Operation Manual

Goodrive100-01 series inverter special for PV water pumps

Preface

Goodrive100-01 special inverters are developed for the power supply of water pumps based on the core control algorithm of Goodrive high performance inverters and the control requirements of PV water pumps. The function of Maximum power tracking, dormant at weak light, wake up at strong light, high water level dormant, underload pre-warning and other control protection functions can ensure normal operation of water pumps according to the customers' requirements to switch to the grid power supply.

Please refer to this manual and the manual of Goodrive100 to commission the inverter.

If the product is ultimately used for military affairs or manufacture of weapon, it will be listed on the export control formulated by ***Foreign Trade Law of the People's Republic of China***. Rigorous review and necessary export formalities are needed when exported.

Our company reserves the right to update the information of our products.

Contents

1 Safety Precautions

Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the inverter. If ignored, physical injury or death may occur, or damage may occur to the devices.

If any physical injury or death or damage to the devices occurs for ignoring to the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

1.1 Safety definition

Danger:	Serious physical injury or even death may occur if not follow relevant requirements
Warning:	Physical injury or damage to the devices may occur if not follow relevant requirements
Note:	Physical hurt may occur if not follow relevant requirements
Qualified electricians:	People working on the device should take part in professional electrical and safety training, receive the certification and be familiar with all steps and requirements of installing, commissioning, operating and maintaining the device to avoid any emergency.

1.2 Warning symbols

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Following warning symbols are used in this manual:

Symbols	Name	Instruction	Abbreviation
⚡ Danger	Danger	Serious physical injury or even death may occur if not follow the relative requirements	⚡
⚠ Warning	Warning	Physical injury or damage to the devices may occur if not follow the	⚠

Symbols	Name	Instruction	Abbreviation
		relative requirements	
⚠ Do not	Electrostatic discharge	Damage to the PCBA board may occur if not follow the relative requirements	⚠
⚠ Hot sides	Hot sides	Sides of the device may become hot. Do not touch.	⚠
Note	Note	Physical hurt may occur if not follow the relative requirements	Note

1.3 Safety guidelines

⚡	◇ Only qualified electricians are allowed to operate on the inverter. ◇ Do not carry out any wiring and inspection or changing components when the power supply is applied. Ensure all input power supply is disconnected before wiring and checking and always wait for at least the time designated on the inverter or until the DC bus voltage is less than 36V. Below is the table of the waiting time:

Inverter module		Minimum waiting time
380V	0.75kW-15kW	5 minutes

⚠	◇ Do not refit the inverter unauthorized; otherwise fire, electric shock or other injury may occur.
⚠	◇ The base of the radiator may become hot during running. Do not touch to avoid hurt.
⚠	◇ The electrical parts and components inside the inverter are electrostatic. Take measurements to avoid electrostatic discharge during relevant operation.

1.3.1 Delivery and installation

⚠	◇ Please install the inverter on fire-retardant material and keep the inverter away from combustible materials. ◇ Connect the braking optional parts (braking resistors, braking units or

	feedback units) according to the wiring diagram.
	✧ Do not operate on the inverter if there is any damage or components loss to the inverter.
	✧ Do not touch the inverter with wet items or body, otherwise electric shock may occur.

Note:

✧   Select appropriate moving and installing tools to ensure a safe and normal running of the inverter and avoid physical injury or death. For physical safety, the erector should take some mechanical protective measurements, such as wearing exposure shoes and working uniforms.

✧   Ensure to avoid physical shock or vibration during delivery and installation.

✧   Do not carry the inverter by its cover. The cover may fall off.

✧   Install away from children and other public places.

✧   The inverter cannot meet the requirements of low voltage protection in IEC61800-5-1 if the sea level of installation site is above 2000m.

✧   The leakage current of the inverter may be above 3.5mA during operation. Ground with proper techniques and ensure the grounding resistor is less than 10Ω. The conductivity of PE grounding conductor is the same as that of the phase conductor (with the same cross sectional area).

✧   R, S and T are the input terminals of the power supply, while U, V and W are the motor terminals. Please connect the input power cables and motor cables with proper techniques; otherwise the damage to the inverter may occur.

1.3.2 Commissioning and running

⚡	✧ Disconnect all power supplies applied to the inverter before the terminal wiring and wait for at least the designated time after disconnecting the power supply.
	✧ High voltage is present inside the inverter during running. Do not carry out any operation except for the keypad setting.
	✧ The inverter may start up by itself when P01.21=1. Do not get close to the inverter and motor.

| | ✧ The inverter can not be used as "Emergency-stop device". |
| | ✧ The inverter can not be used to break the motor suddenly. A mechanical braking device should be provided. |

Note:

✧ Do not switch on or off the input power supply of the inverter frequently.

✧ For inverters that have been stored for a long time, check and fix the capacitance and try to run it again before utilization (see Maintenance and Hardware Fault Diagnose).

✧ Cover the front board before running, otherwise electric shock may occur.

1.3.3 Maintenance and replacement of components

	✧ Only qualified electricians are allowed to perform the maintenance, inspection, and components replacement of the inverter.
⚡	✧ Disconnect all power supplies to the inverter before the terminal wiring. Wait for at least the time designated on the inverter after disconnection.
	✧ Take measures to avoid screws, cables and other conductive matters to fall into the inverter during maintenance and component replacement.

Note:

✧ Please select proper torque to tighten screws.

✧ Keep the inverter, parts and components away from combustible materials during maintenance and component replacement.

✧ Do not carry out any isolation and pressure test on the inverter and do not measure the control circuit of the inverter by megameter.

