor as the performance will be weakened if the distance increase even though the network can perform well without load resistor.

#### 7.2.1.1 Single application

Figure 7-1 is the site Modbus connection figure of single inverter and PC. Generally, the computer does not have RS485 interface, the RS232 or USB interface of the computer should be converted into RS485 by converter. Connect the A terminal of RS485 to the 485+ terminal of the inverter and B to the 485- terminal. It is recommended to use the shield twisted pairs.

When applying RS232-RS485 converter, if the RS232 interface of the computer is connected to the RS232 interface of the converter, the wire length should be as short as possible within the length of 15m. It is recommended to connect the RS232-RS485 converter to the computer directly. If using USB-RS485 converter, the wire should be as short as possible, too. Select a right interface to the upper monitor of the computer (select the interface of RS232-RS485 converter, such as COM1) after the wiring and set the basic parameters such as communication baud rate and digital check bit to the same as the inverter.

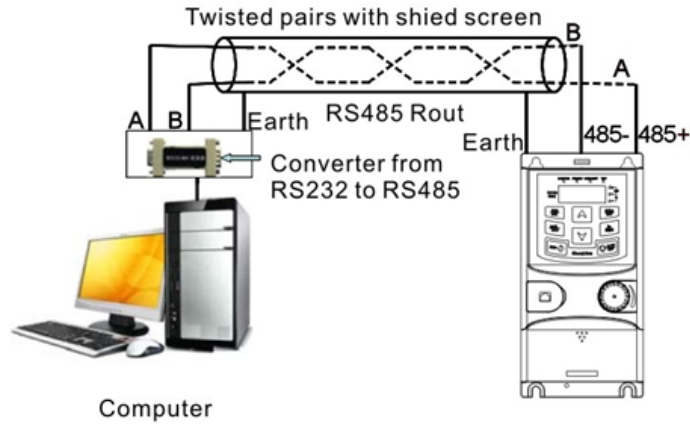


Figure 7-1: RS485 physical connection in single application

**7.2.1.2 Multi-applications**

In real multi-applications, the daisy chain connection and star connection are commonly used. Daisy chain connection is required in the RS485 industrial fieldbus standards. The two ends are connected to terminal resistors of 120Ω which is shown as figure 7-2.

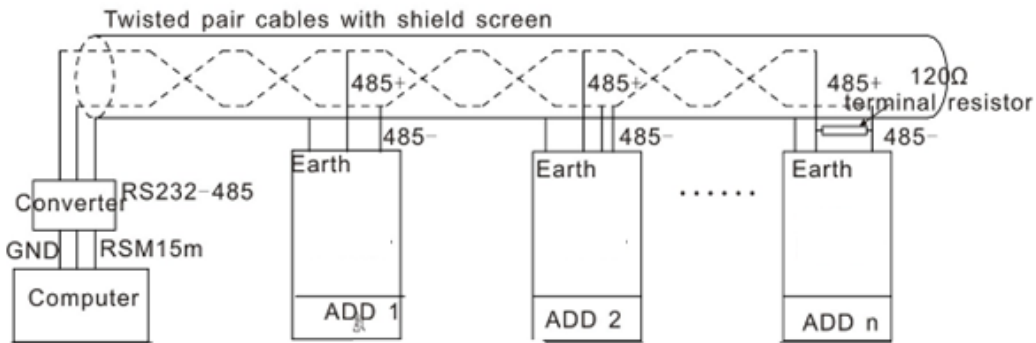


Figure 7-2: Daisy chain connection applications

Figure 7-3 is the star connection. Terminal resistor should be connected to the two devices which have the longest distance. (1# and 15#device)

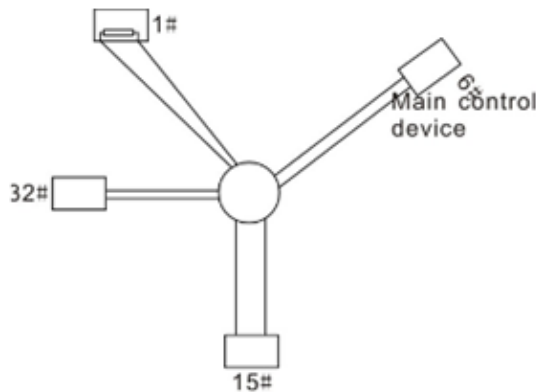


Figure 7-3: Star connection

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 and there should be no repeated address.

## 7.2.2 RTU Mode

### 7.2.2.1 RTU communication frame format

If the controller is set to communicate by RTU mode in Modbus network every 8bit byte in the message includes two 4Bit hex characters. Compared with ACSII mode, this mode can send more data at the same baud rate.

#### Code system

- 1 start bit
- 7 or 8 digital bit, the minimum valid bit can be sent firstly. Every 8-bit frame includes two hex characters (0...9, A... F)
- 1 even/odd check bit . If there is no checkout, the even/odd check bit does not exist.
- 1 end bit (with checkout), 2 Bit (no checkout)

#### Error detection field

- CRC

The data format is illustrated as below:

11-bit character frame (BIT1~BIT8 are the digital bits)

Start Bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	BIT8	Check Bit	End Bit
-----------	------	------	------	------	------	------	------	------	-----------	---------

10-bit character frame (BIT1~BIT7 are the digital bits)

Start Bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	Check Bit	End Bit
-----------	------	------	------	------	------	------	------	-----------	---------

In one-character frame, the digital bit takes effect. The start bit, check bit and end bit is used to send the digital bit right to the other device. The digital bit, even/odd checkout and end bit should be set as the same in real application.

The Modbus minimum idle time between frames should be no less than 3.5 bytes. The network device is detecting, even during the interval time, the network bus. When the first field (the address field) is received, the corresponding device decodes next transmitting character. When the interval time is at least 3.5 byte, the message ends.

The whole message frame in RTU mode is a continuous transmitting flow. If there is an interval time (more than 1.5 bytes) before the completion of the frame, the receiving device will renew the uncompleted message and suppose the next byte as the address field of the new message. As such, if the new message follows the previous one within the interval time of 3.5 bytes, the receiving device will deal with it as the same with the previous message. If these two phenomena all happen during the transmission, the CRC will generate a fault message to respond to the sending devices.

The standard structure of RTU frame:

START	T1-T2-T3-T4(transmission time of 3.5 bytes)
ADDR	Communication address: 0~247(decimal system) (0 is the broadcast address)
CMD	03H: read slave parameters 06H: write slave parameters
DATA (N-1) ... DATA (0)	The data of 2*N bytes are the main content of the communication as well as the core of data exchanging
CRC CHK low bit	Detection value: CRC (16BIT)
CRC CHK high bit	
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

### 7.2.2.2 RTU communication frame error checkout

Various factors (such as RFI noise) may cause error in the data transmission. For example, if the sending message is a logic "1", A-B potential difference on RS485 should be 6V, but it may be -6V because of electromagnetic interference, and then the other devices take the sent message as logic "0". If there is no error checkout, the receiving devices will not find the message is wrong and they may give incorrect response which cause serious result. Hence the checkout is essential to the message.

The theme of checkout is that: the sender calculates the sending data per a fixed formula, and then send the result with the message. When the receiver gets this message, they will calculate another result according to the same method and compare it with the sent message. If two results are the same, the message is correct. If not, the message is incorrect.

The error checkout of the frame can be divided into two parts: the bit checkout of the byte and the whole data checkout of the frame (CRC check).

**Bit checkout of the byte**

The user can select different bit checkouts or non-checkout, which impacts the check bit setting of each byte.

The definition of even checkout: add an even check bit before the data transmission to illustrate the number of “1” in the data transmission is odd number or even number. When it is even, the check byte is “0”, otherwise, the check byte is “1”. This method is used to stabilize the parity of the data.

The definition of odd checkout: add an odd check bit before the data transmission to illustrate the number of “1” in the data transmission is odd number or even number. When it is odd, the check byte is “0”, otherwise, the check byte is “1”. This method is used to stabilize the parity of the data.

For example, when transmitting “11001110”, there are five “1” in the data. If the even checkout is applied, the even check bit is “1”; if the odd checkout is applied; the odd check bit is “0”. The even and odd check bit is calculated on the check bit position of the frame. And the receiving devices also carry out even and odd checkout. If the parity of the receiving data is different from the setting value, there is an error in the communication.

**CRC check**

The checkout uses RTU frame format. The frame includes the frame error detection field which is based on the CRC calculation method. The CRC field is two bytes, including 16 figure binary values. It is added into the frame after calculated by transmitting device. The receiving device recalculates the CRC of the received frame and compares them with the value in the received CRC field. If the two CRC values are different, there is an error in the communication.

During CRC, 0xFFFF will be stored. And then, deal with the continuous 6-above bytes in the frame and the value in the register. Only the 8Bit data in every character is effective to CRC, while the start bit, the end and the odd and even check bit is ineffective.

The calculation of CRC applies the international standard CRC checkout principles. When the user is editing CRC calculation, he can refer to the relative standard CRC calculation to write the required CRC calculation program.

Here provided a simple function of CRC calculation for the reference (programmed with C language):

```
unsigned int crc_cal_value (unsigned char *data_value, unsigned char data_length)
{
int i;
unsigned int crc_value=0xffff;
while(data_length--)
{
  crc_value^=*data_value++;
  for(i=0;i<8;i++)
  {
if(crc_value&0x0001)crc_value=(crc_value>>1)^0xa001;
else crc_value=crc_value>>1;
} }
return(crc_value);
}
```

In ladder logic, CKSM calculated the CRC value according to the frame with the table inquiry. The method is advanced with easy program and quick calculation speed. But the ROM space the program occupied is huge. Hence use it with caution according to the program required space.

**7.3 RTU Command Code and Communication Data Illustration****7.3.1 Command Code:03H****03H (correspond to binary 0000 0011), read N words (Word) (the Max. continuous reading is 16 words)**

Command code 03H means that if the master read data from the inverter, the reading number depends on the “data number” in the command code. The Max. Continuous reading number is 16 and the parameter address should be continuous. The byte length of every data is 2 (one word). The following command format is illustrated by hex (a number with “H” means hex) and one hex occupies one byte.

