Solar PV Water Pump Controller
WLD280 Series User Manual

GUANGZHOU BEDFORD ELECTRIC EQUIPMENT CO., LTD.

V1.0.1

PREFACE

Thanks for choosing our product, we will supply you with considerate service as well as ever.

WLD280 is a solar pump controller which is special designed for solar photovoltaic pump to replace battery with retain water. Solar pump controller receives the DC produced from solar modules and transfer into AC to directly drive all kinds of three-phase pump. WLD280 also supports optional WLD280-PV/ACX power switch box to realize automatic switching between solar photovoltaic and city power, namely solar photovoltaic DC input or city power AC input can be selected by user, to achieve 24-hour operation without manual monitoring. Adopted advanced MPPT technology, with various protection functions such as auto-sleep,over-voltage, under-voltage,and so on, WLD280 is widely used in many applications,such as agriculture, irrigation in orchard, water tower's supply of water, etc.

This product has the characteristics of high quality, multi-function, low noise, strong universality, etc.:

- Adopting advanced MPPT technology, make full used of the power generation efficiency of Solar cell array;
- Support photovoltaic/city two kinds of power source independent selection and automatic switching;
- It can automatically adjust the water flow along with the intensity of sunlight;
- Automatic sleep when on high-water level and automatic restart when on low-water level to realize automatic control though water level;
- Water shortage protection: prevent pump from dry running when there no water;
- It can also enter automatically sleep mode when the intensity of sunlight is weak (e.g. the sunset.), as well as can exit the sleep mode when the intensity of sunlight is becoming strong (e.g. the sun rise);
- With various protection functions, improve the reliability of whole system and special designed for water user, it is widely used on various application and easy operation.

CONTENTS

1 SAFETY PRECAUTIONS

Please read the operation manual carefully before using to keep your safety and make sure proper operation.

In this manual, the safety precautions were sorted to “WARNING” and “CAUTION”.

WARNING: Wrong using may result in death or serious personal injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury or equipment damage. This can also be used as a warning against unsafe operations.

WARNING
● Work on the controller's components/systems by untrained and qualified personnel or failure to comply with the relevant provisions of the WARNING may result in serious personal injury or substantial property damage. Only certified and qualified personnel trained in the design, installation, commissioning and operation of the equipment are permitted to work on this device/system. ● Input power cables are only permitted to be permanently fastened and the unit must be reliably earthed. ● he following terminals may carry dangerous voltages even if the controller is inoperative: ● power terminals R, S, T, (+), (-) ● Connect terminals U, V, W of the motor ● After the power switch is disconnected, you must wait 5 minutes for the controller to discharge before allowing installation operations to begin. ● The minimum cross-sectional area of the grounding conductor must be equal to or greater than the cross-sectional area of the supply power cable.

CAUTION
● Bracket base to lift the cabinet, do not grab the panel to lift it when moving the controller, otherwise the main unit may fall; ● May cause personal injury; ● Always mount the controller on a flame retardant material (e.g. metal), otherwise it may cause a fire; ● If more than two controllers are installed in one cabinet, it is necessary to install a cooling fan and control the air temperature below 45° C. Otherwise, overheating may cause fire or damage to the unit.

2 SPECIFICATION

2.1 Output 3AC 220V

Maximum input DC voltage	400VDC
Recommended DC input voltage range	220VDC~370VDC
Recommended input working voltage	305VDC
The number of Input port	1
Rated output voltage	AC 220V
Cooling method	Air cooling
altitude	This controller should be installed with altitude of lower than 1000m. It will be degraded when the altitude higher than 1000m. For details, rated output current should be degraded 1% for every 100m.
Standard	CE

2.2 Output 3AC 380V

Maximum input DC voltage	800VDC
Recommended DC input voltage range	420VDC~720VDC
Recommended input working voltage	540VDC
The number of Input port	1
Rated output voltage	3AC 380V
Cooling method	Air cooling
altitude	This controller should be installed with altitude of lower than 1000m. It will be degraded when the altitude higher than 1000m. For details, rated output current should be degraded 1% for every 100m.
Standard	CE

2.3 Description of Name Plate

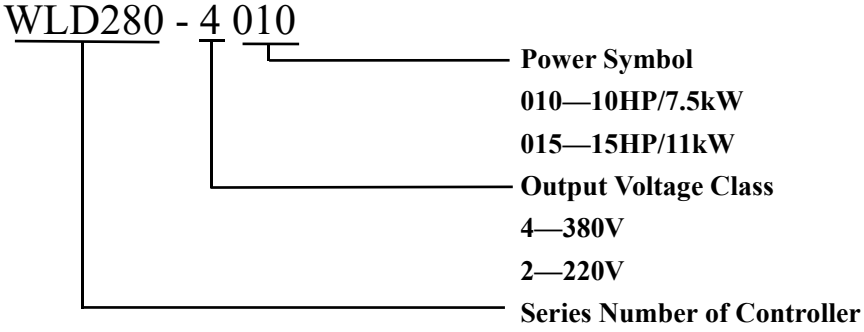


Figure 2.3.1 Nameplate of controller

2.4 Selection Guide

Table 2-4-1 WLD280 List

Model	Rated Output Power (kW)	Rated Input Current (A)	Rated Output Current (A)	Motor Power (kW)
Output 3AC 220V				
WLD280-2001	0.75	7.1	4.5	0.75
WLD280-2002	1.5	11.1	7.0	1.5
WLD280-2003	2.2	15.8	10.0	2.2
WLD280-2004	3.0	18.1	13.0	3.0
WLD280-2005	3.7	23.0	17.0	3.7
WLD280-2007	5.5	32.0	25.0	5.5
WLD280-2010	7.5	40.0	32.0	7.5
WLD280-2015	11.0	56.0	45.0	11.0
WLD280-2020	15.0	70.0	60.0	15.0
WLD280-2025	18.5	80.0	75.0	18.5
WLD280-2030	22.0	97.0	91.0	22.0
WLD280-2040	30.0	125.0	112.0	30.0
WLD280-2050	37.0	155.0	150.0	37.0
WLD280-2060	45.0	178.0	176.0	45.0
WLD280-2075	55.0	210.0	210.0	55.0
Output 3AC 380V				
WLD280-4001	0.75	3.4	2.1	0.75
WLD280-4002	1.5	5.0	3.8	1.5
WLD280-4003	2.2	5.8	5.1	2.2
WLD280-4005	4.0	13.5	9.5	4.0
WLD280-4007	5.5	19.5	14.0	5.5
WLD280-4010	7.5	25.0	18.5	7.5
WLD280-4015	11.0	32.0	25.0	11.0
WLD280-4020	15.0	40.0	32.0	15.0
WLD280-4025	18.5	47.0	38.0	18.5
WLD280-4030	22.0	51.0	45.0	22.0
WLD280-4040	30.0	70.0	60.0	30.0
WLD280-4050	37.0	80.0	75.0	37.0
WLD280-4060	45.0	98.0	92.0	45.0
WLD280-4075	55.0	128.0	115.0	55.0
WLD280-4100	75.0	139.0	152.0	75.0
WLD280-4120	90.0	168.0	180.0	90.0
WLD280-4150	110.0	201.0	215.0	110.0
WLD280-4180	132.0	265.0	260.0	132.0
WLD280-4215	160.0	310.0	305.0	160.0
WLD280-4250	185.0	345.0	340.0	185.0
WLD280-4270	200.0	385.0	380.0	200.0

Please contact company for other specification.

2.5 Description of controller component names

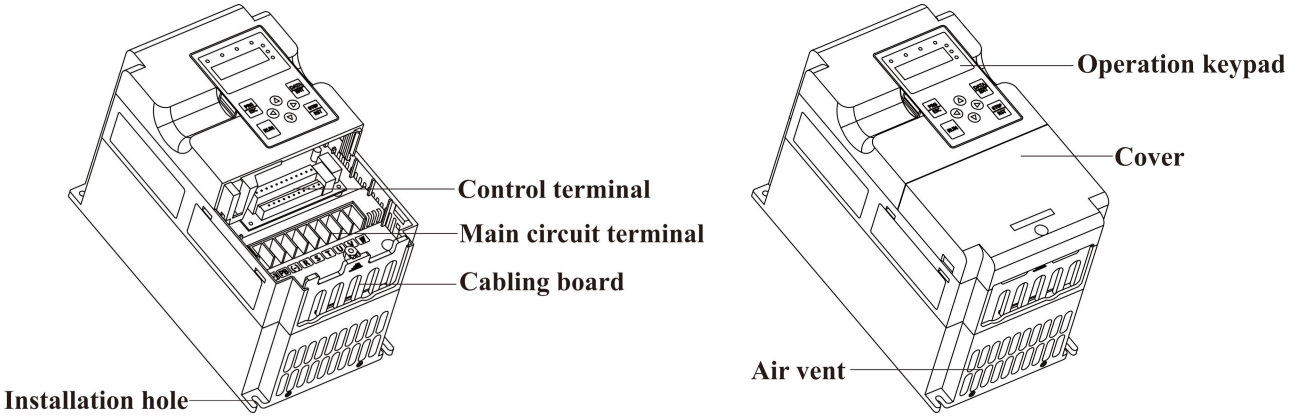


Figure 2.5.1 Parts of controllers (220V: 22.0kW and below, 380V: 37.0kW and below)

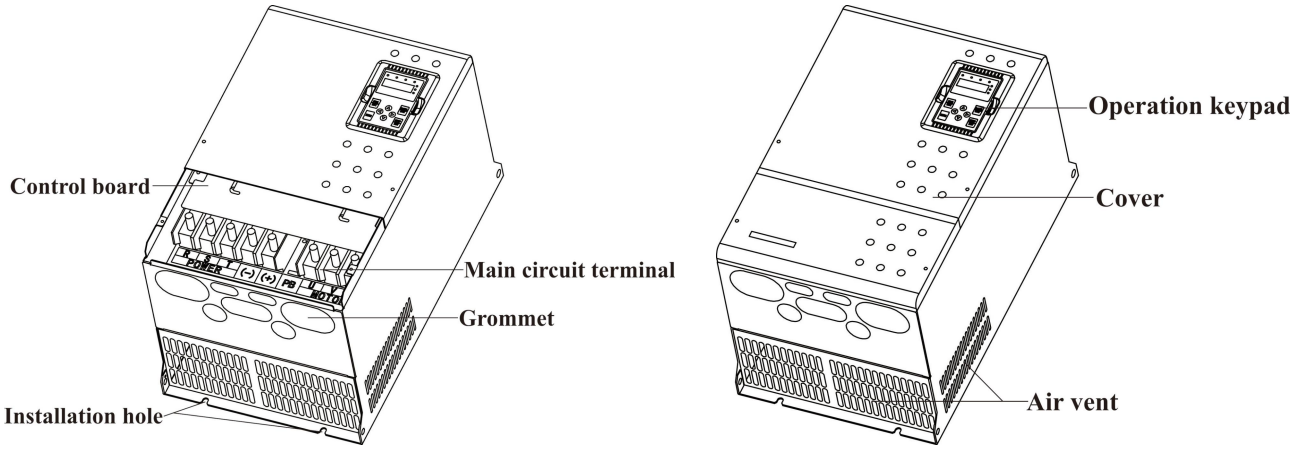


Figure 2.5.2 Parts of controllers (220V: 30kW and above, 380V: 45kW and above)