1.3.4 What to do after scrapping

| ⚠ | ✧ There are heavy metals in the inverter. Deal with it as industrial effluent. |

2 Product overview

2.1 Product specifications

Functions		Specifications
Input	Input AC voltage (V)	AC 3PH 380V (-15%) ~440V (+10%)
	Recommended DC bus voltage	350~750 VDC
	Input current (A)	Refer to the rated value
	Input frequency (Hz)	50Hz or 60Hz Allowed range: 47~63Hz
Output	Output voltage (V)	0~ the input voltage
	Output current (A)	Refer to the rated value
	Output power (kW)	Refer to the rated value
	Output frequency (Hz)	0~400Hz
Control	Control mode	SVPWM, SVC
	Motor type	Asynchronous motor
	Speed ratio	Asynchronous motor 1:100 (SVC)
	Speed control accuracy	±0.2%(SVC)
	Speed fluctuation	± 0.3%(SVC)
	Torque response	<20ms(SVC)
	Torque control accuracy	10%(SVC)
	Starting torque	0.25Hz/150%(SVC)
	Overload capability	150% of rated current: 1 minute 180% of rated current: 10 seconds 200% of rated current: 1 second
Running control	Frequency setting method	Digital setting, analog setting, pulse frequency setting, multi-step speed running setting, simple PLC setting, PID setting, MODBUS communication setting

Functions		Specifications
		Shift between the set combination and set channel.
	Auto-adjustment of the voltage	Keep a stable voltage automatically when the grid voltage transients
	Fault protection	Provide over 30 fault protection functions: overcurrent, overvoltage, undervoltage, overheating, phase loss and overload, etc.
	Special functions for PV water pumps	Maximum power tracking, pre-warning at weak light, auto wake up at strong light, pre-warning when full water, auto wake up at low water level, underload pre-warning and fault protection of water level sensor, when pre-warning, the inverter is in stand-by.
Peripheral interface	Terminal analog input resolution	≤20mV
	Terminal switch input resolution	≤2ms
	Analog input	1 (AI2) 0~10V/0~20mA and 1 (AI3) -10~10V
	Analog output	2 (AO1, AO2) 0~10V /0~20mA
	Digital input	4 common inputs, the Max. frequency: 1kHz, internal impedance: 3.3kΩ; 1 high speed input, the Max. frequency: 50kHz
	Relay output	2 programmable relay output RO1A NO, RO1B NC, RO1C common terminal RO2A NO, RO2B NC, RO2C common terminal Contactor capability: 3A/AC250V
Others	Keypad	External (can be 30m)
	Mountable mode	Wall mountable and flange mountable
	Temperature of the	-10~50℃, derate above 40℃

Functions		Specifications
	running environment	
	Average non-fault time	2 years (25℃ ambient temperature)
	Protective degree	IP20
	Cooling	Air-cooling
	Braking unit	Embedded
	EMC filter	Built-in C3 filter: meet the degree requirement of IEC61800-3 C3 Optional external filter: meet the degree requirement of IEC61800-3 C2

2.2 Name plate
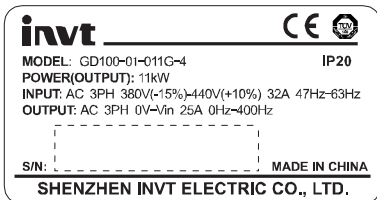
Note: Above is an example of name plates of Goodrive100-01 standard products. CE\TUV\IP20 will be marked on the name plate according to actual certifications.

2.3 Model instruction

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

$$\underline{\text{GD100-01}} - \underline{\text{5R5G}} - \underline{\text{4}}$$
$$①\qquad\qquad②\qquad③$$

Field identification	Sign	Detailed description of the sign	Detailed content
Product abbreviation	①	Product abbreviation	Goodrive100-01 is abbreviated as GD100-01 Goodrive100-01: special for PV water pumps
Rated power	②	Power range + Load type	5R5-5.5kW G——Constant torque load
Voltage degree	③	Voltage degree	4：AC 3PH 380V (-15%)~440V(+10%)

2.4 Rated specifications

GD100-01-XXXX-4	0R7G	1R5G	2R2G	004G	5R5G	7R5G	011G	015G
Rated output power(kW)	0.75	1.5	2.2	4	5.5	7.5	11	15
Maximum DC input current (A)	4.2	6.1	7.1	16.5	23.9	30.6	39.2	49.0
Rated input current(A)	3.4	5.0	5.8	13.5	19.5	25	32	40
Rated output current(A)	2.5	3.7	5	9.5	14	18.5	25	32

Note: the output current is the rated value when the output voltage is 380V. If the output voltage is 400V, 415V and 440V, the output current can be calculated.

2.5 Terminals, wiring and dimension diagram

2.5.1 Wiring diagram of the control circuit
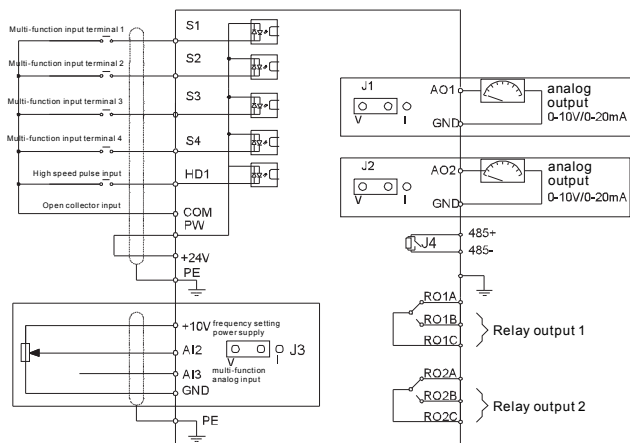
2.5.2 Terminals arrangement
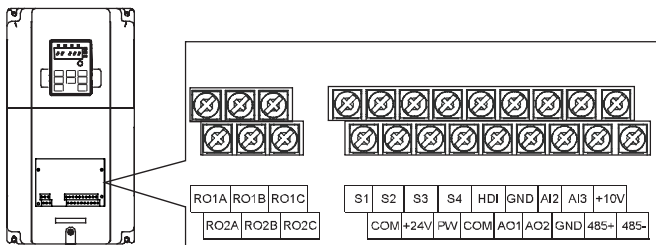
2.5.3 Terminals description

Terminal name	Description
RO1A	RO1 relay output, RO1A NO, RO1B NC, RO1C common terminal
RO1B	Contactor capability:3A/AC250V，1A/DC30V