The command code is used to read the working stage of the inverter.

For example, read continuous 2 data content from 0004H from the inverter with the address of 01H (read the content of data address of 0004H and 0005H), the frame structure is as overleaf:

RTU master command message (from the master to the inverter)

START	T1-T2-T3-T4
ADDR	01H
CMD	03H
High bit of the start address	00H
Low bit of the start address	04H
High bit of data number	00H
Low bit of data number	02H
CRC low bit	85H
CRC high bit	CAH
END	T1-T2-T3-T4

T1-T2-T3-T4 between START and END is to provide at least the time of 3.5 bytes as the leisure time and distinguish two messages for the avoidance of taking two messages as one message.

**ADDR** = 01H means the command message is sent to the inverter with the address of 01H and ADDR occupies one byte

**CMD**=03H means the command message is sent to read data from the inverter and CMD occupies one byte

**“Start address”** means reading data from the address and it occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

**“Data number”** means the reading data number with the unit of word. If the “start address’ is 0004H and the “data number” is 0002H, the data of 0004H and 0005H will be read.

**CRC** occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

RTU slave response message (from the inverter to the master)

START	T1-T2-T3-T4
ADDR	01H
CMD	03H
Byte number	04H
Data high bit of address 0004H	13H
Data low bit of address 0004H	88H
Data high bit of address 0005H	00H
Data low bit of address 0005H	00H
CRC CHK low bit	7EH
CRC CHK high bit	9DH
END	T1-T2-T3-T4

The meaning of the response is that:

**ADDR** = 01H means the command message is sent to the inverter with the address of 01H and ADDR occupies one byte

**CMD**=03H means the message is received from the inverter to the master for the response of reading command and CMD occupies one byte

**“Byte number”** means all byte number from the byte (excluding the byte) to CRC byte (excluding the byte). 04 means there are 4 byte of data from the “byte number” to “CRC CHK low bit”, which are “digital address 0004H high bit”, “digital address 0004H low bit”, “digital address 0005H high bit” and “digital address 0005H low bit”.

There are 2 bytes stored in one data with the fact that the high bit is in the front and the low bit is in the behind of the message, the data of data address 0004H is 1388H, and the data of data address 0005H is 0000H.

CRC occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

### 7.3.2 Command Code:06H

06H(correspond to binary 0000 0110), write one word(Word)

The command means that the master write data to the inverter and one command can write one data other than multiple dates. The effect is to change the working mode of the inverter.

For example, write 5000 (1388H) to 0004H from the inverter with the address of 02H, the frame structure is as overleaf:

RTU master command message (from the master to the inverter)

START	T1-T2-T3-T4
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	04H
High bit of data content	13H
Low bit of data content	88H
CRC CHK low bit	C5H
CRC CHK high bit	6EH
END	T1-T2-T3-T4

RTU slave response message (from the inverter to the master)

START	T1-T2-T3-T4
ADDR	02H
CMD	06H
High bit of writing data address	00H
Low bit of writing data address	04H
High bit of data content	13H
Low bit of data content	88H
CRC CHK low bit	C5H
CRC CHK high bit	6EH
END	T1-T2-T3-T4

**Note:** section 10.2 and 10.3 mainly describe the command format, and the detailed application will be mentioned in 10.8 with examples.

### 7.3.3 Command Code 08H for Diagnosis

Meaning of sub-function codes

Sub-function Code	Description
0000	Return to inquire information data

For example: The inquiry information string is same as the response information string when the loop detection to address 01H of driver is carried out.

The RTU request command is:

START	T1-T2-T3-T4
ADDR	01H
CMD	08H
High bit of sub-function code	00H
Low bit of sub-function code	00H
High bit of data content	12H
Low bit of data content	ABH
CRC CHK low bit	ADH
CRC CHK high bit	14H
END	T1-T2-T3-T4



The RTU response command is:

START	T1-T2-T3-T4
ADDR	01H
CMD	08H
High bit of sub-function code	00H
Low bit of sub-function code	00H
High bit of data content	12H
Low bit of data content	ABH
CRC CHK low bit	ADH
CRC CHK high bit	14H
END	T1-T2-T3-T4

### 7.3.4 Command Code: 10H, Continuous Writing

Command code 10H means that if the master writes data to the inverter, the data number depends on the “data number” in the command code. The Max. continuous reading number is 16.

For example, write 5000(1388H) to 0004H of the inverter whose slave address is 02H and 50(0032H) to 0005H, the frame structure is as below:

The RTU request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	10H
High bit of write data	00H
Low bit of write data	04H
High bit of data number	00H
Low bit of data number	02H
Byte number	04H
High bit of data 0004H	13H
Low bit of data 0004H	88H
High bit of data 0005H	00H
Low bit of data 0005H	32H
Low bit of CRC	C5H
High bit of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The RTU response command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	10H
High bit of write data	00H
Low bit of write data	04H
High bit of data number	00H
Low bit of data number	02H
Low bit of CRC	C5H
High bit of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

### 7.3.5 Data Address Definition

The address definition of the communication data in this part is to control the running of the inverter and get the status information and relative function parameters of the inverter.

#### 7.3.5.1 Function code parameter address rules

The parameter address occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind. The range of high and low byte are: high byte—00~ffH; low byte—00~ffH. The high byte is the group number before the radix point of the function code and the low byte is the number after the radix point. But both the high byte and the low byte should be changed into hex. For example, P05.05, the group number before the radix point of the function code is 05, then the high bit of the parameter is 05, the number after the radix point 05, then the low bit of the parameter is 05, then the functions code address is 0505H and the parameter address of P10.01 is 0A01H.

Function Code	Name	Detailed Instruction of Parameters	Setting Range	Default Value	Modify	Serial No
P10.00	Simple PLC	0: Stop after running once 1: Run at the final value after running once 2: Cycle running	0~2	0	○	354
P10.01	Simple PLC memory	0: Power loss without memory 1: Power loss memory	0~1	0	○	355

**Note:** P29 group is the factory parameter which can not be read or changed. Some parameters can not be changed when the inverter is in the running state and some parameters can not be changed in any state. The setting range, unit and relative instructions should be paid attention to when modifying the function code parameters.

Besides, EEPROM is stocked frequently, which may shorten the usage time of EEPROM. For users, some functions are not necessary to be stocked on the communication mode. The needs can be met on by changing the value in RAM. Changing the high bit of the function code from 0 to 1 can also realize the function. For example, the function code P00.07 is not stocked into EEPROM. Only by changing the value in RAM can set the address to 8007H. This address can only be used in writing RAM other than reading. If it is used to read, it is an invalid address.

#### 7.3.5.2 The address instruction of other function in Modbus

The master can operate on the parameters of the inverter as well as control the inverter, such as running or stopping and monitoring the working status of the inverter.

Below is the parameter list of other functions

Function Instruction	Address Definition	Data Meaning Instruction	R/W Characteristics
Communication control command	2000H	0001H: forward run	W
		0002H: reverse run	
		0003H: forward jog	
		0004H: reverse jog	
		0005H: stop	
		0006H: coast to stop (emergency stop)	
		0007H: fault reset	
		0008H: jog stop	
The address of the communication setting value	2001H	Communication setting frequency (0~Fmax (unit: 0.01Hz))	W
	2002H	PID reference, range (0~1000, 1000 corresponds to 100.0%)	W
	2003H	PID feedback, range (0~1000, 1000 corresponds to 100.0%)	W
	2004H	Torque setting value (-3000~3000, 1000 corresponds to the 100.0% of the rated current of the motor)	W
	2005H	The upper limit frequency setting during forward rotation (0~Fmax (unit: 0.01Hz))	W
	2006H	The upper limit frequency setting during reverse rotation (0~Fmax (unit: 0.01Hz))	W
	2007H	The upper limit torque of electromotion torque (0~3000, 1000 corresponds to the 100.0% of the rated current of the motor)	W

Function Instruction	Address Definition	Data Meaning Instruction	R/W Characteristics
cont	2008H	The upper limit torque of braking torque (0~3000, 1000 corresponds to the 100.0% of the rated current of the motor)	
	2009H	Special control command word Bit0~1: =00: motor 1 =01: motor 2 =10: motor 3 =11: motor 4 Bit2: =1 torque control prohibit =0: torque control prohibit invalid Bit3: =1 power consumption clear =0: no power consumption clear Bit4: =1 pre-exciting =0: pre-exciting prohibition Bit5: =1 DC braking =0: DC braking prohibition	W
	200AH	Virtual input terminal command, range: 0x000~0x1FF	W
	200BH	Virtual input terminal command, range: 0x00~0x0F	W
	200CH	Voltage setting value (special for V/F separation) (0~1000, 1000 corresponds to the 100.0% of the rated voltage of the motor)	W
	200DH	AO output setting 1 (-1000~1000, 1000 corresponds to 100.0%)	W
	200EH	AO output setting 2 (-1000~1000, 1000 corresponds to 100.0%)	W
SW 1 of the inverter	2100H	0001H: forward running	R
		0002H: forward running	
		0003H: stop	
		0004H: fault	
		0005H: POFF status	
		0006H: pre-exciting status	
SW 1 of the inverter	2101H	Bit0: =0: bus voltage is not established =1: bus voltage is established Bit1~2: =00: motor 1 =01: motor 2 =10: motor 3 =11: motor 4 Bit3: =0: asynchronous motor =1: synchronous motor Bit4: =0: pre-alarm without overload =1: overload pre-alarm Bit5~ Bit6: =00: keypad control =01: terminal control =10: communication control	R
Fault code of the inverter	2102H	See the fault type instruction	R
Identifying code of the inverter	2103H	SD1-----0x0106	R
Operation frequency	3000H	Range: 0.00Hz~P00.03	R
Setting frequency	3001H	Range: 0.00Hz~P00.03	R
Bus voltage	3002H	Range: 0~2000V	R
Output voltage	3003H	Range: 0~1200V	R
Output current	3004H	Range: 0.0~3000.0A	R
Operation speed	3005H	Range: 0~65535RPM	R
Output power	3006H	Range: -300.0~300.0%	R
Output torque	3007H	Range: -250.0~250.0%	R
Close loop setting	3008H	Range: -100.0%~100.0%	R
Close loop feedback	3009H	Range: -100.0%~100.0%	R
PID setting	3008H	-100.0~100.0% (unit: 0.1%)	R
PID feedback	3009H	-100.0~100.0% (unit: 0.1%)	R
Input IO	300AH	000~1FF	
Input IO	300BH	000~1FF	
AI 1	300CH	Range: 0.00~10.00V	R
AI 2	300DH	Range: 0.00~10.00V	R
AI 3	300EH	Range: 0.00~10.00V	R

Function Instruction	Address Definition	Data Meaning Instruction	R/W Characteristics
AI 4	300FH	Range: -10.00~10.00V	R
Read high speed pulse 1 input	3010H	Range: 0.00~50.00kHz	R
Read high speed pulse 2 input	3011H	Reserved	R
Read current step of the multi-step speed	3012H	Range: 0~15	R
External length	3013H	Range: 0~65535	R
External counting value	3014H	Range: 0~65535	R
Torque setting	3015H	-300.0~300.0%(Unit: 0.1%)	R
Inverter code	3016H		R
Fault code	5000H		R

R/W characteristics means the function is with read and write characteristics. For example, “communication control command” is writing characteristic and control the inverter with writing command (06H). R characteristic can only read other than write and W characteristic can only write other than read.