2.6 Overall dimensions and mounting dimensions

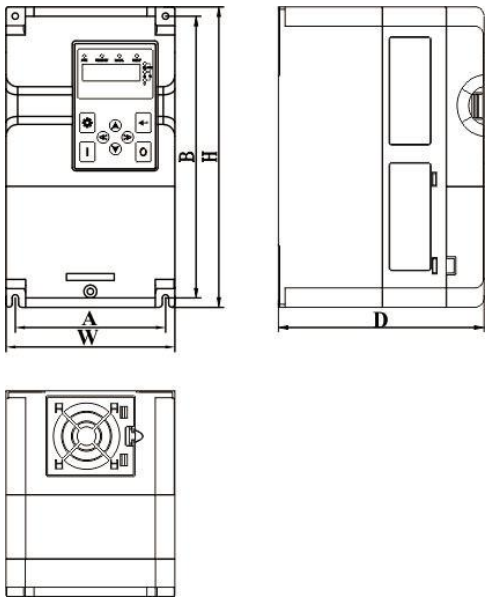


Figure 2.6.1 220V: 0.75kW~22.0kW, 380V: 0.75kW~37.0kW

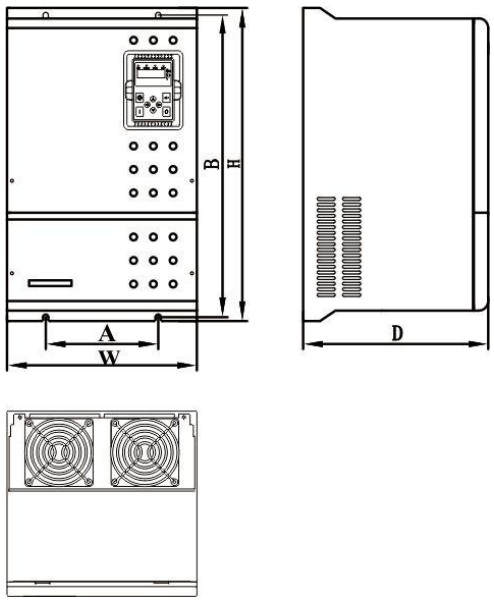


Figure 2.6.2 220V: 30.0kW~55.0kW, 380V: 45.0kW~200.0kW

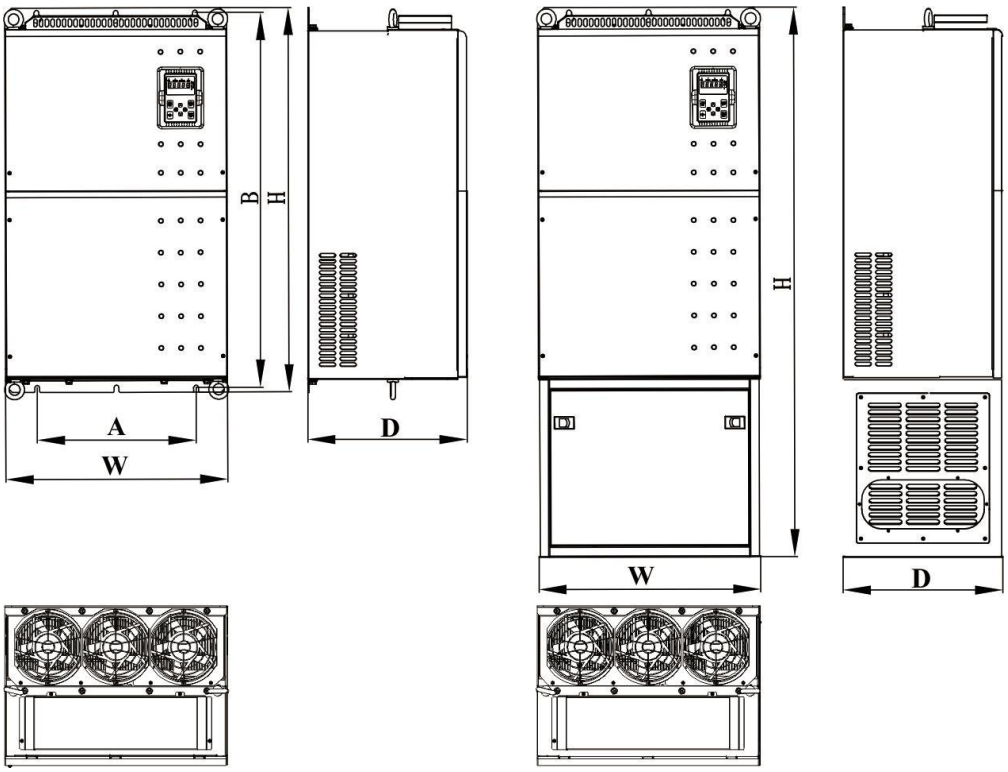
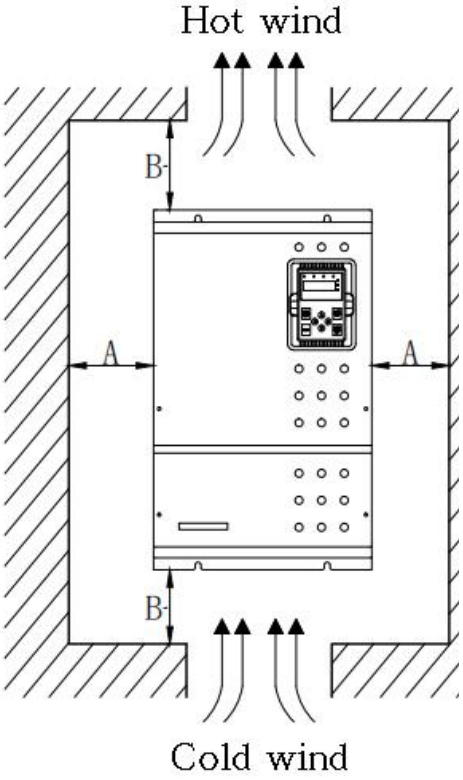


Figure 2.6.3 380V: 132.0kW~200.0kW

Power (kW)	A(mm)	B(mm)	H(mm)	W(mm)	D(mm)	Installation Hole (mm)
	Installation Dimension		External Dimension			
220V: 0.75~2.2 380V: 0.75~2.2	114.0	174.0	186.0	126.0	163.8	5.0
220V: 3.0~3.7 380V: 4.0~5.5	114.0	174.0	186.0	126.0	185	5.0
220V: 5.5 380V: 7.5	129.0	242.0	258.0	145.0	176.5	5.5
220V: 7.5 380V: 11.0~15.0	146.0	301.0	313.0	161.0	210.0	6.0
220V: 11.0~15.0 380V: 18.5~22.0	185.0	330.0	342.0	200.0	200.5	6.0
220V: 18.5~22.0 380V: 30.0~37.0	233.0	381.0	400.0	251.0	213.0	6.0
220V: 30.0~55.0 380V: 45.0~110.0	199.0	534.0	554.0	336.0	327.5	9.0
380V: 132~200 (Without base)	360.0	848.0	870.0	503.0	362.0	11.0
380V: 132~200 (With base)	-	-	1270.0	503.0	362.0	-

3 INSTALLATION

3.1 Installation Space



Model (KW)	Dimension	
220V: 0.75kW~7.5kW 380V: 0.75kW~15.0kW	A≥50mm	B≥100mm
220V: 11.0kW~15.0kW 380V: 18.5kW~22.0kW	A≥50mm	B≥200mm
220V: 15.0kW~22.0kW 380V: 22.0kW~37.0kW	A≥50mm	B≥200mm
220V: 22.0kW~55.0kW 380V: 37.0kW~200.0kW	A≥50mm	B≥300mm

Vertical upward mounting

Figure 3.1.1 Safe space

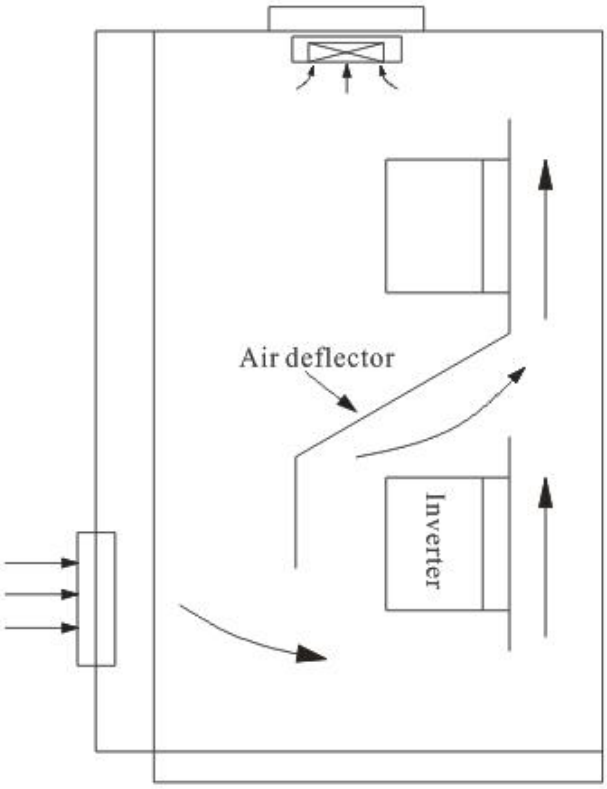


Figure 3.1.2 Installation of multiple controllers

Notice: Add the air deflector when apply the up-down installation.