Terminal name	Description	
RO1C		
RO2A	RO2 relay output, RO2A NO, RO2B NC, RO2C common terminal	
RO2B	Contactor capability:3A/AC250V	
RO2C		
+10V	Local power supply +10V	
AI2	1. Input range: AI2 voltage and current can be chose: 0~10V/0~20mA; AI3 can be shifted by J3 , -10V~+10V	
AI3	2. Input impedance: voltage input: 20kΩ; current input: 500Ω	
	3. Resolution: the minimum one is 5mV when 10V corresponds to 50Hz	
	4. Deviation ±1%, 25℃	
GND	+10V reference null potential	
AO1	1. Output range:0~10V or 0~20mA	
AO2	2. The voltage or the current output is depended on the jumper	
	3. Deviation±1%,25℃	
PE	Grounding terminal	
PW	Provide the input switch working power supply from external to internal. Voltage range: 12~24V	
24V	The inverter provides the power supply for users with a maximum output current of 200mA	
COM	+24V common terminal	
S1	Switch input 1	1. Internal impedance:3.3kΩ
S2	Switch input 2	2. 12~30V voltage input is available
S3	Switch input 3	3. The terminal is the dual-direction input terminal supporting both NPN and PNP
S4	Switch input 4	4. Max input frequency:1kHz
		5. All are programmable digital input terminal. User can set the terminal function through function codes.
HDI	Except for S1~S4, this terminal can be used as high frequency input	

Terminal name	Description
	channel.
	Max. input frequency:50kHz
485+	485 communication interface and 485 differential signal interface
485-	If it is the standard 485 communication interface, please use twisted pairs or shield cable.

2.5.4 Dimension drawings

Wall installation
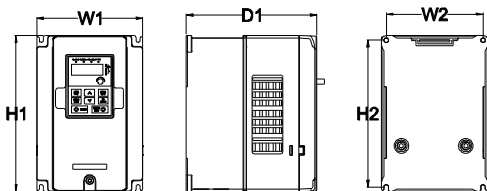
Power	W1	W2	H1	H2	D1	Installation hole
0.75kW~2.2kW	126.0	115.0	186.0	175.0	155.0	5
4kW~5.5kW	146.0	131.0	256.0	243.5	167.0	6
7.5kW~15kW	170.0	151.0	320.0	303.5	196.3	6

3 Function parameters

For the convenience of function codes setting, the function group number corresponds to the first level menu, the function code corresponds to the second level menu and the function code corresponds to the third level menu.

1. Below is the instruction of the function lists:

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

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

The third column "Detailed illustration of parameters": detailed illustration of the function parameters;

The forth column "Default": original factory settings of the parameters;

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

"○": means the set value of the parameter can be modified on stop and running state;

"◎": means the set value of the parameter can not be modified on the running state;

"●": means the value of the parameter is the real detection value which can not be modified;

"◆": means the function code is hidden.

(In order to avoid mistakes, the modify attribute of each parameter is limited by the inverter)

3.1 Parameters of common functions

Function code	Name	Detailed illustration of parameters	Default	Modify
P00 Group Basic function group				
P00.00	Speed control mode	0: Sensorless vector control mode 0 No need to install encoders. Suitable in applications which need low frequency, big torque for high accuracy of rotating speed and torque control. Relative to mode 1, it is more suitable for the	2	◎

Functi on code	Name	Detailed illustration of parameters	Default	Mo dif y
		applications which need small power. 1: Sensorless vector control mode 1 1 is suitable in high performance cases with the advantage of high accuracy of rotating speed and torque. It does not need to install pulse encoder. 2:SVPWM control 2 is suitable in applications which do not need high control accuracy, such as the load of fan and pump. One inverter can drive multiple motors.		
P00.01	Run command channel	Select the run command channel of the inverter. The control command of the inverter includes: start, stop, forward/reverse rotating, jogging and fault reset. 0:Keypad running command channel("LOCAL/REMOT" light off) Carry out the command control by RUN, STOP/RST on the keypad. Set the multi-function key QUICK/JOG to FWD/REVC shifting function (P07.02=3) to change the running direction; press **RUN** and **STOP/RST** simultaneously in running state to make the inverter coast to stop. 1:Terminal running command channel ("LOCAL/REMOT" flickering) Carry out the running command control by the forward rotation, reverse rotation and forward jogging and reverse jogging of the multi-function	0	○
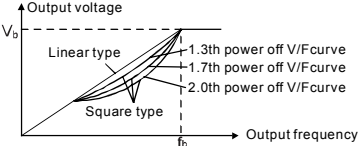
Function code	Name	Detailed illustration of parameters	Default	Modify
		terminals 2:Communication running command channel ("LOCAL/REMOT" on)： The running command is controlled by the upper monitor via communication		
P00.03	Max. output frequency	This parameter is used to set the maximum output frequency of the inverter. Users need to pay attention to this parameter because it is the foundation of the frequency setting and the speed of acceleration and deceleration. Setting range: P00.04~400.00Hz	50.00Hz	◎
P00.04	Upper limit of the running frequency	The upper limit of the running frequency is the upper limit of the output frequency of the inverter which is lower than or equal to the maximum frequency. Setting range:P00.05~P00.03 (Max. output frequency)	50.00Hz	◎
P00.05	Lower limit of the running frequency	The lower limit of the running frequency is that of the output frequency of the inverter. The inverter runs at the lower limit frequency if the set frequency is lower than the lower limit. **Note:** Max. output frequency ≥ Upper limit frequency ≥ Lower limit frequency Setting range:0.00Hz~P00.04 (Upper limit of the running frequency)	0.00Hz	◎
P00.11	ACC time 1	ACC time means the time needed if the inverter speeds up from 0Hz to the Max. output frequency (P00.03).	Depend on model	○
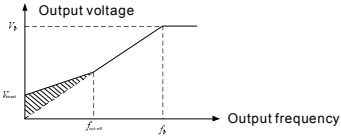
Function code	Name	Detailed illustration of parameters	Default	Modify
P00.12	DEC time 1	DEC time means the time needed if the inverter speeds down from the Max. Output frequency to 0Hz (P00.03). Goodrive100 series inverters have four groups of ACC/DEC time which can be selected by P05. The factory default ACC/DEC time of the inverter is the first group. Setting range of P00.11 and P00.12:0.0~3600.0s	Depend on model	○
P00.13	Running direction selection	0: Runs at the default direction, the inverter runs in the forward direction. FWD/REV indicator is off. 1: Runs at the opposite direction, the inverter runs in the reverse direction. FWD/REV indicator is on. Modify the function code to shift the rotation direction of the motor. This effect equals to the shifting the rotation direction by adjusting either two of the motor lines (U, V and W). The motor rotation direction can be changed by QUICK/JOG on the keypad. Refer to parameter P07.02. **Note:** When the function parameter comes back to the default value, the motor's running direction will come back to the factory default state, too. In some cases it should be used with caution after commissioning if the change of rotation direction is disabled. 2: Forbid to run in reverse direction: It can be used in some special cases if the reverse running is disabled.	0	○

