invt

Operation Manual

BPD Series Solar Pumping Inverter

Preface

BPD series solar pumping inverter 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. All series products apply Infineon power modules. 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 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 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
Single-phase 220V	0.2kW-2.2kW	5 minutes

⚠	◇ Do not refit the inverter unauthorizedly; 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. ◇ Don't operate on the inverter if there is any damage or components loss to the inverter. ◇ Don't 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 pick-up 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).

◇ DC INPUT is the solar input, AC INPUT is the power input and AC OUTPUT is the motor output. Please connect the input power cable and motor cable correctly, otherwise the damage may occur.

◇ Before the cable connection of sing phase AC grid, it is necessary to carry out the

lightning protection, short circuit protection according to the local electrical safety standard.

♦ The distance between the DC output and the DC terminals of the inverter should be shorter than 10 meters; otherwise it is necessary to control the voltage.

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".

Note:
♦ Do not switch on/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.
♦ 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

	BPD0K7TN(AC)	BPD1K5TN(AC)	BPD2K2TN(AC)
DC input			
Maximum input DC bus voltage(V)	450	450	
Starting voltage(V)	80	100	
Minimum working voltage(V)	60	80	
Recommended MPP voltage(V)	80~400	100~400	
Input channel	1:MC4		
Maximum input DC current(A)	9	12	12
Bypass AC input (model supporting mains input)			
Input voltage(Vac)	220/230/240(1PH)(-15%~+10%)		
Input frequency(Hz)	47~63		
AC input terminal	1P2L		
AC output			
Rated power(W)	750	1500	2200
Rated current(A)	5.1(1PH)	10.2(1PH)	14(1PH)
	4.2(3PH)	7.5(3PH)	10(3PH)
Output voltage(Vac)	0~Input voltage		
Output wiring mode	1P2L/2P3L/3P3L		
Output frequency(Hz)	1~400		
Control			
Control mode	V/F		
Motor type	Asynchronous motor		
Others			
Dimension (W/D/H)(mm)	255×300×137	280×300×137	
Weight(Kg)	6.4	7	
Protective degree	IP65		

	BPD0K7TN(AC)	BPD1K5TN(AC)	BPD2K2TN(AC)
Cooling	Natural cooling		
HMI	External LED keypad		
Communication terminal			
External communication	RS485/3 digital input		
Communication interface	Multi-core waterproof connector		
Certification			
Standards	CE; meet the requirement of IEC61800-3 C3		
Operating environment			
Environment temperature	-25~60℃, derate above 45℃		
Altitude	3000m (derate if the sea level is above 2000m)		
Warranty	18 months		

2.2 Name plate

invt Solar Pumping Inverter

Model: BPD0K7TNAC
Power Level: 0.75kW

DC Input
   Vmax. PV: 450V
   MPPT Range: 80V~400V
   Max. Current: 9A

AC Input(-AC)
   Input Voltage: 220V-240V(1PH)
   Input Current: 9.3A
   Frequency: 47Hz-63Hz

AC Output
   Output Voltage: 0V-220V
   Output Current: 5.1A(1PH)/4.2A(3PH)
   Frequency: 1Hz-400Hz

Temperature: -25℃~+60℃
IP level: IP65

CE ☒

Made in China

S/N:

Shenzhen INVT Electric Co., Ltd.

Name plate

2.3 Model instruction

BPD XK TN AC
①   ②   ③ ④

Sign	Field identification	Detailed description of the sign	Detailed content
①	BPD	Product abbreviation	Series of PV water pumps
②	XK	ACoutput power	Max. AC output power 1500W: 1K5 5000W: 5K 150, 000W: 150K
③	TN	Technical type	TL: 1PH TR: 3PH TN: 1PH/3PH
④	AC	Extension digit	Default is standard inverter; AC supports AC input

2.4 Rated specifications

BPDXKXTN	0K7	1K5	2K2
Rated output power(kW)	0.75	1.5	2.2
Maximum DC input current (A)	9	12	12
Rated AC input current-AC model(A)	9.3	15.7	24
Rated output current(A)	5.1	10.2	14

Note: The output current is the rated value when the output voltage is 220V(1PH). If the output voltage is 3PH, the output current can be calculated.

2.5 Terminals, wiring and dimension diagram

2.5.1 Wiring diagram of the control circuit
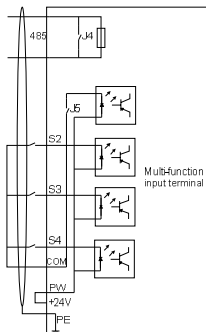
2.5.2 Terminals arrangement
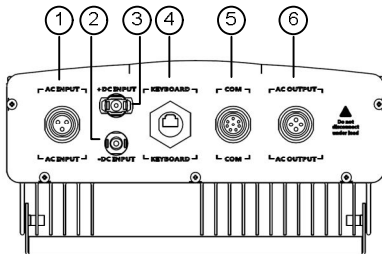
Sign	Terminal name	Pin definition
①	AC input terminal (AC model)	1. L
		2. N
		3. PE
②	PV input terminal-	-DC INPUT
③	PV input terminal+	+DC INPUT
④	External keypad terminal	RJ45
⑤	Function terminal	1. 485+
		2. 485-
		3. S2
		4. S3
		5. COM
		6. S4
		7. COM
		8. PE
⑥	AC output terminal	1. V
		2. W
		3. U
		4. PE

2.5.3 Instruction of power terminals

1. ① is AC input terminal and the model supporting mains input has the terminal. At the grid, the live line, null line and earth line are connected to L, N and PE separately; (Note:

For safety, please ensure PE in reliable connection.)

2. ⑥ is AC output terminal connected to the water pump motor. When using 3PH motor, connect U, V and W of the motor to U, V and W of the inverter. The motor enclosure is connected to PE of ⑥.

3. The wiring is different to the different control modes if the single phase motor is used:

（1）single phase control: Please connect the motor phase to U and W of inverter terminal ⑥, connect the motor shell to PE terminal. There is no need to remove the starting capacitor and the wiring is very easy. But the starting performance is not good and it is only available to some motors.

（2） two phase control: It is necessary to remove the starting capacitor and operation capacitor. The wiring of general motor is as below:，L1 is the running winding， L2 is the starting winding, C1 is the running capacitor, C2 is the starting capacitor when the motor speed exceeds 75% of the rated speed, the starting capacitor is switched off.
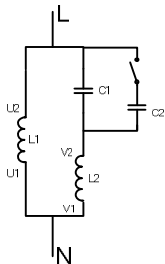
The internal wiring after removing the starting and running capacitor:
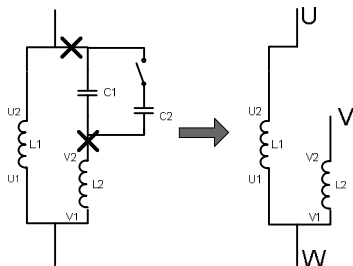
U1 and V1 are the common terminal of the winding, and connect with the W output of the solar inverter, U2 to U output of the solar inverter and V2 to V output of the solar inverter. The operation direction can be changed after voltage phase is changed by the ten bit of P04.34. After the forward direction changing, P00.13 can be used to change the operation direction as the forward and reverse control of three phase motor.