3.2 Disassembly and Installation of Cover Plate

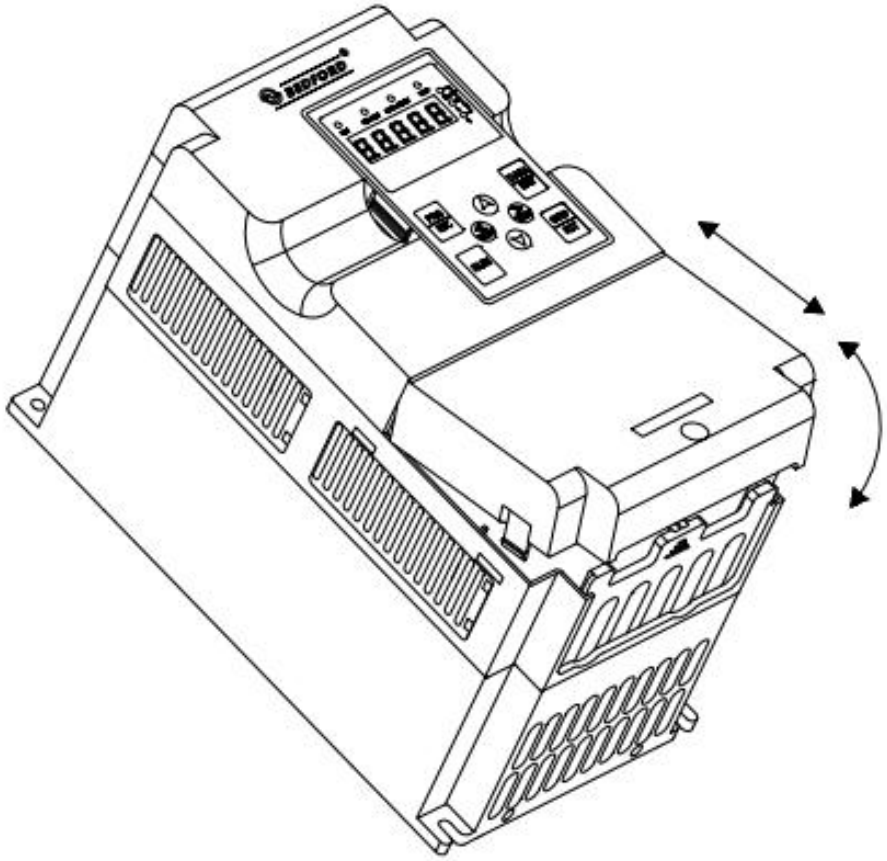


Figure 3.2.1 Disassembly and installation of plastic

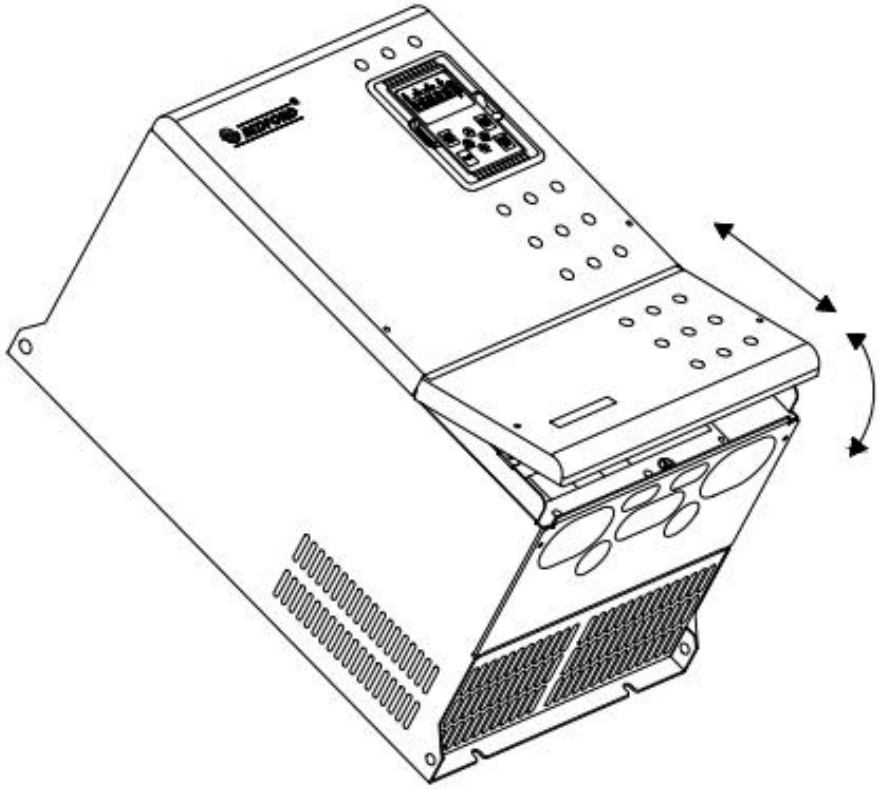


Figure 3.2.2 Disassembly and installation of mental plate

4 WIRING

4.1 Schematic

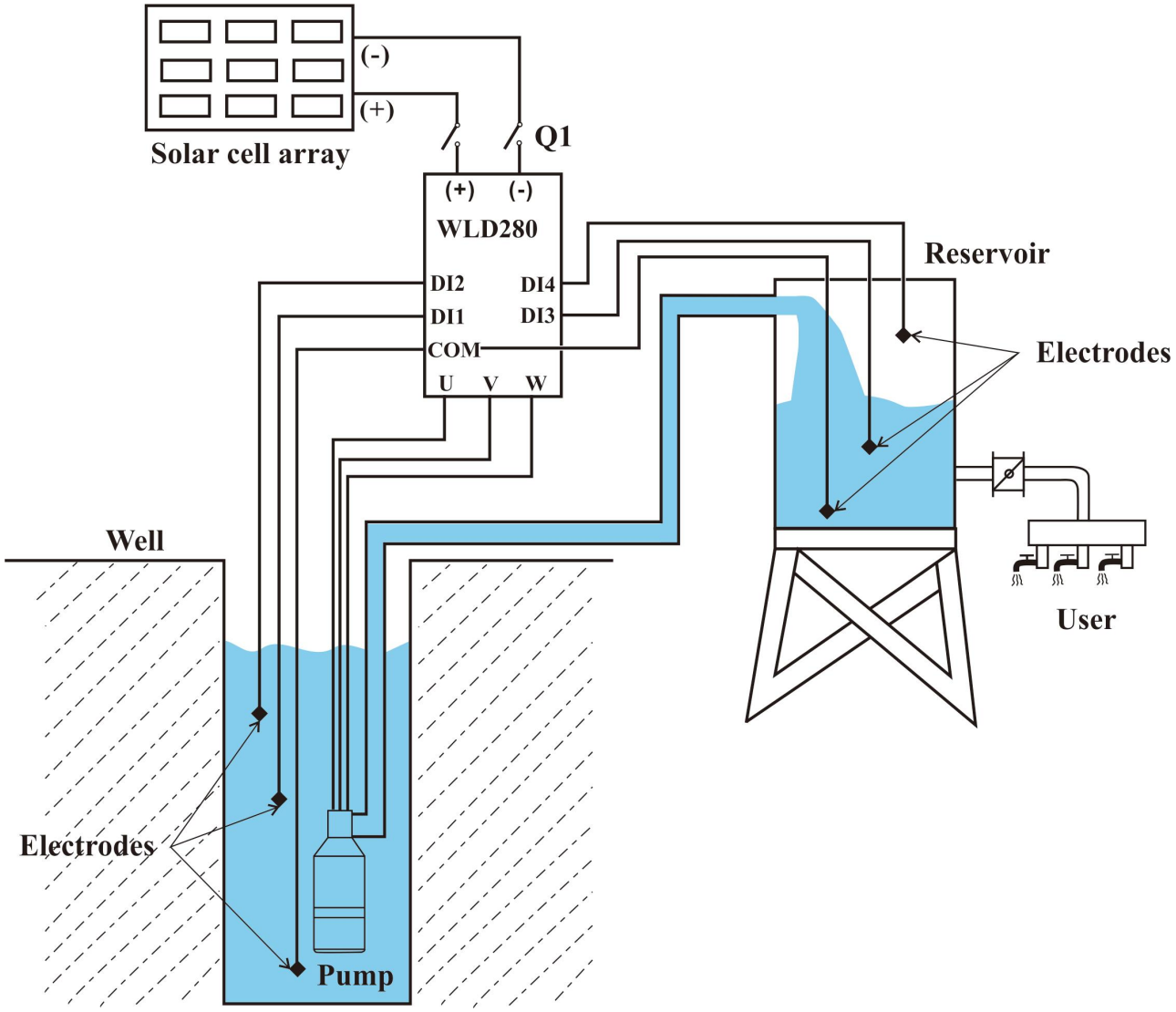


Figure 4.1.1 Photovoltaic water supply system

Notice:

1. The DC circuit breaker Q1 must be installed as the photovoltaic DC input protection switch.

2. When the distance between the PV module and the controller exceeds 10 metres, the DC input needs to be equipped with a Type II lightning protector.

3. when the pump distance from the inverter more than 50 meters, it is recommended to choose the output reactor.

4.2 Solar cell array and AC power supply

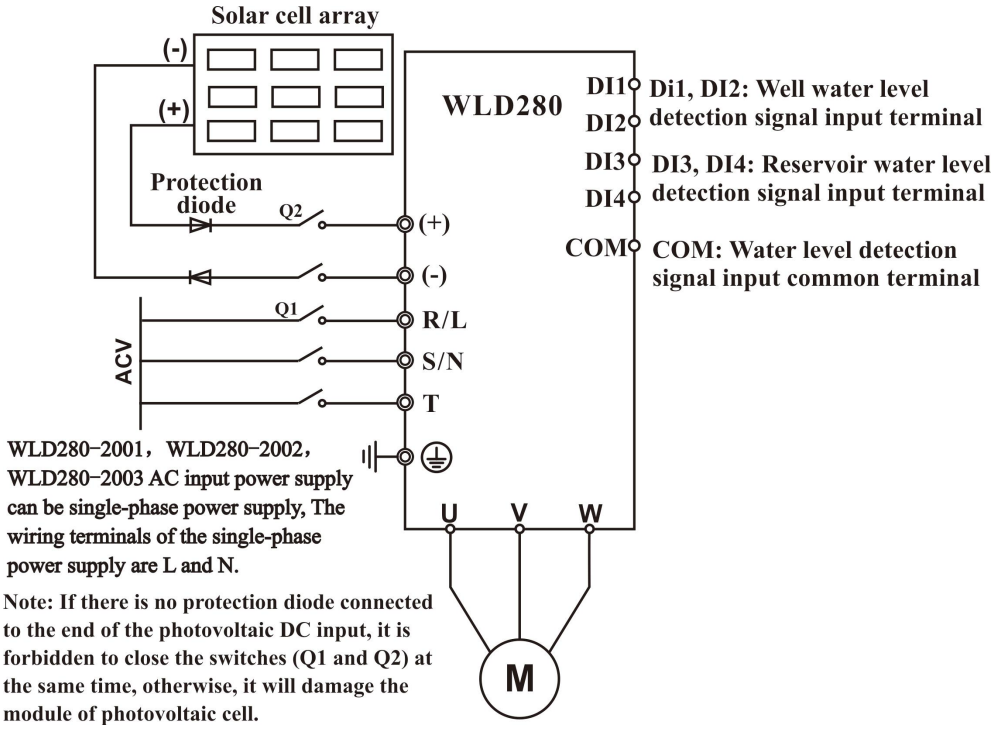


Figure 4.2.1 The solar cell array and the power frequency power supply wiring diagram

Precautions for the commissioning of industrial frequency power supply

Power On Sequencing:disconnect Q2 first, you must wait 5 minutes so that the controller is discharged; or digital tube, LED lights out before closing Q1, otherwise it will damage the controller.

Note:

- **When no secondary tube protection is added to the busbar input, it is forbidden to close the PV panel switch Q2 and the grid input switch Q1 at the same time, otherwise the panel will be damaged.**
- **When converting from an industrial frequency supply to a photovoltaic supply, simply disconnect Q1 and then close Q2.**

The main loop terminals are described as follows:

Terminal Symbol	Function Description
L、N	Terminals of single-phase AC input
R, S, T	Terminals of 3 phase AC input
(+), (-)	Terminals of DC input
U, V, W	Terminals of 3 phase AC output
⏚	Terminals of ground

Control loop terminals are described as follows:

Category	Terminal symbol	Function Description
Power source	+24V-COM	External supply +24V, maximum output current: 200mA Generally used as a digital input and output terminal working power supply and external sensor power supply

Simulate input	AI1-GND	The input range is 0V to 10V/4mA to 20mA, which is determined by DIP switch J3 on the control board Input impedance: 22kΩ (voltage input), 500Ω (current input)
	AI2-GND	
Figure input	DI1-COM	The switching input terminals form optically coupled isolated inputs with +24V and COM Input voltage range: 9V~30V Input impedance: 2.4kΩ DI1,DI2 Water level detection signal input terminals DI3,DI4 Water tower water level detection signal input terminal COM Common terminal for the input of the water level detection signal
	DI2-COM	
	DI3-COM	
	DI4-COM	
Relay output	T/A-T/B	Relay output:T/A, P/A common end, T/B, P/B normally closed,T/C, P/C normally open Contact driving capacity: AC 250V/3A, DC 30V/1A
	T/A-T/C	
	P/A-P/B	
	P/A-P/C	
communication	485+	Standard 485 communication interface, please use twisted pair or shielded cable
	485-	

4.3 Inverter AC/DC switching scheme

4.3.1 Scheme introduction

Under normal circumstances, the inverter does not allow AC and DC access at the same time. In order to achieve AC/DC simultaneous access, external configuration of the switching control circuit is required. The following is a reference scheme

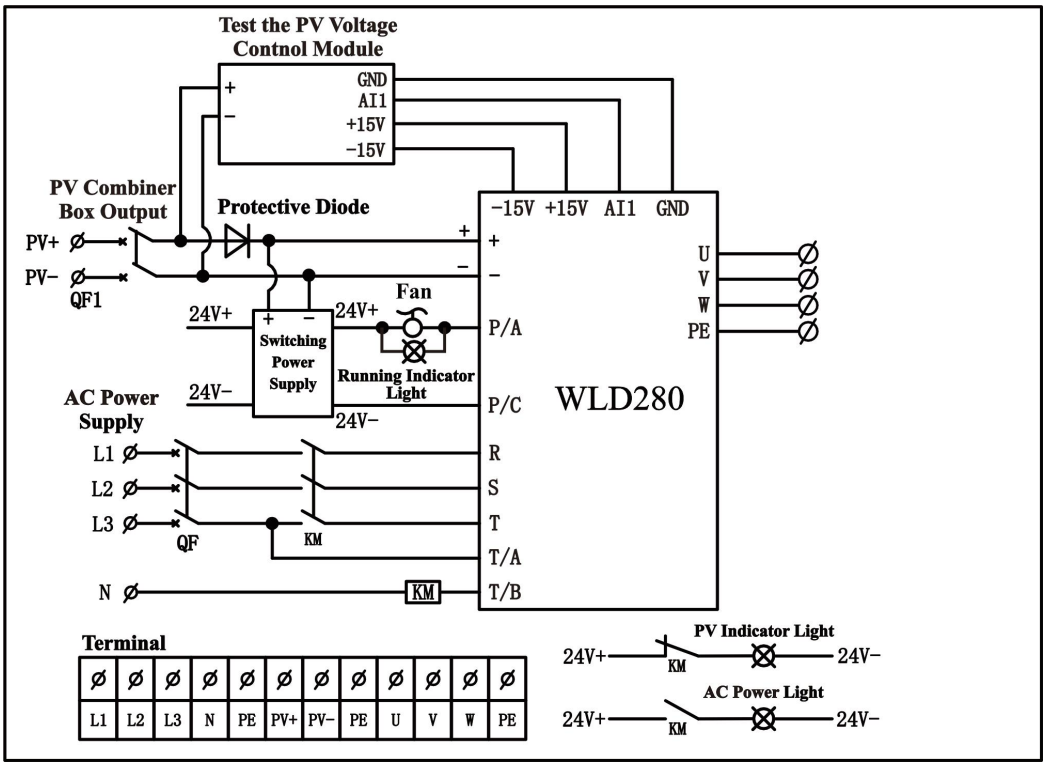


Figure 4.3.1 Inverter AC/DC switching

Note: When AC/DC is connected at the same time, the selection refer to the WLD280-PV/ACX series PV/ mains power switch box manual. The necessary low-voltage electrical appliances include AC circuit breaker QF, AC contactor KM and DC circuit breaker QF. For specific selection, please refer to Table 4-3-1.