Function code	Name	Detailed illustration of parameters	Default	Modify
P00.15	Motor parameter autotuning	0:No operation 1:Rotation autotuning Comprehensive motor parameter autotune. It is recommended to use rotation autotuning when high control accuracy is needed. 2:Static autotuning It is suitable in the cases when the motor can not de-couple form the load. The antotuning for the motor parameter will impact the control accuracy. 3: Static autotuning 2 (No autotuning for non-load current and mutual inductance)	0	◎
P00.18	Function restore parameter	0:No operation 1:Restore the default value 2:Clear fault records **Note:** The function code will restore to 0 after finishing the operation of the selected function code. Restoring to the default value will cancel the user password, please use this function with caution.	0	◎
P01 Group Start-up and stop control				
P01.08	Stop mode	0: Decelerate to stop: after the stop command becomes valid, the inverter decelerates to reduce the output frequency during the set time. When the frequency decreases to 0Hz, the inverter stops. 1: Coast to stop: after the stop command becomes valid, the inverter ceases the output immediately. And the load coasts to stop at the mechanical inertia.	1	○
P01.18	Operation	0: The terminal running command is invalid when	0	○

Function code	Name	Detailed illustration of parameters		Default	Modify
	protection	powering on. 1: The terminal running command is valid when powering on.			
P01.21	Restart after power off	0: Disabled 1: Enabled,		0	○
P02 Group Motor 1 parameters					
P02.01	Rated power of asynchronous motor	0.1~3000.0kW	Set the parameter of the asynchronous motor. In order to ensure the controlling performance,	Depend on model	◎
P02.02	Rated frequency of asynchronous motor	0.01Hz~P00.03	set the P02.01~P02.05 according to the name plate of the asynchronous motor.	50.00Hz	◎
P02.03	Rated speed of asynchronous motor	1~36000rpm	Goodrive100 series inverters provide the function of parameter autotuning. Correct	Depend on model	◎
P02.04	Rated voltage of asynchronous motor	0~1200V	parameter autotuning comes from the correct setting of the motor name plate.	Depend on model	◎
P02.05	Rated current of asynchronous motor	0.8~6000.0A	In order to ensure the controlling performance, please configure the motor according to the standard principles, if the	Depend on model	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
		gap between the motor and the standard one is huge, the features of the inverter will decrease. Note: Reset the rated power of the motor (P02.01), initialize the motor parameter of P02.02~P02.10.		
P02.06	Stator resistor of asynchronous motor	0.001~65.535Ω	Depend on model	○
P02.07	Rotor resistor of asynchronous motor	0.001~65.535Ω	After finish the motor parameter autotuning, the set value of P02.06~P02.10 will renew automatically. These parameters are basic parameters controlled by vectors which directly impact the features. Note: Users cannot modify the parameters freely.	Depend on model	○
P02.08	Leakage inductance of asynchronous motor	0.1~6553.5mH		Depend on model	○
P02.09	Mutual inductance of asynchronous motor	0.1~6553.5mH		Depend on model	○
P02.10	Non-load current of	0.1~6553.5A		Depend on	○