2.5.4 Instruction of communication terminals

Terminal name	Description	
PE	Grounding terminal	
COM	+24V common terminal	
S2	Switch input 2	1. Internal impedance:3.3kΩ 2. 12~30V voltage input is available 3. The terminal is the dual-direction input terminal supporting both NPN and PNP
S3	Switch input 3	4. Max input frequency:1kHz 5. All are programmable digital input terminal. User can set the terminal function through function codes.
S4	Switch input 4	6. S1 is short circuited with COM in the inverter by default and it is not connected externally.
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.	

2.5.5 Dimension drawings
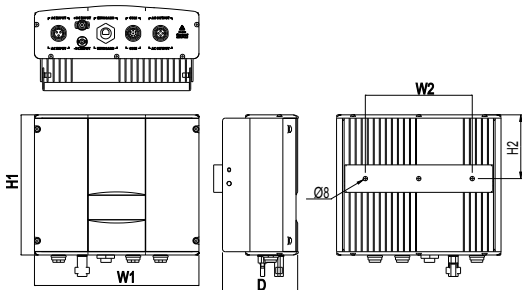
Model	H1 (mm)	W1 (mm)	D (mm)	H2 (mm)	W2 (mm)	Installation hole
BPD0K7TN(AC)	255	300	137	118.5	195	8
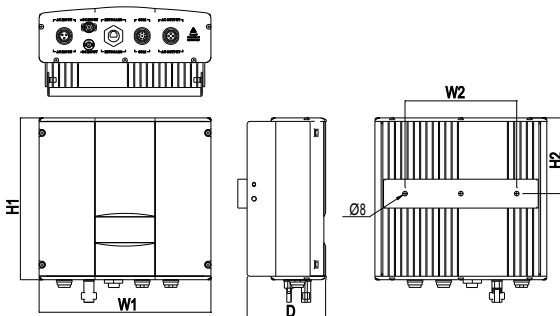
Model	H1 (mm)	W1 (mm)	D (mm)	H2 (mm)	W2 (mm)	Installation hole
BPD1K5TN(AC) BPD2K2TN(AC)	280	300	137	131	195	8

2.6 Keypad Operation Procedure

2.6.1 Keypad instruction

The keypad is used to control solar pumping inverter, read the state data and adjust parameters.
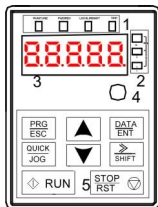
Serial No.	Name		Description
1	State LED	RUN/TUNE	LED off means that the inverter is in the stopping state; LED blinking means the

Serial No.	Name	Description					
			inverter is in the parameter autotune state; LED on means the inverter is in the running state.				
		FWD/REV	FED/REV LED LED off means the inverter is in the forward rotation state; LED on means the inverter is in the reverse rotation state				
		LOCAL/REMOT	LED for keypad operation, terminals operation and remote communication control; LED off means that the inverter is in the keypad operation state; LED blinking means the inverter is in the terminals operation state; LED on means the inverter is in the remote communication control state.				
		TRIP	LED for faults LED on when the inverter is in the fault state; LED off in normal state; LED blinking means the inverter is in the overload pre-alarm state.				
2	Unit LED	Mean the unit displayed currently					
				Hz		Frequency unit	
				A		Current unit	
				V		Voltage unit	
				RPM		Rotating speed unit	
				%		Percentage	
3	Code displaying zone	5-figure LED display displays various monitoring data and alarm code such as set frequency and output frequency.					
		Displayed word	Corresponding word	Displayed word	Corresponding word	Displayed word	Corresponding word
			0		1		2
			3		4		5
			6		7		8
			9		A		B
			C		d		E
			F		H		I
			L		N		n
			o		P		r
			S		t		U

Serial No.	Name	Description				
			v		.	-
4	Digital potentio meter	Corresponds to AI1.				
5	Buttons	PRG ESC	Programm ing key	Enter or escape from the first level menu and remove the parameter quickly		
		DATA ENT	Entry key	Enter the menu step-by-step Confirm parameters		
		▲	UP key	Increase data or function code progressively		
		▼	DOWN key	Decrease data or function code progressively		
		≫ SHIFT	Right-shift key	Move right to select the displaying parameter circularly in stopping and running mode. Select the parameter modifying digit during the parameter modification		
		◇ RUN	Run key	This key is used to operate on the inverter in key operation mode		
		STOP RST ◇	Stop/ Reset key	This key is used to stop in running state and it is limited by function code P07.04 This key is used to reset all control modes in the fault alarm state		
		QUICK JOG	Quick key	The function of this key is confirmed by function code P07.02.		

2.6.2 Keypad displaying

The keypad displaying state of BPD series solar pumping inverter is divided into stopping state parameter, running state parameter, function code parameter editing state and fault alarm state and so on.

2.6.2.1 Displayed state of stopping parameter

When the inverter is in the stopping state, the keypad will display stopping parameters.

In the stopping state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by P07.07. See the instructions of P07.07 for the detailed definition of each bit.

In the stopping state, there are 14 stopping parameters can be selected to be displayed or not. They are: set frequency, bus voltage, input terminals state, output terminals state, PID reference, PID feedback, AI1, AI2 and the current stage of multi-stage speeds, pulse counting value. P07.07 can select the parameter to be displayed or not by bit and ≫ /SHIFT

can shift the parameters form left to right, QUICK/JOG(P07.02=2) can shift the parameters form right to left.

2.6.2.2 Displayed state of running parameters

After the inverter receives valid running commands, the inverter will enter into the running state and the keypad will display the running parameters. RUN/TUNE LED on the keypad is on, while the FWD/REV is determined by the current running direction.

In the running state, there are 22 parameters can be selected to be displayed or not. They are: running frequency, set frequency, bus voltage, output voltage, output torque, PID reference, PID feedback, input terminals state, output terminals state, and the current stage of multi-stage speeds, pulse counting value, AI1, AI2, percentage of motor overload, percentage of inverter overload, linear speed. P07.05 and P07.06 can select the parameter to be displayed or not by bit and 》/SHIFT can shift the parameters form left to right, QUICK/JOG(P07.02=2) can shift the parameters from right to left.

2.6.2.3 Displayed state of fault

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

2.6.2.4 Displayed state of function codes editing

In the state of stopping, running or fault, press PRG/ESC to enter into the editing state (if there is a password, see P07.00).The editing state is displayed on two classes of menu, and the order is: function code group/function code number→function code parameter, press DATA/ENT into the displayed state of function parameter. On this state, press DATA/ENT to save the parameters or press PRG/ESC to escape.
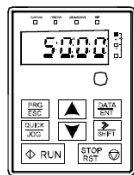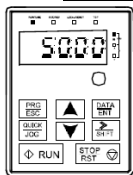
Stopping parameters   Running parameters   Fault display
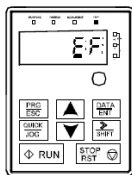
Displayed state

2.6.3 Keypad operation

Operate the inverter via operation panel. See the detailed structure description of function codes in the brief diagram of function codes.

