EMHEATER

User Manual

EM15-SP Series Solar Inverter

China EM Technology Limited

Preface

Thank you for purchasing the EM15-SP series solar inverter developed by China EM Technology Limited.

Features:

- MPPT algorithm of fast tracking of maximum power point of PV cells, efficiency >99%.
- Solar battery working point voltage can be manually or automatically MPPT tracking.
- All weather automatic operation,can also be manually or automatically,
- Realize"sunrise work and sunset sleep".
- 35 kinds protection function. including auto detecting short circuit after power on.
- Auto sleep function/pump dry protect/low frequency protection/over load protection and etc.
- Full protections:overload,over current, overvoltage,under voltage,short circuit, dry pumping etc.
- Output frequency range: V/F(0~3000hz); vector control(0~300HZ).
- Overload capacity:60s with 150% of rated current,3s with 180% of rated current.
- Speed accuracy:±0.5%(SVC);±0.02%(VC).
- Pulse setting input:0Khz~100Khz.
- Remote control, support RS232/RS485 protocol, terminal control, analog control.

Before unpacking, please check carefully:

1. Whether the nameplate model of solar inverter are consistent with your order ratings. The box contains the solar inverter, user manual.
2. Whether the solar inverter is damaged during transportation. If you find any omission or damage, please contact us or your local supplier immediately.

First-time Use

For the users who use this product for the first time, read the manual carefully. If in doubt concerning some functions or performances, contact the technical support personnel to ensure correct use.

Due to the continuous improvement of solar inverter, this document will be updated without prior notice.

EM15-SP series solar inverter complies with the following international standards. All products have passed the CE certification.

IEC/EN61800-5-1: 2003 Variable speed electric drive system safety requirements;

IEC/EN61800-3: 2004 Variable speed electric drive system, Part 3: The Electro Magnetic Compatibility (EMC) Standards of Product and its specific testing methods.

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1. Safety Information and Precautions

In this manual, the notices are graded based on the degree of danger:

Danger: Indicates that failure to comply with the notice will result in severe personal injury or even death.

Warning: Indicates that failure to comply with the notice will result in personal injury or property damage.

Read this manual carefully so that you have a thorough understanding. Installation, commissioning or maintenance may be performed in conjunction with this chapter. EMHEATER will assume no liability or responsibility for any injury or loss caused by improper operation.

1.1 Safety Information

Danger

- Do not use damaged or missing components solar inverter. Failure to comply will result in personal injury.
- Please use the electric motor with upper B insulation class. Failure to comply will result in personal injury.
- Install the solar inverter on incombustible objects such as metal, and keep it away from combustible materials. Failure to comply may result in a fire.
- Wiring must be performed only by qualified personnel under instructions described in this manual. Failure to comply may result in unexpected accidents.
- A circuit breaker must be used to isolate the power supply and the solar inverter. Failure to comply may result in a fire.
- Ensure that the power supply is cut off before wiring. Failure to comply may result in electric shock.
- Connect the solar inverter to ground properly by standard. Failure to comply may result in electric shock.
- Cover the solar inverter properly before power-on to prevent electric shock.
- Do not open the solar inverter’s cover after power-on to prevent from electric shock.
- Do not touch the solar inverter with wet hand and its peripheral circuit to prevent from electric shock.
- Do not touch the terminals of the solar inverter (including the control terminals). Failure to comply may result in electric shock.
- Do not touch the U, V, W terminal or motor connecting terminals when solar inverter automatically does safety testing for the external high-voltage electrical circuit. Failure to comply may result in electric shock.
- Do not go close to the equipment when selected the restart function. Failure to comply may result in personal injury.
- Do not touch the fan or the discharging resistor to check the temperature. Failure to comply will result in personal injury.
- Signal detection must be performed only by qualified personal during operation

Warning:

- When two solar inverters are laid in the same cabinet, arrange the installation positions properly to ensure the enough cooling effect.
- Do not drop wire residue or screw into the solar inverter. Failure to comply will result in damage to the solar inverter.
- Never connect the power supply cables to the output terminals (U, V, W) of the solar inverter. Failure to comply will result in damage to the solar inverter.
- Make sure that all the connecting wires comply with the requirement of EMC and the safety standard in the region. Use wire sizes recommended in the manual. Failure to comply may result in accidents.
- Never connect the braking resistor between the DC bus terminals (P+) and (P-). Failure to comply may result in a fire.
- Do not perform the voltage resistance test on any part of the solar inverter because such test has been done in the factory. Failure to comply will result in accidents.
- All peripheral devices must be connected properly under the instructions described in this manual. Failure to comply will result in accidents.
- Note the danger during the rotary running of motor when check the parameters. Failure to comply will result in accidents.
- Do not change the factory default settings of the solar inverter. Failure to comply will result in damage to the solar inverter.
- Avoid objects falling into the solar inverter when it is running. Failure to comply will result in damage to solar inverter.
- Do not start/stop the solar inverter by turning the contactor ON/OFF. Failure to comply will result in damage to the solar inverter.

2. Product Information

2.1 Designation Rules

EM15 - SP 3 - 7d5
❶ ❷ ❸ ❹

❶	EM15 Series Frequency Inverter
❷	Products Type: PV use
❸	Voltage range: 1: DC 250~450V to Three phase AC 220V 3: DC 350~800V to Three phase AC 380V
❹	Adaptable motor: 7d5: 7.5KW ;011: 11KW

Diagram 2-1 Designation rules

2.2 Model and Technical Data

Table 2-1EM15-SP Model and technical data

EM15-SP1 / Description	d75	1d5	2d2	004	5d5	7d5	011	015	018	022	030	037	045
DC input (+, -)													
Rated power/KW	0.75	1.5	2.2	4	5.5	7.5	11	15	18.5	22	30	37	45
Min. DC voltage/V	120												
Max.DC voltage/V	450												
Recommended MPPT range /V	250~400												
AC output(U, V, W)													
Output current/A	3.8	5.1	9	18	25	32	45	60	75	91	112	150	176

EM15-SP3 / Description	d75	1d5	2d2	004	5d5	7d5	011	015	018	022	030	037	045
	055	075	090	110	132	160	200	220	250	280	315	355	400
DC input (+, -)													
Rated power/KW	0.75	1.5	2.2	4	5.5	7.5	11	15	18.5	22	30	37	45
	55	75	90	110	132	160	200	220	250	280	315	355	400
Min. DC voltage/V	280												
Max.DC voltage/V	800												
Recommended MPPT range /V	350~750												
AC output(U, V, W)													
Output current	2.1	3.8	5.1	9	13	17	25	32	37	45	60	75	91
	112	150	176	210	253	304	377	426	465	520	585	650	725

Output frequency	0~50/60Hz
Power factor	>0.99
Communication mode	RS485 communication
Protection class	IP20
Ambient temperature	-10℃~ +40℃(ambient temperation at 40℃~50℃，please keep derated use)
Storage temperature	-20℃~ +60℃
Humidity	Smaller than 95%RH, non-condensation
Cooling	Forced Air cooling
Altitude	Lower than 1000 m
Humidity	Less than 95%RH, without condensing
Vibration	Less than 5.9 m/s2 (0.6 g)

2.3 Product Appearance and Installation Dimension

2.3.1 Product Appearance

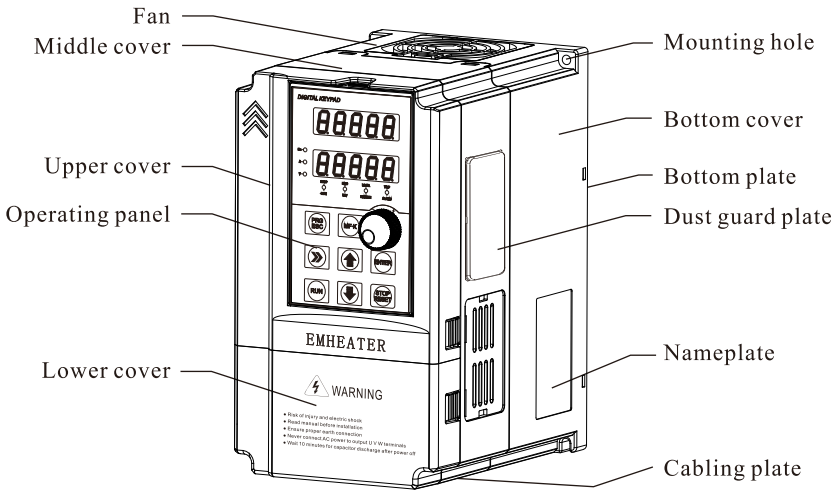


Diagram 2-2 Product appearance (With potentiometer)

2.3.2 Appearance and Installing Dimension

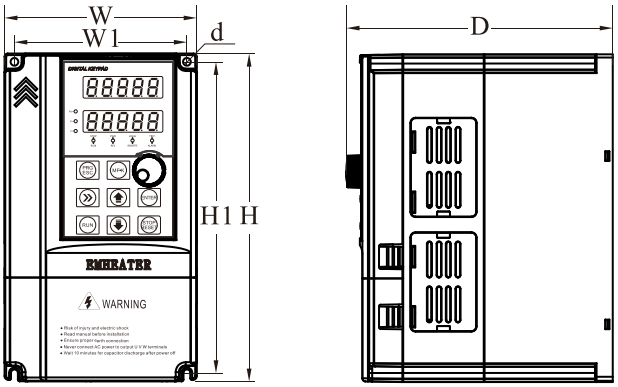


Diagram 2-3 Appearance and installation dimension of EM15 series (Plastic housing structure)

Matching inverter		Appearance and installing dimension (Unit: mm)					
Voltege	Power Range	W	W1	H	H1	D	d
1PH 220V	0.75~2.2kW	120	108	205	195	166	Φ4.5
3PH 220V	0.75~2.2kW						
3PH 380V	4~5.5kW						
3PH 220V	4~5.5kW	162	148	250	238	191	Φ5.5
3PH 380V	7.5~11kW						
3PH 220V	7.5~11kW	223	207	323	307	207	Φ5.5
3PH 380V	15~22kW						

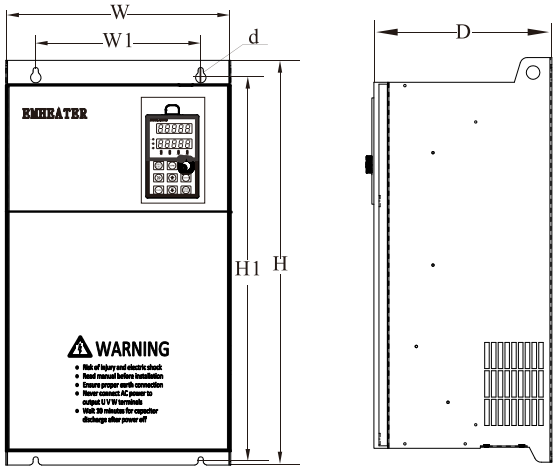


Diagram 2-4 Appearance and installation dimension of EM15 series (Metal housing structure)

Matching inverter		Appearance and installing dimension (Unit: mm)					
Voltege	**Power Range**	**W**	**W1**	**H**	**H1**	**D**	**d**
3PH 220V	15~18.5kW	300	220	540	500	240	Φ7
3PH 380V	30~37kW						
3PH 220V	22kW	340	260	580	540	270	Φ10
3PH 380V	45~55kW						
3PH 220V	37~45KW	410	260	610	575	280	Φ12
3PH 380V	75~90kW						
3PH 380V	110~132kW	460	320	710	690	335	Φ12
3PH 380V	160~220kW	535	360	885	830	370	Φ12
3PH 380V	250~315kW	650	360	1040	985	415	Φ12
3PH 380V	355~400kW	815	600	1350	1250	445	Φ12

2.3.3 Installation Dimension of External Keypad (Keypad Tray)

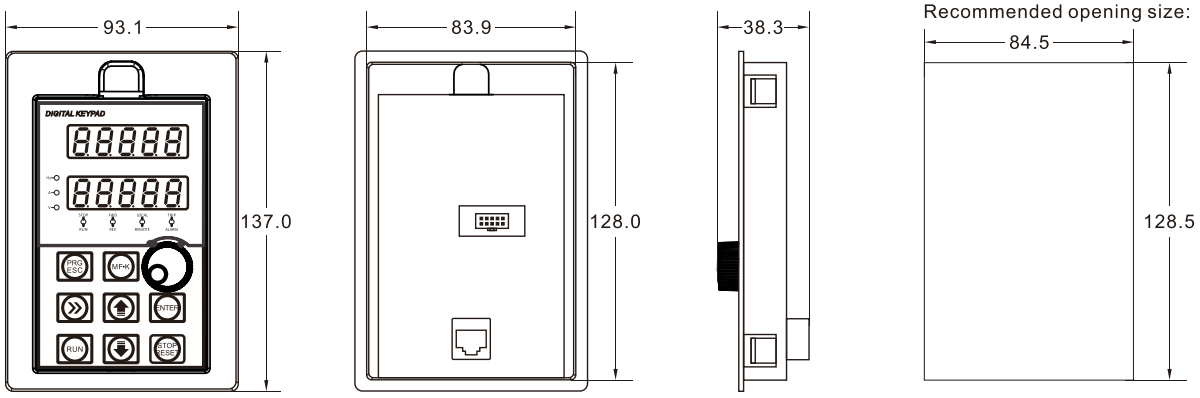


Diagram 2-5 Appearance and installation dimension of external keypad (keypad tray)

3.Installation of Frequency Inverter

3.1 Installation Environment

1. The place with indoor vents or ventilation devices.
2. The environment temperature shall be -10℃~40℃. If the temperature is over 40℃but less than 50℃, better to take down the cover of frequency inverter or open the front door of cabinet to facilitate heat dissipation.
3. Try to avoid high temperature and wet place; the humidity shall be less than 90% without frost deposit.
4. Avoid direct sunlight.
5. Keep away from flammable, explosive and corrosive gas and liquid.
6. No dust, floating fiber and metal particles.
7. Install on the place without strongly vibration. And the vibration should be not over 0.6G, Especially pay attention to far away from the punching machine, etc.
8. Keep away from electromagnetic interference source.

3.2 Installation Direction and Space

In order to not affect the service life of frequency inverter and reduce its performance, note for its installation direction and space and correctly fasten it.