Function code	Name	Detailed illustration of parameters		Default	Modify
	asynchronous motor			model	
P04 Group SVPWM control					
P04.00	V/F curve setting	These function codes define the V/F curve of Goodrive100 motor 1 to meet the need of different loads. 0:Straight line V/F curve；applying to the constant torque load 1:Multi-dots V/F curve 2:1.3th power low torque V/F curve 3:1.7th power low torque V/F curve 4:2.0th power low torque V/F curve Curves 2~4 apply to the torque loads such as fans and water pumps. Users can adjust according to the features of the loads to get the best performance. 5:Customized V/F(V/F separation); in this mode, V can be separated from f and f can be adjusted through the frequency given channel set by P00.06 or the voltage given channel set by P04.27 to change the feature of the curve. **Note:** V_b in the below picture is the motor rated voltage and f_b is the motor rated frequency.		4	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
P04.01	Torque boost	Torque boost to the output voltage for the features of low frequency torque. P04.01 is for the Max. output voltage Vb.	0.0%	○
P04.02	Torque boost close	P04.02 defines the percentage of closing frequency of manual torque to fb. Torque boost should be selected according to the load. The bigger the load is, the bigger the torque is. Too big torque boost is inappropriate because the motor will run with over magnetic, and the current of the inverter will increase to add the temperature of the inverter and decrease the efficiency. When the torque boost is set to 0.0%, the inverter is automatic torque boost. Torque boost threshold: below this frequency point, the torque boost is valid, but over this frequency point, the torque boost is invalid. The setting range of P04.01:0.0%:(automatic) 0.1%~10.0% The setting range of P04.02:0.0%~50.0%	20.0%	○
P04.09	V/F slip compensation gain	This function code is used to compensate the change of the rotation speed caused by load during compensation SVPWM control to improve the rigidity	100.0%	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		of the motor. It can be set to the rated slip frequency of the motor which is counted as below: $\triangle f=fb-n*p/60$ Of which, fb is the rated frequency of the motor, its function code is P02.01; n is the rated rotating speed of the motor and its function code is P02.02; p is the pole pair of the motor. 100.0% corresponds to the rated slip frequency$\triangle f$. Setting range:0.0~200.0%		
P05 Group Input terminals				
P05.00	HDI input selection	0: HDI is high pulse input. See P05.49~P05.54 1:HDI is switch input	0	◎
P05.01	S1 terminals function selection	0: No function 1: Forward rotation operation 2: Reverse rotation operation	1	◎
P05.02	S2 terminals function selection	3: 3-wire control operation 4: Forward jogging 5: Reverse jogging	4	◎
P05.03	S3 terminals function selection	6: Coast to stop 7: Fault reset 8: Operation pause	7	◎
P05.04	S4 terminals function selection	9: External fault input …… 42: PV disabled	0	◎
P05.09	HDI terminals function selection	43: PV voltage reference (optional for grid power supply) 44~63: Reserved	0	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
P05.10	Polarity selection of the input terminals	0x000~0x10F	0X000	◎
P05.49	Reserved	Reserved	0	◆
P05.50	Lower limit frequency of HDI	0.00kHz~P05.52	0.00kHz	○
P05.51	Corresponding setting of HDI low frequency setting	-100.0%~100.0%	0.0%	○
P05.52	Upper limit frequency of HDI	P05.50~50.00kHz	50.00 kHz	○
P05.53	Corresponding setting of upper limit frequency of HDI	-100.0%~100.0%	100.0%	○
P05.54	HDI frequency input filter time	0.000s~10.000s	0.100s	○
P06 Group Output terminals				

Function code	Name	Detailed illustration of parameters	Default	Modify
P06.03	Relay RO1 output selection	0:Invalid 1:In operation 2:Forward rotation operation	1	○
P06.04	Relay RO2 output selection	3:Reverse rotation operation 4: Jogging operation 5:The inverter fault 6:Frequency degree test FDT1 7:Frequency degree test FDT2 8:Frequency arrival 9:Zero speed running 10:Upper limit frequency arrival 11:Lower limit frequency arrival 12:Ready for operation 13:Pre-magnetizing 14:Overload pre-alarm 15: Underload pre-alarm 16:Completion of simple PLC stage 17:Completion of simple PLC cycle 18:Setting count value arrival 19:Defined count value arrival 20:External fault valid 21: Reserved 22:Running time arrival 23:MODBUS communication virtual terminals output 24~30:Reserved	5	○
P08 Group　Enhanced functions				
P08.28	Times of fault reset	0~10	0	○

Function code	Name	Detailed illustration of parameters	Default	Modify
P08.41	Overmodulation selection	LED ones 0: Invalid 1: Valid LED tens 0: Light overcommission; 1: Heavy overcommission	01	◎

3.2 Parameters of special functions

Function code	Name	Detailed illustration of parameters	Default	Modify
P11 Group Protective parameters				
P11.01	Frequency-decreasing at sudden power loss	0.00~1.00 (If the voltage degree is 400V, 0.85 corresponds to 460V)	0.85	◎
P11.02	Frequency decreasing ratio at sudden power loss	0.00Hz~P00.03/s Setting range: 0.00Hz/s~P00.03 (the Max. frequency) After the power loss of the grid, the bus voltage drops to the sudden frequency-decreasing point, the inverter begin to decrease the running frequency at P11.02, to make the inverter generate power again. The returning power can maintain the bus voltage to ensure a rated running of the inverter until the recovery of power.	10.00Hz/s	○
P15 Group Special functions for PV inverters				
P15.00	PV inverter selection	0: Invalid 1: Enable 0 means the function is invalid and the group of parameters can not be used 1 means the function is enabled, and P15 parameters can be adjusted	0	◎
P15.01	Vmpp voltage reference	0: Voltage reference 1: Max. power tracking 0 means to apply voltage reference mode. The reference is a fixed value and given by P15.02.	1	◎

Functi on code	Name	Detailed illustration of parameters	Default	Mo dif y
		1 means to apply the reference voltage of Max. power tracking. The voltage is changing until the system is stable. No matter what kind of reference voltage is applied, if the bus voltage is higher than reference voltage, the target frequency will change to the upper limit of PI output frequency and if the bus voltage is lower than the reference voltage, the target frequency will change to the lower limit of PI output frequency. Note: If terminal 43 is valid, the function is invalid.		
P15.02	Vmpp voltage keypad reference	0.0~6553.5Vdc If P15.01 is 0, the reference voltage is given by P15.02.	530.0V	○
P15.03	PI control deviation	0.0~100.0% (100.0% corresponds to P15.02) If the ratio percentage of bus voltage to reference voltage, which is abs(bus voltage-reference voltage)*100.0%/ reference voltage, if the value exceeds the deviation limit of P15.03, PI adjustment is available, otherwise, there is no PI adjustment and the value is defaulted to be 0.0% Abs: the absolute value	0.0%	○
P15.04	Upper frequency of PI output	P15.05~100.0%(100.0% corresponds to P00.03) P15.04 is used to limit the Max. value of target frequency, 100.0% corresponds to P00.03. After PI adjustment, the target frequency can not exceed the upper limit.	100.0%	○
P15.05	Lower	0.0%~P15.04(100.0% corresponds to P00.03)	20.0%	○

Functi on code	Name	Detailed illustration of parameters	Default	Mo dif y
	frequency of PI output	P15.05 is used to limit the Min. value of target frequency, 100.0% corresponds to P00.03. After PI adjustment, the target frequency can not exceed the lower limit.		
P15.06	KP1	0.00~100.00 The proportion coefficient 1 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	1.00	○
P15.07	KI1	0.00~100.00 The integral coefficient 1 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	1.00	○
P15.08	KP2	0.00~100.00 The proportion coefficient 2 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	4.00	○
P15.09	KI2	0.00~100.00 The integral coefficient 2 of the target frequency The bigger the value is, the stronger the effect and faster the adjustment is.	4.00	○
P15.10	PI switching point	0.0~6553.5Vdc If the absolute value of bus voltage minus the reference value is bigger than P15.10, it will switch to P15.08 and P15.09; otherwise it is P15.06 and P15.07.	50.0V	○
P15.11	Water level control	0: Invalid 1: AI1	0	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
		2: AI2 3: AI3 The function is invalid if select 0. 1~3 is the reference from the simulating signal source of water level control. After selecting the simulating signal source, P15.12, P15.13, P15.14 and P15.15 are valid.		
P15.12	Water level threshold	0.0~100.0% If the simulating signal is less than the water level threshold and keep in the state after the delay time set by P15.13, report A-tF and dormant. If the time is not reached, the signal is bigger than the water level threshold; the time will be cleared automatically. When the signal time is shorter than the water level threshold time, the time will be counted again.	25.0%	○
P15.13	Full water delay	0~10000s Time setting of full water delay	60s	○
P15.14	Non-water delay	0~10000s Time setting of non-water delay. In the full water pre-warning, if the detected simulating signal is bigger than the value set by P15.12, it begins to count the delay time. After lasting for the time set by P15.14, the pre-warning will be cleared. Under the condition of non continuous, delay time will be reset automatically.	600s	○
P15.15	Hydraulic	0.0~100.0%	0.0%	○

Functi on code	Name	Detailed illustration of parameters	Default	Mo dif y
	probe damage	0.0%: Invalid. If it is not 0.0%, when the signal is longer than P15.15, it will report tSF fault directly and stop.		
P15.16	Operation time of water pump underload	0.0~1000.0s Set the operation time of underload operation. Under the continuous underload operation, it will report A - LL if the operation time is reached.	60.0s	○
P15.17	Current detection of underload operation	0.0%: Automatic detection 0.1~100.0% If not 0.0%, it is determined by the inverter. If it is not 0.0%, it is determined by P15.17. 100.0% corresponds to the rated motor current. If the target frequency and the absolute value of the ramp frequency is less than or equal to P15.19, and the current is less than P15.17, after the time set by P15.16, it will report underload fault; otherwise, it will operate normally. If the state is not continuous, the delay counting will be cleared automatically.	0.0%	○
P15.18	Underload reset delay	0.0~1000.0s Underload reset delay The operation time and reset time are counted at the same time during underload, and it is bigger than P15.16 generally to ensure underload pre-warning will be reported. After the time set by P15.18-P15.16, it will reset. If the value is the same as P15.16, it will reset when report underload pre-warning.	120.0s	○

Function code	Name	Detailed illustration of parameters	Default	Modify
P15.19	Lag frequency threshold	0.00~200.00Hz P15.19 is the lag frequency for the analysis of underload operation. If the target frequency and the absolute value of the ramp frequency is less than or equal to P15.19, the current will be compared.	0.30Hz	○
P15.20	Delay time of weak light	0.0~3600.0s Delay time of weak light If the output frequency is less than or equal to the lower limit of PI output frequency and the state lasts for the set value, it will report A-LS and dormant. If the state is not continuous, the delay counting will be cleared automatically. Note: If the bus voltage is lower than +50.0V, it will report directly and no need to wait for the set time.	100.0s	○
P15.21	Delay time of wake-up at weak light	0.0~3600.0s Delay time of wake-up at weak light After the delay time, the pre-warning time of weak light will be cleared and operate again.	300.0s	○
P15.22	Reference voltage display	0.0~2000.0V	0	●
P15.23	Mini voltage reference of Max. power tracking	0.0~P15.24 Valid in MPPT Max. tracking voltage, the Mini. tracked voltage Track in the range of P15.23~P15.24. P15.24 needs to be bigger than P15.23. The less the difference, the faster the tracking is. But the Max.	500.0V	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		voltage needs to be in the range. P15.23 and P15.24 can be adjusted according to site operation.		
P15.24	Max. voltage reference of Max. power tracking	P15.23~6553.5Vdc Valid in MPPT Max. tracking voltage, the Max. tracked voltage	600.0V	○

Remark:

1. The time when the inverters operated to the lower limit of PI output frequency after starting is determined by the ACC time.

2. The instruction of delay time. If various delay conditions such as weak light, full water, and underload are met, the inverter will count the delay time respectively. After the separated delay time is arrived, it will report pre-warning and others are still kept. If the pre-warning is restored, but other conditions for delay are still existent, it will count after the precious time. So if the some pre-warning condition is not met, the pre-warning time will be cleared.
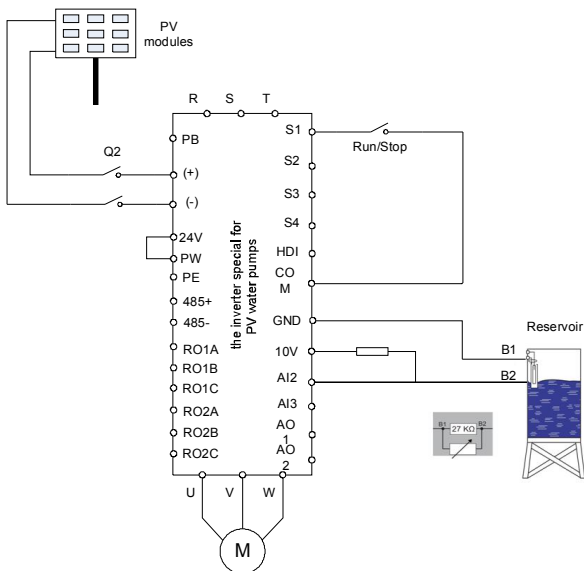
4 Commissioning guide

4.1 Wiring and commissioning steps

4.1.1 Commissioning steps during power supply

1. Wire according to the diagram and check the wiring is correct or not and then switch on Q2.

2. Set the motor parameters

(a) Set P00.18=1 and restore to the factory settings.