2.6.3.1 How to modify the function codes of the inverter

The solar pumping inverter has three levels menu, which are:

1. Group number of function code (first-level menu)

2. Tab of function code (second-level menu)

3. Set value of function code (third-level menu)

Remarks: Press both the PRG/ESC and the DATA/ENT can return to the second-level menu from the third-level menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-level menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the second-level menu without saving the parameters, and keep staying at the current function code.

Under the third-level menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

1) This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;

2) This function code is not modifiable in running state, but modifiable in stop state.

Example: Set function code P00.01 from 0 to 1.
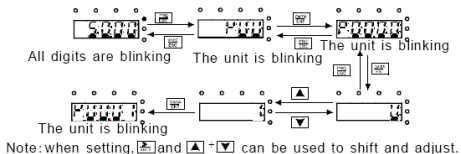
Note: when setting, ▲ and ▲ + ▼ can be used to shift and adjust.

Sketch map of modifying parameters

2.6.3.2 How to set the password of the inverter

BPD series solar pumping inverters provide password protection function to users. Set P7.00 to gain the password and the password protection becomes valid instantly after quitting from the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

Set P7.00 to 0 to cancel password protection function.

The password protection becomes valid instantly after retreating form the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

Note: when setting, ▲ and ▲ + ▼ can be used to shift and adjust.

Sketch map of password setting

2.6.3.3 How to watch the inverter state through function codes

BPD series solar pumping inverters provide group P17 as the state inspection group. Users can enter into P17 directly to watch the state.

Sketch map of state watching
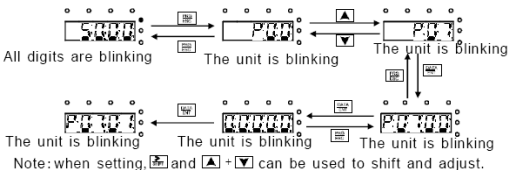
3   Function parameters

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: SVC 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 applications which need small power. 1: SVC 1	2	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
		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 terminals 2:Communication running command channel ("LOCAL/REMOT" on); The running command is controlled by the upper	0	○
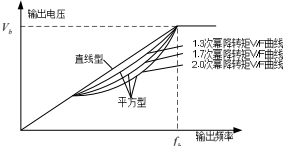
Function code	Name	Detailed illustration of parameters	Default	Modify
		monitor via communication		
P00.03	Max. output frequency	This parameter is used to set the maximum output frequency of the inverter. Users need to pay attention to this parameter because it is the foundation of the frequency setting 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	○
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	Depend on model	○
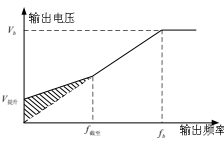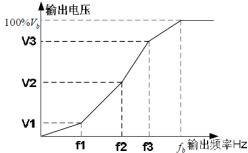
Function code	Name	Detailed illustration of parameters	Default	Modify
		factory default ACC/DEC time of the inverter is the first group. Setting range of P00.11 and P00.12:0.0~3600.0s		
P00.13	Running direction selection	0: Runs at the default direction, the inverter runs in the forward direction. FWD/REV 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. 2: Forbid to run in reverse direction: It can be used in some special cases if the reverse running is disabled.	0	○
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	0	◎

Function code	Name	Detailed illustration of parameters		Default	Modify
		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.			
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 protection	0: The terminal running command is invalid when powering on. 1: The terminal running command is valid when powering on.		1	○
P01.21	Restart after power off	0: Disabled 1: Enabled		1	○
P02 Group　Motor 1 parameters					
P02.00	Motor type	0: 3PH motor 1: 1PH motor		1	◎
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, set the P02.01~P02.05 according to the name plate of the	Depend on model	◎
P02.02	Rated frequency of asynchronous	0.01Hz~P00.03		50.00Hz	◎

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Function code	Name	Detailed illustration of parameters		Default	Modify
	motor		asynchronous motor.		
P02.03	Rated speed of asynchronous motor	1~36000rpm	Pump inverters provide the function of parameter autotuning. Correct parameter autotuning comes from the correct setting of the motor name plate. In order to ensure the controlling performance, please configure the motor according to the standard principles, if the 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.	Depend on model	◎
P02.04	Rated voltage of asynchronous motor	0~1200V		Depend on model	◎
P02.05	Rated current of asynchronous motor	0.8~6000.0A		Depend on model	◎
P02.06	Stator 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	Depend on model	○
P02.07	Rotor resistor of asynchronous motor	0.001~65.535Ω		Depend on model	○