**Note:** when operating on the inverter with the table above, it is necessary to enable some parameters. For example, the operation of running and stopping, it is necessary to set P00.01 to communication running command channel and set P00.02 to MODBUS communication channel. And when operate on “PID given”, it is necessary to set P09.00 to “MODBUS communication setting”.

The encoding rules for device codes (corresponds to identifying code 2103H of the inverter)

Code High 8 Bit	Meaning	Code Low 8 Position	Meaning
01	SD1 Series Vector Inverter	06	SD1 Series Vector Inverter

**Note:** the code is consisted of 16 bit which is high 8 bits and low 8 bits. High 8 bits mean the motor type series and low 8 bits mean the derived motor types of the series. For example, 0110H means SD1 Series vector inverters.

### 7.3.6 Fieldbus Ratio Values

The communication data is expressed by hex in actual application and there is no radix point in hex. For example, 50.12Hz can not be expressed by hex so 50.12 can be magnified by 100 times into 5012, so hex 1394H can be used to express 50.12.

A non-integer can be timed by a multiple to get an integer and the integer can be called fieldbus ratio values.

The fieldbus ratio values are referred to the radix point of the setting range or default value in the function parameter list. If there are figures behind the radix point ( $n=1$ ), then the fieldbus ratio value  $m$  is  $10n$ . Take the table as the example:

Function Code	Name	Detailed Instruction of Parameters	Setting Range	Default Value	Modify	Serial No
P01.20	Hibernation restore delay time	0.0~3600.0s (valid when P01.19=2)	0.0~3600.0	0.0s	○	39
P01.21	Restart after power off	0: Disable 1: Enable	0~1	0	○	40

If there is one figure behind the radix point in the setting range or the default value, then the fieldbus ratio value is 10. if the data received by the upper monitor is 50, then the “hibernation restore delay time” is 5.0 ( $5.0=50\div 10$ ).

If Modbus communication is used to control the hibernation restore delay time as 5.0s. Firstly, 5.0 can be magnified by 10 times to integer 50 (32H) and then this data can be sent.

01  
inverter  
address

06  
read  
command

01 14  
parameters  
address

00 32  
data  
number

49 E7  
CRC check

After the inverter receives the command, it will change 50 into 5 according to the fieldbus ratio value and then set the hibernation restore delay time as 5s.

Another example, after the upper monitor sends the command of reading the parameter of hibernation restore delay time, if the response message of the inverter is as following:

<b>01</b>	<b>03</b>	<b>02</b>	<b>00 32</b>	<b>39 91</b>
inverter address	read command	2 bytes data	parameter data	CRC check

Because the parameter data is 0032H (50) and 50 divided by 10 is 5, then the hibernation restore delay time is 5s.

### 7.3.7 Fault Message Response

There may be fault in the communication control. For example, some parameter can only be read. If a writing message is sent, the inverter will return a fault response message.

The fault message is from the inverter to the master, its code and meaning is as below:

Code	Name	Meaning
01H	Illegal command	The command from master can not be executed. The reason maybe: 1. This command is only for new version and this version can not realize. 2. Slave is in fault status and can not execute it.
02H	Illegal data address	Some of the operation addresses are invalid or not allowed to access. Especially the combination of the register and the transmitting bytes are invalid.
03H	Illegal value	When there are invalid data in the message framed received by slave. <b>Note:</b> This error code does not indicate the data value to write exceed the range, but indicate the message frame is an illegal frame.
04H	Operation failed	The parameter setting in parameter writing is invalid. For example, the function input terminal can not be set repeatedly.
05H	Password error	The password written to the password check address is not same as the password set by P7.00.
06H	Data frame error	In the frame message sent by the upper monitor, the length of the digital frame is incorrect or the counting of CRC check bit in RTU is different from the lower monitor.
07H	Written not allowed.	It only happens in write command, the reason maybe: 1. The written data exceeds the parameter range. 2. The parameter should not be modified now. 3. The terminal has already been used.
08H	The parameter can not be modified during running	The modified parameter in the writing of the upper monitor can not be modified during running.
09H	Password protection	When the upper monitor is writing, or reading and the user password is set without password unlocking, it will report that the system is locked.

The slave uses functional code fields and fault addresses to indicate it is a normal response or some error occurs (named as objection response). For normal responses, the slave shows corresponding function codes, digital address or sub-function codes as the response. For objection responses, the slave returns a code which equals the normal code, but the first byte is logic 1.

For example: when the master sends a message to the slave, requiring it to read a group of address data of the inverter function codes, there will be following function codes:

0 0 0 0 0 1 1 (Hex 03H)

For normal responses, the slave responds the same codes, while for objection responses, it will return:

1 0 0 0 0 1 1 (Hex 83H)

Besides the function codes modification for the objection fault, the slave will respond a byte of abnormal code which defines the error reason. When the master receives the response for the objection, in a typical processing, it will send the message again or modify the corresponding order. For example, set the “running command channel” of the inverter (P00.01, parameter address is 0001H) with the address of 01H to 03, the command is as following:

<b>01</b>	<b>06</b>	<b>00 01</b>	<b>00 03</b>	<b>98 0B</b>
inverter address	read command	parameter address	parameter data	CRC check

But the setting range of “running command channel” is 0~2, if it is set to 3, because the number is beyond the range, the inverter will return fault response message as below:

<b>01</b>	<b>86</b>	<b>04</b>	<b>43 A3</b>
inverter address	abnormal response code	fault code	CRC check

Abnormal response code 86H means the abnormal response to writing command 06H; the fault code is 04H. In the table above, its name is operation failed and its meaning is that the parameter setting in parameter writing is invalid. For example, the function input terminal can not be set repeatedly.

### 7.3.8 Example of Writing and Reading

Refer to section 7.4.1 and 7.4.2 for the command format.

#### 7.3.8.1 Example of reading command 03H

Read the status word 1 of the inverter with the address of 01H (refer to table 1). From the table 1, the parameter address of the status word 1 of the inverter is 2100H.

The command sent to the inverter:

<b>01</b>	<b>03</b>	<b>21 00</b>	<b>00 01</b>	<b>8E 36</b>
inverter address	read parameter	parameter address	data number	CRC check

If the response message is as below:

<b>01</b>	<b>03</b>	<b>02</b>	<b>00 03</b>	<b>F8 45</b>
inverter address	read command	data number	data content	CRC check

The data content is 0003H. From the table 1, the inverter stops.

Watch “the current fault type” to “the previous 5 times fault type” of the inverter through commands, the corresponding function code is P07.27~P07.32 and corresponding parameter address is 071BH~0720H(there are 6 from 071BH).

The command sent to the inverter:

<b>03</b>	<b>03</b>	<b>07 1B</b>	<b>00 06</b>	<b>B5 59</b>
inverter address	read command	start address	total 6 parameters	CRC check

If the response message is as below:

<b>03</b>	<b>03</b>	<b>0C</b>	<b>00 23</b>	<b>00 23</b>	<b>00 23</b>	<b>00 23</b>	<b>00 23</b>	<b>00 23</b>	<b>5F D2</b>
inverter address	 read command	byte number	 current fault type	previous fault type	 previous 2 fault type	previous 3 fault type	 previous 4 fault type	previous 5 fault type	 CRC check

See from the returned data, all fault types are 0023H (decimal 35) with the meaning of maladjustment (STo).

#### 7.3.8.2 Example of writing command 06H

Make the inverter with the address of 03H to run forward. See table 1, the address of “communication control command” is 2000H and forward running is 0001. See the following table:

Function Instruction	Address Definition	Data Meaning Instruction	R/W Characteristics
Communication control command	2000H	0001H: forward run	W
		0002H: reverse run	
		0003H: forward jog	
		0004H: reverse jog	
		0005H: stop	
		0006H: coast to stop (emergency stop)	
		0007H: fault reset	
		0008H: jog stop	
		0009H: pre-exciting	

The command sent by the master:

03      06      20 00      00 01      42 28  
 inverter      write      parameter      forward      CRC  
 address      command      address      running      check

If the operation is successful, the response may be as below (the same with the command sent by the master):

03      06      20 00      00 01      42 28  
 inverter      write      parameter      forward      CRC  
 address      command      address      running      check

Set the Max. Output frequency of the inverter with the address of 03H as 100Hz.

Function Code	Name	Detailed Instruction of Parameters	Setting Range	Default Value	Modify	Serial No
P00.03	Max. output frequency	P00.04~600.00Hz (400.00Hz)	10.00~600.00	50.00Hz	○	3

See the figures behind the radix point, the fieldbus ratio value of the Max. output frequency (P00.03) is 100. 100Hz timed by 100 is 10000 and the corresponding hex is 2710H.