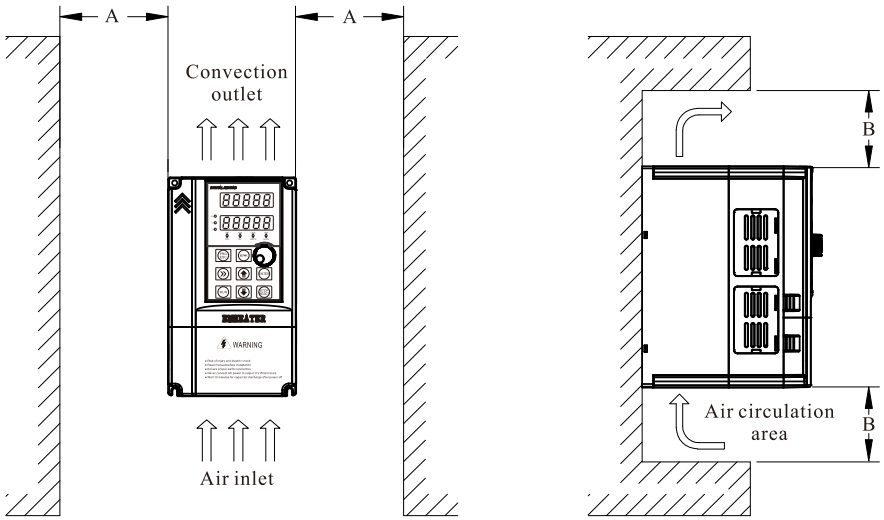


Diagram3-1 Ventilating duct installation dimension diagram of frequency inverter

Power class	Installation dimension	
	A	B
≤7.5kW	≥ 20mm	≥ 100mm
11kW - 30kW	≥ 50mm	≥ 200mm
≥ 37kW	≥ 50mm	≥ 300mm

Please install the frequency inverter vertically, to send out the heat upward, and pay attention to direction of frequency inverter to avoid inversion.

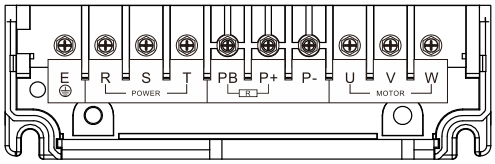
If there are several units of frequency inverter installed, please install them side by side, do not to install up and down.

3.3 Sketch and Description of Main Circuit Terminals

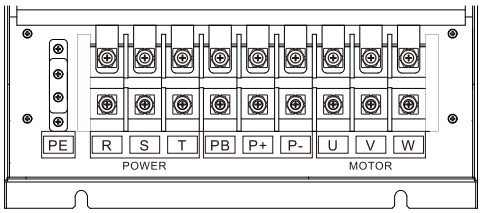
3.3.1 Function and Description of Main Circuit Terminals

Three phase 220V output：EM15-SP1-d75~EM15-SP1-011

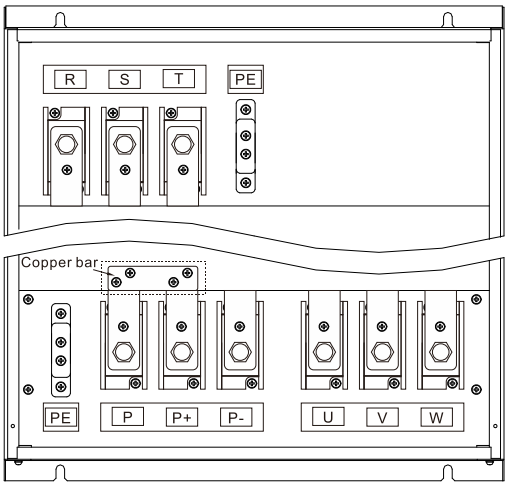
Three phase 380V output：EM15-SP3-d75～EM15-SP3-022



Three phase 380V output：EM15-SP3-030～EM15-SP3-090



Three phase 380V output：EM15-SP3-110～EM15-SP3-400



Terminal symbol	Function description
R, S, T	AC power input terminals
P+,PB	Braking resistor connectin
P+,P-	DC power input terminals
⏚ or E/PE	Grounding terminal
U,V,W	Three-phase AC power output terminals

3.4 Control Circuit and Main Circuit Terminals Description

3.4.1 Control Circuit and Main Circuit Wiring

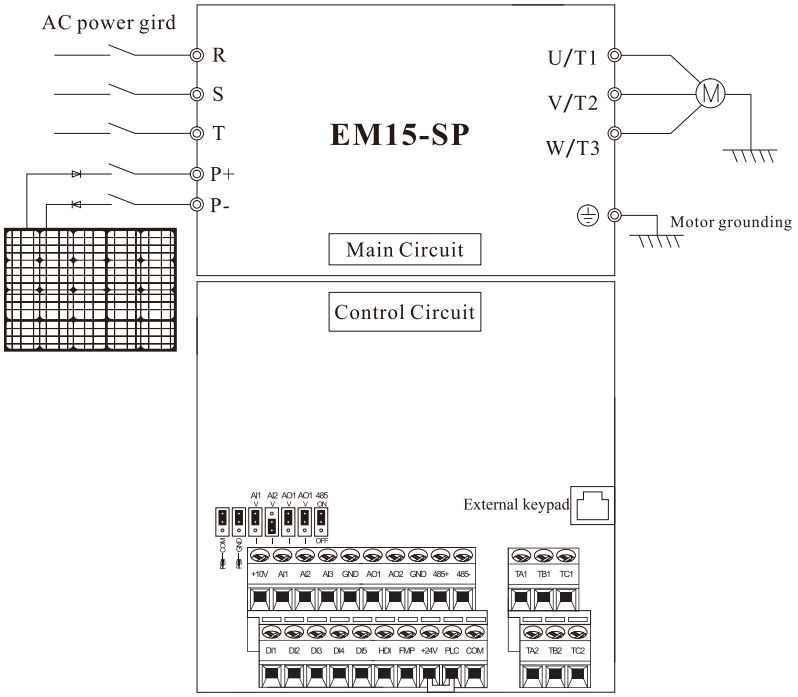


Diagram3-2 EM15-SP control circuit and main circuit wiring

3.4.2 Control Circuit Terminal Layout

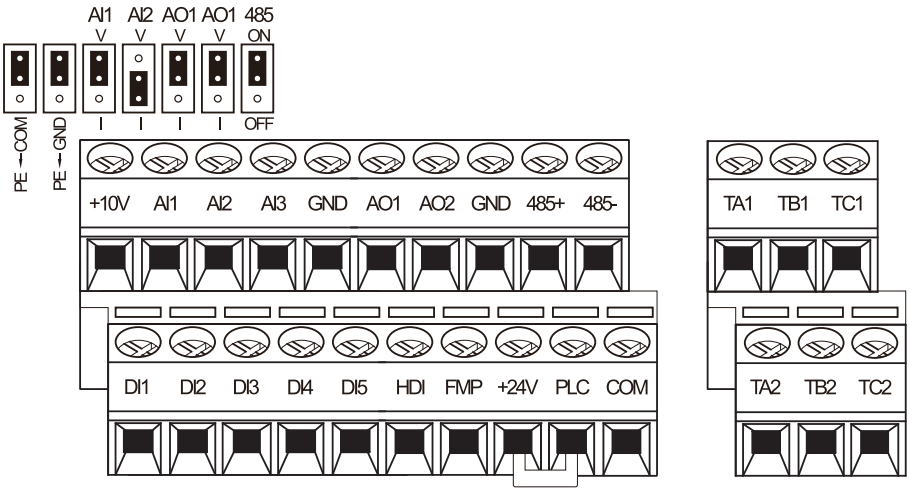


Diagram3-3 EM15-SP control circuit terminal sketch diagram

3.4.3 Description of Control Circuit Terminals

Type	Terminal Symbol	Terminal Name	Terminal function description
Power Supply	+10V-GND	External +10V power supply	Provide +10V power supply to external unit. Maximum output current:10Ma Generally, it provides power supply to external potentiometer with resistance range of 1 kΩ~5kΩ
	+24V-COM	External +24V power supply	Provide +24 V power supply to external unit. Generally, it provides power supply to DI/DO terminals and external sensors.Maximum output current: 200 mA

Type	Terminal Symbol	Terminal Name	Terminal function description
	PLC	External power supply input terminals	It connect with +24V default
Analog input	AI1-GND	Analog input 1	1. Input range: DC 0V~10V/ 0mA~20mA(decided by jumper AI1/AI2 on the control board); AI3: DC -10V~+10V 2. Impedance: 22 kΩ (voltage input), 500 Ω (current input)
	AI2-GND	Analog input 2	
	AI3-GND	Analog input 3	
Digital input	DI1-COM	Digital input 1	1. Optical coupling isolation, compatible with dual polarity input 2.Input Impedance: 2.4 kΩ 3. Voltage range for level input: 9V~30 V
	DI2-COM	Digital input 2	
	DI3-COM	Digital input 3	
	DI4-COM	Digital input 4	
	DI5-COM	Digital input 5	
	HDI-COM	High Speed Pulse Input	Maximum input frequency: 100 kHz
Analog output	AO1-GND	Analog output 1	Voltage or current output is decided by jumper AO1/AO2. Output voltage range: 0V~10 V Output current range: 0mA~20 mA
	AO2-GND	Analog output 2	
	FMP- COM	High Speed Pulse Output	Constrained by function code b4-00 "FMP terminal output mode selection" as the high-speed pulse output, the highest frequency is 100kHz; when use as an open collector output, specifications is the same as DO.
Relay output	TA1-TB1	NC terminal	Contact driving capacity: 250 VAC, 3 A, COSø = 0.4 DC 30 V, 1 A
	TA2-TB2		
	TA1-TC1	NO terminal	
	TA2-TC2		
RS485 Output	485+	Communication port terminal	Input and output signal terminals for MODBUS protocol communication
	485-		
Auxiliary interface	PG card interface		PG cards: Open-collector, differential are selectable options.
	Communications expansion		Reversed
	External keypad interface		Connected to an external keypad
Jumper	PE-COM		COM grounding PE selection ,default connection. In the case of interference, connecting PE to COM can improve anti-interference
	PE-GND		GND grounding PE selection ,default connection. In the case of interference, connecting PE to COM can improve anti-interference.
	AI1		AI1 output selection. Voltage or Current output, voltage output by default.
	AI2		AI2 output selection. Voltage or Current output, current output by default.
	AO1/AO2		AO1/AO2 output selection. Voltage or Current output, voltage output by default.
	458		485 communication resistor selection, default connection ON. In the case of interference, anti-interference can be improved.

3.5 Collection Diagram For Different Motor

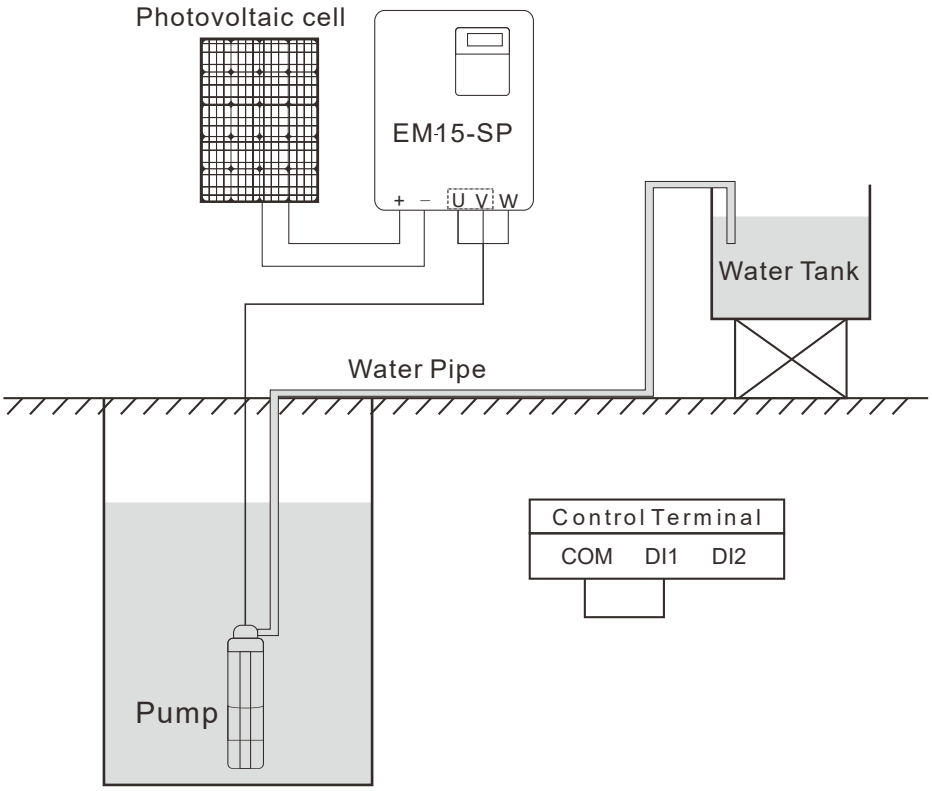


Diagram3-4 220V three phase installed without water level sensor (PV Input)

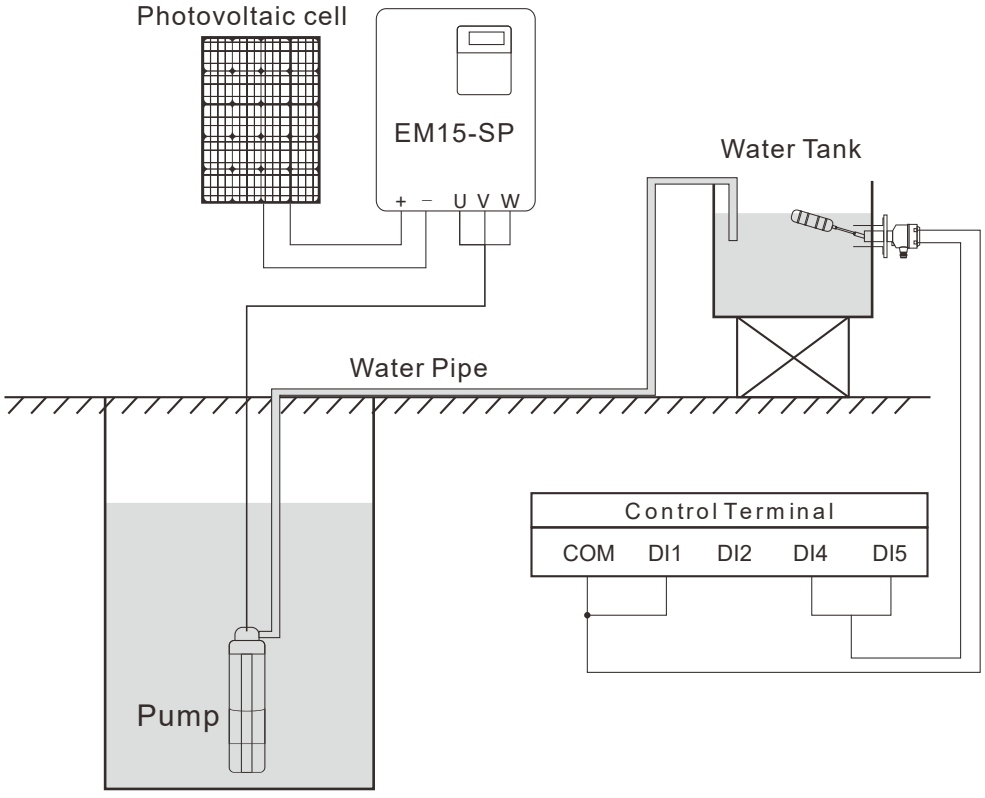


Diagram3-5 Diagram of 3phsae inverter connection method (PV Input)

3.5.1 The Wiring of Water-Level Automatic Control

The wiring for floater water-level switch connected by cable

The common port, which using floate water-level switch connected by cable, is fed to the terminal "COM" of EM15-SP. And then, connected to DI1.