Function code	Name	Detailed illustration of parameters		Default	Modify
P02.08	Leakage inductance of asynchronous motor	0.1~6553.5mH	which directly impact the features. **Note:** Users cannot modify the parameters freely.	Depend on model	○
P02.09	Mutual inductance of asynchronous motor	0.1~6553.5mH		Depend on model	○
P02.10	Non-load current of asynchronous motor	0.1~6553.5A		Depend on model	○
P04 Group	**SVPWM control**				
P04.00	V/F curve setting	These function codes define the V/F curve of BPD series 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		4	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
		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. 		
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.	20.0%	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		 The setting range of P04.01:0.0%:(automatic) 0.1%~10.0% The setting range of P04.02:0.0%~50.0%		
P04.03	V/F frequency point 1	If P04.00 =1, the user can set V//F curve by P04.03~P04.08 V/F is set to the motor load.	0.00Hz	○
P04.04	V/F voltage point 1	**Note: V1＜V2＜V3，f1＜f2＜f3. if the low-frequency voltage is high,**	00.0%	○
P04.05	V/F frequency point 2	**overtemperature and burning may occur and the overcurrent stall and protection may occur**	00.00Hz	○
P04.06	V/F voltage point 2	**to the solar inverter.** 	00.0%	○
P04.07	V/F frequency point 3		00.00Hz	○
P04.08	V/F voltage point 3		00.0%	○
P04.09	V/F slip compensation gain	The setting range of P04.03: 0.00Hz~P04.05 The setting range of P04.04: 0.0%~110.0% (rated voltage of motor1) The setting range of P04.05: P04.03~P04.07 The setting range of P04.06: 0.0%~110.0%(rated voltage of motor1) The setting range of P04.07: P04.05~P02.02(rated frequency of motor1) or P04.05~ P02.16(rated frequency of motor1) The setting range of P04.08: 0.0%~110.0% (rated voltage of motor1)	0.0%	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		This function code is used to compensate the change of the rotation speed caused by load during compensation SVPWM control to improve the rigidity of the motor. It can be set to the rated slip frequency of the motor which is counted as below: $\triangle f=f_b-n*p/60$ Of which, fb is the rated frequency of the motor, its function code is P02.02; n is the rated rotating speed of the motor and its function code is P02.03; p is the pole pair of the motor. 100.0% corresponds to the rated slip frequency $\triangle f$. Setting range:0.0~200.0%		
P04.34	Two-phase control of single phase motor	Ones:two phase control mode 0:Disabled 1:Enabled Tens: Voltage of the secondary winding(V phase) reverse 0:Not reversed 1:Reversed The setting range: 0~0x11	0x10	◎
P04.35	Voltage ratio of V and U	0.00~2.00	1.00	○
P05 Group **Input terminals**				
P05.01	S1 terminals function selection	0: No function 1: Forward rotation operation 2: Reverse rotation operation	0	◎
P05.02	S2 terminals function selection	3: 3-wire control operation 4: Forward jogging 5: Reverse jogging	45	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
P05.03	S3 terminals function selection	6: Coast to stop 7: Fault reset 8: Operation pause	46	◎
P05.04	S4 terminals function selection	9: External fault input 10:Increasing frequency setting(UP) 11:Decreasing frequency setting(DOWN) 12:Cancel the frequency change setting 13:Shift between A setting and B setting 14:Shift between combination setting and A setting 15:Shift between combination setting and B setting 16:Multi-step speed terminal 1 17:Multi-step speed terminal 2 18:Multi-step speed terminal 3 19:Multi- stage speed terminal 4 20:Multi- stage speed pause 21:ACC/DEC time 1 22:ACC/DEC time 2 23:Simple PLC stop reset 24:Simple PLC pause 25:PID control pause 26:Traverse Pause(stop at the current frequency) 27:Traverse reset(return to the center frequency) 28:Counter reset 29:Torque control prohibition 30:ACC/DEC prohibition 31:Counter trigger 32:Reserve 33:Cancel the frequency change setting	0	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
		temporarily		
		34:DC brake		
		35: Reserve		
		36:Shift the command to the keypad		
		37:Shift the command to the terminals		
		38:Shift the command to the communication		
		39:Pre-magnetized command		
		40:Clear the power		
		41:Keep the power		
		42: PV disabled		
		43: PV voltage reference		
		44: Switch between solar input and power frequency input		
		45: Full water signal		
		46: Non-water signal		
		47~63: Reserved		
P05.10	Polarity selection of the input terminals	If the bit is 0, the input terminal is positive; If the bit is 1, the input terminal is negative. BIT4 / BIT3 / BIT2 S4 / S3 / S2 The setting range: 0x000~0x1FF	0X000	◎
P06 Group	**Output terminals**			
P06.03	Relay RO1 output selection	0:Invalid 1:In operation 2:Forward rotation operation	30	○
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	5	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		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-warning		
		15: Underload pre-warning		
		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		
		24~26: Reserved		
		27: Weak light		
		28:Switch between solar input and power frequency input after threshold arrived		
		29:Switch between solar input and power frequency input by teminal input		
		30 :Reserved		
		Note: 30, 29 and 28 are combined into output of one relay. As long as one of two conditions is met, the relay outputs high bit.		
P06.10	Switch on delay of RO1	0.000~50.000s	10.000 s	○

Function code	Name	Detailed illustration of parameters	Default	Modify
P06.11	Switch off delay of RO1	0.000~50.000s	10.000s	○
P06.12	Switch on delay of RO2	0.000~50.000s	0.000s	○
P06.13	Switch off delay of RO2	0.000~50.000s	0.000s	○
P07 Group Human-Machine Interface				
P07.27	Current fault type	0:No fault 1:IGBT U phase protection(OUt1)		●
P07.28	Previous fault type	2:IGBT V phase protection(OUt2) 3:IGBT W phase protection(OUt3)		●
P07.29	Previous 2 fault type	4:OC1 5:OC2 6:OC3		●
P07.30	Previous 3 fault type	7:OV1 8:OV2		●
P07.31	Previous 4 fault type	9:OV3 10:UV		●
P07.32	Previous 5 fault type	11:Motor overload(OL1) 12:The inverter overload(OL2) 13:Input side phase loss(SPI) 14:Output side phase loss(SPO) 15:Overheat of the rectifier module(OH1) 16:Overheat fault of the inverter module(OH2) 17:External fault(EF) 18:485 communication fault(CE) 19:Current detection fault(ItE) 20:Motor antotune fault(tE) 21:EEPROM operation fault(EEP)		●

Function code	Name	Detailed illustration of parameters	Default	Modify
		22:PID response offline fault(PIDE)		
		23:Braking unit fault(bCE)		
		24:Running time arrival(END)		
		25:Electrical overload(OL3)		
		26~31:Reserved		
		32:Grounding short circuit fault 1(ETH1)		
		33:Grounding short circuit fault 2(ETH2)		
		34:Speed deviation fault(dEu)		
		35:Maladjustment(STo)		
		36:Underload fault(LL)		
		37:Hydraulic probe damage(tSF)		
		38:PV reverse connection fault(PINV)		
		39:PV overcurrent(PVOC)		
		40:PV overvoltage(PVOV)		
		41:PV undervoltage(PVLV)		
		Alarm:		
		Weak light pre-warning(A-LS)		
		Underload pre-warning(A-LL)		
		Full water pre-warning(A-tF)		
		Water-empty warning(A-tL)		
P08 Group	**Enhanced functions**			
P08.28	Times of fault reset	0~10	5	○
P08.29	Interval time of automatic fault reset	0.1~3600.0s	10.0s	○

3.2 Parameters of special functions

Function code	Name	Detailed illustration of parameters	Default	Modify
P11 Group	**Protective parameters**			