The command sent by the master:

03      06      00 03      27 10      62 14  
 inverter      write      parameter      forward      CRC  
 address      command      address      running      check

If the operation is successful, the response may be as below (the same with the command sent by the master):

03      06      00 03      27 10      62 14  
 inverter      write      parameter      forward      CRC  
 address      command      address      running      check

**Note:** the blank in the above command is for illustration. The blank can not be added in the actual application unless the upper monitor can remove the blank by themselves.

### 7.3.8.3 Example of continuous writing command10H

Example 1: make the inverter whose address is 01H run forward at 10Hz. Refer to the instruction of 2000H and 0001. Set the address of "communication setting frequency" is 2001H and 10Hz corresponds to 03E8H. See the following table.



Function Instruction	Address Definition	Data Meaning Instruction	R/W Characteristics
Communication control command	2000H	0001H: forward run	W/R
		0002H: reverse run	
		0003H: forward jog	
		0004H: reverse jog	
		0005H: stop	
		0006H: coast to stop (emergency stop)	
		0007H: fault reset	
		0008H: jog stop	
Address of the communication setting	2001H	Communication setting frequency (0~Fmax {unit: 0.01Hz})	W/R
	2002H	PID given, range (0~1000, 1000 corresponds to 100.0%)	

Set P00.01 to 2 and P00.06 to 8.

The command sent to the inverter:

01 10 20 00 00 02 04 00 01 03 E8 3B 10  
 inverter address continuous parameter data byte forward 10Hz CRC check  
 writing command address number number running

If the response message is as below:

01 10 20 00 00 02 4A 08  
 inverter address continuous parameter data CRC check  
 address writing command address number

Example 2: set the ACC time of 01H inverter as 10s and the DEC time as 20s

Function Code	Name	Detailed Instruction of Parameters	Default Value	Modify
P00.11	ACC time 1	ACC time means the time taken to accelerate from 0Hz to the Max. One (P00.03).	Depends on model	<input type="radio"/>
P00.12	DEC time 1	DEC time means the time taken to decelerate from Max. Output frequency to 0Hz (P00.03). Goodrive300 series inverters define four groups of ACC/DEC time which can be selected by P05. The factory default ACC/DEC time of the inverter is the first group. Setting range of P00.11 and P00.12:0.0~3600.0s	Depends on model	<input type="radio"/>

The corresponding address of P00.11 is 000B, the ACC time of 10s corresponds to 0064H, and the DEC time of 20s corresponds to 00C8H.

The command sent to the inverter:

01 10 00 0B 00 02 04 00 64 00 C8 F2 55  
 inverter address continuous parameter data byte 10s 20s CRC check  
 writing command address number number

If the response message is as below:

01 10 00 0B 00 02 30 0A  
 inverter address continuous parameter data CRC check  
 address writing command address number

**Note:** The space between above commands is for instruction and there is no space between the commands during actual applications.

### Common communication fault

Common communication faults: no response to the communication or the inverter returns abnormal fault.

The possible reason for no response to the communication:

Selecting wrong serial interface, for example, if the converter is COM1, selecting COM2 during the communication

The baud rate, digital bit, end bit and check bit are not the same with the inverter + and - of RS485 are connected in reverse.

The 485-wire cap on the terminal board of the inverter is not plug in. the wire cap in behind the terminal arrangement.

## Appendix A Technical Data

### A.1 Ratings

#### A.1.1 Capacity

Inverter sizing is based on the rated motor current and power. To achieve the rated motor power given in the table, the rated current of the inverter must be higher than or equal to the rated motor current. Also the rated power of the inverter must be higher than or equal to the rated motor power. The power ratings are the same regardless of the supply voltage within one voltage range.

##### Note:

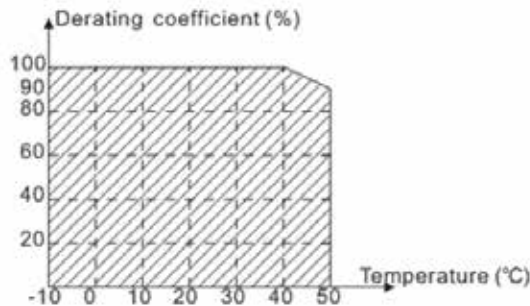
1. The maximum allowed motor shaft power is limited to  $1.5 \cdot P_N$ . If the limit is exceeded, motor torque and current are automatically restricted. The function protects the input bridge of the drive against overload.
2. The ratings apply at ambient temperature of  $40^\circ\text{C}$ .
3. It is important to check that in common DC systems the power flowing through the common DC connection does not exceed  $P_N$ .

#### A.1.2 Derating

The load capacity decreases if the installation site ambient temperature exceeds  $40^\circ\text{C}$ , the altitude exceeds 1000 meters or the switching frequency is changed from 4 kHz to 8, 12 or 15 kHz.

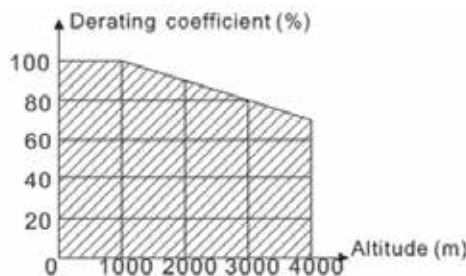
##### A.1.2.1 Temperature derating

In the temperature range  $+40^\circ\text{C} \dots +50^\circ\text{C}$ , the rated output current is decreased by 1% for every additional  $1^\circ\text{C}$ . Refer to the below list for the actual derating.



##### A.1.2.2 Altitude derating

The device can output rated power if the installation site below 1000m. The output power decreases if the altitude exceeds 1000 meters. Below is the detailed decreasing range of the derating:



### A.2 Power Supply



- Check the voltage rating of the inverter complies with the supply power voltage.

## A.3 Cables

### A.3.1 Power cables

Select the input power and motor cables according to local regulations.

**Note:** A separate PE conductor is required if the conductivity of the shielded cable is not sufficient.

### A.3.2 Control cables

All analogue control cables and the cable used for the frequency input must be shielded.

Relay cables need to be braided metallic screen.

**Note:** Run analogue and digital signals separately.

Check the insulation of the input power cable according to local regulations before connecting to the drive.

Model	Recommended Cable Size (mm <sup>2</sup> )		Connecting Cable Size (mm <sup>2</sup> )			Terminal Screw	Tightening Torque (Nm)
	RST	PE	RST	P1 (+)	PE		
	UVW		UVW				
SD1-2.5A-21	1.5	1.5	1~4	1~4	1~4	M3	0.8
SD1-4.2A-21	1.5	1.5	1~4	1~4	1~4	M3	0.8
SD1-7.5A-21	2.5	2.5	1~4	1~4	1~4	M3	0.8
SD1-10A-21	2.5	2.5	1~4	1~4	1~4	M3	0.8
SD1-2.5A-23	1.5	1.5	1-1.5	1-1.5	1-1.5	M3	0.8
SD1-4.2A-23	1.5	1.5	1-1.5	1-1.5	1-1.5	M3	0.8
SD1-7.5A-23	2.5	2.5	1.5~6	2.5~6	2.5~6	M4	1.13
SD1-10A-23	2.5	2.5	1.5~6	2.5~6	2.5~6	M4	1.13
SD1-16A-23	2.5	2.5	1.5~6	2.5~6	2.5~6	M4	1.13
SD1-20A-23	4	4	4~10	4~10	4~10	M5	2.3
SD1-30A-23	6	6	4~10	4~10	4~10	M5	2.3
SD1-2.5A-43	1.5	1.5	1-1.5	1-1.5	1-1.5	M3	0.8
SD1-4.2A-43	1.5	1.5	1-1.5	1-1.5	1-1.5	M3	0.8
SD1-5.5A-43	1.5	1.5	1-1.5	1-1.5	1-1.5	M3	0.8
SD1-9.5A-43	2.5	2.5	2.5~6	2.5~6	2.5~6	M4	1.13
SD1-14A-43	2.5	2.5	2.5~6	2.5~6	2.5~6	M4	1.13
SD1-18.5A-43	4	4	4~10	4~10	4~10	M5	2.3
SD1-25A-43	6	6	4~10	4~10	4~10	M5	2.3
SD1-32A-43	6	6	4~10	4~10	4~10	M5	2.3
SD1-38A-43	10	10	10~16	10~16	10~16	M5	2.3
SD1-45A-43	16	16	10~16	10~16	10~16	M5	2.3
SD1-60A-43	25	16	25~50	25~50	16~25	M6	2.5
SD1-75A-43	25	16	25~50	25~50	16~25	M6	2.5
SD1-92A-43	35	16	35~70	35~70	16~35	M8	10
SD1-115A-43	50	25	35~70	35~70	16~35	M8	10
SD1-150A-43	70	35	35~70	35~70	16~35	M8	10
SD1-180A-43	95	50	70~120	70~120	50~70	M12	35
SD1-215A-43	120	70	70~120	70~120	50~70	M12	35

**Note:**

1. It is appropriate to use the recommended cable size under 40°C and rated current. The wiring distance should be no more than 100m.

2. Terminals P1, (+), PB and (-) connects the DC reactor options and parts.

## A.4 Breaker and Electromagnetic Contactor

It is recommended that to protect the installation, a fuse of the appropriate rating is utilised.

Select a breaker (MCCB) which matches the rated capacity of the inverter. The capacity of the inverter should be 1.5-2 times the rated current.



- Due to the inherent operating principle and construction of circuit breakers, hot ionized gases may escape from the breaker enclosure in case of a short-circuit. To ensure safe use, always follow the manufacturer's instructions.

It is necessary to install the electromagnetic contactor in the input side to control the switching on and off safety of the main circuit. It can switch off the input power supply when system faults.

Model	Fuse (A)	Breaker (A)	The rated working current of the contactor (A)
SD1-2.5A-21	10	10	9
SD1-4.2A-21	16	16	12
SD1-7.5A-21	25	25	25
SD1-10A-21	50	40	32
SD1-2.5A-23	6	6	9
SD1-4.2A-23	10	10	9
SD1-7.5A-23	16	16	12
SD1-10A-23	25	25	18
SD1-16A-23	35	32	25
SD1-20A-23	35	32	32
SD1-30A-23	50	63	50
SD1-2.5A-43	6	6	9
SD1-4.2A-43	10	10	9
SD1-5.5A-43	10	10	9
SD1-9.5A-43	25	25	25
SD1-14A-43	35	32	25
SD1-18.5A-43	63	40	38
SD1-25A-43	63	63	50
SD1-32A-43	63	63	50
SD1-38A-43	100	100	65
SD1-45A-43	100	100	80
SD1-60A-43	125	125	95
SD1-75A-43	150	160	115
SD1-92A-43	150	200	170
SD1-115A-43	200	200	170
SD1-150A-43	250	250	205
SD1-180A-43	325	315	245
SD1-215A-43	350	350	300

## A.5 CE

The CE mark is attached to the drive to verify that the drive follows the provisions of the European Low Voltage (2006/95/EC) and EMC Directives (2004/108/EC).

### A.5.1 Compliance with the European EMC Directive

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3:2004) covers requirements stated for drives. See section EMC regulations.

## A.6 EMC Regulations

EMC product standard (EN 61800-3:2004) specifies the EMC requirements.

First environment: domestic environment (includes establishments connected to a low-voltage network which supplies buildings used for domestic purposes).

Second environment includes establishments connected to a network not directly supplying domestic premises.

Four categories of the inverter:

Inverter of category C1: inverter of rated voltage less than 1000 V and used in the first environment.

Inverter of category C2: inverter of rated voltage less than 1000 V other than pins, sockets and motion devices and intended to be installed and commissioned only by a professional electrician when used in the first environment.

**Note:** IEC/EN 61800-3 in EMC standard doesn't limit the power distribution of the inverter, but it defines the upstage, installation and commission. A competent person with necessary skills in installing and/or commissioning power drive systems, including their EMC aspects.

Inverter of category C3: inverter of rated voltage less than 1000 V and used in the second environment other than the first one

Inverter of category C4: inverter of rated voltage more than 1000 V or the nominal current is above or equal to 400A and used in the complicated system in second environment

### A.6.1 Category C2

The emission limits are complied with the following provisions:

1. The optional EMC filter is selected according to the options and installed correctly.
2. The motor and control cables are selected as specified in this manual.
3. The drive is installed according to the instructions given in this manual.



- In a domestic environment, this product may cause radio interference, in which case supplementary mitigation measures may be required.

### A.6.2 Category C3

The immunity performance of the drive complies with the regulations of IEC/EN 61800-3, second environment.

The emission limits are complied with the following provisions:

1. The optional EMC filter is selected according to the options and installed correctly.
2. The motor and control cables are selected as specified in this manual.
3. The drive is installed according to the instructions given in this manual.

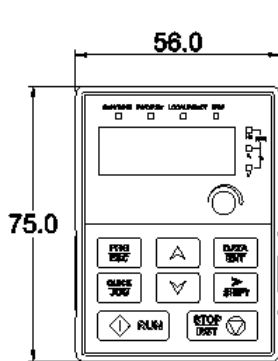


- A drive of category C3 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.

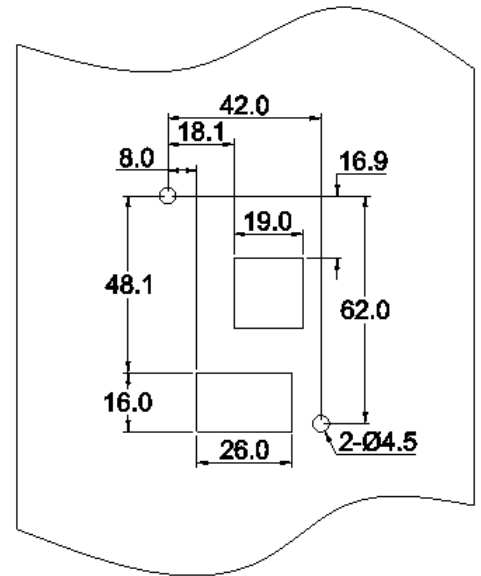
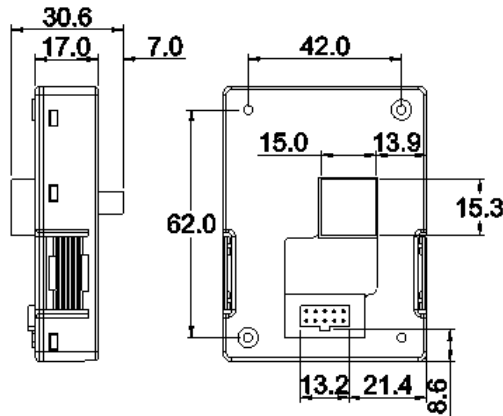
## Appendix B Dimension Drawings

Dimension drawings of the SD1 Series are shown below. The dimensions are given in millimeters and inches.

### B.1 External Keypad Structure



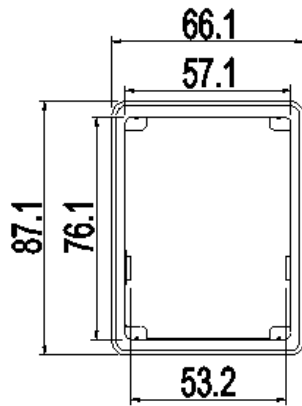
Overall drawing



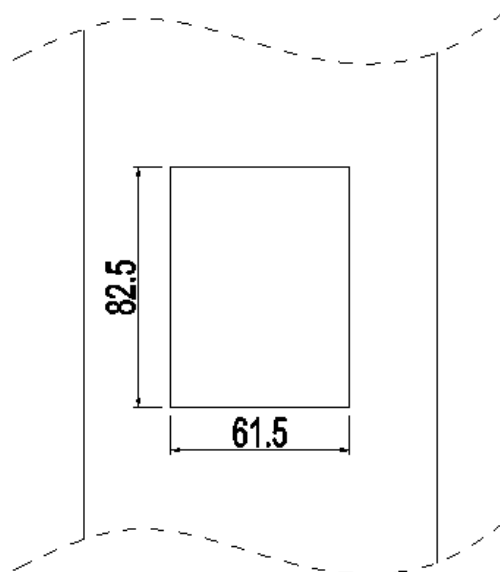
Hole drawing

**Note:** The external keypad is optional for the inverters ( $\leq 2.2\text{kW}$ ) and the standard keypad of inverters ( $\geq 4\text{kW}$ ) can be used as the external keypad.

The keypad can be mounted externally on optional mounting bracket (max cable length 40 meters).

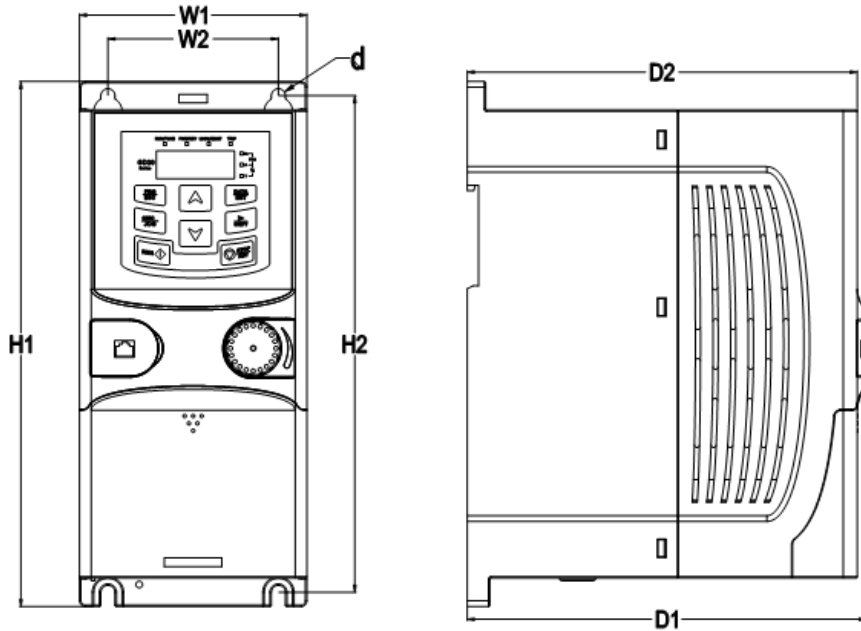


Installation bracket



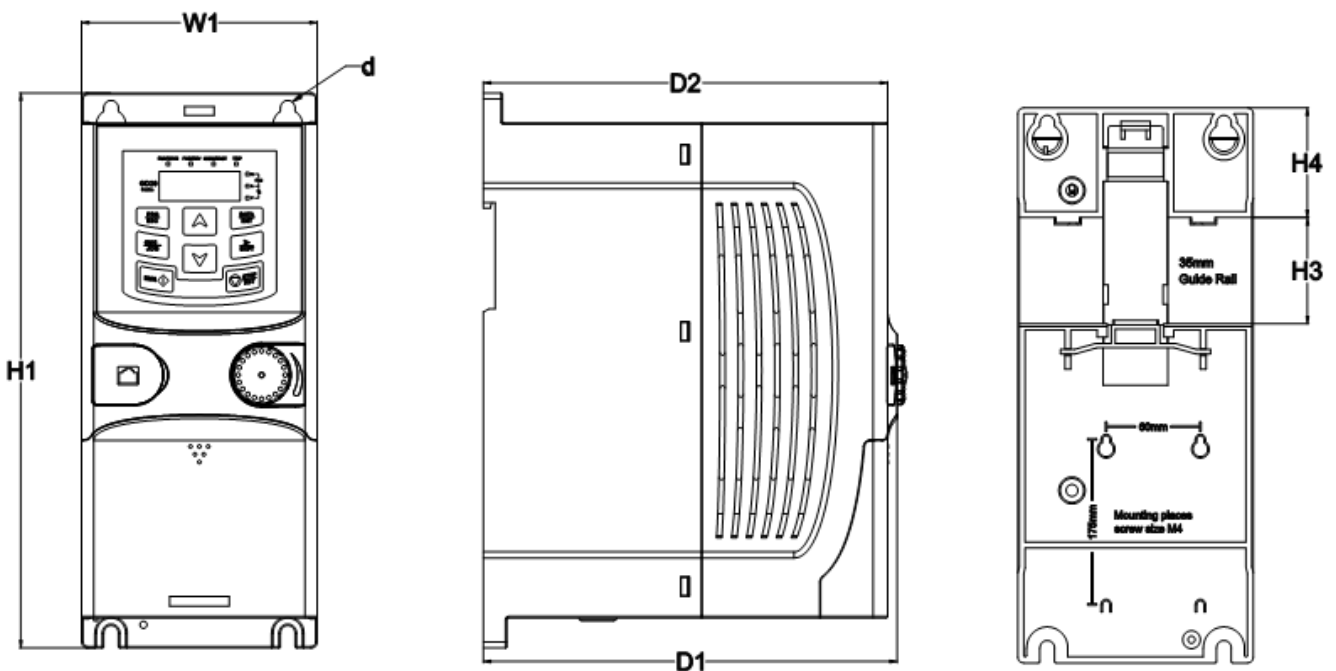
Installation dimension

## B.2 Inverter Chart



Wall mounting of 0.75~2.2kW inverters

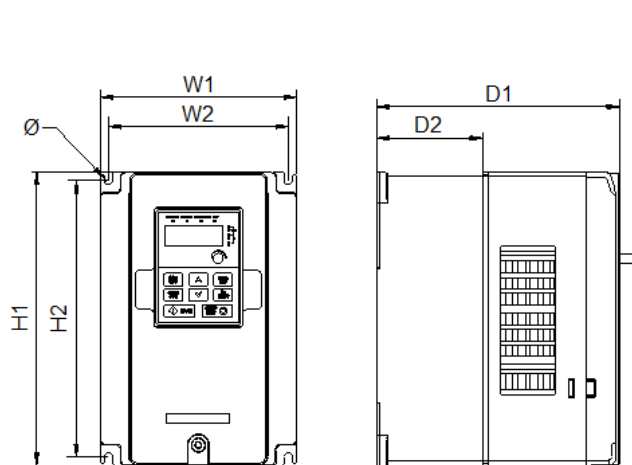
Model	W1	W2	H1	H2	D1	D2	Installation Hole (d)
SD1-2.5A-21	80.0	60.0	160.0	150.0	123.5	120.3	5
SD1-4.2A-21	80.0	60.0	160.0	150.0	123.5	120.3	5
SD1-7.5A-21	80.0	60.0	185.0	175.0	140.5	137.3	5
SD1-10A-21	80.0	60.0	185.0	175.0	140.5	137.3	5
SD1-2.5A-23	80.0	60.0	185.0	175.0	140.5	137.3	5
SD1-4.2A-23	80.0	60.0	185.0	175.0	140.5	137.3	5
SD1-2.5A-43	80.0	60.0	185.0	175.0	140.5	137.3	5
SD1-4.2A-43	80.0	60.0	185.0	175.0	140.5	137.3	5
SD1-5.5A-43	80.0	60.0	185.0	175.0	140.5	137.3	5



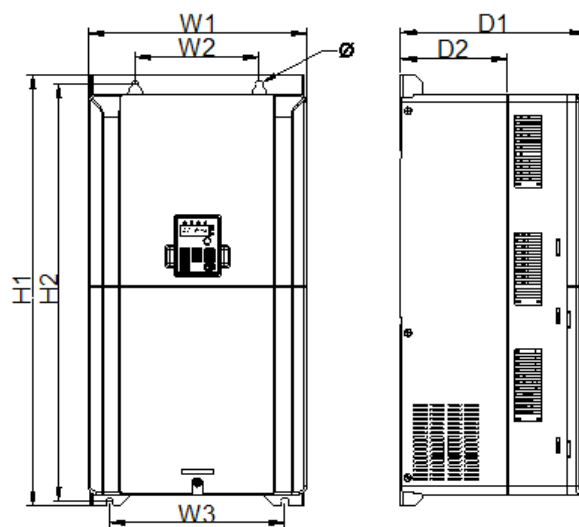
Rail mounting of inverters of 1PH 200V/3PH 380V ( $\leq 2.2\text{kW}$ ) and 3PH 200V ( $\leq 0.75\text{kW}$ )  
Dimension (unit: mm)



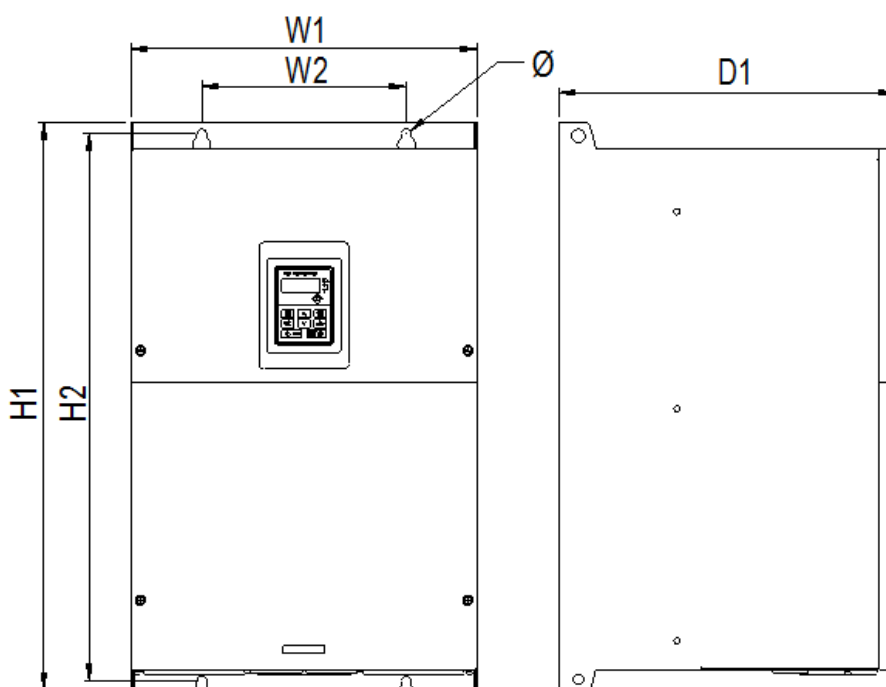
Model	W1	H1	H3	H4	D1	D2	Installation Hole (d)
SD1-2.5A-21	80.0	160.0	35.4	36.6	123.5	120.3	5
SD1-4.2A-21	80.0	160.0	35.4	36.6	123.5	120.3	5
SD1-7.5A-21	80.0	185.0	35.4	36.6	140.5	137.3	5
SD1-10A-21	80.0	185.0	35.4	36.6	140.5	137.3	5
SD1-2.5A-23	80.0	185.0	35.4	36.6	140.5	137.3	5
SD1-4.2A-23	80.0	185.0	35.4	36.6	140.5	137.3	5
SD1-2.5A-43	80.0	185.0	35.4	36.6	140.5	137.3	5
SD1-4.2A-43	80.0	185.0	35.4	36.6	140.5	137.3	5
SD1-5.5A-43	80.0	185.0	35.4	36.6	140.5	137.3	5



Wall mounting of 3PH 380V 4~37kW and 3PH 200V 1.5~7.5 kW inverters

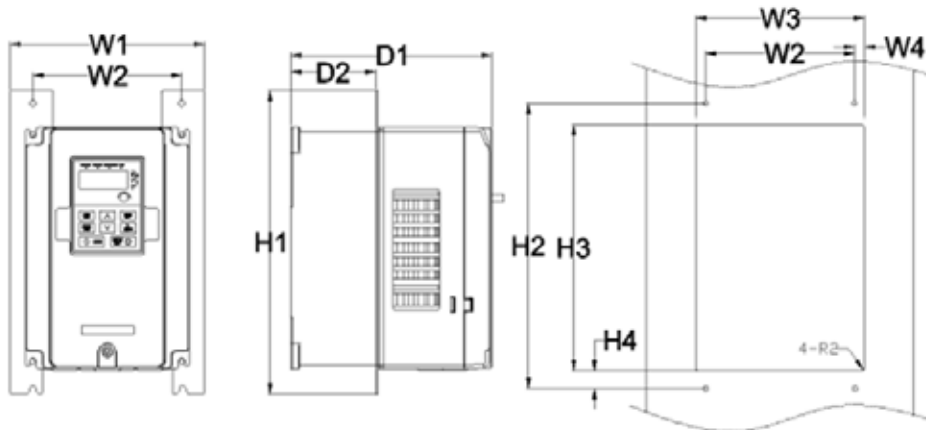


Wall mounting of 3PH 380V 45~75kW inverters

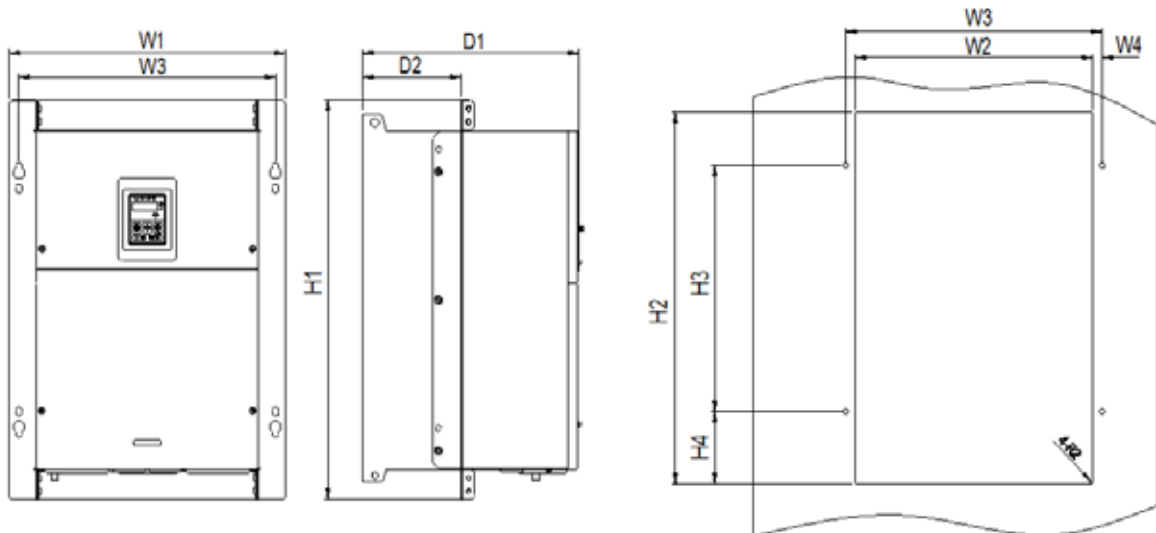


Wall mounting of 3PH 380V 90~110kW inverters  
Dimension (unit: mm)