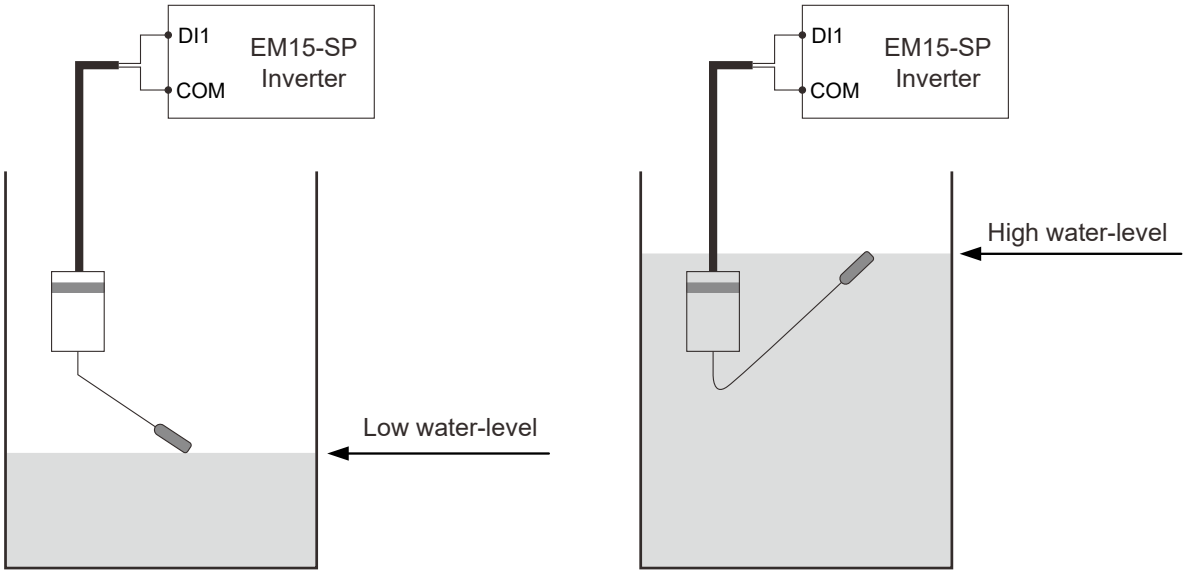


Diagram3-6 Diagram of Low water level and high water level

Remarks:

When the actual water-level in the wells is higher than the horizontal line of high water-level, DI1 will be connected to the "COM" as well as controller automatically will start the pump. On the contrary, if the actual water-level is lower than the horizontal line of low water-level, DI1 will be disconnected from "COM" as well as controller automatically stop the pump to prevent anhydrous idling.

The wiring for floater water-level switch mounted on a side

The floater water-level switch mounted on a side is the normally open contact to output and its common wire is connected to the terminal COM of EM15-SP inverter. At the same time, the low level-water wire is connected to terminal DI4 and the high water-level wire is connected the terminal DI5.

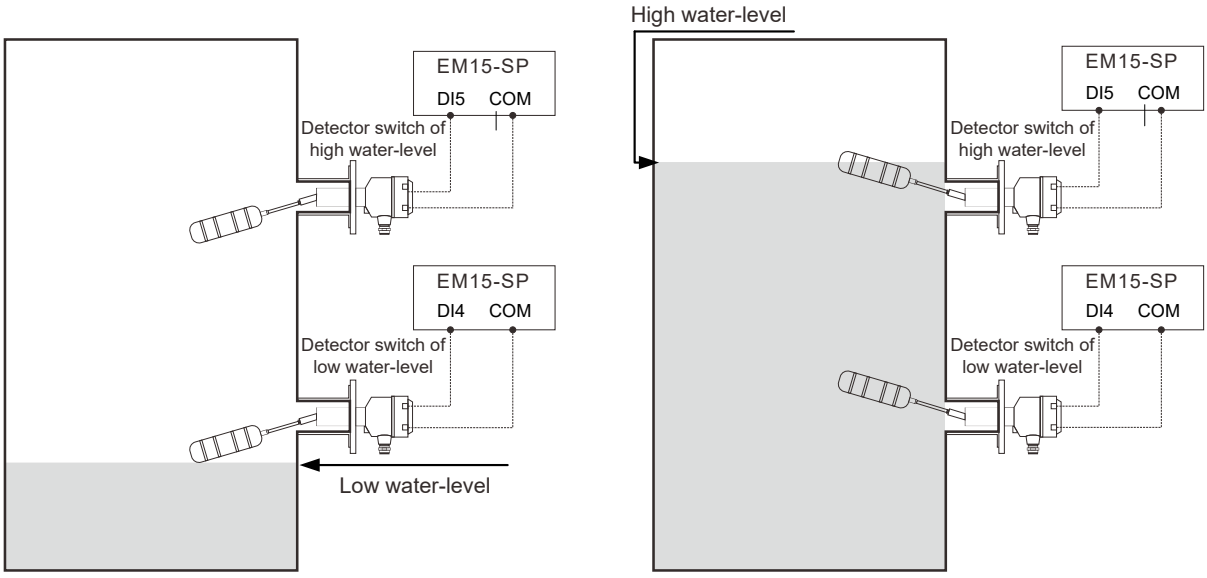


Diagram3-7 Diagram of Low water level and high water level

Remarks:

When the actual water-level in the reservoir is lower than horizontal line of low water-level, DI4 and DI5 will be disconnected from the COM as well as controller automatically strat the pum. On the contrary, if the actual water-level is higher than the horizontal line of high water-level, DI4 and DI5 will be connected to COM as well as controller automatically stop the pump to prevent water overflow.

Notice:

1. If only use one detection signal of water-level in the reservoir, DI4 and DI5 must be connected together by conductor.

4 Operation and Display

4.1 Instruction of Operation and Display

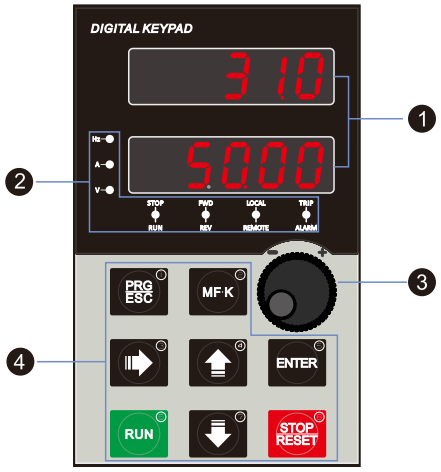


Diagram 4-1 Operating panel

No.	Name	Function	
❶	LED display area	The 5-digit LED display is able to display the set frequency, output frequency, monitoring data and fault codes.	
❷	Unit / Status Indicator area	Hz	Frequency unit
		A	Current unit
		V	Voltage unit
		STOP/ RUN	OFF indicates that the frequency inverter is in the stop state and ON indicates that the frequency inverter is in the running state.
		FWD/REV	It is Forward/Reversal indicator, ON indicates Reverse rotation.
		LOCAL /REMOTE	It indicates whether the frequency inverter is operated by operation keypad, terminals or remoter (communication). OFF indicates keypad operation control state; ON indicates terminals operation control state; Blinking indicates remote operation control state.
		TRIP /ALARM	Tunning/ Torque Control/Fault indicator When the indicator is ON, it indicates torque control mode. When the indicator is blinking slowly, it indicates the auto-tuning state. When the indicator is blinking quickly, it indicates the fault state.
❸	Encoder knob	Frequency, data or function code increase or decrease; the encoder knob has the confirmation key function	
❹	Operation key area	PRG ESC	Programming key: Enter or exit menu level I.
		ENTER	Confirmation key: Enter the menu interfaces level by level, and confirm the parameter setting. Note: Select the displayed parameters in turn in the stop or running state.
		MF·K	Multi-function key: Perform function switchover according to the setting of b9-01
		»	Shift key: Select the displayed parameters in turn in the stop or running state, and select the digit to be modified when modifying parameters.
		▲	Increment key: Increase data or function code.
		▼	Decrement key: Decrease data or function code.
		RUN	Running key: Start the frequency inverter in the keypad control mode.
		STOP RESET	Stop/Reset key: Stop the frequency inverter when it is in the running state and perform the reset operation when it is in the fault state. The functions of this key are restricted by b9-00.

4.2 Function Code Table

Debugging specification:

1. Set A1-00 to turn on photovoltaic mode, or it'll run in ordinary inverter mode; Set A1-01 to enable MPPT function to search Vmpp voltage automatically; Otherwise, the default Vmpp voltage needs to be set manually;
2. Target frequency is the maximum frequency limit, and MPPT automatically controls the operating frequency and searches for the maximum operating frequency;
3. Stability parameters A1-13, A1-14: Adjust to the stable state of bus voltage, output frequency and output current (normal small fluctuation);
4. Light intensity detection:
5. Other protection functions: dormancy and underload
6. The operation direction of the pump is limited. If there is no water coming out, the motor wiring can be adjusted or b0.18 can be set to change the direction;
7. Relevant Settings of A1-04, sleeping voltage, etc. should be made according to the configuration of the panel. Default parameters are suitable for working near 500V DC voltage;
8. Power on automatic operation:

Group A1: PV Function Control Parameters

Code	Name	Setting range	Default
A1-00	PV mode enable	0: Disabled 1: PV mode 1(High efficient) 2: PV mode 2(High stability)	1
	A1-00=0 means solar control mode unvalid, A1 group parameters unable. A1-00=1/2 means solar control mode, A1 group parameters enable.		
A1-01	PV mode selection	Unit's digit: Vmpp mode 0: A1-02 setting(CVT) 1: MPPT Automatic algorithm tracking Ten's digit: Voc detection mode 0: A1-03 setting 1: Auto detection Hundred's digit: Auto running mode 0: Disabled 1: Auto start after 5s delay Thousand's digit: AC voltage detection 0: No detection and no switching 1: Automatic detection and automatic switching (5.5KW and above)	H0.0.1
	Vmpp mode: When the value is 0, the voltage is set by A1-02 . When the value is 1, the maximum power is used to track a given reference voltage, and the reference voltage will continue to change until the system is stable. **Voc detection mode:** When the value is 0, the voltage is set by A1-03 . When the value is 1, automatically detect the voltage， the voltage will continue to change accoding the real input voltage.		
A1-02	Vmpp voltage manual setting	0~100.0%	80.0%
	Manual setting value of Vmppt voltage		
A1-03	Voc voltage manual setting	0.0V~1000.0V	650.0V 380.0V
	Manual setting value of Voc voltage.		

	When VOC is automatically detected, this value limits the lower limit of automatic detection		
A1-04	CVT proportional gain	0.0% ~999.9%	100.0%
	The larger value, the greater effect and the faster adjustment.		
A1-05	CVT integral gain	0.0%~999.9%	100.0%
	The larger value, the greater effect and the faster adjustment.		
A1-06	CVT differential gain	0.0%~ 999.9%	0.0%
A1-07	Frequency limiting starting point	0.0%~100.0%	5.0%
A1-08	Frequency limiting ending point	0.0%~100.0%	50.0%
A1-09	Weak magnetic limit multiple	0.0~9.9	1.2
	Set to 0 to cancel the weak magnetic limit.		
A1-10	Mppt search upper limit voltage	0.0%~100.0%	90.0%
A1-11	Mppt search lower limit voltage	0.0%~100.0%	75.0%
A1-12	MPPT search gain	0% - 500%	100%
A1-13	MPPT search time interval	0.0 - 10.0s	2.0s
A1-14	Stabilizer filtering time(PV mode 2)	0~1000ms	50ms
A1-16	Dormancy voltage	0.0~1000.0V	250.0V 150.0V
	This parameter to decide low-voltage dormancy warning judgement . When inverter is in running state, if the bus voltage is lower than dormancy voltage A1-16, inverter enters the dormant state and stops automatically		
A1-17	Wake up voltage	0.0~1000.0V	350.0V 250.0V
A1-18	Wake-up delay	0~30000s	60s
	When the inverter is in warning state (A-LP) and the currently running command is valid, then when the bus voltage is larger than the wake-up voltage A1-17, after the wake-up delay A1-18, the low-voltage sleep warning will be automatically cleared and the inverter running again.		
A1-19	Detection frequency of low frequency warning	0.00~300.00Hz	10.00Hz
	This parameter to decide low frequency warning judgement. When inverter is in running state, if the running frequency is lower than detection frequency A1-19 and the continuous running time is greater than detection time A1-20, inverter enters the low frequency warning state(A-LF) and stops automatically.		
A1-20	Detection time of low frequency warning	0~30000s	10s
A1-21	Auto restore time of low frequency warning	0~30000s	60s
	Auto restore time of low frequency warning setting. When the inverter is in warning state (A-LF) and the currently running command is valid, then when the running frequency is greater than the detection frequdncy A1-19 and the continuous time is greater than auto restore time A1-21, the low frequency warning will be automatically cleared and the inverter running again.		
A1-22	Detection current of under load warning	0.0~999.9A	0.0A

	This parameter to decide under load warning judgement. When inverter is in running state, if the running current is lower than detection current A1-22 and the continuous running time is greater than detection time A1-23, inverter enters the under load warning state(A-LL) and stops automatically.		
A1-23	Detection time of under load warning	0~30000s	10s
A1-24	Auto restore time of under load warning	0~30000s	60s
	Auto restore time of under load warning setting. When the inverter is in warning state (A-LL) and the currently running command is valid, then when the running current is greater than the detection current A1-22 and the continuous time is greater than auto restore time A1-24, the under load warning will be automatically cleared and the inverter running again.		
A1-25	Detection current of over current warning	0.0~999.9A	0.0A
	This parameter to decide over current warning judgement. When inverter is in running state, if the running current is greater than detection current A1-25 and the continuous running time is greater than detection time A1-26, inverter enters the over current warning state(A-Oc) and stops automatically.		
A1-26	Detection time of over current warning	0~30000s	10s
A1-27	Auto restore time of over current warning	0~30000s	60s
	Auto restore time of over current warning setting. When the inverter is in warning state (A-Oc) and the currently running command is valid, then when the running current is greater than the detection current A1-25 and the continuous time is greater than auto restore time A1-27, the over current warning will be automatically cleared and the inverter running again.		
A1-28	Bus voltage detection thresholds of Min. power	0.0%~100.0%	90.0%
	This parameter to decide minimum power warning judgement. When inverter is running, if the DC voltage is lower than bus voltage detection thresholds of Min. power A1-28, inverter enters the minimum power warning state(A-Lr) and stops automatically. Note: Bus voltage detection thresholds = A1-28*U0-12		
A1-29	Detection frequency of minimum power	0.0%~100.0%	15.0%
	This parameter to decide minimum power warning judgement. When inverter is running, if the running frequency is Detection frequency of minimum power A1-29, inverter enters the minimum power warning state(A-Lr) and stops automatically. Note: Detection frequency = A1-29*F0-08		
A1-30	Auto restore time of minimum power	0~30000s	60s
	Auto restore time of minimum power warning setting. When the inverter is in warning state(A- Lr) and the currently running command is valid, then when A1-28 and A1-29 both meet the fault recovery conditions and the continuous time is greater than auto restore time A1-30, the minimum power warning will be automatically cleared and the inverter running again.		
A1-31	Full-water detection mode	Unit's digit: Detection source 0: Single DI terminal detection 1: Double DI terminals detection 2: AI1 3: AI2	0