Function code	Name	Detailed illustration of parameters	Default	Modify
P11.01	Frequency decreasing at sudden power loss	0.00~1.00 (When the voltage degree is 400V, the corresponding power loss frequency down voltage point of 0.85 is 460V.)	0.85	◎
P11.02	Frequency decreasing ratio at sudden power loss	Setting range: 0.00Hz/s~P00.03 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.	2.00 Hz/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	1	◎
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 means to apply the reference voltage of Max. power tracking. The voltage is changing until the system is stable. **Note**: If terminal 43 is valid, the function is invalid.	1	◎
P15.02	Vmpp voltage keypad reference	0.0~6553.5Vdc If P15.01 is 0, the reference voltage is given by P15.02. (During test, reference voltage should be lower than PV input voltage; otherwise, the system	250.0V	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		will run at lower limit of frequency)		
P15.03	PI control deviation	0.0~100.0% (100.0% corresponds to P15.02) If the ratio percentage of real 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 frequency of PI output	0.0%~P15.04(100.0% corresponds to P00.03) 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.	20.0%	○
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.	15.00	○
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.	15.00	○
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	15.00	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		faster the adjustment is.		
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.	15.00	○
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.	20.0V	◎
P15.11	Water level control	0：Digital input of the water-level control 1：AI1(the water-level signal is input through AI1, not supported currently) 2：AI2（the water-level signal is input through AI2） 3：AI3（the water-level signal is input through AI3） If the function code is 0, the water-level signal is control by the digital input. See 45 and 46 functions of S terminal for detailed information. If the full-water signal is valid, the system will report the warning (A-tF) and sleep after the time of P15.13. During the warning, the full-water signal is invalid and the system will clear the warning after the time of P15.14. If the empty-water signal is valid, the system will report the warning (A-tL) and sleep after the time of P15.32. During the warning, the empty-water signal is invalid and the system will clear the warning after the time of P15.33.(the function code of P15.13, P15.14, P15.32, P15.33 is relative to the water-level control) If the function code is 1~3, it is the reference of theater control analog signal. (the function code of P15.12, P15.13, P15.14, P15.15 is relative to the water-level control)	0	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
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. 0 is full water and 1 is no water.	25.0%	○
P15.13	Full water delay	0~10000s Time setting of full water delay	5s	○
P15.14	Wake-up delay when full water	0~10000s The delay time setting. During the full-water warning, if the detected water level signal is higher than the threshold of P15.12, the delay counts, after the time set by P15.14, the warning is cleared. During the non-continuous application, the delay timing will clear automatically.	20s	○
P15.15	Hydraulic probe damage	0.0~100.0% 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.	0.0%	○
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	0.0%: Automatic detection 0.1~100.0%	0.0%	○

Function code	Name	Detailed illustration of parameters	Default	Modify
	operation	If it is 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.		
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	○
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.	100.0s	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		Note: If the PV voltage is lower than software undervoltage point, it will report directly and no need to wait for the set time. If P15.29=0, the system will switch to the power frequency input when the light is weak.		
P15.21	Delay time of wake-up at weak light	0.0~3600.0s Delay time of wake-up at weak light During the weak light warning, if the PV voltage is higher than the starting voltage, after the delay time, the warning will be cleared and it will run again. When P15.29=0, if the PV voltage is higher than P15.31, after the delay time, it will switch to solar input mode.	300.0s	○
P15.22	Initial reference voltage display	0.0~2000.0V		●
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. voltage needs to be in the range. P15.23 and P15.24 can be adjusted according to site operation. The default value depends on model. 0.75kW:80V 1.5kW, 2.2kW:100V	80.0V	○
P15.24	Max. voltage reference of Max. power tracking	P15.23~P15.28 Valid in MPPT Max. tracking voltage, the Max. tracked voltage The default value depends on model.	400.0V	○

Function code	Name	Detailed illustration of parameters	Default	Modify
		0.75kW:400V 1.5kW, 2.2kW:400V		
P15.25	Adjustment of initial reference voltage	0.0~200.0V MPPT begins to change from the reference voltage Initial reference voltage =PV voltage-P15.25	5.0V	○
P15.26	Upper and lower limit time of Vmppt	0.0~10.0s When P15.26 is set to 0.0, the automatic adjustment is invalid. If it is not 0.0, the upper and lower limit of Vmppt will be adjusted automatically after the time set by P15.26. The medium value is the current bus voltage and the limit is P15.27: Maximum / Minimum reference voltage=Current bus voltge±P15.27 and it will update to P15.23 and P15.24 at the same time	0.0s	○
P15.27	Upper and lower limit of Vmppt	20.0~100.0V The adjustment of the upper and lower limit	30.0V	○
P15.28	Maximum value of Vmppt	P15.24~6553.5V The upper limit can not exceed the P15.28 when Vmppt is the maximum value	400.0V	○
P15.29	PV input and power frequency input selection	0:Automatic input 1:Forced power frequency input 2:Forced PV input If the value is 0, the system will switch between PV and power frequency according to the detected PV voltage and threshold; If the value is 1, the system will force to switch to power frequency input; If the value is 2, the system will force to switch to PV input.	2	◎

Function code	Name	Detailed illustration of parameters	Default	Modify
		Note: When the terminal input 44 is valid, the function code will be invalid.		
P15.30	Switch to the threshold of power frequency input	0.0V~P15.31 If PV voltage is lower than the threshold or the light is weak, it can switch to power frequency input through the relay output. (Note: The minimum working voltage of the system is 60V.) If the value is 0, it is invalid The default value depends on model: The value equals to PV starting voltage; PV starting voltage; 0.75kW:80V 1.5kW, 2.2kW:100V	80.0V	○
P15.31	Switch to the threshold of solar input	P15.30~400V If PV voltage is higher than the threshold, after the delay time of P15.21, it can switch to solar input through the relay output. In order to avoid repeated switching, the threshold needs to be higher than the threshold of P15.30. If the value is 0.0, it is invalid The default value depends on model: The value is 20V higher than PV starting voltage; PV starting voltage; 0.75kW:100V 1.5kW, 2.2kW:120V	100.0V	○
P15.32	Empty-water delay	0~10000s The delay time setting	5s	○
P15.33	Wake-up delay of empty-water	0~10000s The delay time setting	20s	○
P17 Group State viewing				
P17.38	Current of the main winding	It is the current of the main winding group when applying capacitance-removing to control the single	0.0A	●

Function code	Name	Detailed illustration of parameters	Default	Modify
	group	phase motor 0.00~100.00A		
P17.39	Current of the secondary winding group	It is the current of the main winding group when applying capacitance-removing to control the single phase motor 0.00~100.00A	0.0A	●
P19 Group Voltage boost				
P19.06	Bus reference voltage	Set the parameter to bus reference voltage at PV input 220.0V~450.0V	330.0V	◎
P19.08	Starting voltage	When PV voltage reaches the starting voltage, boost the circuit. 60.0~200.0 The default value depends on power degree: 0.75kW:80V 1.5kW, 2.2kW:100V	80.0V	◎

Note:

1. The time when the pump 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 Installation guidelines

4.1 Unpacking inspection

Inspect the information of the order and the name plate to ensure the product are the ordered one and no damage to the package. If any problem, contact the supplier as soon as possible.