(b) Set P00.01=0 and change the command to keypad control.

(c) Set the name plate of the motor, including P02.01, P02.02, P02.03, P02.04 and P02.05 (remember to press "ENT" after setting).

3. Detection of water yield for water pumps

Set the lower limit of output frequency P00.05=6.00Hz, stop mode P01.08=1 and coast to

stop.

And then, set P15.00=1 to enable the special functions for water pumps, click "Run" key and the default mode is MPPT, observe the running frequency and water yield. If the operation frequency or water yield is low at normal light, the motor wires may be reserved, so it is necessary to exchange the wiring.

4. PI adjustment to the water yield

If the user requires large or low water yield, it is necessary to adjust PI (P15.06~P15.10) properly. The bigger PI parameters, the stronger the effect is, but the frequency fluctuation of the motor is bigger; in reserve, the lower the water yield is, the more stable the motor frequency is.

5. Commissioning of MPPT speed tracking

P15.23 and P15.24 is the minimum and maximum voltage of the power tracking in MPPT mode. If the voltage range is smaller, the faster the tracking is. But the bus voltage in normal operation needs to be in the range; otherwise the maximum power can not be tracked. Generally:

(a) If the rated motor voltage is 415V, P15.23=520(minimum reference voltage), P15.24=600(maximum reference voltage).

(b) If the rated motor voltage is 380V, P15.23=500(minimum reference voltage), P15.24=550(maximum reference voltage).

(c) If the rated motor voltage is 220V, P15.23=270(minimum reference voltage), P15.24=330(maximum reference voltage).

Above settings are only for reference.

6. Fault setting and reset time setting of fault delay

If the pre-warning of weak light, full water and underload are needed, it is necessary to set the detection point, delay time and reset time according to the actual working. Full water/no water settings are P15.11~P15.14; the function settings of underload are P15.16~P15.19; the function settings of weak light are P15.20~P15.21. Default settings can be used, too.

7. Parameters setting after normal operation

If the water yield is normal and the system operation is stable, the commissioning is finished. Set P00.01=1, switch to terminal mode and set P01.18=1, P01.21=1 and

P08.28=5.

Note: 0.85 of P11.01 corresponds to 460V. The coefficient can be modified, but can not be modified to below 0.65 (0.65 corresponds to undervoltage point 350V, so it may report undervoltage fault if the actual bus voltage is less than the value).

4.1.2 Commissioning steps during grid power supply

1. Wire according to the diagram and check the wiring is correct or not
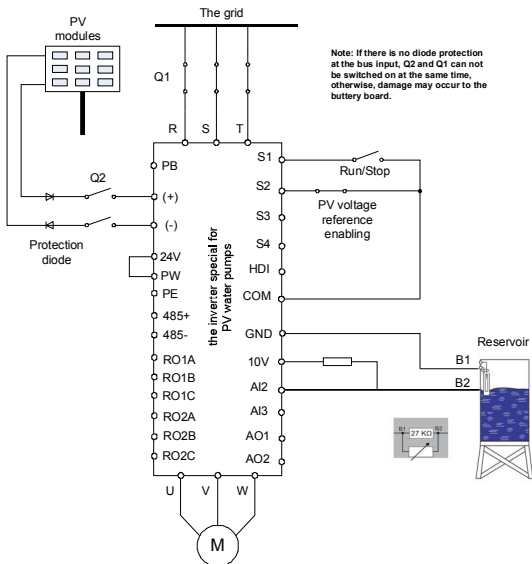
Switch off Q2 and then switch on Q1.

2. After the power frequency, commission the system according to steps 2, 3, 4, 6 and 7 mentioned in 3.1.1.

3. Set P5.02=43 and then switch on S2 (or set P15.01=0) to enable the PV voltage reference.

4. Observe the bus voltage and set P15.02 to ensure the value is less than the bus voltage during operation. The bigger the value is, the bigger the water yield is. It is recommended to use the voltage value which is 20~30V less than the bus voltage in normal operation.

5. Switch off Q1 and S2 and switch on Q2 to switch to PV power supply.

Note: If there is no diode protection at the bus input, Q2 and Q1 can not be switched on at the same time, otherwise, damage may occur to the buttery board.

5 Fault instruction

5.1 Common faults and solutions

Fault code	Fault type	Possible cause	Solutions
OUt1	IGBT Ph-U fault	1. The acceleration is too fast. 2. IGBT module fault. 3. The connection of the driving wires is not good, 4. Grounding is not properly.	1. Increase Acc time. 2. Change the power unit. 3. Check the driving wires. 4. Inspect external equipment and eliminate interference.
OUt2	IGBT Ph-V fault		
OUt3	IGBT Ph-W fault		
OC1	Over-current when acceleration	1. The acceleration or deceleration is too fast. 2. The voltage of the grid is too low. 3. The power of the inverter is too low. 4. The load transients or is abnormal. 5. The grounding is short circuited or the output is phase loss. 6. There is strong external interference.	1. Increase the ACC time 2. Check the input power 3. Select the inverter with a larger power 4. Check if the load is short circuited (the grounding short circuited or the wire short circuited) or the rotation is not smooth. 5. Check the output configuration. 6. Check if there is strong interference.
OC2	Over-current when deceleration		
OC3	Over-current when constant speed running		
OV1	Over-voltage when acceleration	1. The input voltage is abnormal. 2. There is large energy feedback.	1. Check the input power 2. Check if the DEC time of the load is too short or the inverter starts during the rotation of the motor or it needs to increase the energy consumption
OV2	Over-voltage when deceleration		
OV3	Over-voltage when constant speed running		