		Ten's digit: 51# DI function detection logic 0: Enable in High level 1: Enable in low level Hundred's digit: 52# DI function detection logic 0: Enable in High level 1: Enable in low level	
	Detection source: 0: Single DI terminal detection When the DI function is 52 or 53, signal output is judged through a single terminal. The signal control logic can be defined by Ten's digit and hundred's digit. 1: Double DI terminals detection Set any two terminals to 52, 53(Defulat DI4,DI5), signal output only when the two DI terminals valid or invalid in the same time. 2: AI1 3: AI2 When the detection source set to 2,3(AI), single output when the analog feedback voltage < A1-32*10V		
A1-32	Analog full-water detection thresholds	0 - 100.0%	25.0%
A1-33	Detection time of full-water warning	0 - 30000sec	10sec
	When inverter is in running state, if the inverter detected the full-water warning signal and the continuous running time is greater than detection time A1-32, inverter enters the full-water warning state(A-TF) and stops automatically.		
A1-34	Exit time of full-water warning	0 - 30000sec	10sec
	When the inverter is in warning state(A-TF) and the currently running command is valid, if the full-water warning signal is invalid, and the continuous time is greater than auto restore time A1-34, the full-warter warning will be automatically cleared and the inverter running again.		
A1-35	Analog sensor damaged Thresholds	0~100.0%	0.0%
	The full-water detection source is analog (AI1/AI2): When the value is not 0, and the analog feedback value > A1-35*10V, inverter will be output A-SS (Sensor failure). When A1-35=0.0%, analog sensor detection is invalid.		
A1-36	PV DC correction coefficient	0.0~200.0%	100.00%
A1-37	PV DC correction offset	-100.00A~100.00A	0.00A
A1-38	power curve point 0	0.0kw~999.9kw	0.5kw
A1-39	power curve point 1	0.0kw~999.9kw	1.0kw
A1-40	power curve point 2	0.0kw~999.9kw	1.5kw
A1-41	power curve point 3	0.0kw~999.9kw	2.0kw
A1-42	power curve point 4	0.0kw~999.9kw	2.5kw
A1-43	flow curve point 0	0.0~999.9m^3/h	0.0 m^3/h
A1-44	flow curve point 1	0.0~999.9m^3/h	5.0 m^3/h
A1-45	flow curve point 2	0.0~999.9m^3/h	10.0m^3/h
A1-46	flow curve point 3	0.0~999.9m^3/h	15.0m^3/h
A1-47	flow curve point 4	0.0~999.9m^3/h	20.0m^3/h

A1-48	Starting frequency of under load warning	0.00 - 320.00Hz	0.00Hz
	0.00Hz: Frequency detection is invalid If the value is not 0, the under load warning only effective if output frequency is greater than A1-48.		
A1-49	Dormancy power	0.0% - 100.0%	0.0%
	If the value is 0, dormancy voltage mode is valid(A1-16, A1-17,A1-18) If the value is not 0, dormancy power mode is valid(A1-18, A1-49,A1-50, A1-51)		
A1-50	Detection time of dormancy power	0 - 30000sec	60sec
A1-51	Dormancy frequency	0.00Hz ～300.00Hz	10.00Hz

Group F0: Basic function parameters

Code	Name	Setting range	Default
F0-00	G/P type selection	1: G type	Model dependent
F0-01	Motor control mode	0: Sensorless vector control 1: Closed-loop vector control 2: VF control 3: Single phase output mode with single phase motor 4: Three phase output mode with single phase motor	2

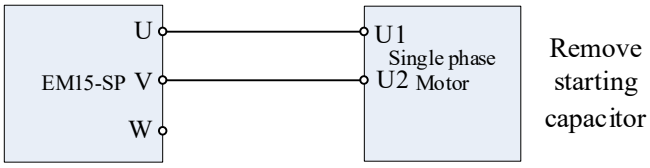
For three phase motor:

0: Sensorless vector control
1: Closed-loop vector control
2: VF control

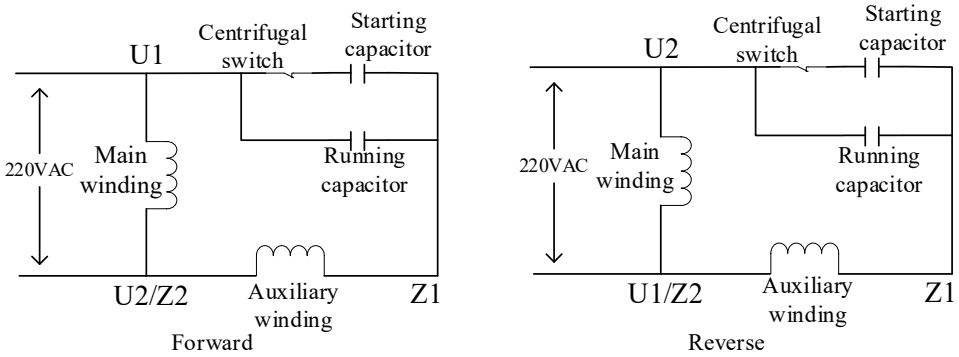
For single phase motor

3: Single phase output mode with single phase motor

The wiring for this mode is shown in the following diagram:

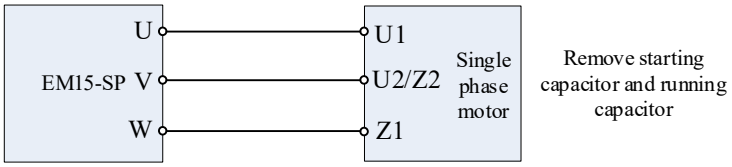


The inverter simulates the voltage of the power grid, but using VF output can only achieve a small range of speed regulation. The wiring method is the same as the grid drive, removing the starting capacitor can expand the range of speed regulation. Increasing the value of P3-01 can improve the starting torque and low-frequency torque; This mode cannot achieve reverse operation, and when reverse is required, it can only be achieved by modifying the wiring;



Note:

1) Single-phase motors are mainly composed of a main winding (U1/U2), an auxiliary winding (Z1/Z2), a running capacitor, a starting capacitor, and a centrifugal switch;

Code	Name	Setting range	Default
	2) Single-phase (220VAC) power supply needs to be reversed, it is necessary to realize by exchanging U1, U2 (or Z1/Z2) wiring; 3) The capacitance of the starting capacitor is generally larger than that of the running capacitor, which can improve the starting torque; the starting capacitor will be disconnected by the centrifugal switch when the mechanical speed reaches a certain value; some motors with light-load starting do not have a starting capacitor; **4: Three phase output mode with single phase motor** The wiring for this mode is shown in the following diagram:  This mode adopts three-phase output, and the starting capacitor and running capacitor need to be removed on the motor side. The voltage ratio UV/WV can be adjusted through P0-20 (The larger the P0-20, the larger the WV and the smaller the UV.). In this mode, due to the 90° voltage difference between the two outputs, the single-phase output voltage is not up to Udc/√2, but generally only up to Udc/2(P0-20=1); The load carrying capacity is weak at high speeds; however, this mode is capable of reversing the motor through the inverter; **Note:** When driving a single-phase motor, the inverter also needs to set motor parameters (P1 group), such as rated current, rated voltage, rated frequency, etc.		
F0-02	Command source selection	0: Keypad (LED OFF) 1:Terminal command (LED ON) 2: RS485 communication (LED flash)	0
F0-03	Main frequency source X selection	0: Set by F0-08 of keypad, UP/DOWN setting not saved after power down. 1: Set by F0-08 of keypad, UP/DOWN setting memorized power down. 2: Analog AI1 3: Analog AI2 4: Keypad potentiometer 5: PULSE trains frequency reference (DI5) 6: Multiple step command reference 7: Simple PLC 8: PID 9: Communication setting	4
F0-04	Auxiliary frequency reference source Y	As same as F0-03 (main frequency reference source X)	0
F0-05	The auxiliary frequency source Y range basic reference when superposition	0:Relative to the maximum frequency 1:Relative to frequency source X	0
F0-06	The auxiliary frequency source Y range when superposition	0%～150%	100%
F0-07	Frequency source selection when superposition	Unit's digit:frequency source selection 0: main frequency source 1:Arithmetic result of main and auxiliary operation	00

Code	Name	Setting range	Default
		(arithmetic relationship operation depends on ten's digit) 2: Switchover between main frequency X source and auxiliary source Y 3: Switchover between main source X and arithmetic operation between of main source X and auxiliary source Y. 4: Switchover between auxiliary source Y and arithmetic operation between of main source X and auxiliary source Y Ten's digit : The arithmetic operation relationship between main and auxiliary. 0: main + auxiliary 1: main – auxiliary 2: Maximumof X and Y 3: Minimum of X and Y	
F0-08	Preset frequency	0.00Hz～Maximum（F0-10）	50.00Hz
F0-09	Rotation direction	0: Forward direction 1: Reverse direction	0
F0-10	Maximum frequency	50.00Hz～600.00Hz	50.00Hz
F0-11	Upper limit frequency source	0:F0-12 1:AI1 2:AI2 3: UP/DOWN key 4:PULSE trains 5: Communication setting	0
F0-12	Upper limit frequency source	Lower limit frequency F0-14～Maximum frequency F0-10	50.00Hz
F0-13	Upper limit frequency offset	0.00Hz～Maximum frequency F0-10	0.00Hz
F0-14	Lower limit frequency	0.00Hz～Maximum frequency F0-12	0.00Hz
F0-15	Carrier frequency	0.5kHz～16.0kHz	Model dependent
F0-16	Carrier frequency auto adjusting with temperature	0: Not 1: Yes	1
F0-17	Acceleration time 1	0.00s～650.00s(F0-19=2) 0.0s～6500.0s(F0-19=1) 0s～65000s(F0-19=0)	Model dependent
F0-18	Deceleration time 1	0.00s～650.00s(F0-19=2) 0.0s～6500.0s(F0-19=1) 0s～65000s(F0-19=0)	Model dependent
F0-19	Acceleration/Deceleration time unit	0:1s 1:0.1s 2:0.01s	1
F0-20	The balance factory for single phase pump driving (3 phase output)	0.00 ～2.00	1.0
F0-21	The offset of auxiliary frequency source when perform superposition	0.00Hz～Maximum frequency F0-10	0.00Hz
F0-22	Frequency resolution	1:0.1Hz 2:0.01Hz	2

Code	Name	Setting range	Default
F0-23	Record of digital setting frequency of power failure	0: Not record 1: Record	0
F0-25	The reference frequency of Acceleration/ deceleration time	0:Maximum frequency (F0-10) 1: Setting frequency 2:100Hz	0
F0-26	Base frequency for UP/ DOWN modification during running	0: Running frequency 1: Setting frequency	0
F0-27	Binding command source to frequency source	Unit digit: Frequency source is bound by keypad command 0: No bonding 1: frequency is set by digital 2:AI1 3:AI2 4:AI3 5:PULSE 6:multi-step frequency 7:Simple PLC 8:PID 9:Communication setting Ten digit: Frequency source is bound by terminals Hundreds digit: Frequency source is bound by communication Thousands of digit: Automatic run Binding frequency source selection	0000
F0-28	Serial communication protocol	0: Protocol MODBUS-RTU	0

Group F1: Motor parameters group

Code	Name	Setting range	Default
F1-00	Motor type selection	0: General asynchronous motor 1: Variable frequency asynchronous motor 2: Permanent magnet synchronous motor	0
F1-01	Rated motor power	0.1KW～1000.0KW	Model dependent
F1-02	Rated motor voltage	1V～2000V	Model dependent
F1-03	Rated motor current	Inverter power <= 55KW:0.01A～655.35A Inverter power> 55KW:0.1A～6553.5A	Model dependent
F1-04	Rated motor frequency	0.01Hz～Maximum frequency	Model dependent
F1-05	Rated motor speed	1rpm～65535rpm	Model dependent
F1-06	Asyn. Motor Stator resistance	Inverter power<= 55KW:0.001Ω～65.535Ω Inverter power> 55KW: 0.0001Ω～6.5535Ω	Auto tuning
F1-07	Asyn. motor rotor resistance	Inverter power<= 55KW:0.001Ω～65.535Ω Inverter power> 55KW : 0.0001Ω～6.5535Ω	Auto tuning
F1-08	Asyn. motor Motor leakage inductance	Inverter power<= 55KW:0.01mH～655.35mH Inverter power> 55KW:0.001mH～65.535mH	Auto tuning
F1-09	Asyn. motor mutual	Inverter power<= 55KW:0.1mH～6553.5mH	Auto

Code	Name	Setting range	Default
	inductance	Inverter power> 55KW:0.01mH～655.35mH	tuning
F1-10	Asyn. mtor no-load current	Inverter power<= 55KW: 0.01A～F1-03 Inverter power> 55KW:0.1A～F1-03	Auto tuning
F1-16	Synchronous motor stator resistance	Inverter power <= 55KW：0.001Ω～65.535Ω Inverter power > 55KW：0.0001Ω～6.5535Ω	Auto tuning
F1-17	Synchronous motor D-axis inductance	Inverter power <= 55KW0.01mH～655.35mH Inverter power > 55KW : 0.001mH～65.535mH	Auto tuning
F1-18	Synchronous motor Q axis inductance	Inverter power <= 55KW：0.01mH～655.35mH Inverter power > 55KW : 0.001mH～65.535mH	Auto tuning
F1-20	Synchronous motor back electromotive force	0.1V～6553.5V	Auto tuning
F1-37	Auto tuning mode selection	0: no operation 1: Asynchronous motor still tunes 2: Asynchronous motor complete tuning 11: Synchronous motor tuning with load 12: Synchronous motor with no-load tuning	0

Group F2: Motor vector control parameters

Code	Name	Setting range	Default
F2-00	Speed loop proportional gain 1	1～100	10
F2-01	Speed loop integral time 1	0.01s～10.00s	0.20s
F2-02	Switching frequency 1	0.00～F2-05	5.00Hz
F2-03	Speed loop proportional gain 2	1～100	10
F2-04	Speed loop integral time 2	0.01s～10.00s	0.20s
F2-05	Switching frequency 2	F2-02～Maximum frequency	10.00Hz
F2-06	Slip compensation coefficient	50%～200%	100%
F2-07	Speed loop filter time constant	0.000s～0.100s	0.003s
F2-08	Vector control over excitation gain	0～200	0
F2-09	Upper limit of torque source selection in speed control mode	0:set by F2-10 1:AI1 2:AI2 3:UP/DOWN key 4:PULSE 5:communication 6:MIN(AI1,AI2) 7:MAX(AI1,AI2) The full range of 1-7 option is correspond to F2-10	0
F2-10	Upper limit of torque digital setting in speed control mode	0.0%～200.0%	150.0%
F2-13	Excitation adjustment proportional gain	0～60000	1000

Code	Name	Setting range	Default
F2-14	Excitation adjustment integral gain	0～60000	1000
F2-15	Torque adjustment proportional gain	0～60000	1000
F2-16	Torque adjustment integral gain	0～60000	1000