Packing list of Solar pumping inverter:

	BPD0K7TN(AC)/BPD1K5TN(AC)/BPD2K2TN(AC)
Inverter	1
Installation bracket	1
Operation manual	1
Expansion bolts	3 (M6*60)
DC connector	1
Communication connector	1
AC connector	1(2)
Keypad	1
Network cable	1

4.2 Before installation

4.2.1 Installation place

Select installation place based on the following considerations:

Installation space(mm)
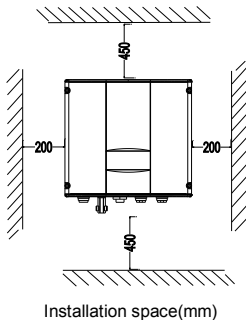
(1) The environment temperature is between -25℃~60℃;

(2) The installation surface should be perpendicular to the horizontal line. Refer to the following figure:
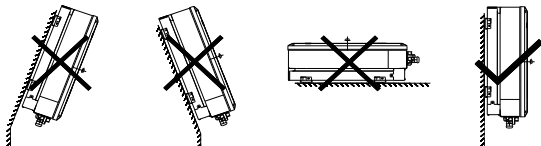
Installation position

4.2.2 Cable specifications

The user can select connection cable according the table below:

Cable specifications

Model	DC side	AC input side	AC output side	Communication cable
	Recommended cross sectional area mm²/ Cable No.	Recommended cross sectional area mm²/ Cable No.	Recommended cross sectional area mm²/ Cable No.	Recommended cross sectional area mm²/ Cable No.
BPD0K7TN(AC)/ BPD1K5TN(AC)/ BPD2K2TN(AC)	**4/AWG 12**	**4/AWG 12**	**2.5/AWG 14**	**0.52/AWG 20**

Recommended crimp tools and insertion and removal tools for cables

	AC input side	AC output side	Communication cable
Crimp tools	**CT-0.14/4**	**CT-0.14/4**	**CT-P20/28**
Insertion and removal tools	RT-2.5	RT-2.5	RT-1.0

4.3 Mechanical installation

It is recommended to install the inverter on the firm wall or metal bracket vertically. Take the typical installation environment as the example, the manual describes how to install the inverter on concrete wall.
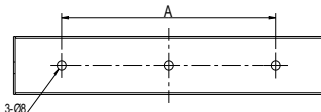
Installation bracket

Size of installation bracket

Model	Installation hole
	A(mm)
BPD0K7TN(AC)/BPD1K5TN(AC)/BPD2K2TN(AC)	195

Installation steps of Solar pumping inverter:

(1) At first, take down the installation bracket from the machine by only removing M5 hex socket cap screws;

(2) Then use expansion bolts to fix the installation bracket at the proper location of the walls;

(3) Lift the inverter to suspend it on the installation bracket through M8 hex socket cap screws;

(4) Finally, fasten M5 hex socket cap screws connecting the inverter with the bracket. For firm installation, the operators cannot release the device until the inverter is installed on the bracket firmly.
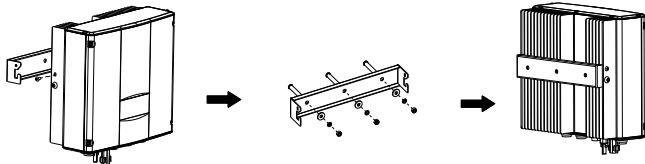
Installation of Solar pumping inverter

4.4 Electrical installation
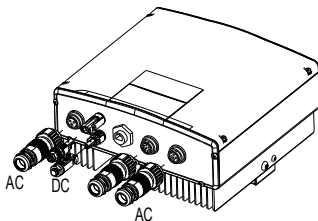
Electrical wiring of the inverter

Steps of electrical connection:

1) If the distance between the solar inverter and the motor is longer than 50 meters, it is recommended to install the output reactor to avoid the frequent overcurrent protection and the motor isolation damage.

2) Connect the DC output, AC input, AC output and the communication wire to the male, and then plug it to the female of the inverter. Tighten up to ensure the proper connection. Press the male as following:

4.4.1 Instruction of the communication terminal

1) Plug the cable into the pin and the stripping length is 5.5mm
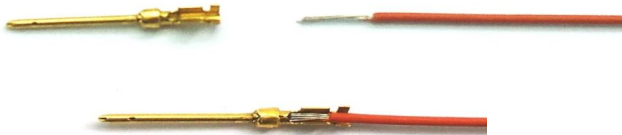
2) Select the corresponding position and note the position of the jaw and contact
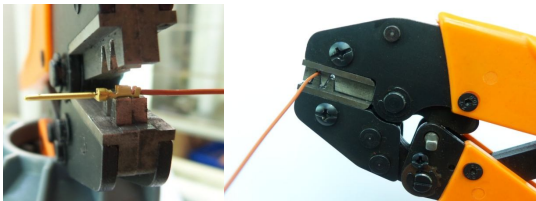
3)   After the pressing, the qualified contactor is finished.
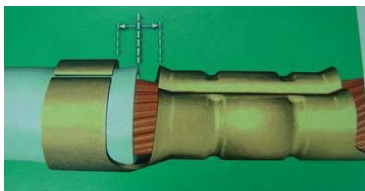
Qualified contactor

Unqualified contactor

4)   The installation of the contactor and the product
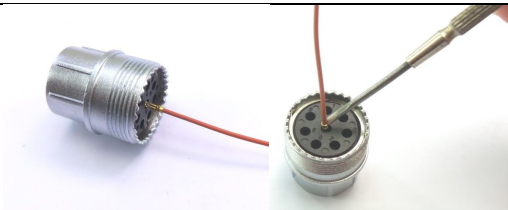
Push directly   Push with tools when the cable is too thin
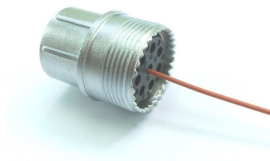
The pushing is finished

5) Pin-removing
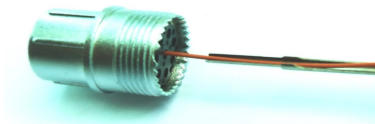
Plug at the cable direction
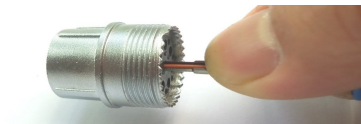
Press the notch with thumb after plugging

Pull out

4.4.2 Installation instruction of AC input and output terminals

1) Plug the cable into the pin and the stripping length is 8mm and the wire core can be saw after plugging

2) Select the corresponding position and note the position of the jaw and contact

3) After the pressing, the qualified contactor is finished.
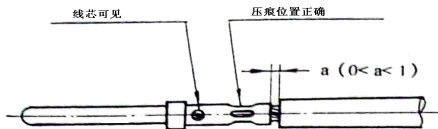
4) The installation of the contactor and the product

Push directly   Push with tools when the cable is too thin

5)   Pin-removing

Plug at the cable direction

Push vertically

Shell separation of the contactor

4.5 Inspection before operation

Check as follows before operation:

(1) Detect the voltage of the components is in the allowable input voltage range of the inverter;

(2) If applying mains supply, detect the voltage of AC wiring port at AC input side is in the

allowable voltage range of the grid;

(3) Check the inverter is in good grounding;

(4) Ensure all DC inputs or AC inputs in power-off state before connecting the cables to the inverter;

(5) Ensure all electrical safety precautions are clearly-identified on the installation site;

(6) Confirm the external keypad is in correct connection.

4.6 Instruction of LEDs

Displayed state	Instruction
Green LED flickering	The inverter has been power-on and control circuit is working.
Green LED on	The inverter is running.
Yellow LED on	The inverter alarms and it will restart after alarm clearing.
Red LED on	The inverter has fault.