Model	W1	W2	W3	H1	H2	D1	D2	Installation Hole
SD1-7.5A-23	146.0	131.0	—	256.0	243.5	167.0	84.5	6
SD1-10A-23	146.0	131.0	—	256.0	243.5	167.0	84.5	6
SD1-16A-23	146.0	131.0	—	256.0	243.5	167.0	84.5	6
SD1-20A-23	170.0	151.0	—	320.0	303.5	196.3	113.0	6
SD1-30A-23	170.0	151.0	—	320.0	303.5	196.3	113.0	6
SD1-9.5A-43	146.0	131.0	—	256.0	243.5	167.0	84.5	6
SD1-14A-43	146.0	131.0	—	256.0	243.5	167.0	84.5	6
SD1-18.5A-43	170.0	151.0	—	320.0	303.5	196.3	113.0	6
SD1-25A-43	170.0	151.0	—	320.0	303.5	196.3	113.0	6
SD1-32A-43	170.0	151.0	—	320.0	303.5	196.3	113.0	6
SD1-38A-43	200.0	185.0	—	340.6	328.6	184.3	104.5	6
SD1-45A-43	200.0	185.0	—	340.6	328.6	184.3	104.5	6
SD1-60A-43	250.0	230.0	—	400.0	380.0	202.0	123.5	6
SD1-75A-43	250.0	230.0	—	400.0	380.0	202.0	123.5	6
SD1-92A-43	282.0	160.0	226.0	560.0	542.0	238.0	138.0	9
SD1-115A-43	282.0	160.0	226.0	560.0	542.0	238.0	138.0	9
SD1-150A-43	282.0	160.0	226.0	560.0	542.0	238.0	138.0	9
SD1-180A-43	338.0	200.0	—	554.0	535.0	329.2	—	9.5
SD1-215A-43	338.0	200.0	—	554.0	535.0	329.2	—	9.5



Flange mounting of 3PH 380V 4~75kW and 3PH 200V 1.5~7.5kW inverters



Flange mounting of 3PH 380V 90~110kW inverters  
Dimension (unit: mm)

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Installation Hole	Screw
SD1-7.5A-23	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
SD1-10A-23	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
SD1-16A-23	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
SD1-20A-23	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
SD1-30A-23	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
SD1-9.5A-43	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
SD1-14A-43	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5
SD1-18.5A-43	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
SD1-25A-43	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
SD1-32A-43	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5
SD1-38A-43	266	250	224	13	371	250	350.6	20.3	184.6	104	6	M5
SD1-45A-43	266	250	224	13	371	250	350.6	20.3	184.6	104	6	M5
SD1-60A-43	316	300	274	13	430	300	410	55	202	118.3	6	M5
SD1-75A-43	316	300	274	13	430	300	410	55	202	118.3	6	M5
SD1-92A-43	352	332	306	13	580	400	570	80	238	133.8	9	M8
SD1-115A-43	352	332	306	13	580	400	570	80	238	133.8	9	M8
SD1-150A-43	352	332	306	13	580	400	570	80	238	133.8	9	M8
SD1-180A-43	418.5	361	389.5	14.2	600	559	370	108.5	329.5	149.5	9.5	M8
SD1-215A-43	418.5	361	389.5	14.2	600	559	370	108.5	329.5	149.5	9.5	M8

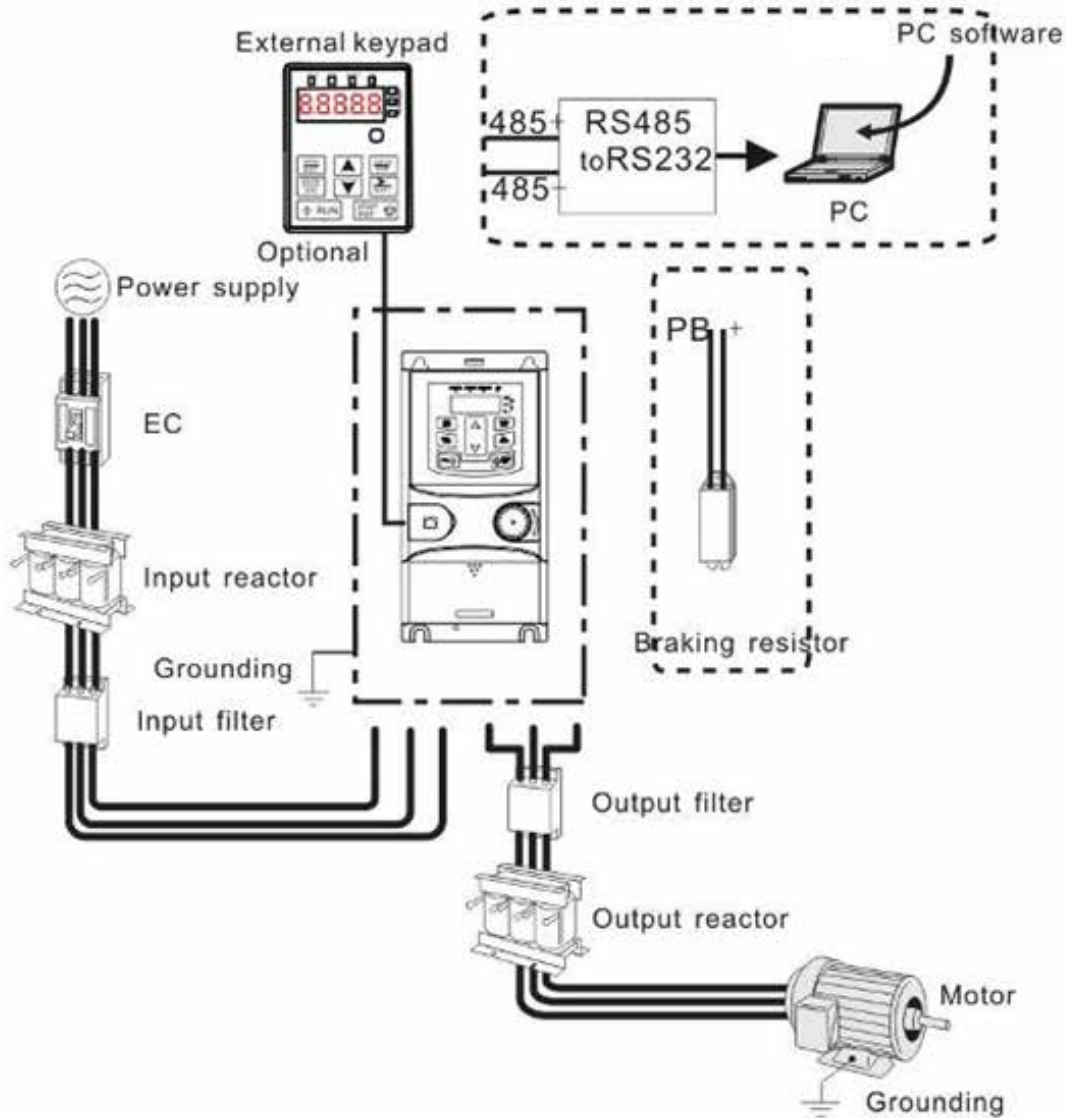
**Note:** The installation bracket is optional



# Appendix C Options and Parts








This chapter describes how to select the options and parts of SD1 Series.

## C.1 Peripheral Component Wiring

Below is the peripheral component wiring of SD1 Series inverters.



Pictures	Name	Descriptions	Reference
	External keypad	When the external keypad is valid, local keypad is off; when local keypad is valid, both local and external keypads are on.	SD1-KP
	External Keypad with Copy Function	When the external keypad with copy function is valid, local keypad is off; when local keypad is valid, both local and external keypads are on.	SD1-KP-CPY

Pictures	Name	Descriptions	Reference
	Cables	To supply motor and control, cables should be correctly specified and installed as per recommendation.	See Appendix A.3
	Breaker	Prevent from electric shock and protect the power supply and the cables system from overcurrent when short circuits occur. (Please select the breaker with the function of reducing high order harmonic and the rated sensitive current to 1 inverter should be above 30mA).	See Appendix A.4
	Input reactor	This device is used to improve the power factor of the input side of the inverter and control the higher harmonic current.	See Appendix C.2
	Input filter	Control the electromagnetic interference generated from the inverter, please install close to the input terminal side of the inverter.	See Appendix C.3
	Braking resistors	Shorten the DEC time. Only braking resistors are needed for models less than 45Kw, larger models require brake chopper.	See Appendix C.4
	Output filter	Reduces the RFI noise from the output side of the inverter. Install close to the output terminals of the inverter.	Please call IMO
	Output reactor	Extends the effective transmitting distance of the inverter to control the high voltage transients when switching on/off the IGBT of the inverter.	See Appendix C.2

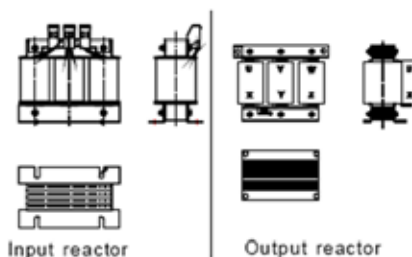
## C.2 Reactors

### C.2.1 Input Reactor

Transient high currents to the input power circuit may cause damage to the rectifying components. It is recommended to use AC reactor in the input side for the avoidance of high-voltage transients of the power supply and improvement of power factor.

### C.2.2 Output Reactor

If the distance between the inverter and the motor is longer than 50m, frequent overcurrent protection trips may occur due to inverter because of high leakage current caused by parasitic capacitance effects from the long cables to the ground. To avoid damage of the motor insulation, it may be necessary to add reactor compensation. If the distance between the inverter and motor is 50~100m, see the table below for model selection; if it exceeds 100m, consult with IMO technical support.