Group F3: V/F control parameters

Code	Name	Setting range	Default
F3-00	VF curve setting	0:Linear V / F curve 1:Multi-point V / F curve 2:Square V / F curve 3: 1.2 power V / F 4: 1.4 power V / F 6: 1.6 power V/F 8: 1.8 power V/f 10: VF completely separation mode 1 11:VF Semi-separated separation mode 2	0
F3-01	Torque booster	0.0%:（Automatic torque boost） 0.1%～30.0%	Model dependent
F3-02	Torque boost cut-off frequency	0.00Hz～Maximum frequency	50.00Hz
F3-03	Multipoint VF frequency point 1	0.00Hz～F3-05	0.00Hz
F3-04	Multipoint VF voltage point 1	0.0%～100.0%	0.0%
F3-05	Multipoint VF frequency point 2	F3-03～F3-07	0.00Hz
F3-06	Multipoint VF voltage point 2	0.0%～100.0%	0.0%
F3-07	Multipoint VF frequency point 3	F3-05～Motor rated frequency(F1-04)	0.00Hz
F3-08	Multipoint VF voltage point 3	0.0%～100.0%	0.0%
F3-09	VF Slip compensation gain coefficient	0.0%～200.0%	100.0%
F3-10	VF over excitation gain	0～500	0
F3-11	VF oscillation suppression gain	0～100	50
F3-13	VF separate voltage source	0: set by digital（F3-14） 1:AI1 2:AI2 3: UP/DOWN key 4:PULSE 5:Multiple speed command 6:Simple PLC 7:PID 8:Communication Note: 100.0% corresponds to the motor rated voltage	0
F3-14	VF separate voltage digital	0V～Rated motor voltage	0V

Code	Name	Setting range	Default
	setting		
F3-15	acceleration time of VF separate	0.0s～1000.0s Note: Indicates the deceleration time when 0V changes to the motor rated voltage	0.0s

Group F4: Input terminals

Code	Name	Setting range	Default
F4-00	DI1 function selection	0: No function 1: Forward running FWD 2: Reverse running REV 3: 3 line control mode 4: Forward Jog（FJOG） 5: Reverse Jog（RJOG） 6: Terminal UP 7: Terminal DOWN 8: Free stop 9: Fault reset（RESET） 10: Run pause 11: Normally open (NO) input of external fault 12: Multiple step terminals 1 13: Multiple step terminals 2 14: Multiple step terminals 3 15: Multiple step terminals 4 16: Acceleration/ deceleration selection terminals 1 17: Acceleration/ deceleration selection terminals 2 18: Frequency source switch 19: UP/DOWN setting reset (terminals or keypad) 20: Running command terminals switch 21: Acceleration/deceleration forbidden 22: PID pause 23:PLC status reset 29: Torque control forbidden 32: Starting DC braking 33: Normally closed (NC) input of external fault 34: Frequency change enable 35: Change PID direction 36: External stop terminal 1 37: Control commands switchover terminal 2 38: PID integral pause 39: Switcover between frequency source X and preset frequency 40: Switcover between frequency source Y and preset frequency 43: PID paramater switchover 44: User define fault 1 45: User define fault 2 46: Speed control /Torque control swithover 47: Emergency stop 48: External stop terminal 2 49: DC braking in deceleration 50: Clear the current running time 51: Full-water detection 1 52: Full-water detection 2 53: MPPT stop/ Photovoltaic control stop	1
F4-01	DI2 function selection		9
F4-02	DI3 function selection		53
F4-03	DI4 function selection		51
F4-04	DI5 function selection		52
F4-05	HDI function selection		2

Code	Name	Setting range	Default
F4-10	DI filter time	0.000s～1.000s	0.010s
F4-11	Terminals command mode	0: Two line control 1 1: Two line control 2 2: Three line control 1 3: Three line control 2	0
F4-12	Terminals UP/DOWN Change ratio	0.001Hz/s～65.535Hz/s	1.00Hz/s
F4-13	AI curve 1 minimum input	0.00V～F4-15	0.00V
F4-14	AI curve 1 minimum input corresponding setting	-100.0%～+100.0%	0.0%
F4-15	AI curve 1 Max. input	F4-13～+10.00V	10.00V
F4-16	AI curve 1 Max input corresponding setting	-100.0%～+100.0%	100.0%
F4-17	AI1 filter time	0.00s～10.00s	0.10s
F4-18	AI curve 2 minimum input	0.00V～F4-20	0.00V
F4-19	AI curve 2 minimum input corresponding setting	-100.0%～+100.0%	0.0%
F4-20	AI curve 2 Max. input	F4-18～+10.00V	10.00V
F4-21	AI curve 2Max input corresponding setting	-100.0%～+100.0%	100.0%
F4-22	AI2 filter time	0.00s～10.00s	0.10s
F4-23	AI curve 3 minimum input	-10.00V～F4-25	0.20V
F4-24	AI curve 3 minimum input corresponding setting	-100.0%～+100.0%	0.0%
F4-25	AI curve 3 Max. input	F4-23～+10.00V	9.80V
F4-26	AI curve 3Max input corresponding setting	-100.0%～+100.0%	100.0%
F4-27	AI3 filter time	0.00s～10.00s	0.50s
F4-28	PULSE Min. input	0.00kHz～F4-30	0.00kHz
F4-29	PULSE Min. input corresponding setting	-100.0%～100.0%	0.0%
F4-30	PULSE Maximum input	F4-28～100.00kHz	50.00kHz
F4-31	PULSE Max. Input corresponding setting	-100.0%～100.0%	100.0%
F4-32	PULSE filter time	0.00s～10.00s	0.10s
F4-33	AI Curve selection	Units' digit:AI1 curve selection 1: Curve 1（2 point, see F4-13～F4-16） 2: Curve 2（2 point, see F4-18～F4-21） 3: Curve 3 (2 point, see F4-23～F4-26) 4: Curve 4（4 point, seeA6-00～A6-07） 5: Curve 5（4 point, see A6-08～A6-15） Ten's digit:AI2 curve selection，as above Hundred's digit: Curve set by potentiometer of keypad, as above	321
F4-34	When AI input is less than minimum setting selection	Units' digit: AI 1 is less than minimum input Set selection 0:Corresponds to the minimum input setting	000

Code	Name	Setting range	Default
		1:0.0% Ten's digit: A2 is less than minimum input Set selection, as above Hundred's digit: Potentiometer less than Min. Input selection, as above	
F4-35	DI1 Relay time	0.0s～3600.0s	0.0s
F4-36	DI2 Relay time	0.0s～3600.0s	0.0s
F4-37	DI3 Relay time	0.0s～3600.0s	0.0s
F4-38	DI terminal effective mode choose 1	0:Enable in High level 1:Enable in low level Digits:DI1 Ten's:DI2 Hundred's: DI3 Thousand's:DI4 Ten thousand's: DI5	00000
F4-39	DI terminal effective mode choose 2	0:Enable in High level 1:Enable in low level Digits:DI6 Ten's:DI7 Hundred's: DI8 Thousand's: DI9 Ten thousand's: DI10	00000

Group F5: Output terminals

Code	Name	Setting range	Default
F5-00	FMP terminals output mode selection	0: High speed pulse output (FMP) 1: Digital output (FMR)	0
F5-01	FMR output function selection	0: No output 1: Frequency inverter running 2: Fault output (Free stop fault) 3: FDT1 Frequency level detect output 4: Frequency arrives 5: Zero speed running (no output when stop) 6: Motor overload pre-alarm 7: Inverter overload pre-alarm 8: Preset counting arrives 9: Specify counting arrives 10: Length arrives 11: PLC cycle running finish 12: Cumulative run time arrives 13: Frequency limit 14: Torque limit 15: Ready to run 16: AI1>AI2 17: Upper limit frequency arrives 18: Lower limit frequency arrives (relative to running) 17: Upper limit frequency arrives 18: Lower limit frequency arrives 19: Under voltage status output 20: Communication setting 21: Positioning finish (reserve) 22: Positioning approach (Reserve) 23: Zero speed running 2(output when in stop as well)	0
F5-02	Relay 1 function selection		2
F5-03	Relay 2 function selection		0

Code	Name	Setting range	Default
		24: Accumulated power up time arrives 25: Frequency level detection FDT2 output 26: Output when frequency 1 arrives 27: Output when frequency 2 arrives 28: Output when current 1 arrives 29: Output when current 2 arrives 30: Output when timing up 31: AI1 input over limit 32: Under loading 33: reverse running 34: Zero current state 35: Module temperature arrives 36: Output current is exceeded 37: Lower frequency arrival (output when stop as well) 38: Alarm output (all faults) 39: Motor overtemperature warning 40: Current running time arrives 41: Fault output (for free stop failure and undervoltage is not output)	
F5-06	FMP output function selection	0: Running frequency 1: Setting frequency 2: Output current 3: Output torque (Absolute value of torque) 4: Output power 5: Output voltage 6: Pulse input (100% corresponds to 100.0Hz) 7: AI1 8: AI2 9: Keyboard potentiometer 10: Length 11: Count value 12: Communication settings 13: Motor speed 14: Output current (100.0% corresponds to 1000.0A) 15: Output voltage (100.0% corresponds to 1000.0V) 16: Output torque (torque actual value)	0
F5-07	AO1 output function selection		0
F5-08	AO2 output function selection		1
F5-09	FMP maximum frequency	0.01kHz～100.00kHz	50.00kHz
F5-10	AO1 zero bias coefficient	-100.0%～+100.0%	0.0%
F5-11	AO1 gain	-10.00～+10.00	1.00
F5-12	AO2 zero bias	-100.0%～+100.0%	0.0%
F5-13	AO2 gain	-10.00～+10.00	1.00
F5-17	FMR output relay time	0.0s～3600.0s	0.0s
F5-18	RELAY1 output relay time	0.0s～3600.0s	0.0s
F5-19	RELAY2 output relay time	0.0s～3600.0s	0.0s
F5-20	Resersed	0.0s～3600.0s	0.0s
F5-22	DO output terminal valid state selection	0: Positive logic 1: Negative logic Bits: FMR Ten’s bit: Reserved Hundreds’s bit: RELAY2	00000

Code	Name	Setting range	Default
		Thousands's bits: RELAY1 Ten thousands's bit;s: Reserved	

Group F6: Start and stop control

Code	Name	Setting range	Default
F6-00	Starting mode	0: Directly start 1: start after speed tracking 2: Pre-excitation start (AC asynchronous machine)	0
F6-01	Resersed	-	-
F6-02	Resersed	-	-
F6-03	Starting speed	0.00Hz～10.00Hz	0.00Hz
F6-04	Starting speed keeping time	0.0s～100.0s	0.0s
F6-05	Start DC braking current / pre-excitation current	0%～100%	0%
F6-06	Start DC braking time / pre-excitation time	0.0s～100.0s	0.0s
F6-07	Acceleration and deceleration mode	0: Linear acceleration / deceleration 1: S curve acceleration / deceleration A 2: S curve acceleration and deceleration B	0
F6-08	S curve starting section time ratio	0.0%～(100.0%-F6-09)	30.0%
F6-09	S curve finishing section time ratio	0.0%～(100.0%-F6-08)	30.0%
F6-10	Stop mode	0: Deceleration stop 1: free parking	0
F6-11	start frequency when in stop with DC braking	0.00Hz～Maximum frequency	0.00Hz
F6-12	Waiting time of stop with DC braking	0.0s～100.0s	0.0s
F6-13	Braking current when Stop with DC braking	0%～100%	0%
F6-14	DC braking time when stop	0.0s～100.0s	0.0s
F6-15	Brake usage ratio	0%～100%	100%

Group F7: Keyboard and display

Code	Name	Setting range	Default
F7-01	MF.K function button option	0: MF.K is invalid 1: Switchover between Operation panel command channel and remote command channel (terminal command channel or communication command channel) 2: Forward and reverse switching 3: Forward Jog 4: Reverse Jog	**0**
F7-02	STOP/RESET function	0: STOP/RES button enable only in operation panel control mode 1: STOP/RES button enable in any control mode	**1**
F7-03	LED display parameters 1 in	0000～FFFF	1F

	running mode	Bit00: Running frequency 1(Hz) Bit01: Setting frequency (Hz) Bit02: DC bus voltage (V) Bit03: Output voltage (V) Bit04: Output current (A) Bit05: Output power (KW) Bit06: Output torque (%) Bit07: DI input status Bit08: DO output status Bit09: AI1 voltage (V) Bit10: AI2 voltage (V) Bit11: Voltage of potentiometer(V) Bit12: Counting Bit13: Length Bit14: Load speed display Bit15: PID setting	
F7-04	LED display parameters 2 in running mode	0000～FFFF Bit00: PID feedback Bit01: PLC stage Bit02: PULSE input pulse train frequency （kHz） Bit03: Running frequency 2（Hz） Bit04: Rest running time Bit05: AI1 before correction voltage (V) Bit06: AI2 before correction voltage (V) Bit07: operation panel potentiometer before correction voltage (V) Bit08: Line speed Bit09: Current power-on time (Hour) Bit10: Current running time (Min) Bit11: PULSE train input pulse frequency (Hz) Bit12: Communication setpoint Bit13: Encoder feedback speed (Hz) Bit14: Main frequency X display (Hz) Bit15: Auxiliary Frequency Y Display (Hz)	0
F7-05	LED display in stop mode	0000 ~ FFFF Bit00: Set frequency (Hz) Bit01: Bus voltage (V) Bit02: DI input status Bit03: DO output status Bit04: AI1 voltage (V) Bit05: AI2 voltage (V) Bit06: Operation panelpotentiometer voltage (V) Bit07: Count value Bit08: Length value Bit09: PLC stage Bit10: Load speed Bit11: PID setting Bit12: PULSE train input pulse frequency (kHz)）	33
F7-06	Load speed display factor	0.0001～6.5000	1.0000
F7-07	Heat sink of Inverter IGBT model temperature	0.0℃～100.0℃	-
F7-08	Heat sink of Inverter Rectifiertemperature	0.0℃～100.0℃	-
F7-09	Cumulative run time	0h～65535h	-
F7-10	Products serial No.	-	-

F7-11	Software version No.	-	-
F7-12	The number of decimal places of load speed Displays	0: 0 decimal places 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1
F7-13	Accumulated time since power on	0～65535 hour	-
F7-14	Cumulative power consumption	0～65535 KWh	-

Group F8: Auxiliary function

Code	Name	Setting range	Default
F8-00	Jog running frequency	0.00Hz～Maximum frequency	2.00Hz
F8-01	Jog acceleration	0.0s～6500.0s	20.0s
F8-02	Jog deceleration	0.0s～6500.0s	20.0s
F8-03	Acceleration time 2	0.0s～6500.0s	Model dependent
F8-04	Deceleration time 2	0.0s～6500.0s	Model dependent
F8-05	Acceleration time 3	0.0s～6500.0s	Model dependent
F8-06	Deceleration time 3	0.0s～6500.0s	Model dependent
F8-07	Acceleration time 4	0.0s～6500.0s	Model dependent
F8-08	Deceleration time 4	0.0s～6500.0s	Model dependent
F8-09	Jumping frequency 1	0.00Hz～Maximum frequency	0.00Hz
F8-10	Jumping frequency 2	0.00Hz～Maximum frequency	0.00Hz
F8-11	Jump frequency range	0.00Hz～Maximum frequency	0.00Hz
F8-12	Dead zone time of forward to reverse	0.0s～3000.0s	0.0s
F8-13	Reverse running enable	0: Enabled 1: Disabled	0
F8-14	Running mode when setting frequency is less than the lower limit frequency	0: Run at lower limit frequency 1: Stop 2: Zero speed running	0
F8-15	Drop control	0.00Hz～10.00Hz	0.00Hz
F8-16	Set the cumulative power-up arrival time	0h～65000h	0h
F8-17	Set the cumulative running arrival time	0h～65000h	0h
F8-18	Start protection selection	0: Disabled 1: Enabled	0
F8-19	Frequency detection value (FDT1)	0.00Hz～Maximum frequency	50.00Hz
F8-20	Frequency detection hysteresis (FDT1)	0.0%～100.0%（FDT1 voltage level）	5.0%