5 Commissioning guidelines

5.1 Commissioning steps during power supply

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

Q2.
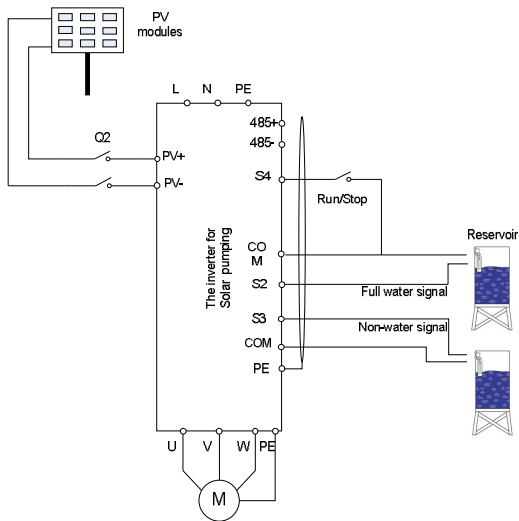
2. Set the motor parameters

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

(b) Set P02.00 to 0 3PH motor and 1 1PH motor. It is necessary to set P04.34=0x01 if the

single phase motor whose capacitor is removed during the two phase motor control；.

(c) Set the name plate of the motor, including P02.01, P02.02, P02.03, P02.04 and P02.05

(the maximum setting of P02.04 is 200V for the single phase motor whose capacitor is

removed).

3. Detect water yield for water pumps

Click "Run" key, observe the running frequency and water yield. If the running frequency or

water yield is low at normal light, the motor wires may be reversed, it is necessary to set P00.13=1 or exchange the wiring of the motor. The operation direction of single phase motor whose capacitor is removed can only be changed by function code.

4. Set operation mode

If the water yield is normal and the system runs stably, set operation mode.

(a) Automatic operation: set P00.01=1, P05.01=1;

(b) Manual operation: set P00.01=1, P05.01=0 and P05.04=1, select S4 as start-up and stop control terminal, as shown in above wiring diagram, the system can run only when the user switches on S4.

5.2 Commissioning steps during grid power supply

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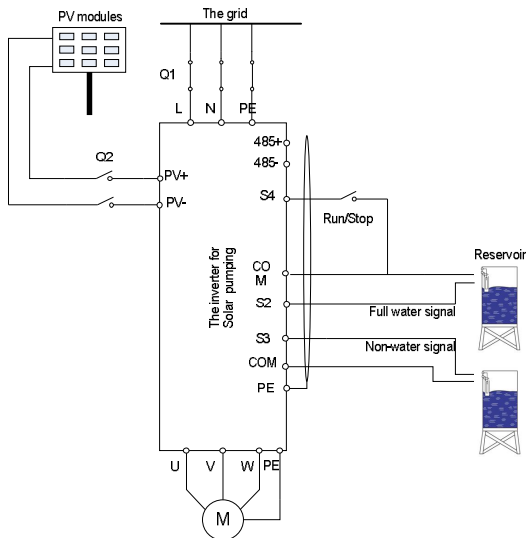
Switch off Q2 and then switch on Q1.

2. Set the motor parameters

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

  (b) Set P02.00 to 0 3PH motor and 1 1PH motor. It is necessary to set P04.34=0x01 if the single phase motor whose capacitor is removed during the two phase motor control.

(c) Set the name plate of the motor, including P02.01, P02.02, P02.03, P02.04 and P02.05 (the maximum setting of P02.04 is 200V for the single phase motor whose capacitor is removed).

3. Set P15.29=1.

4. Detect water yield for water pumps

Click "Run" key, observe the running frequency and water yield. If the running frequency or water yield is low at normal light, the motor wires may be reversed, it is necessary to set P00.13=1 or exchange the wiring of the motor. The operation direction of single phase motor whose capacitor is removed can only be changed by function code.

5. Set operation mode

If the water yield is normal and the system runs stably, set operation mode.

(a) Automatic operation: set P00.01=1, P05.01=1;

(b) Manual operation: set P00.01=1, P05.01=0 and P05.04=1, select S4 as start-up and stop control terminal, as shown in above wiring diagram, the system can run only when the user switches on S4.

5.3 Commissioning steps during automatic switching between PV and grid power supply

  1. Connect as the system diagram and switch on Q1 and Q2.
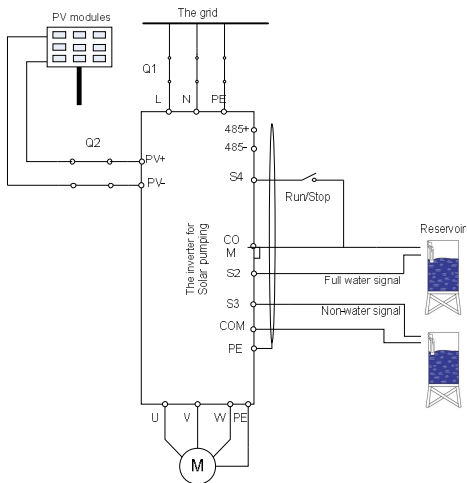
2. Set the motor parameters

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

  (b) Set P02.00 to 0 3PH motor and 1 1PH motor. It is necessary to set P04.34=0x01 if the single phase motor whose capacitor is removed during the two phase motor control.

(c) Set the name plate of the motor, including P02.01, P02.02, P02.03, P02.04 and P02.05 ((the maximum setting of P02.04 is 200V for the single phase motor whose capacitor is removed).

3. Set P15.29=0.

4. Detect water yield for water pumps

Click "Run" key, observe the running frequency and water yield. If the running frequency or water yield is low at normal light, the motor wires may be reversed, it is necessary to set P00.13=1 or exchange the wiring of the motor. The operation direction of single phase motor whose capacitor is removed can only be changed by function code.

5. Set operation mode

If the water yield is normal and the system runs stably, set operation mode.

(a) Automatic operation: set P00.01=1, P05.01=1;

(b) Manual operation: set P00.01=1, P05.01=0 and P05.04=1, select S4 as start-up and stop control terminal, as shown in above wiring diagram, the system can run only when the user switches on S4.

5.4 Advanced setting

Note: The default setting of the inverter for water pump can apply to most conditions and the advanced setting is unnecessary.

1. 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.

2. 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) 0.75kW: P15.23=80(Min. reference voltage), P15.24=400(Max. reference voltage)

(b)1.5kW, 2.2kW: P15.23=10(Min. reference voltage), P15.24=400(Max. reference voltage)

Above settings are only for reference and can be adjusted according to the actual applications or by automatic adjustment.

3. Fault setting and reset time setting of fault delay

If the pre-warning of weak light, full water, empty 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 , P15.32~P15.33; 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.

Note: P11.01 frequency decreasing at sudden power loss 0.85 corresponds to 265V. The user is allowed to modify the coefficient (≥0.58) according to needs (the corresponding undervoltage point of 0.58 is 180V, undervoltage fault when the actual bus voltage is lower

than the value).

4. Special setting for single phase motor

(a)When the single phase motor is in bad running performance, the user can adjust P04 VF curve setting, set P04.00=1 and set P04.03~P04.08 to appropriate values according to commissioning conditions; increase the voltage if the motor can not start and decrease the voltage if the current is high.