**Note:**

The derate voltage of the input reactor is  $2\% \pm 15\%$ . The derate voltage of the output reactor is  $1\% \pm 15\%$ . Above options are external.

## C.3 Filter

### C.3.1 C3 Filter Type Instruction

The following is an example of the filter type instruction for SD1-RC3-10

Character Designation	Detail Instruction
SD1	Inverter series
RFC3	Filter category
10A	Rated current

### C.3.2 C3 Filter

External C3 filters are optional for SD1 Series inverters of 1PH 200V/3PH 380V ( $\leq 2.2\text{kW}$ ) and 3PH 200V ( $\leq 0.75\text{kW}$ ). The inverters of 3PH 380V ( $\geq 4\text{kW}$ ) and 3PH 200V ( $\geq 1.5\text{kW}$ ) have the embedded C3 filters which can be selected to connect by J10 (J10 is packed with the manual).

The input RFI filter can decrease RFI noise of the inverter to the surrounding equipments.

Output RFI filter can decrease the radio noise cause by the cables between the inverter and the motor and leakage current of the conducting wires.

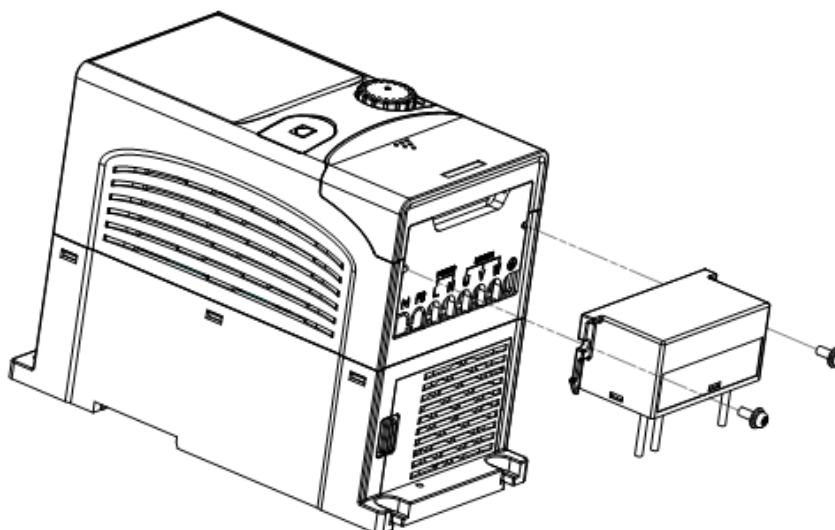
Our company configured some filters for the convenient of the users.

Model	Input Filter
SD1-2.5A-21	SD1-RFC3-10
SD1-4.2A-21	
SD1-7.5A-21	
SD1-10A-21	
SD1-2.5A-23	SD1-RFC3-7
SD1-4.2A-23	
SD1-2.5A-43	
SD1-4.2A-43	
SD1-5.5A-43	

#### Note:

1. The input RFI meet the requirement of C3 after adding input filters.
2. Above options are external; the customer should indicate when purchasing.

### C.3.3 Installation Instruction for C3 Filter



The installation procedures for C3 filter are as below:

1. Connect the filter cable to the corresponding input terminal of the inverter according to the label;
2. Fix the filter onto the inverter with M3\*10 screws (as shown in above picture).

### C.3.4 C2 Filter Type Instruction

The following is an example of the filter type instruction for SD1-RFC2-10

Character Designation	Detail Instruction
SD1	Inverter series
RFC2	Filter category (C2)
10A	Rated current

### C.3.5 C2 Filter

The optional C2 filter can be mounted externally to provide the C2 RFI emission requirements.

Model	Input Filter
SD1-2.5A-21	SD1-RFC2-10
SD1-4.2A-21	
SD1-7.5A-21	
SD1-10A-21	
SD1-2.5A-23	SD1-RFC2-7
SD1-4.2A-23	
SD1-7.5A-23	SD1-RFC2-16
SD1-10A-23	
SD1-16A-23	
SD1-20A-23	SD1-RFC2-32
SD1-30A-23	
SD1-2.5A-43	SD1-RFC2-45
SD1-4.2A-43	
SD1-5.5A-43	
SD1-9.5A-43	
SD1-14A-43	SD1-RFC2-16
SD1-18.5A-43	
SD1-25A-43	
SD1-32A-43	SD1-RFC2-32
SD1-38A-43	
SD1-45A-43	SD1-RFC2-45
SD1-60A-43	
SD1-75A-43	
SD1-92A-43	SD1-RFC2-65
SD1-115A-43	
SD1-150A-43	SD1-RFC2-100
SD1-180A-43	
SD1-215A-43	




- When installing C2 filter, EMC/J10 jumper must be removed.


## C.4 Braking Components

### C.4.1 Select the braking components

It is recommended to use braking resistor or braking chopper when the motor is required to stop rapidly or the motor is driven by a high inertia load. The motor will become a generator if its rotating speed is higher than the corresponding speed of the reference frequency, thus, the inertial energy of the motor and load return to the inverter and charge the capacitors in the main DC circuit. When the voltage increases above the limit, damage may occur to the inverter. It is necessary to apply braking chopper/resistor to prevent over voltage trips.



	<ul style="list-style-type: none"> <li>• Only competent personnel are authorised to design, install, commission and operate on the inverter.</li> <li>• Follow the instructions in “warning” during working. Physical injury, death or serious damage may occur.</li> <li>• Only competent personnel are authorised to install. Damage to the inverter or braking options and parts may occur. Read the instructions carefully before connecting braking resistors or brake choppers to inverter.</li> <li>• Do not connect the braking resistor with other terminals except for PB and (-). Do not connect the braking unit with other terminals except for (+) and (-). Damage to inverter, braking circuit or fire may occur.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Connect the braking resistor or braking unit with the inverter according to the diagram. Incorrect wiring may cause damage to the inverter or other devices.</li> </ul>
--	--


SD1 Series inverters have internal braking units.


Model	Type of braking unit	Braking resistor at 100% of the braking torque ( $\Omega$ )	The absorbed power of the braking resistor			Min. braking resistor ( $\Omega$ )
			10% braking	50% braking	80% braking	
SD1-2.5A-21	Internal braking unit	361	0.06	0.30	0.48	42
SD1-4.2A-21		192	0.11	0.56	0.90	42
SD1-7.5A-21		96	0.23	1.10	1.80	30
SD1-10A-21		65	0.33	1.70	2.64	21
SD1-2.5A-23		653	0.11	0.56	0.9	100
SD1-4.2A-23		326	0.23	1.13	1.8	100
SD1-7.5A-23		122	0.6	3	4.8	80
SD1-10A-23		122	0.6	3	4.8	80
SD1-16A-23		89.1	0.75	4.13	6.6	60
SD1-20A-23		65.3	1.13	5.63	9	47
SD1-30A-23		32	2.25	11.3	18	23
SD1-2.5A-43		653	0.11	0.56	0.90	100
SD1-4.2A-43		326	0.23	1.13	1.80	100
SD1-5.5A-43		222	0.33	1.65	2.64	54
SD1-9.5A-43		122	0.6	3	4.8	80
SD1-14A-43		89.1	0.75	4.13	6.6	60
SD1-18.5A-43		65.3	1.13	5.63	9	47
SD1-25A-43		44.5	1.65	8.25	13.2	31
SD1-32A-43		32.0	2.25	11.3	18	23
SD1-38A-43		27	3	14	22	19
SD1-45A-43		22	3	17	26	17
SD1-60A-43		17	5	23	36	17
SD1-75A-43		13	6	28	44	11.7
SD1-92A-43		10	7	34	54	6.4
SD1-115A-43		8	8	41	66	6.4
SD1-150A-43		6.5	11	56	90	6.4
SD1-180A-43		5.4	14	68	108	4.4
SD1-215A-43	4.5	17	83	132	4.4	

**Note:**

Select the resistor and power of the braking chopper according to the data in the table.

The braking resistor may increase the braking torque of the inverter. The resistor power in the above table is designed on 100% braking torque and 10% braking duty. Higher wattage resistors can be used for higher braking duty. Calculate resistor rating according to braking requirement.

	<ul style="list-style-type: none"> <li>• Ensure minimum resistance as per table above.</li> </ul>
--	---

	<ul style="list-style-type: none"> <li>• For frequent braking i.e. more than 10%, increase power accordingly.</li> </ul>
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## C.4.2 Placing the brake resistor

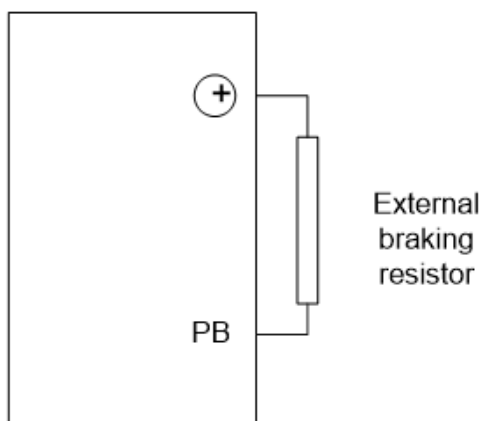
Use shielded cables for braking resistor cables.

Braking resistors become hot, ensure they are located in open area for cooling.



- The materials near the brake resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. Protect the resistor against contact.

Only external braking resistor is needed in SD1 Series.



## Appendix D Further Information

### D.1 Product and Service Inquiries

Address any inquiries about the product to your supplier, quoting the model and serial number of the unit.

### D.2 Document Library

Manuals and other product documents in PDF format on the Internet. Go to [www.imopc.com](http://www.imopc.com)

**Torque Vector Inverter**

# **SD1 Series**

**Instruction Manual**

1st Edition, Feb 2017

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The purpose of this instruction manual is to provide accurate information in handling, setting up and operating of the SD1 series of inverters. Please feel free to send your comments regarding any errors or omissions you may have found, or any suggestions you may have for generally improving the manual.

In no event will IMO Precision Controls Ltd. be liable for any direct or indirect damages resulting from the application of the information in this manual.

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