Fault code	Fault type	Possible cause	Solutions
			components.
UV	DC bus Under-voltage	The voltage of the power supply is too low.	Check the input power of the supply line
OL1	Motor overload	1. The voltage of the power supply is too low. 2. The motor setting rated current is incorrect. 3. The motor stall or load transients is too strong.	1. Check the power of the supply line 2. Reset the rated current of the motor 3. Check the load and adjust the torque lift
OL2	Inverter overload	1. The acceleration is too fast 2. Reset the rotating motor 3. The voltage of the power supply is too low. 4. The load is too heavy. 5. Close loop vector control, reverse direction of the code panel and long low-speed operation	1. Increase the ACC time 2. Avoid the restarting after stopping. 3. Check the power of the supply line 4. Select an inverter with bigger power. 5. Select a proper motor.
OL3	Electrical overload	The inverter will report overload pre-alarm according to the set value.	Check the load and the overload pre-alarm point.
SPI	Input phase loss	Phase loss or fluctuation of input R,S,T	1. Check input power 2. Check installation distribution
SPO	Output phase loss	U,V,W phase loss input(or serious asymmetrical three phase of the load)	1. Check the output distribution 2. Check the motor and cable

Fault code	Fault type	Possible cause	Solutions
OH1	Rectify overheat	1. Air duct jam or fan damage 2. Ambient temperature is too high. 3. The time of overload running is too long.	1. Refer to the overcurrent solution 2. Redistribute dredge the wind channel or change the fan 3. Low the ambient temperature
OH2	IGBT overheat		4. Check and reconnect 5. Change the power 6. Change the power unit 7. Change the main control panel
EF	External fault	SI external fault input terminals action	Check the external device input
CE	Communication error	1. The baud rate setting is incorrect. 2. Fault occurs to the communication wiring. 3. The communication address is wrong. 4. There is strong interference to the communication.	1. Set proper baud rate 2. Check the communication connection distribution 3. Set proper communication address. 4. Chang or replace the connection distribution or improve the anti-interference capability.
ItE	Current detection fault	1. The connection of the control board is not good 2. Assistant power is bad 3. Hoare components is broken	1. Check the connector and repatch 2. Change the Hoare 3. Change the main control panel

Fault code	Fault type	Possible cause	Solutions
		4. The modifying circuit is abnormal.	
tE	Autotuning fault	1. The motor capacity does not comply with the inverter capability 2. The rated parameter of the motor does not set correctly. 3. The offset between the parameters from autotune and the standard parameter is huge 4. Autotune overtime	1. Change the inverter mode 2. Set the rated parameter according to the motor name plate 3. Empty the motor load. 4. Check the motor connection and set the parameter. 5. Check if the upper limit frequency is above 2/3 of the rated frequency.
EEP	EEPROM fault	1. Error of controlling the write and read of the parameters 2. Damage to EEPROM	1. Press STOP/RST to reset 2. Change the main control panel
PIDE	PID feedback fault	1. PID feedback offline 2. PID feedback source disappear	1. Check the PID feedback signal 2. Check the PID feedback source
bCE	Braking unit fault	1. Braking circuit fault or damage to the braking pipes 2. The external braking resistor is not sufficient	1. Check the braking unit and , change new braking pipe 2. Increase the braking resistor
ETH1	Grounding shortcut fault 1	1. The output of the inverter is short circuited with the	1. Check if the connection of the motor is normal or

Fault code	Fault type	Possible cause	Solutions
		ground. 2. There is fault in the current detection circuit.	not 2. Change the Hoare 3. Change the main control panel
ETH2	Grounding shortcut fault 2	1. The output of the inverter is short circuited with the ground. 2. There is fault in the current detection circuit.	1. Check if the connection of the motor is normal or not 2. Change the Hoare 3. Change the main control panel
dEu	Velocity deviation fault	1.The load is too heavy or stalled.	1. Check the load and ensure it is normal. Increase the detection time. 2. Check whether the control parameters are normal.
STo	Maladjustment fault	1. The control parameters of the synchronous motors not set properly. 2. The autoturn parameter is not right. 3. The inverter is not connected to the motor.	1. Check the load and ensure it is normal. 2. Check whether the control parameter is set properly or not. 3. Increase the maladjustment detection time.
END	Time reach of factory setting	1. The actual running time of the inverter is above the internal setting running time.	1. Ask for the supplier and adjust the setting running time.
LL	Electronic underload fault	1. The inverter will report the underload pre-alarm according to the set value.	1. Check the load and the underload pre-alarm point.

Fault code	Fault type	Possible cause	Solutions
tSF	Hydraulic probe damage	1. Hydraulic probe damage and the feedback signal wire are not connected well	1.Check the wiring and change the probe
A-LS	Weak light pre-warning	The output frequency is lower than or equal to the lower limit of PI output frequency and keep to reach to the weak light delay time	1.Check the lower limit of PI output and the setting value of delay time
A-LL	Underload pre-warning	1.The water pumps runs at a small load and the operation time reaches the set time	1.Check the water level of the resource and the pre-warning point of underload
A-tF	Full-water pre-warning	1.The feedbacked water level is lower than the threshold and keep it for a certain time	1.Check the pre-warning point of the water level

Table: recommended solar modules

Inverter model	Max DC input current (A)	20±3V		30±3V		36±3V		42±3V	
		Module power ±5Wp	Modules per string * strings	Module power ±5Wp	Modules per string * strings	Module power ±5Wp	Modules per string * strings	Module power ±5Wp	Modules per string * strings
GD100-01-0R7 G-4	4.2	30	29*1	-	-	-	-	-	-
GD100-01-1R5 G-4	6.1	60	30*1	-	-	-	-	-	-
GD100-01-2R2 G-4	7.1	90	30*1	-	-	145	18*1	175	15*1
GD100-01-004 G-4	16.5	85	28*2	220	22*1	140	17*2	160	15*2
GD100-01-5R5 G-4	23.9	-	-	-	-	195	17*2	220	15*2
GD100-01-7R5 G-4	30.6	-	-	215	21*2	175	17*3	200	15*3	300	15*2
GD100-01-011 G-4	39.2	-	-	200	22*3	195	17*4	220	15*4	-	-
GD100-01-015 G-4	49	-	-	205	22*4	200	18*5	240	15*5	300	15*4

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