Table 4-3-1 Circuit breaker and cable specification reference selection table

Model	AC circuit Breaker (A)	DC circuit breaker	AC contactor (A)	Lightning protector	Input/ Output Cable (mm^2)
Output 3AC 220V					
WLD280-2001	10	10A/1000VDC	9	Type Ⅱ 1000VDC	1.0
WLD280-2002	10	10A/1000VDC	9		1.5
WLD280-2003	20	20A/1000VDC	18		1.5
WLD280-2004	25	25A/1000VDC	25		2.5
WLD280-2005	32	32A/1000VDC	32		4
WLD280-2007	50	50A/1000VDC	38		4
WLD280-2010	63	63A/1000VDC	50		6
WLD280-2015	80	80A/1000VDC	80		10
WLD280-2020	100	100A/1000VDC	80		16
WLD280-2025	125	125A/1000VDC	115		25
WLD280-2030	140	140A/1000VDC	115		35
WLD280-2040	180	180A/1000VDC	150		50
WLD280-2050	225	225A/1000VDC	185		70
WLD280-2060	250	250A/1000VDC	225		95
WLD280-2075	315	315A/1000VDC	265		120
Output 3AC 380V					
WLD280-4001	10	10A/1000VDC	9	Type Ⅱ 1000VDC	1.0
WLD280-4002	16	16A/1000VDC	9		1.0
WLD280-4003	16	16A/1000VDC	9		1.0
WLD280-4005	25	25A/1000VDC	18		1.5
WLD280-4007	25	25A/1000VDC	25		2.5
WLD280-4010	40	40A/1000VDC	32		4
WLD280-4015	63	63A/1000VDC	38		4
WLD280-4020	63	63A/1000VDC	50		6
WLD280-4025	100	100A/1000VDC	65		10
WLD280-4030	100	100A/1000VDC	80		10
WLD280-4040	125	125A/1000VDC	80		16
WLD280-4050	160	160A/1000VDC	115		25
WLD280-4060	200	200A/1000VDC	115		35
WLD280-4075	200	200A/1000VDC	150		50
WLD280-4100	250	250A/1000VDC	185		70
WLD280-4120	315	315A/1000VDC	225		95
WLD280-4150	400	400A/1000VDC	265		120
WLD280-4180	400	400A/1000VDC	330		120
WLD280-4215	630	630A/1000VDC	400		150
WLD280-4250	630	630A/1000VDC	400		185

Model	AC circuit Breaker (A)	DC circuit breaker	AC contactor (A)	Lightning protector	Input/ Output Cable (mm^2)
WLD280-4270	630	630A/1000VDC	500		185

Please contact company for other specification.

4.4 The wiring of water-level automatic control

4.4.1 The wiring to prevent pump from anhydrous idling

4.4.1.1 The wiring for floater water-level switch connected by cable

If you use a rod type float level switch with normally open (NO) contact output, the common terminal line is connected to the COM terminal of WLD280, the low water level control line is connected to the DI1 terminal of WLD280, and the high water level control line is connected to the DI2 terminal of WLD280, then set DI1=0 and DI2=0 in the parameter F0-15. If you select a normally closed (NC) rod type float level switch, then set DI1=1 and DI2=1 in the parameter F0-15. If you choose the normally closed (NC) type rod float switch, set DI1=1 and DI2=1 in parameter F0-15.

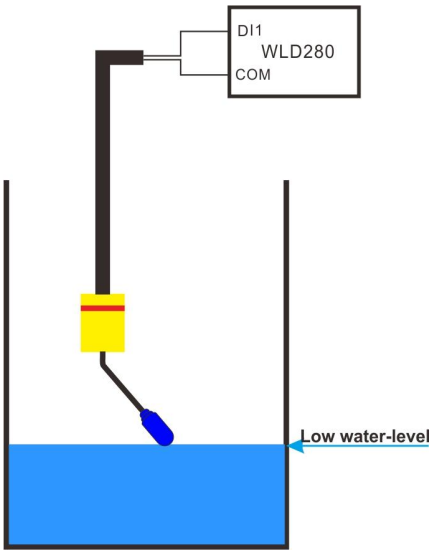


Figure 4.4.1 The low water-level

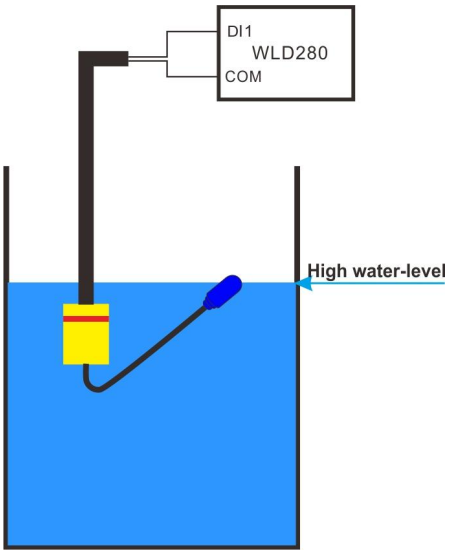


Figure 4.4.2 The high water-level

Remarks: When the water level of the well is higher than the high water level, the normally open lines DI1, DI2 and COM are connected, and WLD280 automatically controls the pump to run. When the water level of the well is lower than the low water level, the normally open wires DI1, DI2 and COM are disconnected, and WLD280 automatically controls the pump to stop, preventing the pump from empty pumping.

4.4.1.2 The wiring for floater water-level switch connected by rod

If you use a rod type float level switch with normally open (NO) contact output, the common terminal line is connected to the COM terminal of WLD280, the low water level control line is connected to the DI1 terminal of WLD280, and the high water level control line is connected to the DI2 terminal of WLD280, then set DI1=0 and DI2=0 in the parameter F0-15. If you select a normally closed (NC) rod type float level switch, then set DI1=1 and DI2=1 in the parameter F0-15. If you choose the normally closed (NC) type rod float switch, set DI1=1 and DI2=1 in parameter F0-15.

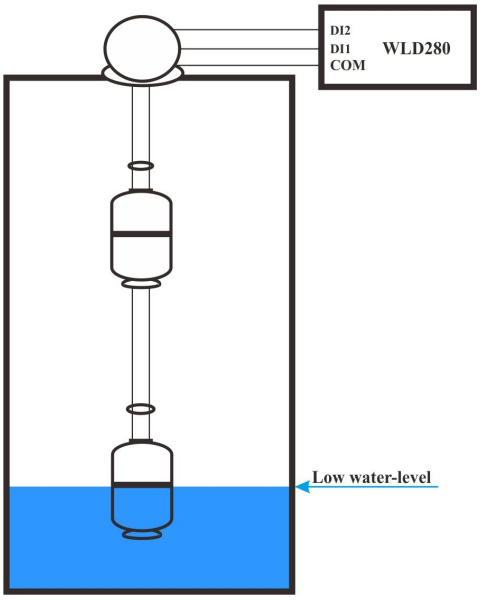


Figure 4.4.3 Low water-level

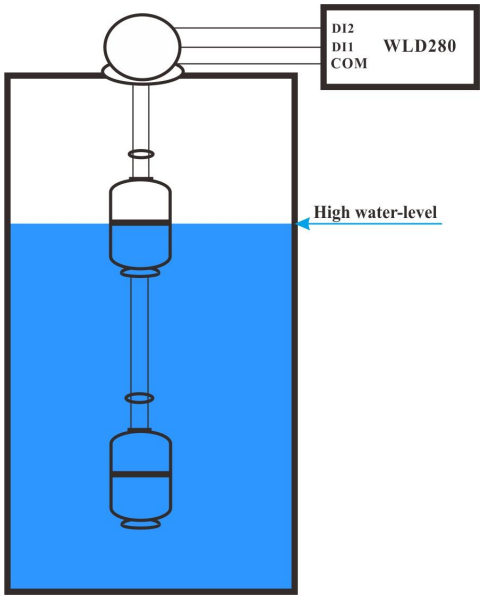


Figure 4.4.4 High water-level

Remarks: Using the contact output for the normally open (NO) type linkage type float level switch, the water level of the well is higher than the high water level, DI1, DI2 and COM connected, WLD280 automatically control the pump operation. When the water level of the well is lower than the low water level, DI1, DI2 and COM are disconnected, and WLD280 automatically controls the pump to stop, preventing the pump from pumping empty.

4.4.1.3 The wiring for water-level sensors

Three water level probe sensor signal lines, as shown in Figure 4-4 -5, ①shortest signal line (high water position), connect to WLD280's DI2 terminal; ② signal line (low water position), connect to WLD280's DI1 terminal; ③ longest signal line (common terminal), connect to WLD280's COM terminal. Set DI1=0 and DI2=0 in parameter F0-15.

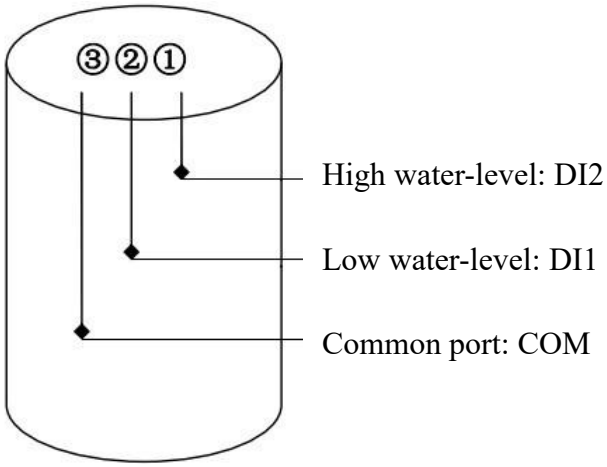


Figure 4.4.5 The wiring for water-level sensors in the well

Remarks:The water level of the well is higher than the high water level, DI1, DI2 and COM are connected, and WLD280 automatically controls the pump to run. When the water level of the well is lower than the low water level, DI1, DI2 and COM will be disconnected, and WLD280 will automatically control the pump to stop and prevent the pump from pumping.

Note: if only use one detection signal of water-level in the wells, “DI1” and “DI2” must be connected together by conductor.

4.4.2 The wiring of reservoir

4.4.2.1 The wiring for floater water-level switch connected by cable

Use the common terminal wire of the cable type float level switch to connect to the COM terminal of WLD280, select the normally open (NO) wire to DI3 (DI3 and DI4 are shorted), then set DI3=0 and DI4=0 in the parameter F0-15. If you select the normally closed (NC) wire to DI3 (DI3 and DI4 are shorted), then set DI3=1 and DI4=1 in the parameter F0-15= 1.

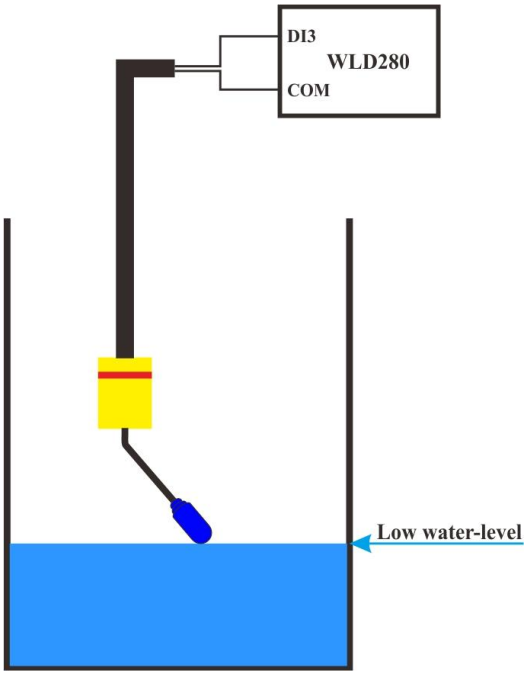


Figure 4.4.6 Low water-level

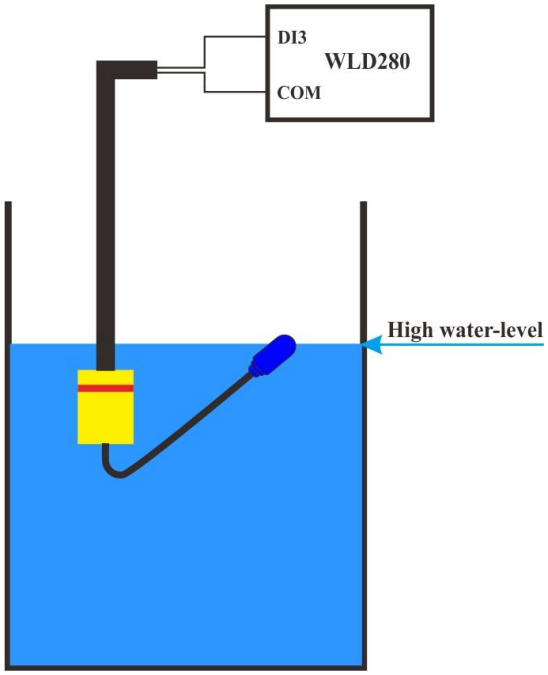


Figure 4.4.7 High water-level

Remarks:Using the contact output for the normally open (NO) type rod float water level switch, the water level of the cistern (water tower) is lower than the low water level water level, DI3, DI4 and COM disconnect, WLD280 automatically control the pump to run, to the cistern (water tower) water injection. Cistern (water tower) water level is higher than the high water level, DI3, DI4 and COM closed, WLD280 automatically control the pump to stop, to prevent the cistern (water tower) water overflow.

4.4.2.2 The wiring for floater water-level switch connected by rod

If you use a rod type float level switch with normally open (NO) contact output, the common terminal line is connected to the COM terminal of WLD280, the low water level control line is connected to the DI3 terminal of WLD280, and the high water level control line is connected to the DI4 terminal of WLD280, then set DI3=0 and DI4=0 in the parameter F0-15. If you choose a normally closed (NC) rod type float level switch, then set DI3=1 and DI4=1 in the parameter F0-15. If a normally closed (NC) rod float switch is selected, set DI3=1 and DI4=1 in parameter F0-15.