(b)When the light is normal and the system starts slowly, increase P15.25 initial voltage differential value appropriately.

(c)For the single phase motors with two-phase control (capacitor-removing):

①the maximum voltage needs to be less than 1/1.6 of the bus voltage. It is recommended to set the rated voltage less than 200V, P02.04=200V, or limit the maximum voltage output by multi-dot V/F curve;

②observe the current of the winding group through P17.38 and P17.39, the switched current is the combination current of the two winding groups. The impedance of the winding group is different, so the current is different at the same voltage output.

③ P04.35 can be used to change the output current of the main and secondary winding group. The qualified people are recommended to adjust; otherwise the motor performance may be impacted.

5.5 Flow chart of the commissioning

```
                              ┌─────────┐
                              │  Start  │
                              └─────────┘
                                   │
                    ┌──────────────────────────────┐
                    │ Power up the BPD              │
                    │ inverter after the wiring     │
                    │ is checked to be okay         │
                    └──────────────────────────────┘
                                   │
                            ┌─────────────┐
                            │  P00.18=1   │
                            └─────────────┘
                                   │
               ┌──────────┐  N  ┌──────────────┐  N
               │ 3-phase  │────▶│ Single-phase │────▶
               │  pump    │     │ pump whose   │
               │  motor   │     │ capacitors   │
               └──────────┘     │ can be       │
                    │ Y         │ removed?     │
                    │           └──────────────┘
                    │                 │ Y
            ┌─────────────┐   ┌───────────────┐   ┌─────────────┐
            │  P02.00=0   │   │ P02.00=1,     │   │  P02.00=1   │
            │             │   │ P04.34=0x0    │   │             │
            │             │   │ 1             │   │             │
            └─────────────┘   └───────────────┘   └─────────────┘
                    │                 │                 │
            ┌─────────────┐   ┌───────────────┐   ┌─────────────┐
            │ Set pump    │   │ Set pump      │   │ Set pump    │
            │ motor       │   │ motor         │   │ motor       │
            │ parameters  │   │ parameters    │   │ parameters  │
            └─────────────┘   └───────────────┘   └─────────────┘
                    │                 │                 │
                    │         ┌───────────────┐         │
                    │         │ P02.04=200    │         │
                    │         └───────────────┘         │
                    │                 │                 │
                    └─────────────────┴─────────────────┘
                                   │
               ┌──────────┐  N  ┌──────────┐  N
               │ PV Input │────▶│ AC Input │────▶
               │  Only?   │     │  Only?   │
               └──────────┘     └──────────┘
                    │ Y              │ Y              │
            ┌─────────────┐   ┌─────────────┐   ┌──────────────┐
            │  P15.29=2   │   │  P15.29=1   │   │ PV/AC Auto   │
            │             │   │             │   │ switch:      │
            │             │   │             │   │ P15.29=0     │
            └─────────────┘   └─────────────┘   └──────────────┘
                    │                 │                 │
                    └─────────────────┴─────────────────┘
                                   │
                          ┌──────────────┐
                          │ Hit "Run" on │
                          │ Keypad       │
                          └──────────────┘
                                   │
                         ┌──────────┐  N  ┌─────────────┐
                         │ Water    │────▶│  P00.13=1   │
                         │ pumping  │     └─────────────┘
                         │ status   │
                         │ okay?    │
                         └──────────┘
                              │ Y
                    ┌──────────┐  N  ┌────────────────────┐
                    │ Run      │────▶│ Run manually:      │
                    │ automa-  │     │ P00.01=1, P05.01=0,│
                    │ tically? │     │ P05.04=1, Close S4 │
                    └──────────┘     └────────────────────┘
                         │ Y                   │
            ┌──────────────────────┐           │
            │ P00.01=1, P05.01=1   │           │
            └──────────────────────┘           │
                         │                      │
                         └──────────┬───────────┘
                                    │
                              ┌─────────┐
                              │   End   │
                              └─────────┘
```

5.6 Simple parameters setting

Solar power supply			Grid power supply			Automatic switching		
Three phase motor	Single phase motor	Single phase motor (capacitor-removing)	Three phase motor	Single phase motor	Single phase motor (capacitor-removing)	Three phase motor	Single phase motor	Single phase motor (capacitor-removing)
P00.18=1	P00.18=1	P00.18=1	P00.18=1	P00.18=1	P00.18=1	P00.18=1	P00.18=1	P00.18=1
P02.00=0	P02.00=1	P02.00=1	P02.00=0	P02.00=1	P02.00=1	P02.00=0	P02.00=1	P02.00=1
P02.01= rated power	P02.01= rated power	P02.01= rated power	P02.01= rated power	P02.01= rated power	P02.01= rated power	P02.01= rated power	P02.01= rated power	P02.01= rated power
P02.02= rated frequency	P02.02= rated frequency	P02.02= rated frequency	P02.02= rated frequency	P02.02= rated frequency	P02.02= rated frequency	P02.02= rated frequency	P02.02= rated frequency	P02.02= rated frequency
P02.03= rated speed	P02.03= rated speed	P02.03= rated speed	P02.03= rated speed	P02.03= rated speed	P02.03= rated speed	P02.03= rated speed	P02.03= rated speed	P02.03= rated speed
P02.04= rated voltage	P02.04= rated voltage	P02.04= 200	P02.04= rated voltage	P02.04= rated voltage	P02.04= 200	P02.04= rated voltage	P02.04= rated voltage	P02.04= 200
P02.05= rated current	P02.05= rated current	P02.05= rated current	P02.05= rated current	P02.05= rated current	P02.05= rated current	P02.05= rated current	P02.05= rated current	P02.05= rated current
P15.29=2	P15.29=2	P15.29=2	P15.29=1	P15.29=1	P15.29=1	P15.29=0	P15.29=0	P15.29=0
P00.01=1	P00.01=1	P04.34= 0x01	P00.01=1	P00.01=1	P04.34= 0x01	P00.01=1	P00.01=1	P04.34= 0x01
P05.01=1	P05.01=1	P00.01=1 P05.01=1	P05.01=1	P05.01=1	P00.01=1 P05.01=1	P05.01=1	P05.01=1	P00.01=1 P05.01=1

Table: recommended solar modules

Inverter model	Max DC input current (A)	Open-circuit voltage degree of solar module							
		30±1V		37±1V		45±1V		38±1V (Mono-Crystalline Silicon)	
	(A)	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
BPD0K7TN(AC)	9	190	4*1	250	3*1	300	3*1	-	-
BPD1K5TN(AC)	12	190	8*1	250	6*1	300	5*1	-	-
BPD2K2TN(AC)	12	190	12*1	250	9*1	300	8*1	275	8*1

Note: because of the low efficiency, the 2.2kW model can be configured at most of 3.1kW solar modules, 1.5kW model at most of 2.1kW and 0.75kW at most of 1kW for more water yield. Different water pumps have different water yield.

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