F8-21	Frequency arrival detection amplitude	0.0%～100.0%（Maximum frequency ）	0.0%
F8-22	Jump frequency during acceleration/deceleration	0: Invalid 1: Valid	0
F8-25	Swtich over point between acceleration time 1 to acceleration time 2	0.00Hz～Maximum frequency	0.00Hz
F8-26	Swtich over point between deceleration time 1 to deceleration time 2	0.00Hz～Maximum frequency	0.00Hz
F8-27	Terminal control prior	0: Invalid 1: Valid	0
F8-28	Frequency detection value (FDT2)	0.00Hz～Maximum frequency	50.00Hz
F8-29	Frequency detection hysteresis (FDT2)	0.0%～100.0%（FDT2 voltage level）	5.0%
F8-30	Any arrival frequency detection value 1	0.00Hz～Maximum frequency	50.00Hz
F8-31	Any arrival frequency detection amplitude 1	0.0%～100.0%（Maximum frequency）	0.0%
F8-32	Any arrival frequency detection value 2	0.00Hz～Maximum frequency	50.00Hz
F8-33	Any arrival frequency detection amplitude 2	0.0%～100.0%（Maximum frequency）	0.0%
F8-34	Zero current detection level	0.0%～300.0% 100.0% corresponds to the motor rated current	5.0%
F8-35	Zero current detection delay time	0.01s～600.00s	0.10s
F8-36	Output current over limit	0.0%（No detect） 0.1%～300.0%（Rated current）	200.0%
F8-37	Output current over limit detect relay time	0.00s～600.00s	0.00s
F8-38	Any arrival current 1	0.0%～300.0%(Motor rated current)	100.0%
F8-39	Any arrival current 1 detect amplitude	0.0%～300.0%(Motor rated current)	0.0%
F8-40	Any arrival current 2	0.0%～300.0%(Motor rated current)	100.0%
F8-41	Any arrival current 2 detect amplitude	0.0%～300.0%(Motor rated current)	0.0%
F8-42	Timing function selection	0: Invalid 1: Valid	0
F8-43	Timing of run time selection	0: Set by F8-44 1: AI1 2: AI2 3: Potentiometer of operation panel The range of analog input corresponds to F8-44	0
F8-44	Timing value setting of running time	0.0Min～6500.0Min	0.0Min
F8-45	Lower limit of AI1 input voltage protection	0.00V～F8-46	3.10V
F8-46	Upper limit of AI1 input	F8-45～10.00V	6.80V

	voltage protection		
F8-47	IGBT Module temperature arrives	0℃～100℃	75℃
F8-48	Cooling fan control	0: Working in running 1: Working after power up 2: Working by temperature(45℃/40℃) 3: Solar Mode, working if Vpn > A1-17)	3
F8-49	Wake up frequency	Sleep frequency (F8-51)～Maximum（F0-10)	0.00Hz
F8-50	Wake up delay time	0.0s～6500.0s	0.0s
F8-51	Sleep frequency	0.00Hz～Wake up frequency （F8-49)	0.00Hz
F8-52	Sleep delay time	0.0s～6500.0s	0.0s
F8-53	Current running arrival time setting	0.0～6500.0 mins	0.0Min

Group F9: Fault and Protection

Code	Name	Setting range	Default
F9-00	Motor overload protection selection	0: Prohibited 1: Allow	1
F9-01	Motor overload protection gain	0.20～10.00	1.00
F9-02	Motor overload pre- warning coefficient	50%～100%	80%
F9-03	Overvoltage stall gain	0～1000	0
F9-04	Overvoltage stall protection voltage	120%～150%	135%
F9-05	Over-current stall gain	0～100	0
F9-06	Overcurrent stall protection current	100%～200%	150%
F9-07	Ground short circuit protection options when power on	0: Invalid 1: Valid	0
F9-08	Under voltage setting	50~100%	100%
F9-09	Fault auto reset times	0～20	20
F9-10	DO action selection during fault auto reset	0: No action 1: Action	0
F9-11	Fault auto reset interval time	0.1s～100.0s	5.0s
F9-12	Input phase loss/ contactor pull protection selection	Bit: Input phase loss protection selection Ten: Contactor pull protection options 0: Disabled 1: Enabled	00
F9-13	Output phase loss protection	0: Disabled 1: Enabled	0
F9-14	First fault type	0: No fault 1: Reserved 2: Overcurrent in acceleration 3: Over current in deceleration 4: Over current in constant speed during 5: Over voltage in acceleration	—
F9-15	Second fault type		—
F9-16	Third (latest one) fault type		—

		6: Over voltage in deceleration 7: Over voltage in constant speed during 8: Buffer resistance overload 9: Undervoltage 10: Inverter overload 11: Motor overload 12: Input phase loss 13: Output phase loss 14: Igbt Module overheating 15: External fault 16: Communication error 17: Contactor is abnormal 18: Current detection is abnormal 19: Motor tuning abnormal 20: Encoder / PG card is abnormal 21: Parameter read and write exception 22: Inverter hardware abnormality 23: Motor to ground short circuit 24: Reserved 25: Reserved 26: Running time arrives 27: User defined fault 1 28: user defined fault 2 29: Power-up time arrives 30: Under load 31: PID feedback is missing in running 40: Fast current limit timeout 41:Motor switch in running 42: The speed deviation is too big 43: Motor over speed 45: Motor overtemperature 51: Initial position error	
F9-17	Frequency at when the third (last) failure frequency	—	—
F9-18	Current at when the third (last) failure frequency	—	—
F9-19	DC bus voltage at when the third (last) failure frequency	—	—
F9-20	Input terminals status at when the third (last) failure frequency	—	—
F9-21	Output terminals status at when the third (last) failure frequency	—	—
F9-22	Inverter status when the third (last) failure frequency	—	—
F9-23	Power up time when the third (last) failure frequency	—	—
F9-24	Running time when the third (last) failure frequency	—	—
F9-27	Frequency at when the second failure	—	—
F9-28	Current at when the second failure	—	—

F9-29	DC bus voltage at when the second failure	—	—
F9-30	Input terminals status at when the second failure	—	—
F9-31	Output terminals status at when the second failure	—	—
F9-32	Inverter status at when the second failure	—	—
F9-33	Power up time when the second failure	—	—
F9-34	Running time when the second failure	—	—
F9-37	Frequency at when the first failure	—	—
F9-38	Current at when the first failure	—	—
F9-39	DC bus voltage at when the first failure	—	—
F9-40	Input terminals status at when the first failure	—	—
F9-41	Output terminals status at when the first failure	—	—
F9-42	Inverter status at when the first failure	—	—
F9-43	Power up time when the first failure	—	—
F9-44	Running time when the first failure	—	—
F9-47	Fault protection action selection 1	Bit: Motor overload (11) 0: Free stop 1: Stop by stop mode setting 2: Continue to run Ten: Input missing (12) Hundreds: Output phase loss (13) Thousands of bits: external failure (15) Million: communication anomaly (16)	00000
F9-48	Fault protection action selection 2	Bit: Encoder / PG card exception (20) 0: Free stop Ten: Function code read and write exception (21) 0: Free stop 1: Stop by stop mode setting Hundred places: reserved Thousands: Motor overheating (25) Million: run time arrival (26)	00000
F9-49	Fault protection action selection 3	Bit: User defined fault 1 (27) 0: Free stop 1: Stop by stop mode 2: Continue to run Ten: User Defined Fault 2 (28) 0: Free Stop 1: Stop by stop mode 2: Continue to run Hundreds: Power-up time arrives (29)	00000

		0: Free stop 1: Stop by stop mode 2: Continue to run Thousands of bits: (30) 0: Free stop 1: Deceleration stop 2:Skip to 7% of the rated motor frequency to continue running, restore to run with setting frequency after no missing load Million: PID feedback lost in running (31) 0: Free parking 1: Stop by stop mode 2: Continue to run	
F9-50	Fault protection action selection 4	Bit: the speed deviation is too large (42) 0: Free stop 1: Stop by stop mode 2: Continue to run Ten: Motor over speed (43) Hundred places: initial position error (51)	00000
F9-54	Running frequency of continue running when fault alarm	0: Run at the current operating frequency 1: Run at set frequency 2: Run at the upper limit frequency 3: Run at the lower limit frequency 4: Run at an abnormal standby frequency	0
F9-55	An abnormal standby frequency	0.0%～100.0% (100.0% corresponds to the maximum frequency F0-10)	100.0%
F9-56	Motor temperature sensor type	0: No temperature sensor 1:PT100 2:PT1000	0
F9-57	Motor overheat protection threshold	0℃～200℃	110℃
F9-58	Motor overheat pre-warning threshold	0℃～200℃	90℃
F9-59	Working action of Instantaneous power fail selection	0: Invalid 1: Deceleration 2: Deceleration stop	0
F9-60	Judgment voltage of instantaneous power fail pause	80.0%～100.0%	90.0%
F9-61	Voltage recovery judgment time when instantaneous power fail	0.00s～100.00s	0.50s
F9-62	Judgment voltage of instantaneous power failure action	60.0%～100.0%(Standard bus voltage)	80.0%
F9-63	Load miss protection	0: Disable 1: Enable	0
F9-64	Load miss detection level	0.0～100.0%	10.0%
F9-65	Load miss detection time	0.0～60.0s	1.0s
F9-67	Over speed detection	0.0%～50.0%(Max frequency)	20.0%
F9-68	Over speed detection time	0.0s: No detect 0.1～60.0s	1.0s

F9-69	Detection value of the speed deviation is too big	0.0%～50.0%(Max frequency)	20.0%
F9-70	Detection time of speed deviation is too big.	0.0s: No detect 0.1～60.0s	0.0s

Group FA: PID function

Code	Name	Setting range	Default
FA-00	PID reference source	0: FA-01 1: AI1 2: AI2 3: Keyboard potentiometer 4: PULSE setting 5: Communication reference 6: Multi-step instructions reference	0
FA-01	PID value setting	0.0%～100.0%	50.0%
FA-02	PID feedback source	0:AI1 1: AI2 2: Keyboard potentiometer 3: AI1-AI2 4: PULSE setting 5: Communication reference 6: AI1 + AI2 7: MAX (| AI1 |, | AI2 |) 8: MIN (| AI1 |, | AI2 |)	0
FA-03	PID working direction	0: Positive effect 1: Reverse effect	0
FA-04	PID reference feedback range	0～65535	1000
FA-05	Proportional gain Kp1	0.0～100.0	20.0
FA-06	Integral time Ti1	0.01s～10.00s	2.00s
FA-07	Differential time Td1	0.000s～10.000s	0.000s
FA-08	PID reversal cutoff frequency	0.00～Maximum frequency	2.00Hz
FA-09	PID deviation limit	0.0%～100.0%	0.0%
FA-10	PID differential limiting	0.00%～100.00%	0.10%
FA-11	PID reference given change time	0.00～650.00s	0.00s
FA-12	PID feedback filter time	0.00～60.00s	0.00s
FA-13	PID output filter time	0.00～60.00s	0.00s
FA-14	Reserve	-	-
FA-15	Proportional gain Kp2	0.0～100.0	20.0
FA-16	Integral time Ti2	0.01s～10.00s	2.00s
FA-17	Derivative time Td2	0.000s～10.000s	0.000s
FA-18	PID parameter switching condition	0: Do not switch 1: Switch via DI terminal 2:Automatic switching according to the deviation	0
FA-19	PID parameter switching deviation 1	0.0%～FA-20	20.0%

FA-20	PID parameter switching deviation 2	FA-19～100.0%	80.0%
FA-21	PID initial value	0.0%～100.0%	0.0%
FA-22	PID initial value hold time	0.00～650.00s	0.00s
FA-23	The maximum value of positive deviations for two output	0.00%～100.00%	1.00%
FA-24	The maximum value of reverse deviations for two output	0.00%～100.00%	1.00%
FA-25	PID integral property	Bit: Integral separation 0: Invalid 1: Valid Ten:Whether to stop the integral working after outputting to the limit 0: Continue integral working 1: Stop integral working	00
FA-26	PID feedback loss detection value	0.0%:Do not judge feedback loss 0.1%～100.0%	0.0%
FA-27	PIDFeedback loss detection time	0.0s～20.0s	0.0s
FA-28	PID calculating when stop	0: Don't execute calculating when stop 1: Execute PID calculating when stop	0

Group FC: multi-step instructions, simple PLC

Code	Name	Setting range	Default
FC-00	Multi - step instructions0	-100.0%～100.0%	0.0%
FC-01	Multi - step instructions 1	-100.0%～100.0%	0.0%
FC-02	Multi - step instructions 2	-100.0%～100.0%	0.0%
FC-03	Multi - step instructions 3	-100.0%～100.0%	0.0%
FC-04	Multi - step instructions 4	-100.0%～100.0%	0.0%
FC-05	Multi - step instructions 5	-100.0%～100.0%	0.0%
FC-06	Multi - step instructions 6	-100.0%～100.0%	0.0%
FC-07	Multi - step instructions 7	-100.0%～100.0%	0.0%
FC-08	Multi - step instructions 8	-100.0%～100.0%	0.0%
FC-09	Multi - step instructions 9	-100.0%～100.0%	0.0%
FC-10	Multi - step instructions 10	-100.0%～100.0%	0.0%
FC-11	Multi - step instructions 11	-100.0%～100.0%	0.0%
FC-12	Multi - step instructions 12	-100.0%～100.0%	0.0%
FC-13	Multi - step instructions 13	-100.0%～100.0%	0.0%
FC-14	Multi - step instructions 14	-100.0%～100.0%	0.0%
FC-15	Multi - step instructions 15	-100.0%～100.0%	0.0%
FC-16	Simple PLC running mode	0: Single run to end and stop 1: Single run to end and keep final value 2: Continue to run in loop	0
FC-17	Simple PLC power loss	Bit: Power off memory options	00

	memory selection	0: No memory power-off 1: Power off memory Ten: Stop memory selection 0: Stop no memory 1: Stop memory	
FC-18	Running time of simple PLC Segment 0	0.0s(h)～6553.5s(h)	0.0s/h
FC-19	Acceleration/deceleration time of simple PLC Segment 0	0～3	0
FC-20	Running time of simple PLC Segment 1	0.0s(h)～6553.5s(h)	0.0s/h
FC-21	Acceleration/deceleration time of simple PLC Segment 1	0～3	0
FC-22	Running time of simple PLC Segment 2	0.0s(h)～6553.5s(h)	0.0s/h
FC-23	Acceleration/deceleration time of simple PLC Segment 2	0～3	0
FC-24	Running time of simple PLC Segment 3	0.0s(h)～6553.5s(h)	0.0s/h
FC-25	Acceleration/deceleration time of simple PLC Segment 3	0～3	0
FC-26	Running time of simple PLC Segment 4	0.0s(h)～6553.5s(h)	0.0s/h
FC-27	Acceleration/deceleration time of simple PLC Segment 4	0～3	0
FC-28	Running time of simple PLC Segment 5	0.0s(h)～6553.5s(h)	0.0s/h
FC-29	Acceleration/deceleration time of simple PLC Segment 5	0～3	0
FC-30	Running time of simple PLC Segment 6	0.0s(h)～6553.5s(h)	0.0s/h
FC-31	Acceleration/deceleration time of simple PLC Segment 6	0～3	0
FC-32	Running time of simple PLC Segment 7	0.0s(h)～6553.5s(h)	0.0s/h
FC-33	Acceleration/deceleration time of simple PLC Segment 7	0～3	0
FC-34	Running time of simple PLC Segment 8	0.0s(h)～6553.5s(h)	0.0s(h)
FC-35	Acceleration/deceleration time of simple PLC Segment 8	0～3	0
FC-36	Running time of simple PLC Segment 9	0.0s(h)～6553.5s(h)	0.0s/h

FC-37	Acceleration/deceleration time of simple PLC Segment 9	0～3	0
FC-38	Running time of simple PLC Segment 10	0.0s(h)～6553.5s(h)	0.0s/h
FC-39	Acceleration/deceleration time of simple PLC Segment 10	0～3	0
FC-40	Running time of simple PLC Segment 11	0.0s(h)～6553.5s(h)	0.0s/h
FC-41	Acceleration/deceleration time of simple PLC Segment 11	0～3	0
FC-42	Running time of simple PLC Segment 12	0.0s(h)～6553.5s(h)	0.0s/h
FC-43	Acceleration/deceleration time of simple PLC Segment 12	0～3	0
FC-44	Running time of simple PLC Segment 13	0.0s(h)～6553.5s(h)	0.0s/h
FC-45	Acceleration/deceleration time of simple PLC Segment 13	0～3	0
FC-46	Running time of simple PLC Segment 14	0.0s(h)～6553.5s(h)	0.0s/h
FC-47	Acceleration/deceleration time of simple PLC Segment 14	0～3	0
FC-48	Running time of simple PLC Segment 15	0.0s(h)～6553.5s(h)	0.0s/h
FC-49	Acceleration/deceleration time of simple PLC Segment 15	0～3	0
FC-50	Simple PLC run time unit	0:s（2） 1:h（hour）	0
FC-51	Multi-step instruction 0 step given mode	0: set by FC-00 1:AI1 2:AI2 3: Keyboard potentiometer 4: PULSE train 5: PID 6: Preset frequency (F0-08) is given, UP / DOWN can be modified	0

Group Fd: Communication

Code	Name	Setting range	Default
Fd-00	Communication baud rate	bit:MODBUS 0:300BPS 1:600BPS 2:1200BPS 3:2400BPS 4:4800BPS	6005

		5:9600BPS 6:19200BPS 7:38400BPS 8:57600BPS 9:115200BPS Ten: reserved Hundred places: reserved	
Fd-01	MODBUS data format	0: No parity (8-N-2) 1: Even check (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1) (MODBUS active)	0
Fd-02	Local address	0:Broadcast address 1～249 (MODBUS、Profibus-DP enable)	1
Fd-03	MODBUS respond relay	0～20ms (MODBUS enable)	2
Fd-04	Serial communication timeout	0.0:Disable 0.1～60.0s (MODBUS, Profibus-DP, CANopen enable)	0.0

Group FE: Customized parameter

Code	Name	Setting range	Default
FE-00 ～ FE-49	Customized parameter	F0.xx~Fd.xx	-

This parameter can be customized to display parameters, allowing users to group the required parameters into PE group, with a maximum support of 50 parameters.

Example: Set FE-00 = F0.01, FE-00 will be displayed as uF001 in the customized parameter function group interface.

The user can switch between displaying full function parameter group or customized function parameter group using the multi-function key (MFK).

-FUNC: Full function parameter group

-USEr: Customized function parameter group (PE group)

For example, if you need the inverter to display only the customized function parameter group, the operation steps are as follows:

In the initial interface of inverter, press multi-function key(MFK) to select -USEr , and then press ENTER to confirm, it will enter the interface of customized function parameter group.

Note: After setting the display of customized function parameter group through multi-function key, the PRG key enters the parameter group that remains a customized function parameter group. If you need to display full function parameter group, you need to select -FUNC by MFK key.

Group FP: Function code management

Code	Name	Setting range	Default
FP-00	User password	0～65535	0
FP-01	Restore default settings	0: On operation 1: Restore parameters to factory setting except motor parameters 2: Clear record information	0

FP-02	Function parameter group display selection	Bit: U group monitoring parameters 0: Not displayed 1: Display Ten: Advanced parameters 0: Not displayed 1: display	01
FP-03	Personality parameter group show selection	Bit: User custom parameter group display selection 0: Not displayed 1: Display Ten: User Change Parameter Group Display Selection 0: Not displayed 1: Display	00
FP-04	Parameter modification property	0: Modifiable 1: Not modifiable	0
FP-05	Distributor unlock password	0 – 65535	
FP-06	Factory unlock password	0 – 65535	

Group U0: Monitor parameters

U0-00	Running frequency	0.01Hz	7000H
U0-01	Setting frequency	0.01Hz	7001H
U0-02	DC voltage of PV arrays	0.1V	7002H
U0-03	Output voltage	1V	7003H
U0-04	Output current	0.01A	7004H
U0-05	Power of PV arrays	0.1KW	7005H
U0-06	Current of PV arrays	0.01A	7006H
U0-07	DI state	1	7007H
U0-08	DO state	1	7008H
U0-09	AI1 voltage	0.01V	7009H
U0-10	AI2 voltage	0.01V	700AH
U0-11	Motor (pump) speed	1rpm	700BH
U0-12	PV open circuit voltage(Voc)	0.1V	700CH
U0-13	Flow rate of pump	0.1m^3/hr	700DH
U0-14	Daily flow	0.1m^3	700EH
U0-15	Cumulative flow(low water level)	0.1m^3	700FH
U0-16	Cumulative flow (high water level)	0.1Km^3	7010H
U0-17	Daily generated electricity	0.1kwh	7011H
U0-18	Cumulative electricity consumption(low water level)	0.1kwh	7012H
U0-19	Cumulative electricity consumption(high water level)	1Mwh	7013H
U0-20	The rest running time	0.1Min	7014H
U0-21	AI1 voltage before correction	-	7015H
U0-22	AI2 voltage before correction	-	7016H
U0-23	AI3 voltage before correction	-	7017H
U0-24	Pump running speed	r/min	7018H
U0-25	Current power up time	1min	7019H
U0-26	Present running time		701AH
U0-28	Communication setting value	-	701CH

U0-30	Main frequency X	-	701EH
U0-31	Auxiliary frequency Y	-	701FH
U0-32	Viewing any register address value	-	7020H
U0-34	Motor temperature	-	7022H
U0-35	Target torque	-	7023H
U0-37	Power factor angle	-	7025H
U0-39	Target voltage of V/F separation	-	7027H
U0-40	Output voltage of V/F separation	-	7028H
U0-41	DI input state visual display	-	7029H
U0-42	DO output state visual display	-	702AH
U0-43	DI function state visual display 1	-	702BH
U0-44	DI function state visual display 2	-	702CH
U0-45	Fault information	-	702DH
U0-59	Present setting frequency (%)	-	703BH
U0-60	Present running frequency (%)	-	703CH
U0-61	Inverter running state	-	703DH
U0-62	Current fault code	-	703EH
U0-63	Sent value of point-point communication	-	703FH
U0-64	Received value of point-point communication	-	7040H
U0-65	Torque upper limit	-	7041H

5. Fault Diagnosis and Solution

5.1 Fault Alarm and Countermeasures

EM15-SP inverter has 35 types of warning information and protection function. In case of abnormal fault, the protection function will be invoked, the inverter will stop output, and the faulty relay contact of the inverter will start, and the fault code will be displayed on the display panel of the inverter. Before consulting the service department, the user can perform self-check according to the prompts of this chapter, analyze the fault cause and find out t solution. If the fault is caused by the reasons as described in the dotted frame, please consult the agents of inverter or our company directly. Among the 35 types of warning information, Err22 is hardware over current or over voltage signal. In most cases, the hardware over voltage fault will cause Err22 alarm.

Table 7-1 Common faults and solution of the frequency inverter

Fault Code	Err01	**Fault Type**	Inverter unit protection
1: The output circuit is grounded or short circuited. 2: The connecting cable of the motor is too long. 3: The IGBT overheat. 4: The internal connections become loose. 5: The main control board is faulty. 6: The drive board is faulty. 7: The inverter IGBT is faulty.			1: Eliminate external faults. 2: Install a reactor or an output filter. 3: Check the air filter and the cooling fan. 4: Connect all cables properly. 5: Ask for technical support 6: Ask for technical support 7: Ask for technical support
Fault Code	Err02/Err04	**Fault Type**	Over current during acceleration/ at constant speed
1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The acceleration time is too short. 4: Manual torque boost or V/F curve is not appropriate. 5: The voltage is too low. 6: The startup operation is performed on the rotating motor. 7: A sudden load is added during acceleration. 8: The frequency inverter model is of too small power class.			1: Eliminate external faults. 2: Perform the motor auto- tuning. 3: Increase the acceleration time. 4: Adjust the manual torque boost or V/F curve. 5: Adjust the voltage to normal range. 6: Select rotational speed tracking restart or start the motor after it stops. 7: Remove the added load. 8: Select a frequency inverter of higher power class.
Fault Code	Err03	**Fault Type**	Over current during deceleration
1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The deceleration time is too short. 4: The voltage is too low. 5: A sudden load is added during deceleration. 6: The braking unit and braking resistor are not installed.			1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the deceleration time. 4: Adjust the voltage to normal range. 5: Remove the added load. 6: Install the braking unit and braking resistor.
Fault Code	Err05/ Err06	**Fault Type**	Overvoltage during acceleration/deceleration
1: The input voltage is too high. 2: An external force drives the motor during acceleration. 3: The acceleration/deceleration time is too short. 4: The braking unit and braking resistor are not installed.			1: Adjust the voltage to normal range. 2: Cancel the external force or install a braking resistor. 3: Increase the acceleration/deceleration time. 4: Install the braking unit and braking resistor.
Fault Code	Err07	**Fault Type**	Overvoltage at constant speed
1: The input voltage is too high. 2: An external force drives the motor during deceleration.			1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor.
Fault Code	Err08	**Fault Type**	Control power supply fault

The input voltage is not within the allowable range.			Adjust the input voltage to the allowable range.
Fault Code	Err09	**Fault Type**	Low voltage
1: Instantaneous power failure occurs on the input power supply. 2: The frequency inverter's input voltage is not within the allowable range. 3: The DC bus voltage is abnormal. 4: The rectifier bridge and buffer resistor are faulty. 5: The drive board is faulty. 6: The main control board is faulty.			1: Reset the fault. 2: Adjust the voltage to normal range. 3: Ask for technical support 4: Ask for technical support 5: Ask for technical support 6: Ask for technical support
Fault Code	Err10	**Fault Type**	Frequency inverter overload
1: The load is too heavy or locked- rotor occurs on the motor. 2: The frequency inverter model is of too small power class.			1: Reduce the load and check the motor and mechanical condition. 2: Select a frequency inverter of higher power class.
Fault Code	Err12	**Fault Type**	Power input phase loss
1: The three-phase power input is abnormal. 2: The drive board is faulty. 3: The lightningproof board is faulty. 4: The main control board is faulty.			1: Eliminate external faults. 2: Ask for technical support. 3: Ask for technical support. 4: Ask for technical support.
Fault Code	Err13	**Fault Type**	Power output phase loss
1: The cable connecting the frequency inverter and the motor is faulty. 2: The frequency inverter's three-phase outputs are unbalanced when the motor is running. 3: The drive board is faulty. 4: The IGBT module is faulty.			1: Eliminate external faults. 2: Check whether the motor three phase winding is normal. 3: Ask for technical support. 4: Ask for technical support.
Fault Code	Err14	**Fault Type**	IGBT Module overheat
1: The ambient temperature is too high. 2: The air filter is blocked. 3: The fan is damaged. 4: The thermally sensitive resistor of the IGBT module is damaged. 5: The inverter IGBT module is damaged.			1: Lower the ambient temperature. 2: Clean the air filter. 3: Replace the damaged fan. 4: Replace the damaged thermally sensitive resistor. 5: Replace the inverter module.
Fault Code	Err15	**Fault Type**	External equipment fault
1: External fault signal is input via DI. 2: External fault signal is input via virtual I/O.			1: Reset the operation. 2: Reset the operation.
Fault Code	Err16	**Fault Type**	Communication fault
1: The host computer is in abnormal state. 2: The communication cable is faulty. 3: The communication extension card is set improperly. 4: The communication parameters in group bA are set improperly.			1: Check the cabling of host computer. 2: Check the communication cabling. 3: Set the communication extension card correctly. 4: Set the communication parameters properly.
Fault Code	Err18	**Fault Type**	Current detection fault
1: The HALL device is faulty. 2: The drive board is faulty.			1: Replace the faulty HALL device. 2: Replace the faulty drive board.
Fault Code	Err22	**Fault Type**	Frequency inverter hardware fault
1: Overvoltage exists. 2: Over current exists.			1: Handle based on over voltage. 2: Handle based on over current.

Appendix I. Modbus Communication Protocol

EM15series of inverter provides RS485 communication interface, and adopts MODBUS communication protocol. User can carry out centralized monitoring through PC/PLC to get operating requirements. And user can set the running command, modify or read the function codes, the working state or fault information of frequency inverter by Modbus communication protocol.

I. About Protocol

This serial communication protocol defines the transmission information and use format in the series communication and it includes master-polling (or broadcasting) format, master coding method and the content includes function code of action, transferring data and error checking. The response of slave is the same structure, and it includes action confirmation, returning the data and error checking etc. If slave takes place the error while it is receiving the information or cannot finish the action demanded by master, it will send one fault signal to master as a response.

II. Application Methods

The frequency inverter will be connected into a “Single-master Multi-slave” PC/PLC control net with RS485 bus as the communication slave.

III. Bus Structure

1) Hardware interface.

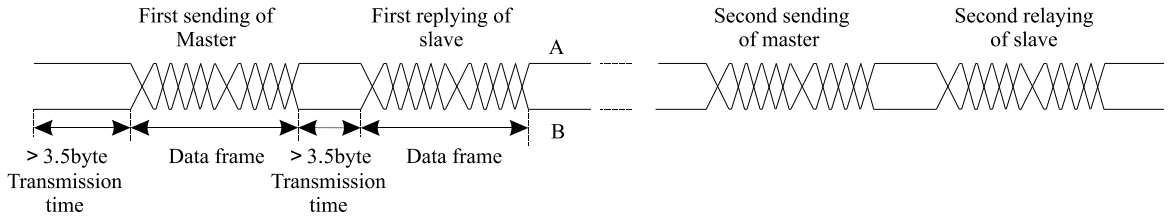
The “485+” and “485-“terminals on frequency inverter are the communication interfaces of Modbus

2) Topological mode

It is a “Single-master Multi-slave” system. In this network, every communication machine has a unique slave address. One of them is as “master” (usually PC host machine, PLC and HMI, etc.), actively sends out the communication, to read or write the parameters of slave. Other machines will be used as slave and response to the inquiry/command from master. At one time only one machine can send the data and other machines are in the receiving status. The setup range of slave address is 0 to 247. Zero refers to broadcast communication address. The address of slave must is exclusive in the network.

3) Transmission mode

There provide asynchronous series and half-duplex transmission mode. In the series asynchronous communication, the data is sent out frame by frame in the form of message. According to the Modbus-RTU protocol, when the free time of no transmission in communication data lines is more than the transmission time of 3.5byte, it indicates that a new start of communication frame.



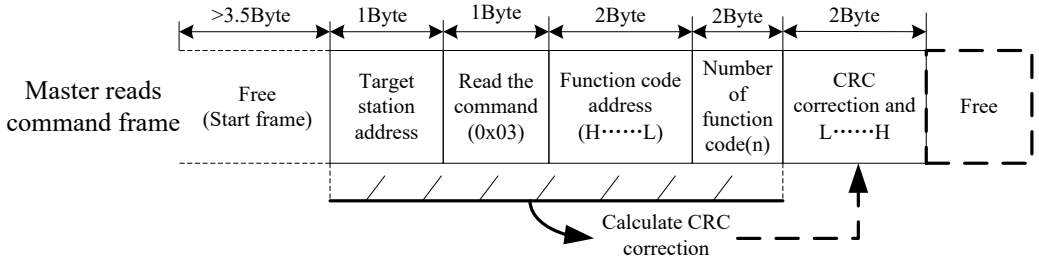
EM15 series inverter has built-in the Modbus-RTU communication protocol, and is applicable to response the slave “Inquiry/command” or doing the action according to the master’s “Inquiry / Command” and response to the data.

Here, master is personnel computer (PC), industrial machine or programmable logical controller (PLC), and the slave is inverter. Master not only visits some slave, but also sends the broadcast information to all the slaves. For

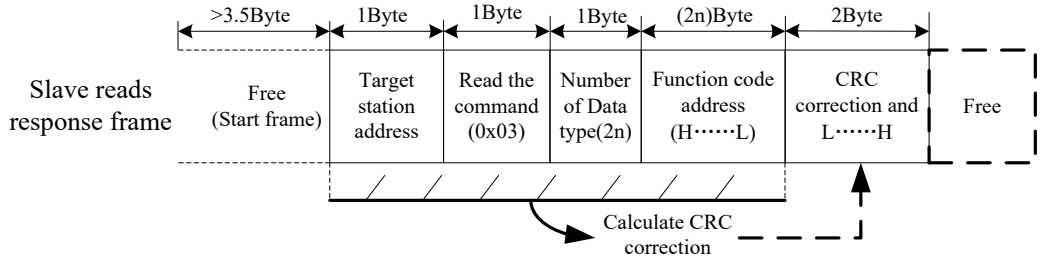
the single master "Inquiry/Command", all of slaves will return a signal that is a response; for the broadcast information provided by master, slave needs not feedback a response to master machine.

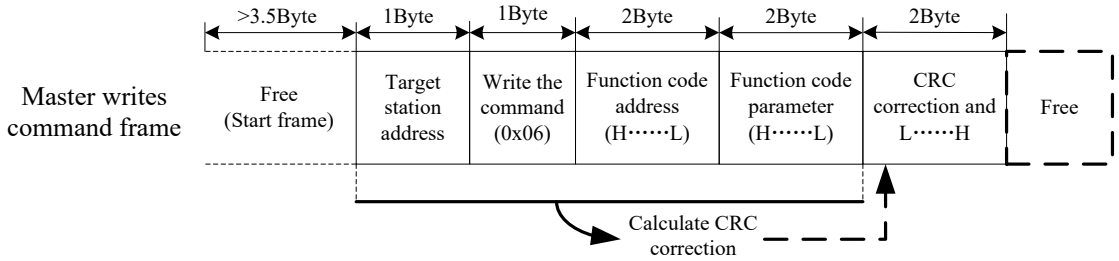
Communication data structure

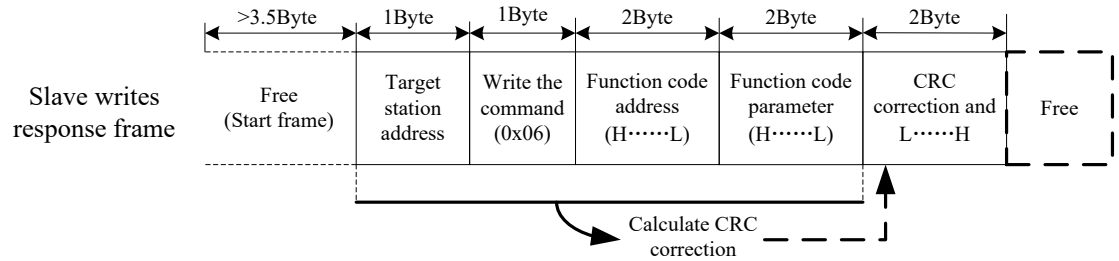
Modbus protocol communication data format of EM15 series inverter is shown as following. The inverter only support the reading and writing of Word type parameters, the corresponding reading operation command is "0x03", the writing operation command is "0x06". The writing and reading operation of byte or bit is not supported.



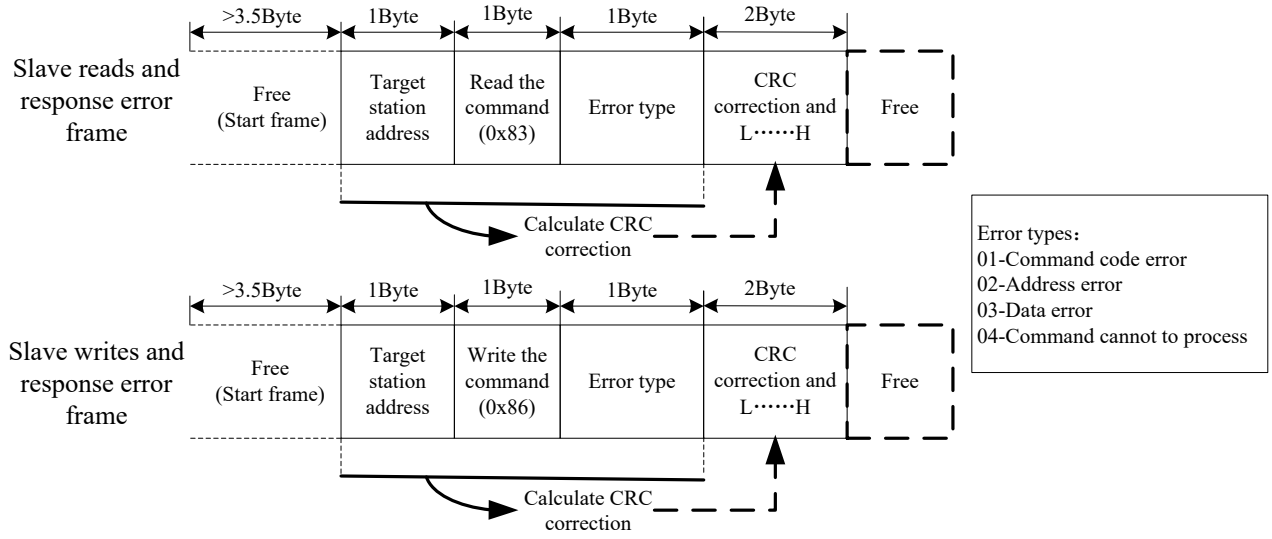
In theory, the host computer can continuously read several function codes once (that is, the maximum value of "n" is 12), but note that not to jump across the last function code in this function group to avoid the wrong reply.







If the wrong communication frame was detected by the salve or other reasons caused the failure of reading and writing, the wrong frame will be replied.



RTU frame format

Frame start (START)	More than the 3.5- character time
Slave address(ADR)	Communication address:1 to 247(0: broadcast address)
Command code(CMD)	03: Read slave parameters 06: Write slave parameters
Function code address(H)	It indicates the external parameter address of frequency inverter in hexadecimal format; There are functional code or non-functional code (such as running state parameter/ running command parameters) type parameters, for details see the address definition. During the transmission, high bit is put in the front, and low bit is at the back.
Function code address(L)	
Number of function code(H)	It indicates the number of function code ready by the frame. If it is "1", then it indicates that it reads one function code. During the transmission, high bit is put in the front, and low bit is at the back. Only one function code can be modified at one time without the field.
Number of function code(L)	
Data(L)	It indicates the replying data or the data waiting to write-in. During the transmission, high bit is put in the front, and low bit is at the back.
Data(H)	
END	3.5- character time

CRC Checking

In RTU mode, messages include an error-checking field that is based on a CRC method. The CRC field checks the contents of the entire message. The CRC field is two bytes, containing a16-bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message. The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field.

If the two values are not equal, that means transmission is error

The CRC is started by 0xFFFF.Then a process begins of applying successive eight-bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits, and the parity bit, do not apply to the CRC. During generation of the CRC, each eight-bit character is exclusive ORed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a 1, the register is then exclusive ORed with a preset, fixed value. If the LSB was a 0, no exclusive OR takes place. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next eight-bit byte is exclusive ORed with the register's current value, and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value.

When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte.

```
unsigned int crc_chk_value(unsigned char *data_value,unsigned char length
{
    unsigned int crc_value=0xFFFF;
    int i;
    while(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);
}
```

Definition of communication parameter address

Read and write function-code parameters (Some functional code is not changed, only for the manufacturer use.)

The group number and mark of function code is the parameter address for indicating the rules.

High level bytes: F0~FF(Group F), A0~AF(GroupA), 70-7F(Group U)

Low level bytes: 00 ~ FF

For example: F3-12, address indicates to 0xF30C.

Note: Group U: Only for reading parameter, cannot be changed parameters.

Some parameters cannot be changed during operation, some parameters regardless of what kind of state the inverter in, the parameters cannot be changed. Change the function code parameters, pay attention to the scope of the parameters, units, and relative instructions.

Function code group	Communication inquiry address	Inquiry address When Communication modifies RAM
F0~FE	0xF000~ 0xFEFF	0x0000~ 0x0EFF
A1	0xA100~0xA1FF	0x4100~0x41FF
U0	0x7000~ 0x70FF	

Besides, due to EEPROM be frequently stored, it will reduce the lifetime of EEPROM. In the communication mode, and some function codes don't have to be stored as long as change the RAM value.

Stop/start parameter

Command word address	Command function
1000H	Communication set value(-10000 ~ 10000)(Decimal)

Note: Communication setting value is the percentage of relative value, 10000 corresponds to 100%, -10000 correspond to -100.00%.

Control command input frequency inverter: (Write only)

Command word address	Command function

2000H	0001: Forward running
	0002: Reverse running
	0003: Forward jog
	0004: Reverse jog
	0005: Free stop
	0006:Decelarating stop
	0007: Fault reset

Read inverter status: (Read only)

Command word address	Command function
3000H	0001: Forward running
	0002: Reverse running
	0003: Stop

Parameter locking password collation: (If the feedback is the 8888H, it indicates the password collation passed)

Password address	Contents of input password
1F00H	*****

Digital output terminal control: (write in only)

Address Of locking password command	Contents of locking password command
2001H	BIT0: DO1 output control BIT1: DO2 output control BIT2: Relay 1 output control BIT3: Relay 2 output control BIT4: FMR output control BIT5: VDO1 BIT6: VDO2 BIT7: VDO3 BIT8: VDO4 BIT9: VDO5

Analog output AO1 control: (write in only)

Command word address	Command function
2002H	0~7FFF indicates 0%~100%

Analog output AO2 control: (write in only)

Command word address	Command function
2003H	0~7FFF indicates 0%~100%

Pulse output control: (write in only)

Command word address	Command function
2004H	0~7FFF indicates 0%~100%

Inverter fault description:

Inverter fault description	Inverter fault information

8000H	0000: No fault 0001: Reserved 0002: acceleration over current 0003: deceleration over current 0004: Constant speed over current 0005: acceleration over voltage 0006: deceleration over voltage 0007:Constant speed over voltage 0008: Buffer resistor fault 0009: less voltage fault 000A:Frequency inverter overload 000B: Motor overload 000C: Input phase failure 000D: Output phase failure 000E: IGBT overheat 000F: External equipment fault 0010: Communication fault 0011: Contactor fault 0012: Current detection fault 0013: Motor auto-tuning fault 0014: Encoder/PG fault	0015: EEPROM read-write in fault 0016: Frequency inverter hardware fault 0017: Short circuit to ground fault 0018: Reversed 0019: Reversed 001A: Accumulative running time reached 001B: User-defined fault 1 001C: User-defined fault 2 001D: Accumulative power-on time reached 001E: Off load 001F: PID lost during running 0028: fast current limit fault 0029: Motor switchover fault during running 002A: Too large speed deviation 002B: Motor over-speed 002D: Motor overheat 005A: Encode lines setting fault 005B: Not connect to the encoder 005C: Initial location fault 005E: Speed feedback fault

ModBus communication fault address

Address Definition	**Fault information**	
8001	0000:Not fault 0001:Password error 0002:Command code error 0003:CRC error 0004:Illegal address	0005:Illegal data 0006:Parameter change invalid 0007:System locked 0008:Inverter busy (EEPROM is storing)

EMHEATER®

Warranty Card

www. emheater. com

Customer Information	Company:	
	Address:	
	Contact:	
	Tel:	
Product Information	Product model	
	Body barcode (Attach here):	
	Name of agent:	
	(Maintenance time and content):	
	Maintenance personnel:	

Warranty Agreement

1) The warranty period of the product is 12 months (refer to the barcode on name plate). During the warranty period, if the product fails or is damaged under the condition of normal use by following the instructions, EMHEATER will be responsible for free maintenance.

2) Within the warranty period, maintenance will be charged for the damages caused by the following reasons:
   A. Improper use or repair/modification without prior permission;
   B. Fire, flood, abnormal voltage, other disasters and secondary disaster;
   C. Hardware damage caused by dropping or transportation after procurement;
   D. Improper operation;
   E. Trouble out of the frequency inverter (for example, external device).

3) If there is any failure or damage to the product, please correctly fill out the Product Warranty Card in detail.

4) The maintenance fee is charged according to the latest Maintenance Price List of EMHEATER.

5) The Product Warranty Card is not re-issued. Please keep the card and present it to the maintenance personnel when asking for maintenance.

6) If there is any problem during the service, contact EMHEATER's agent or EMHEATER directly.

7) This agreement shall be interpreted by China EM Technology Limited.

EMHEATER®

Product Certification

Products Name: Frequency Inverter

Products Model: EM15 series

Production Date: Reference product label

QC Test: 

The manufacture, assembly and performance of this product have been tested and passed the factory quality standards and are allowed to leave the factory.

EMHEATER

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