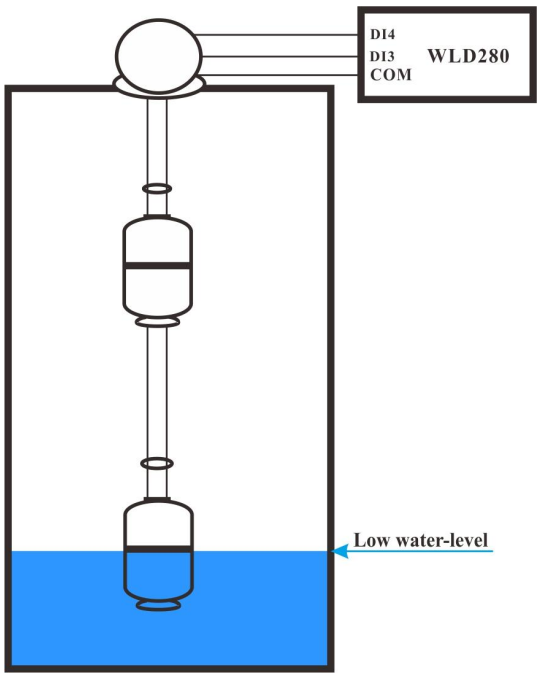


Figure 4.4.8 Low water-level

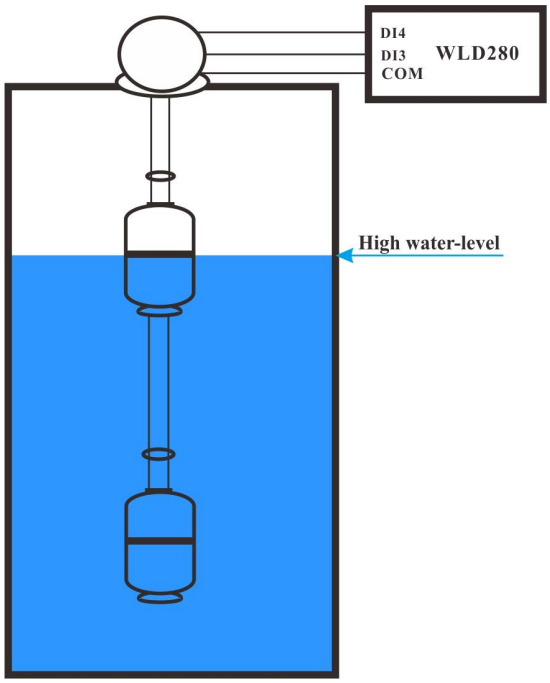


Figure 4.4.9 High water-level

Remarks: Using the contact output for the normally open (NO) type rod float water level switch, the water level of the cistern (water tower) is lower than the low water level water level, DI3, DI4 and COM disconnect, WLD280 automatically control the pump to run, to the cistern (water tower) water injection. Cistern (water tower) water level is higher than the high water level, DI3, DI4 and COM closed, WLD280 automatically control the pump to stop, to prevent the cistern (water tower) water overflow.

4.4.2.3 The wiring for water-level sensors

Three water level probe sensor signal lines, as shown on the left, ① shortest signal line (high water position), connect to WLD280's DI4 terminal; ② signal line (low water position), connect to WLD280's DI3 terminal; ③ longest signal line (common terminal), connect to WLD280's COM terminal. Set DI3=0 and DI4=0 in parameter F0-15.

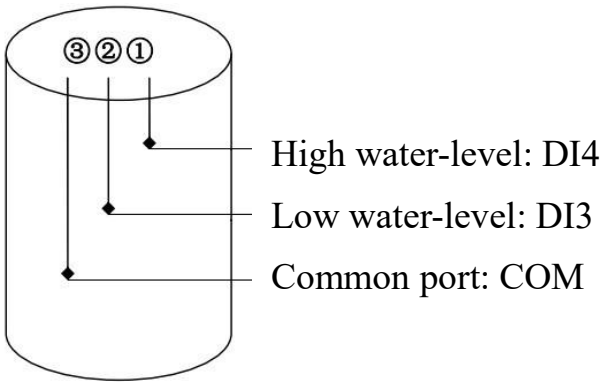


Figure 4.4.10 The wiring for water-level sensors in the well

Remarks: The water level of the cistern (water tower) is lower than the low water level, DI3, DI4 and COM are disconnected, and WLD280 automatically controls the pump to run and inject water into the cistern (water tower). The water level of the cistern (water tower) is higher than the high water level, DI3, DI4 and COM are closed, and WLD280 automatically controls the pump to stop, preventing the cistern (water tower) from overflowing.

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

Wiring diagram: If you use a side-mounted float level switch with normally open (NO) contact output, the common terminal line is connected to the COM terminal of the WLD280, the control line of the low level float switch is connected to the DI3 terminal of the WLD280, and the control line of the high level float switch is connected to the DI4 terminal of the WLD280, then set DI3=0 and DI4=0 in the parameter F0-15. If you use a side-mounted float level switch with a contact output of the normally closed (NC) type, set DI3=1 and DI4=1 in parameter F0-15.

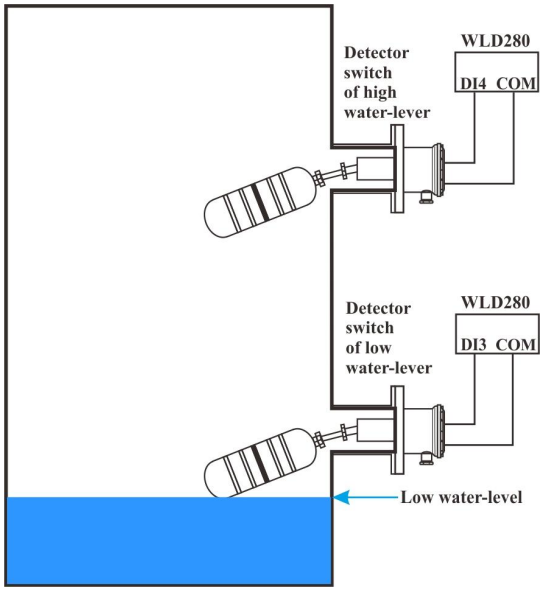


Figure 4.4.11 Low water-level

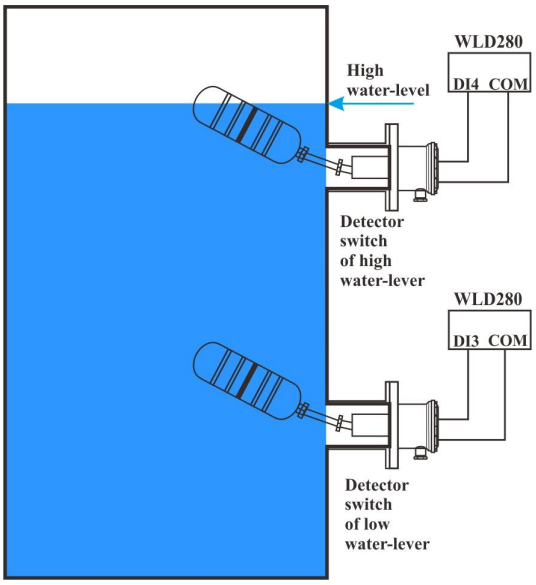


Figure 4.4.12 High water-level

Remarks: Using the contact output is normally open (NO) type side mounted float water level switch, the reservoir (water tower) is lower than the low water level, DI3, DI4 and COM disconnect, WLD280 automatically control the pump to run to the reservoir water; reservoir (water tower) is higher than the high water level, DI3, DI4 and COM, WLD280 automatically control the pump to stop to the reservoir water.

Notice:

1. If only use one detection signal of water-level in the reservoir, “DI3” and “DI4” must be connected together by conductor.

2. It is required to modify the wiring of floater switch’s NC or NO according to the parameter setting (F0-15).

5 OPERATION

5.1 Keypad Description

5.1.1 Keypad schematic diagram

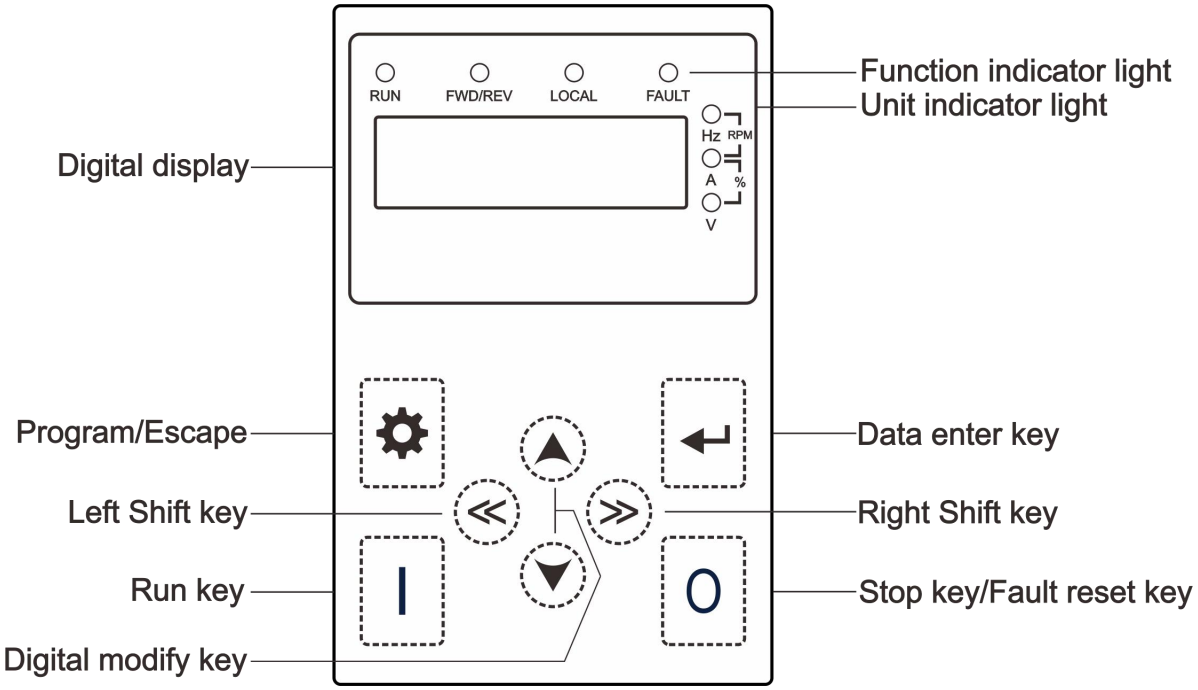


Figure 5.1.1 Keypad schematic diagram

5.1.2 Key function description

Button Symbol	Name	Function Description
	Programming Key	Entry or escape of first-level menu and remove parameters quickly
	Enter Key	Progressively enter menu and confirm parameters
	UP Increment Key	Progressively increase data or function codes
	DOWN Decrement Key	Progressive decrease data or function codes
	Right Shift Key	In running or standby mode, press this button to select the parameters to cyclically display. In parameter setting mode, select the bit to be modified
	Left Shift Key	In running or standby mode, press this button to select the parameters to cyclically display. In parameter setting mode, select the bit to be modified
	Run Key	Start to run the controller in keypad control mode
	Stop/Reset key	In running status, can be used to stop the controller. When fault alarm, can be used to reset the controller in any control mode.

5.1.3 Indicator light description

5.1.3.1 Function Indicator Light Description

Indicator Light Name	Indicator Light Description
RUN	Extinguished: stop status Light on: operation status
FWD/REV	Extinguished: Forward operation Light on: Reverse operation
FAULT	Extinguished: normal operation status Light on: overload pre-warning status

5.1.3.2 Unit Indicator Light Description

Symbol	Description
Hz	Frequency unit
A	Current unit
V	Voltage unit
RPM	Rotation speed unit
%	Percentage

5.1.3.3 Digital Display

Have 5 digit LED, which can display all kinds of monitoring data and alarm codes such as reference frequency, output frequency and so on.

5.2 Operation Process

5.2.1 Parameter setting

Three levels of menu are:

1. Function code group (first-level);
2. Function code (second-level);
3. Function code value (third-level).

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

5.2.2 Fault reset

If the controller has fault, it will prompt the related fault information. User can use O to reset the fault. After fault reset, the controller is at stand-by state. If user does not reset the controller when it is at fault state, the controller will be at operation protection state, and can not run.

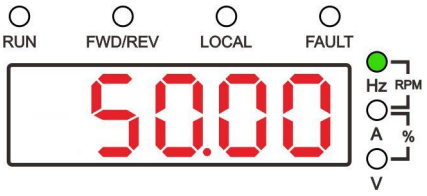
5.3 Running State

5.3.1 Power-on initialization

Firstly the system initializes during the controller power-on, and LED displays “Ld280”, and seven indicator lights are all on. After the initialization is completed, the controller is on stand-by status.

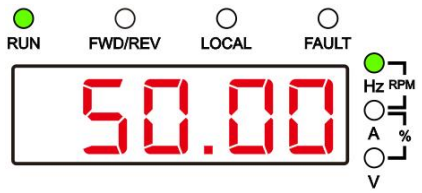
5.3.2 Stand-by

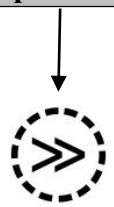
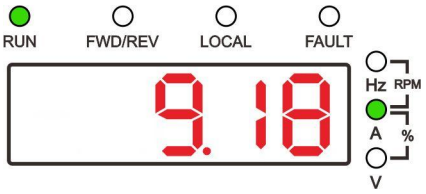
At stand-by status, parameters of reference frequency and DC bus voltage can be display.

Operation	Description	Display	Notes
	Setting frequency		○: Light off ◐: Light flickering ●: Light on
	DC bus voltage		○: Light off ◐: Light flickering ●: Light on

5.3.3 Running state

In the operation state, the operation frequency, set frequency, bus voltage, output voltage, and output current parameters can be displayed. The table below.

Operation	Description	Display	Notes
	Output frequency		○: Light off ◐: Light flickering ●: Light on
	Reference frequency		
	DC bus voltage		
	Output voltage		

Operation	Description	Display	Notes
	Output current		

5.3.4 Fault

WLD280 series controller provide various of fault information, please refer to WLD280 series controller faults and solutions for details.

6 PARAMETER FUNCTION

Function code	Name	Description		Factory setting
F0-00	Run command source	0: Water-level automatic control through keypad start/stop 1: Water-level automatic control 2: Manual control through keypad		2
F0-01	Upper frequency limit	Inverter output frequency range: (F0-02~60.00Hz)		50.00Hz
F0-02	Lower frequency limit	0.01Hz~F0-01, Shutdown when the operating frequency falls below this value		30.00Hz
F0-03	Restart delay time	(0.0s~3600.0s); Please refer to F0-17 when using.		10.0s
F0-04	Output voltage after start	100V ~ 900V, bus voltage greater than the set value, there is output	Output 220Vseries:150V	150V
			Output 380Vseries:350V	350V
F0-05	Maximum power point's voltage	100V ~ 900V, PV array maximum power point voltage	Output 220Vseries:310V	Depend on PV array
			Output 380Vseries:540V	
F0-06	The maximum output power	The maximum output power of PV array. （0.1kW~900.0kW） Note: The set value must be F0-06≥F0-07		Depend on PV array
F0-07	Motor-pump rated power	0.1kW~1000.0kW		Depend on model
F0-08	Motor-pump rated frequency	0.01Hz~60.00Hz		Depend on model
F0-09	Motor-pump rated voltage	1V~460V		Depend on model
F0-10	Motor-pump rated current	0.01A~655.35A (Inverter power≤55kW) 0.1A~6553.5A (Inverter power>55kW)		Depend on model
F0-11	Reserve			
F0-12	Water shortage	0.0%~100.0%	If the water shortage coefficient is 0, it	0

<table>
<tr><th>Function code</th><th>Name</th><th colspan="2">Description</th><th>Factory setting</th></tr>
<tr><td></td><td>detection coefficient</td><td></td><td rowspan="3">is invalid. Otherwise, when the output current of the inverter is less than the value of F0-12*F0-10, and the duration is longer than water shortage detection time F0-13, the inverter reported “A033” (digital display) fault. When reporting “A033” fault delay F00-14 can automatically restart, If F00-14=0, it could not restart after the water shortage fault.</td><td></td></tr>
<tr><td>F0-13</td><td>Water shortage detection time</td><td>0.0s~3600.0s</td><td>10.0s</td></tr>
<tr><td>F0-14</td><td>Water shortage fault recovery time</td><td>0.0min~ 3600.0min</td><td>10.0min</td></tr>
<tr><td>F0-15</td><td>input statue selection of water-level detection terminal</td><td colspan="2"><table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr></table>0000~1111.
Water well low water level DI1, water well high water level DI2, water tower low water level DI3, water tower high water level DI4.when using normally open(NO) cable float water level switch, the corresponding water position is 0, when using normally closed(NC) cable float water level switch, the corresponding water position is 1, such as the water well float select normally closed (NC) wire connected to DI1 (DI1 and DI2 shorted), the common terminal wire connected to the COM terminal, Set DI1=1 and DI2=1 in parameter F0-15. water tower Float select normally closed (NC) wire connected to DI3 (DI3 and DI4 shorted), common terminal line connected to the COM terminal, then set DI3 = 1, DI4 = 1 in parameter F0-15, that is F0-15=1111</td><td>0000</td></tr>
<tr><td>F0-16</td><td>Reserve</td><td colspan="2"></td><td></td></tr>
<tr><td>F0-17</td><td>Power on restart selection</td><td colspan="2">0: Invalid
1: Valid</td><td>1</td></tr>
<tr><td>F0-18</td><td>Power supply selection</td><td colspan="2">0~1: Invalid automatic switch (city power preferred)
2: Automatic switching between city power and photovoltaic (PV)</td><td>0</td></tr>
<tr><td rowspan="2">F0-19</td><td rowspan="2">Switching voltage from PV to city power</td><td rowspan="2">10.0V~900.0V</td><td>Output 220Vseries</td><td>150.0V</td></tr>
<tr><td>Output 380V series</td><td>300.0V</td></tr>
<tr><td>F0-20</td><td>Switching delay time from PV to city power</td><td colspan="2">0.0min~3600.0min</td><td>5.0min</td></tr>
<tr><td rowspan="2">F0-21</td><td rowspan="2">Switching power from city power to PV</td><td rowspan="2">10.0V~900.0V</td><td>Output 220Vseries</td><td>300.0V</td></tr>
<tr><td>Output 380V series</td><td>530.0V</td></tr>
</table>

Function code	Name	Description		Factory setting
F0-22	Switching delay time from city power to PV	0.0min~3600.0min		5.0min
F0-23	Transition time between PV and city power	0.0s~3600.0s		1.0s
F0-24	Night mode	0: Invalid 1: When the PV voltage is less than the value of the valve (it has been switched to the city power when it is lower than the set value of F0-19, and the value of the valve is 50.0V), the inverter stops working after a short delay.		0
F0-25	Reserve			0000
F0-26	Output power correction factor	0%~1000%		100.0%
F0-27	Instantaneous flow correction factor	0%~1000%		100.0%
F0-28	Motor-pump rated flow	Q_N: 0.0m³/h~1000.0m³/h		Depend on model
F0-29	Motor-pump rated head	H_N: 0.0m~6000.0m		Depend on model
F0-30	Cumulative flow	0m³~65535 m³		0
F0-31	High level of photovoltaic power generation	0~65535	Generating capacity (kwh)=F0-31* 1000 + F0-32	0
F0-32	Low level of photovoltaic power generation	0~999.9		0.0
F0-33	Cumulative flow zero clearing	0: Invalid; 1: Zero clearing		0
F0-34	Automatic maximum power voltage search function selection	0: Manual. Need to set F0-05, the system will run according to this power point voltage; 1: Auto 1. No need to set F0-05, the system will automatically select the starting reference voltage and automatically search for the maximum power point voltage according to the on-site environment, the rate of regulation is slower than Auto 2; 2: Auto 2. No need to set F0-05, the system will take this voltage as the starting reference voltage and automatically search for the maximum power point voltage according to the on-site environment,the rate of regulation is faster than Auto 1.		2

Function code	Name	Description	Factory setting
		Suggestions for use: Manual (F0-34=0): 0.75kW~3.0kW models utility/photovoltaic input at the same time Auto 1 (F0-34=1): 0.75kW~3.0kW utility/photovoltaic input at the same time. Auto 2 (F0-34=2): First, all models only PV input, second, 4.0kW and above models utility / PV input at the same time.	
F0-35	Reserve		
F0-36	Communication address	0 ~247, 0 as broadcast address.	001
F0-37	Communication baud rate setting	0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS This parameter is used to set the data transmission rate between the upper computer and the controller. Note that the baud rate set by the host computer and the controller must be the same, otherwise, the communication cannot be carried out. The higher the baud rate, the faster the communication speed	5
F0-38	Data Format	0: No parity (8-N-2) 1: Even parity (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1) The data format set by the host computer and the controller must be the same; otherwise, communication is not possible.	3
F0-39	Communication response delay	0ms~20ms The interval time between the end of the inverter data reception and the transmission of the response data to the host computer. If the response delay is less than the system processing time, the response delay is subjected to the system processing time. If the response delay is longer than the system processing time, the system needs to wait after system process data until the the response delay time	2ms

Function code	Name	Description	Factory setting
		arrives, then send data to host computer.	
F0-40	Communication timeout failure time	0.0s (invalid), 0.0s~60.0s When the function code is set to a valid value, if the interval between one communication and the next communication exceeds the communication timeout period, the system will report a communication failure error (CE). In a continuous communication system, it can monitor the communication status by setting this parameter.	0.0s
F0-41	Restore parameter	0: No action 1: Restore factory setting, excluding motor parameters, fault record information, accumulated running time 2: Clear record information, such as fault record information, accumulated running time	0
F0-42	Carrier frequency setting	0.5kHz~16.0kHz	Depends on the model setting
F0-43	Acceleration time	0.0s~650.0s, Time required to accelerate the frequency from 0.00 Hz to the maximum output frequency (60.00 Hz)	Depends on the model setting
F0-44	Reserve		
F0-45	The Third latest fault type	0: No fault 1: IGBT fault (OUT) 2: Over-current (OC) 3: Over-voltage (OV) 4: DC bus under-voltage (P.OFF) 5: Motor overload (OL1) 6: Controller overload (OL2) 7: Input voltage phase failure (SPI) 8: Output voltage phase failure (SPO) 9: IGBT Overheat (OH2) 10: External Fault (EF) 11: Communication Error (CE) 12: Contactor Fault (CF) 13: Current detection fault (ITE) 14: EEPROM fault (EEP) 15: Water shortage fault (A033)	0
F0-46	The Second latest fault type		0
F0-47	The Current fault type		0
F0-48	Output frequency at the current fault	Output frequency when fault is happening	000.00

Function code	Name	Description	Factory setting
F0-49	Output current at the current fault	Output current when fault is happening	000.00
F0-50	DC bus voltage at the current fault	DC bus voltage when fault is happening	0000.0
F0-51	Input terminals Status at the current fault	0000~1111, the value as a decimal digit. Display the latest digit input terminals status, the sequence is as below: BIT3 BIT2 BIT1 BIT0 DI4 DI3 DI2 DI1 When input terminal status is ON,the value is 1; When input terminal status is OFF, the value is 0. By the value, can recognize the status of digit input signal at that time.	0000
F0-52	Output terminals Status at the current fault	0000~1111, the value as a decimal digit. Display the latest digit output terminals status, the sequence is as below: BIT1 BIT0 P/C T/C When output terminal status is ON, the value is 0; When output terminal status is OFF, the value is 1. By the value, can recognize the status of digit output signal at that time.	00
F0-53	Cooling fan control mode	0: The fan operates when the Controller is running 1: The fan operates when the temperature is reached	0
F0-54	Reserve		

7 INITIAL DEBUGGING

In order to ensure photovoltaic water supply system can work in efficiency, reliability and steady, the parameters setting of controller and debugging for the first time were performed by the professional electrical engineering technicist according to the following steps. (you'd better choose a sunny day with strong sunlight to debugging.)

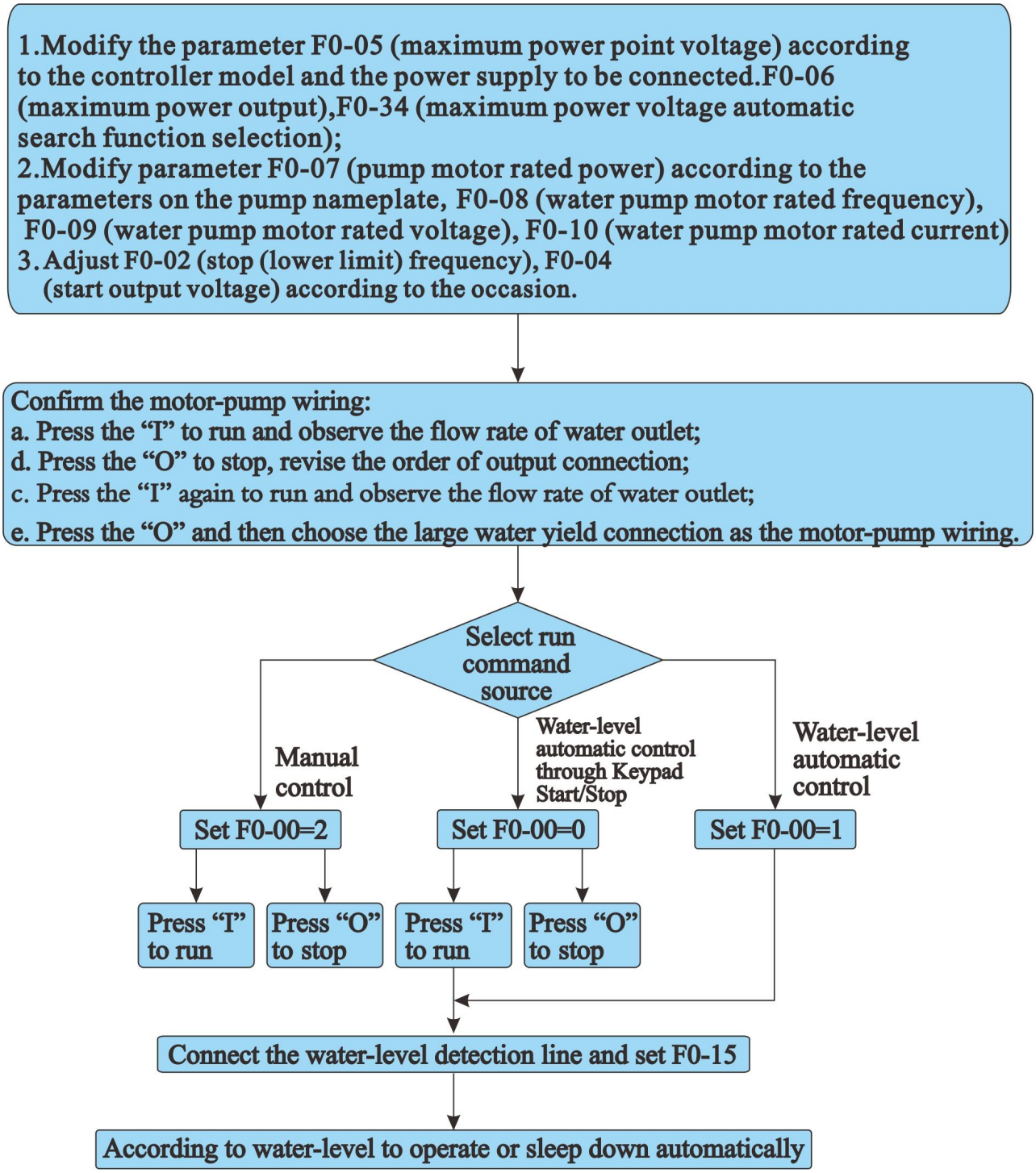


Figure 7 .1.1 Flow chart of debugging for the first time

8 TROUBLE SHOOTING

8.1 Fault and trouble shooting

Fault Code	Fault Type	Reason	Solution
OC	Over-current	1. Sudden change of pump; 2. Low input voltage; 3. The capacity of controller is smaller	1. Inspect pump and reduce the change; 2. Check the power supply (PV Array Voltage); 3. Select Select bigger capacity controller
OV	Over-voltage	1. High input voltage; 2. At the moment of power failure, restart the motor immediately that rotor is still rotating	1. Check the power supply (PV Array Voltage); 2. Avoid to restart the motor immediately until it stop running completely
P.OFF	DC bus under-voltage	1. Low input voltage	1. Check the power supply (PV Array Voltage);
OL1	Motor overload	1. Improper current protection threshold of motor; 2. Oversize load or locked rotor; 3. The capacity of controller is smaller	1. Set the rated current of motor properly; 2. Reduce the load and inspect the motor and mechanical status. 3. Select Select bigger capacity controller
OL2	Controller	1. Oversize load or locked rotor 2. The capacity of controller is smaller	1. Reduce the load and inspect the motor and mechanical status. 2. Select Select bigger capacity controller
SPI	Input voltage phase failure	1. 3 Phase input power source abnormal 2. DCB (Drive Circuit Board) abnormal 3. Anti-Thunder board abnormal 4. MCB (Main Circuit Board) abnormal	1. Inspect and remove the fault in the peripheral circuit 2. Seeking the technical support from Manufacturer 3. Seeking the technical support from manufacturer 4. Seeking the technical support from manufacturer
SPO	Output voltage phase failure	1. The wire between controller and motor is abnormal 2. Controller output 3 phase unbalanced when motor is running. 3. DCB (Drive Circuit Board) abnormal 4. IGBT abnormal	1. Inspect and remove the fault in the peripheral circuit 2. Inspect motor 3 phase winding and remove the fault 3. Seeking the technical support from manufacturer 4. Seeking the technical support from manufacturer

Fault Code	Fault Type	Reason	Solution
OH2	IGBT overheat	1. High ambient temperature 2. Air vent blocked 3. Cooling fan breakdown 4. Thermal resistor breakdown 5. IGBT damaged	1. Lower ambient temperature 2. Clean air vent 3. Replace cooling fan 4. Replace thermal resistor 5. Replace IGBT
CE	Communication error	1. Upper computer operating abnormal 2. Communication cable operating abnormal 3. Communication parameter setting improperly	1. Inspect upper computer 2. Inspect communication cable 3. Set parameter properly
CF	Contactor fault	1. DCB and power source abnormal 2. Contactor abnormal	1. Replace DCB or power source board 2. Replace contactor
ITE	Current detection fault	1. Wires or connectors of control board are loose; 2. Hall sensor is damaged; 3. Amplifying circuit is abnormal	1. Check the wiring and connectors; 2. Seeking the technical support from Manufacturer 3. Seeking the technical support from Manufacturer
EEP	EEPROM fault	1. R/W fault of control parameters; 2. EEPROM is damaged	1. Press O to reset, seeking the technical support from manufacturer 2. Seeking the technical support from manufacturer
A033	Water Shortage Fault	1. Water shortage is detected by the system	1. Check whether water is deficient

8.2 Common Faults and Solutions

Controller may have following faults or malfunctions during operation, please refer to the following solutions

(1) No display after power on:

- Inspect whether the voltage of power supply is the same as the controller rated voltage or not with multi-meter. If the power supply has problem, inspect and solve it.
- Check the CHARGE light. If the light is off, Please ask for support. If the light is on, the fault may be lies in the switching power supply. Please ask for support.

(2) Power supply air switch trips off when power on:

- Check for ground or short circuit between input power supplies to rule out the presence of a problem.
- Check to see if the rectifier bridge has broken down, if damaged, seek service.

(3) Motor doesn't move after controller running:

- Inspect if there is balanced three-phase output among U, V, W. If yes, then motor could be damaged, or mechanically locked. Please solve it.
- If the output is unbalanced or lost, the controller drive board or the output module may be damaged, ask for support.
- If there is no output voltage, the driver board or output module may be damaged, please seek service.

(4) Controller displays normally when power on, but switch at the input side trips when running:

- Inspect whether the output side of controller is short circuit. If yes, ask for support.
- Inspect whether ground fault exists. If yes, solve it.
- If trip happens occasionally and the distance between motor and controller is too far, it is recommended to install output AC reactor.

9 MAINTENANCE

⚠ WARNING
● Maintenance must be performed according to designated maintenance methods. ● Maintenance, inspection and replacement of parts must be performed only by authorized personnel. ● After turning off the main circuit power supply, waiting for 10 minutes before performance maintenance or inspection. ● DO NOT directly touch components or devices of PCB board. Otherwise controller can be damaged by electrostatic. ● After maintenance, all screws must be tightened.

9.1 Daily Maintenance

In order to prevent the failure of the controller, ensure the normal operation of the equipment and extend the service life of the controller, it is necessary to carry out routine maintenance of the controller, and the contents of routine maintenance are indicated below:

Inspection items	Element
Temperature/Humidity	Confirm that the ambient temperature is 0℃~40℃ and the humidity is 20%~90
Oil mist and dust	Make sure there is no oil mist, dust or condensation in the controller.
controllers	Check the controller for abnormal heat and vibration.
FAN	Confirm that the fan is functioning properly and there is no debris stuck in it, etc.
Input Power	Confirm that the voltage and frequency of the input power supply are within the allowable range
Electrical machinery	Check the motor for abnormal vibration, heat, abnormal noise and lack of phase, etc.

9.2 Periodic Maintenance

In order to prevent the controller from malfunctioning and to ensure its long time high performance and stable operation, the user must check the controller regularly (within half a year), and the contents of the check are indicated below:

Inspection items	Inspection content	Methods of elimination
Screws for external terminals	Loose screws or not	Tighten
PCB board	Dust, spoils	Complete removal of debris with dry compressed air
FAN	Abnormal noise and vibration, whether the cumulative time exceeds 20,000 hours	1. Remove debris 2.Replace the fan
electrolytic capacitor	Is there any discoloration, is there any odor	Replacement of electrolytic capacitors
lit. scatter heat device	Dust, spoils	Complete removal of debris with dry compressed air
Power component	Dust, spoils	Complete removal of debris with dry compressed air

9.3 Replacement of Wearing Parts

Fans and electrolytic capacitors are wearing part, please make periodic replacement to ensure long term, safety and failure-free operation. The replacement periods are as follows:

◆Fan: Must be replaced when using up to 20,000 hours;

◆Electrolytic Capacitor: Must be replaced when using up to 30,000~40, 000 hours.

***Tips:**

In fact, the application of the product is closely associated with solar sell and environment. only you correctly preset the parameters of solar cell and additional use of the parameters (“F0-02 and F0-04”) the highest utilization efficiency can be achieved.

1. Firstly, according to the solar sell panel to preset the parameters F0-05,F0-06,F0-34.

2. Secondary, presetting the lower frequency limit “F0-02” of ensuring that the pump can work in this frequency.

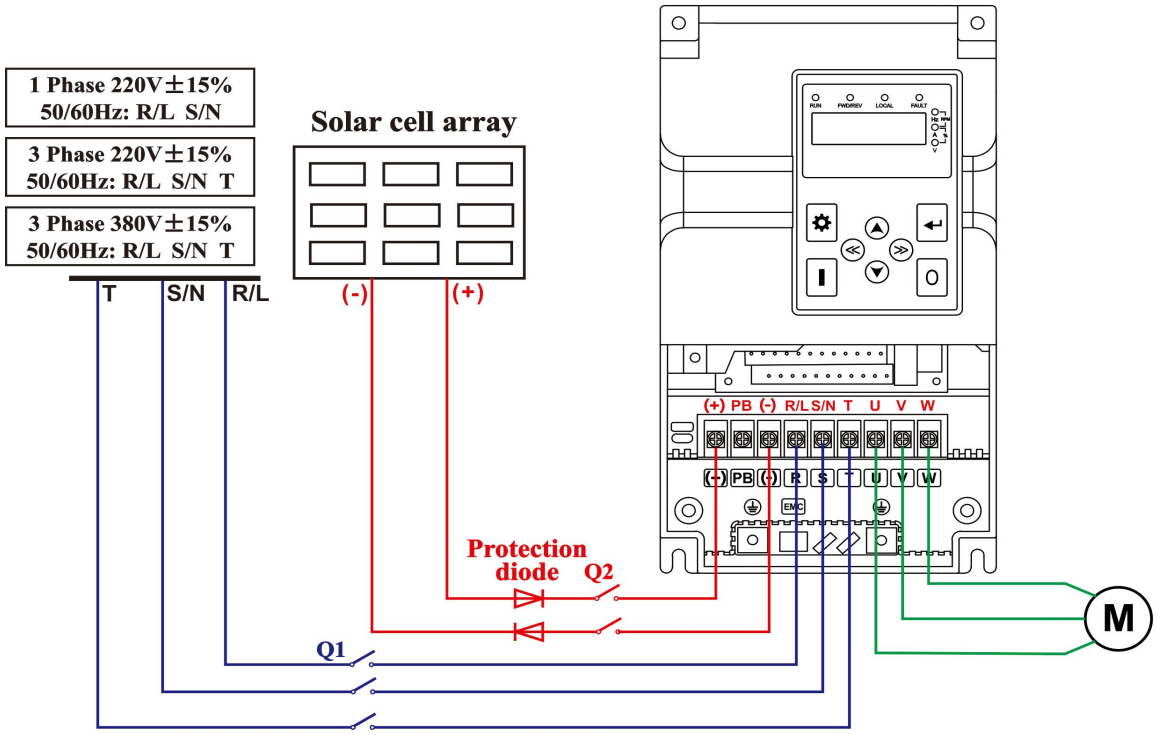
3.Under the premise of 2, set the starting voltage F0-04 appropriately: under normal lighting conditions, if frequent start-stop, the starting voltage should be increased appropriately, under the premise of 2 can also be appropriate to reduce the lower limit frequency.

According to your personal situation, the use of these two parameters can be used in conjunction with the appropriate use of solar energy efficiently! The parameters are shown in the table below:

Function code	Name	Description		Factory setting
F0-02	The lower frequency	0.00Hz~60.00Hz, when the running frequency is lower than this value, the controller will stop running		30.00Hz
F0-04	Output voltage after start	100V ~ 900V, bus voltage greater than the set value, there is output	Output 220Vseries:150V	150V
			Output 380Vseries:350V	350V
F0-05	Maximum power point's voltage	100V ~ 900V, PV array maximum power point voltage	Output 220Vseries:310V	Depend on PV array
			Output 380Vseries:540V	
F0-06	The maximum output power	The maximum output power of PV array. （0.1kW~900.0kW） Note: The set value must be F0-06≥F0-07		Depend on PV array
F0-34	Automatic maximum power voltage search function selection	0: Manual. Need to set F0-05, the system will run according to this power point voltage; 1: Auto 1. No need to set F0-05, the system will automatically select the starting reference voltage and automatically search for the maximum power point voltage according to the on-site environment, the rate of regulation is slower than Auto 2; 2: Auto 2. No need to set F0-05, the system will take this voltage as the starting reference voltage and automatically search for the maximum power point voltage according to the on-site environment,the rate of regulation is faster than Auto 1. Suggestions for use: Manual (F0-34=0): 0.75kW~3.0kW models utility/photovoltaic input at the same time Auto 1 (F0-34=1): 0.75kW~3.0kW utility/photovoltaic input at the same time. Auto 2 (F0-34=2): First, all models only PV input, second, 4.0kW and above models utility / PV input at the same time.		2

10 Controller Wiring Guide

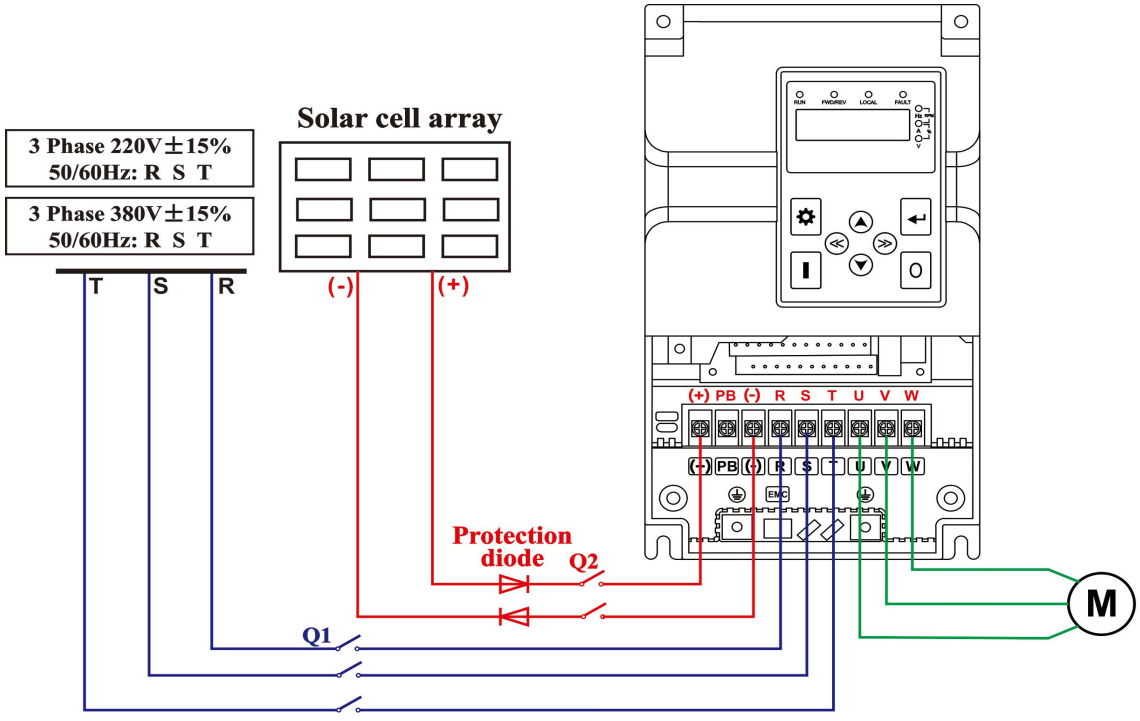
■ **220V：0.75~2.2kW，380V：0.75~2.2kW,Wiring Diagrams**



WLD280-2001, WLD280-2002, WLD280-2003 AC input power supply can be single-phase power supply, The wiring terminals of the single-phase power supply are L and N.

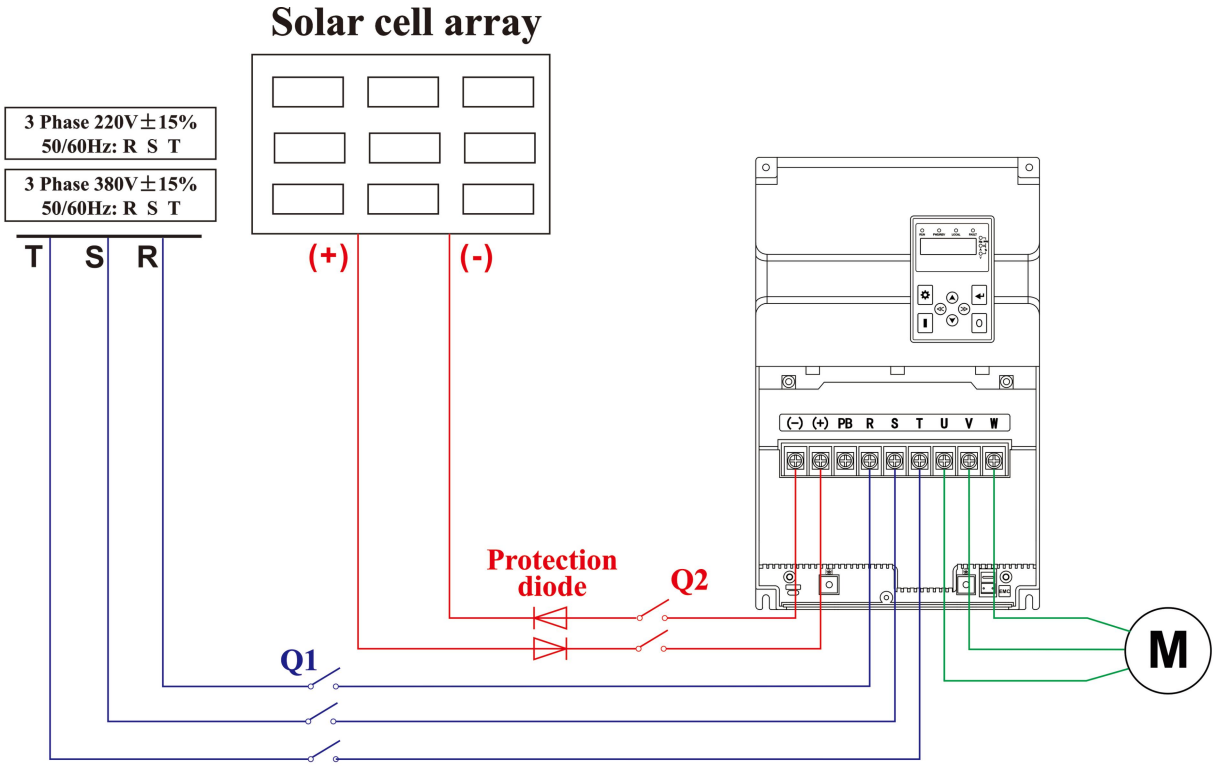
Note: It is forbidden to close the switches (Q1 and Q2) at the same time.

■ **220V：3.0kW~15.0kW，380V：4.0kW~22.0kW ,Wiring Diagrams**



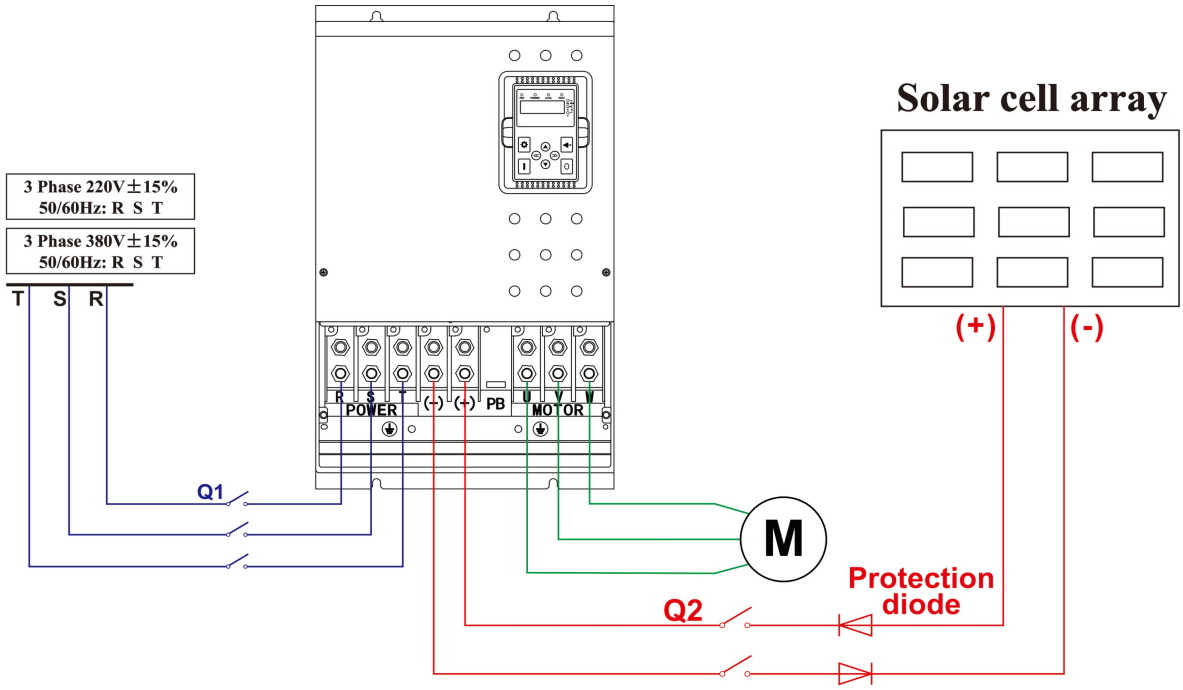
Note: It is forbidden to close the switches (Q1 and Q2) at the same time.

■ 220V：18.5kW~22.0kW，380V：30.0kW ~ 37.0kW,Wiring Diagrams



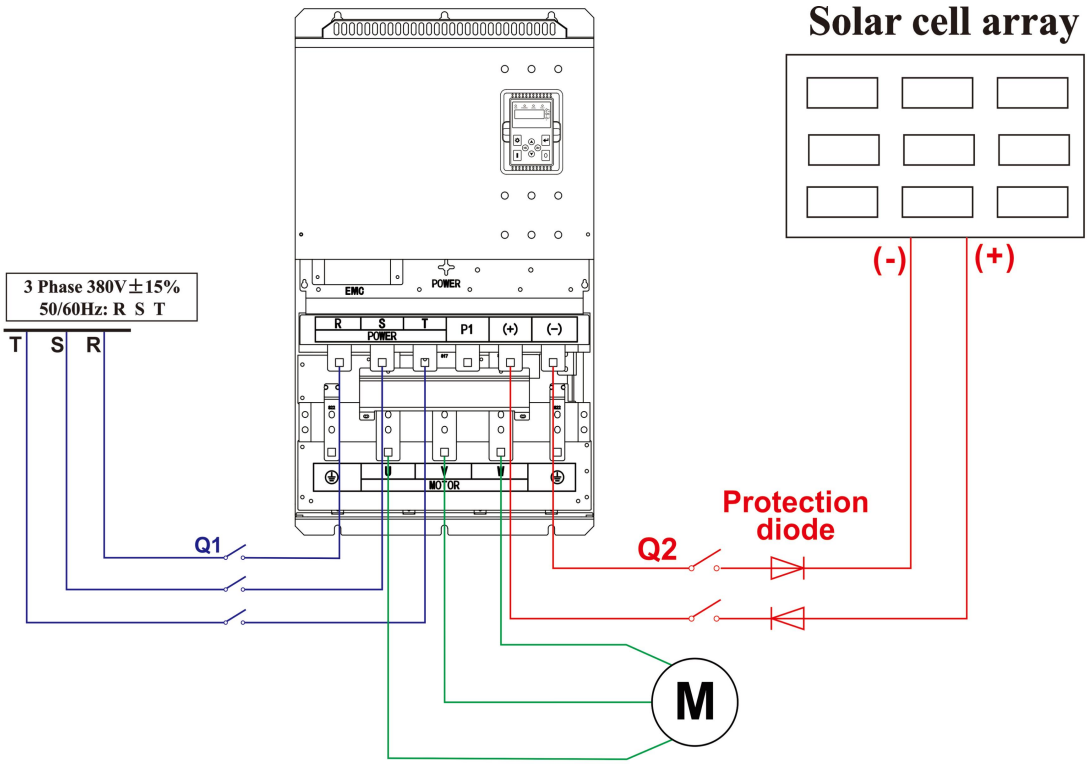
Note: It is forbidden to close the switches (Q1 and Q2) at the same time.

■ 220V：30.0kW~55.0kW，380V：45.0kW ~ 110.0kW,Wiring Diagrams



Note: It is forbidden to close the switches (Q1 and Q2) at the same time.

■ **380V：132.0kW ~ 200.0kW,Wiring Diagrams**



Note: It is forbidden to close the switches (Q1 and Q2) at the same time.

Agent: