



PDS33 Solar Pump Controller

User Manual

Preface

Thank you for using PDS33 series products. This manual provides you with relevant operation instructions and detailed description of parameters. Please read this manual carefully before installation, running, maintenance or inspection.

Please make sure the wiring and the pump's rotation direction is correct before using.

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Notes for Safe Operation

■ Before Installation



Do not install or operate the controller which is damaged or has missing parts. Otherwise, it may result in equipment damage or life harm.

■ Installation



- ◎ Hold the bottom of the controller when installing or moving the controller, you must not just hold the shell, in order to prevent the injury or breaking of controller.
- ◎ Install the controller on nonflammable material like metal. Otherwise it may cause a fire.
- ◎ When the controller is mounted in a protective cabinet, the cabinet needs to set vents to ensure ambient temperature is below 40°C, otherwise it may be damaged because of high temperature.
- ◎ When installing the controller, you should avoid direct sunlight, the controller can be installed under the PV arrays.



- ◎ Ensure only qualified personnel can install and operate the controller. Otherwise it can cause an electrical shock or damage of the controller.
- ◎ Make sure the controller is isolated from power supply by the circuit breaker. Otherwise it may cause a fire.
- ◎ Make sure that the ground terminal (⊕) is grounded correctly.
- ◎ Do not touch the power input terminals or the pump's terminals. Otherwise it may cause an electrical shock.

■ Operation



- ⊙ Do not open or remove the front cover during operation. Otherwise it may cause an electrical shock.
- ⊙ Before testing the pump must be installed; you cannot make the pump dry-run for a long time. In order to test the pump, the maximum dry-run time is not more than 15s
- ⊙ If the pump turning is reversed, it can change any two cables of the pump's three power cables.
- ⊙ When the water pump is stopped due to the light shadow, it will restart the operation after 300s.
- ⊙ If a water level probe is installed in the well, when the water level is below the level of water shortage, the water pump will stop. If there is no water level probe, it will need to be short connection of controller's related terminals. If a water level probe is not used, the controller's terminals must be short connected

■ Maintenance and check



- ⊙ Only qualified or authorized professional personnel can maintain, replace and inspect the controller. Otherwise it may cause damage and injury.
- ⊙ Wait at least 10 minutes after the power failure, or make sure that is no residual voltage before carry out maintenance and inspection, otherwise it may cause damage.

■ Others



- ⊙ Failing to follow these instructions, which result in damage to the machine, cannot enjoy the warranty service.

Chapter 1 How It Works

1.1 System Description

The PDS33 solar pumping system serves to provide water in remote applications where electrical grid power is either unreliable or unavailable. The controller can convert DC power from the PV array to AC power, and drive variable kinds of pumps. In sunny days, the PDS33 solar pumping system can continuously pump water. The system is without batteries and other energy storage devices, it is recommended to take water to a reservoir for later use and water sources are those natural or special such as river, lake, well or waterway, etc. A float switch can be installed in the water tower to control the pump operation. And install a low-level probe in well to detect the well water so that when the water shortage pump is stopped. Figure 1 shows a typical diagram of a PDS33 solar pumping system. The major parts and components in the system are listed after the diagram.

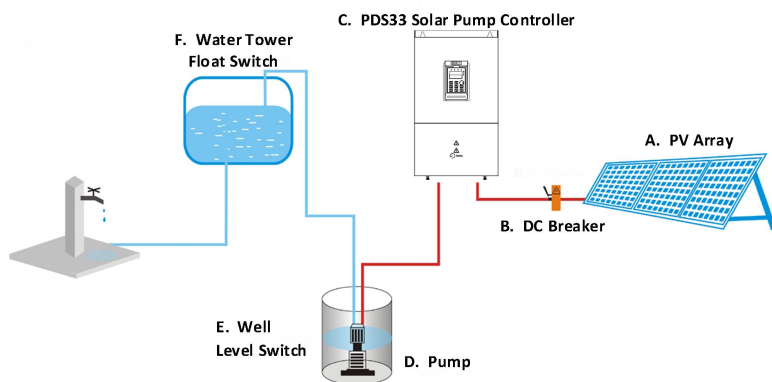


Figure 1-1-1 PDS33 solar pumping system

1.2 System Consist

- A. Solar Array
- B. DC Breaker or Disconnecting Switch
- C. PDS33 series Solar Pump Controller
- D. Pump and Motor
- E. Water Source Level Switches (optional)
- F. Tank Level Switches (optional)

The PDS33 solar pump controller runs at variable speed while matching the changing power provided by the solar array. Variable speed operation means there is no in-rush or surge of energy during the pump/motor start-up, helping to eliminate wear on the motor and pumping system.

■ Pump Check Valve Requirements

Notice: In order to ensure maximum system reliability and water delivery, check valves must be installed in the drop pipe. The first check valve must be installed at the pump and additional check valves should be installed every 30m (100 ft) of vertical pipe after the pump.

1.3 System Functions

■ System Diagnostics

The PDS33 solar pump controller continuously monitors system performance and detects a variety of abnormal conditions. In many cases, the controller will compensate as needed to maintain continuous system operation; however, if there is high risk of equipment damage, the controller will protect the system and display the fault condition. If possible, the controller will try to restart itself when the fault condition subsides. See Diagnostics and Troubleshooting section for a list of Fault Codes and corrective actions.

■ Motor Soft-Start

Normally, when there is a demand for water and power is available, the PDS33 solar pump controller will be operating. Whenever the PDS33 solar pump

controller detects a need for water, the controller always “ramps up” the motor speed while gradually increasing motor voltage, resulting in a cooler motor and lower start-up current compared to conventional water systems. Due to the controller’s soft-start feature this will not harm the motor.

■Overheat Monitoring

The PDS33 solar pump controller can be operated at full power when the ambient temperature reaches 45 °C. At temperatures above 45 °C, the controller reduces the carrier frequency and maintains operation as much as possible.

■Water Level Control

The PDS33 solar pump controller can access two water level switch detects remotely control the pump automatically. Level switch for PDS33 solar pump controller is optional, not mandatory.

■Hybrid Input of DC & AC Power Supply

PDS33 Solar Pump Controller supports both DC and AC power input. When they are connected at a same time, the system will start the water pump with DC input power if it is available, and AC input power works as backup, ensuring the continuous power supply.

Note: According to different models, the power supply can be both single phase 220V, and also 3 phase 380V, please seek the details from manufacturer or certificated agents.

Chapter 2 General Information

The PDS33 solar pump controller is a variable speed motor drive designed to run any IEC three-phase asynchronous motors. The PDS33 solar pumping system provides water to remote locations by converting high voltage, direct current from a solar array into alternating current to run a standard three-phase asynchronous motor. When solar energy is not enough AC input power can work as a backup power supply. The controller provides fault detection, motor soft start, and speed control. The PDS33 solar pump controller is designed to provide these features with the plug and play ease of installation.

The PDS33 solar pump controller is designed with the high standard of reliability expected of products. In conditions of weak sunshine, the controller can also drive the pump to lift water, AC input power can work as a backup power supply, to prevent the system panels from failure, and controller only stops in extreme conditions. Full operation is restored automatically whenever abnormal conditions subside.

2.1 Inspection

Before starting , inspect the PDS33 solar pump controller unit. Verify that the part number is correct and that no damage has occurred during transit.

NOTE: PDS33 solar pump controller is one component of a PDS33 solar pumping system which has other two optional components, solar array and AC pump with motor.

2.2 Descriptions and Features

The PDS33 solar pump controller is based on a standard PDS33 platform controlling a standard three-phase asynchronous motor driving a pump powered by a solar array or an optional AC generator backup.

The PDS33 solar pump controller continuously monitors system performance and incorporates a number of features for pumping system protection. In the event of a

fault, the PDS33 solar pump controller will indicate the type of fault through the LED display mounted on the front cover of controller.

The PDS33 solar pumping system is optimized for pumping under adverse input power conditions unique to solar arrays:

- Internal diagnostics will tolerate a lower input voltage.
- Whenever possible, the controller attempts to drive the pump load by maximizing power output from the solar array.

An easy to use interface is provided to enhance configurability and enable remote system monitoring.

- A LED display provides a detailed indication of system status.
- A small keypad offers flexibility for selection of user options.

2.3 Protection Features

Electronic monitoring gives the controller the capability to monitor the system and automatically shut down in the event of:

- Dry well conditions – with low level switch
- Bound Pump – with auto-reversing torque.
- High Voltage Surge
- Low Input Voltage
- Open Motor Circuit
- Short circuit
- Overheat

NOTE: This controller provides motor overload protection by preventing motor current from exceeding rating current and by limiting the duty cycle in the event of low water level. This controller does not provide over temperature sensing of the motor.

2.4 PDS33 Solar Pump Controller Model Description

PDS33 - 4 T 5R5B - EH

① ② ③ ④ ⑤ ⑥

Segment	Description	Options
①	PDS series	Solar Pump Controller
②	Series ID	3: Series of 3rd generation. 3: Apply to three-phase induction motor
③	Rated Output Voltage	2: 220V three phase; 4: 380V three phase
④	Input Voltage	S: DC 330V rating, MPPT range DC 275V~ 380V (Note 1) T: DC 560V rating, MPPT range DC 500V~750V (Note 2)
⑤	Motor Power Rating	004:4kW;5R5:5.5kW;R: decimal point
⑥	EH	English series@ High voltage
<p>Note 1: Supporting Alternating Current input, with voltage rating of AC 220V single phase connected to terminal R&T.</p> <p>Note 2: Supporting Alternating Current input, with voltage rating of AC 380V three phase connected to terminal R, S and T.</p>		

Sheet 2-4-1 PDS33 Model Description

2.5 PDS33 Technical Specification

General Parameters			
Protection			
Surge Protection	Integrated	Overvoltage Protection	Integrated
Under voltage Protection	Integrated	Locked pump Protection	Integrated
Open circuit Protection	Integrated	Short circuit Protection	Integrated
Overheated Protection	Integrated	Dry Run Protection	Integrated
Communication			
MODBUS Communication Card	Optional RS-485		
Others			
Ambient Temperature Range	-20°C~60°C;>45°C, Derating as Required		
Cooling Method	Fan Cooling		
Ambient Humidity	≤ 95%RH		
Standard Warranty(month)	18		
Certificates	IEC/EN 61800-5-1,IEC/EN 61800-2:2004,IEC/EN61800-3:2004,CE		

Sheet 2-5-1 PDS33 Technical Specification

2.6 PDS33 Model Selection

Controller Model	PDS33-2S2R2B-EH	PDS33-4T2R2B-EH	PDS33-4T004B-EH	PDS33-4T5R5B-EH
Input Data				
Max Input Voltage(Voc)	DC 450V		DC 900V	
Recommended Voltage, at MPP	DC 275-380V		DC 500-750V	
Recommended PV Array Power [kW]	2.7~3.5	2.7~3.5	4.8~6.4	6.6~8.8
Alternate AC Generator				
Input Voltage	1SP 220-240		3PH 380-480	
Max Amps(RMS)[A]	23	5.8	10.5	14.6
Power and VA Capability[kVA]	4	4	5.9	8.9
Output Data				
Output Voltage, Rated	3PH 0-220/240		3PH 0-380/480	
Max Amps(RMS)[A]	9.6	5.1	9	13
Output Power, Rated[kW]	2.2	2.2	4	5.5
Output Frequency	0~50Hz/60Hz			

Sheet 2-6-1 PDS33 2.2 kW—5.5kW Selection Sheet

Controller Model	PDS33-4T7R5B-EH	PDS33-4T011B-EH	PDS33-4T015B-EH	PDS33-4T018R5B-EH
Input Data				
Max Input Voltage(Voc)	DC 900V			
Recommended Voltage, at MPP	DC 500-750V			
Recommended PV Array Power [kW]	9~12	13.2~17.6	18~24	22.2~29.6
Alternate AC Generator				
Input Voltage	3PH 380-480			
Max Amps(RMS)[A]	20.5	26	35	38.5
Power and VA Capability[kVA]	11	17	21	24
Output Data				
Output Voltage, Rated	3PH 0-380/480			
Max Amps(RMS)[A]	17	25	32	37
Output Power, Rated[kW]	7.5	11	15	18.5
Output Frequency	0~50Hz/60Hz			

Sheet 2-6-2 PDS33 7.5 kW—18.5 kW Selection Sheet

Controller Model	PDS33-4T022B-EH	PDS33-4T030B-EH	PDS33-4T037B-EH	PDS33-4T045B-EH
Input Data				
Max Input Voltage(Voc)	DC 900V			
Recommended Voltage, at MPP	DC 500-750V			
Recommended PV Array Power [kW]	26.4~35.2	36~48	44~59.2	54~72
Alternate AC Generator				
Input Voltage	3PH 380-480			
Max Amps(RMS)[A]	46.5	62	76	92
Power and VA Capability[kVA]	30	40	57	69
Output Data				
Output Voltage, Rated	3PH 0-380/480			
Max Amps(RMS)[A]	45	60	75	91
Output Power, Rated[kW]	22	30	37	45
Output Frequency	0~50Hz/60Hz			

Sheet 2-6-3 PDS33 22 kW—45 kW Selection Sheet

Controller Model	PDS33-4T055B-EH	PDS33-4T075B-EH	PDS33-4T093B-EH	PDS33-4T110B-EH
Input Data				
Max Input Voltage(Voc)	DC 900V			
Recommended Voltage, at MPP	DC 500-750V			
Recommended PV Array Power [kW]	66~88	90~120	112~149	132~176
Alternate AC Generator				
Input Voltage	3PH 380-480			
Max Amps(RMS)[A]	113	157	180	214
Power and VA Capability[kVA]	85	114	134	160
Output Data				
Output Voltage, Rated	3PH 0-380/480			
Max Amps(RMS)[A]	112	150	176	210
Output Power, Rated[kW]	55	75	93	110
Output Frequency	0~50Hz/60Hz			

Sheet 2-6-4 PDS33 55 kW—110 kW Selection Sheet

Controller Model	PDS33-4T132B-EH	PDS33-4T160B-EH	PDS33-4T185B-EH	PDS33-4T200B-EH
Input Data				
Max Input Voltage(Voc)	DC 900V			
Recommended Voltage, at MPP	DC 500-750V			
Recommended PV Array Power [kW]	158~211	192~256	222~296	240~320
Alternate AC Generator				
Input Voltage	3PH 380-480			
Max Amps(RMS)[A]	256	307	345	385
Power and VA Capability[kVA]	192	231	245	260
Output Data				
Output Voltage, Rated	3PH 0-380/480			
Max Amps(RMS)[A]	253	304	340	377
Output Power, Rated[kW]	132	160	185	200
Output Frequency	0~50Hz/60Hz			

Sheet 2-6-5 PDS33 132 kW—200 kW Selection Sheet

Controller Model	PDS33-4T220B-EH	PDS33-4T250B-EH	PDS33-4T280B-EH	PDS33-4T315B-EH
Input Data				
Max Input Voltage(Voc)	DC 900V			
Recommended Voltage, at MPP	DC 500-750V			
Recommended PV Array Power [kW]	264~352	300~400	336~448	378~504
Alternate AC Generator				
Input Voltage	3PH 380-480			
Max Amps(RMS)[A]	430	468	525	590
Power and VA Capability[kVA]	280	355	396	445
Output Data				
Output Voltage, Rated	3PH 0-380/480			
Max Amps(RMS)[A]	426	465	520	585
Output Power, Rated[kW]	220	250	280	315
Output Frequency	0~50Hz/60Hz			

Sheet 2-6-6 PDS33 220 kW—315 kW Selection Sheet

Controller Model	PDS33-4T355B-EH	PDS33-4T400B-EH
Input Data		
Max Input Voltage(Voc)	DC 900V	
Recommended Voltage, at MPP	DC 500-750V	
Recommended PV Array Power [kW]	426~568	480~640
Alternate AC Generator		
Input Voltage	3PH 380-480	
Max Amps(RMS)[A]	665	785
Power and VA Capability[kVA]	500	565
Output Data		
Output Voltage, Rated	3PH 0-380/480	
Max Amps(RMS)[A]	650	725
Output Power, Rated[kW]	355	400
Output Frequency	0~50Hz/60Hz	

Sheet 2-6-6 PDS33 355 kW—400 kW Selection Sheet

Note: according to different regions, the recommended PV array power is 1.2 ~ 1.6 times the power of the controller.

Chapter 3 Mechanical and Electrical Installation

3.1 Outline & Installation Dimensions Diagram

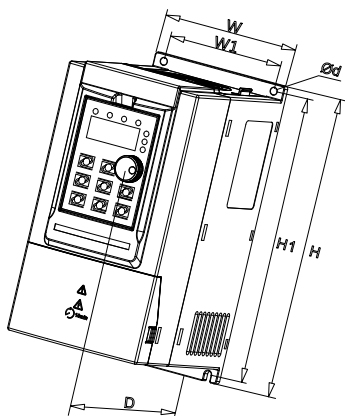


Figure 3-1-1 2.2 kW-7.5 kW Outline Dimension

Type	Outline Dimension			Installation Dimension		Hole Size
	H	W	D	H1	W1	d
PDS33-2S2R2B-EH	187	88	138	177	73	5
PDS33-4T2R2B-EH						
PDS33-4T004B-EH	207	100	147	197	85	5
PDS33-4T5R5B-EH	247	130	167	237	113	5
PDS33-4T7R5B-EH						

Sheet 3-1-1 PDS33 2.2 kW—7.5 kW Dimension

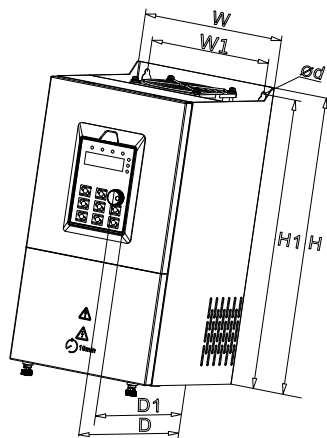


Figure 3-1-2 11 kW-110 kW Outline Dimension

Type	Outline Dimension			Installation Dimension		Hole Size
	H	W	D	H1	W1	d
PDS33-4T011B-EH	360	182	197	331	156	7
PDS33-4T015B-EH						
PDS33-4T018R5B-EH	385	219	197	356	156	7
PDS33-4T022B-EH						
PDS33-4T030B-EH	442	256	228	414	199	7
PDS33-4T037B-EH						
PDS33-4T045B-EH	543	310	280	523	245	10
PDS33-4T055B-EH						
PDS33-4T075B-EH	580	358	328	560	270	10
PDS33-4T093B-EH						
PDS33-4T110B-EH						

Sheet 3-1-2 PDS33 11kW—110kW Dimension

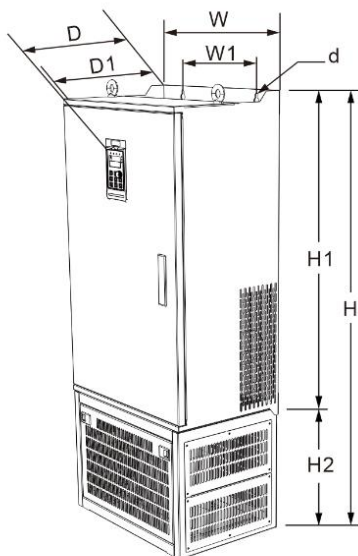


Figure 3-1-3 132kW-200kW Outline Dimension

Type	Outline Dimension					Installation Dimension		Hole Size
	H	H2	W	D	D1	H1	W1	d
PDS33-4T132B-EH	1199	350	502	355	342	842	320	10
PDS33-4T160B-EH								
PDS33-4T185B-EH								
PDS33-4T200B-EH	1570	426	600	408	398	1147	400	12
PDS33-4T220B-EH								

Type	Outline Dimension					Installation Dimension		Hole Size
	H	H2	W	D	D1	H1	W1	d
PDS33-4T250B-EH	1570	426	600	408	398	1147	400	12
PDS33-4T280B-EH								
PDS33-4T315B-EH	1696	426	800	408	398	1266	520	12
PDS33-4T355B-EH								
PDS33-4T400B-EH								

Sheet 3-1-3 PDS33 132kW—400kW Dimension

3.2 Keypad Dimensions Diagram

■ Keypad Dimensions

We designed 2 kinds of keypad with different sizes.

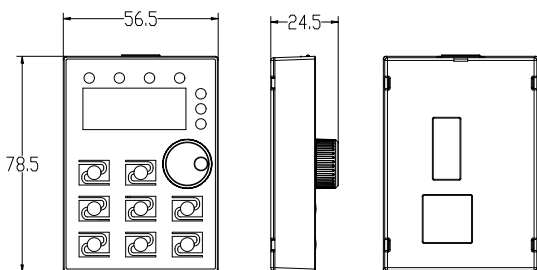


Figure 3-2-1 2.2kW-7.5kW Keypad Dimension

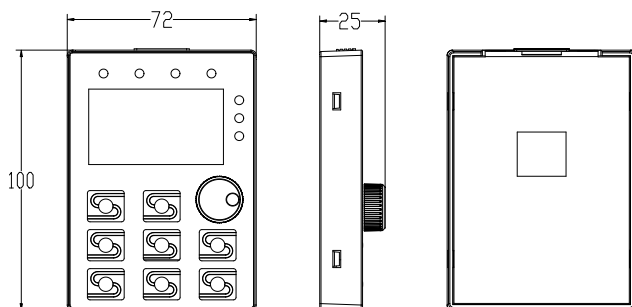


Figure 3-2-2 11kW-200kW Keypad Dimension

3.3 Mechanical Installation

3.3.1 Overheat protection

Install the PDS33 solar pump controller in a control box with control terminals and power wiring. Install the control box out of direct sunlight to prevent overheating and reduced performance. The optimum location is on the mounting pole for the solar array underneath the array for protection from the sun, heat, and weather elements. Placing the control box in direct sunlight or high ambient temperatures will result in reduced performance due to temperature foldback protection of the PDS33 solar pump controller. For optimum performance, maximize the shading of the control box.

It is recommended that use a wire tube to protect the electric wire from the destruction of wildlife and natural weathering, and bury the wire tube into the ground to strengthen protection. If you do not use a wire tube, you can use a higher quality outdoor cable.

3.3.2 Location Selection

The PDS33 solar pump controller is intended for operation in ambient temperatures up to 60°C, but in order to avoid overheating caused by the failure, it

is recommended to install the controller in the shadow position.

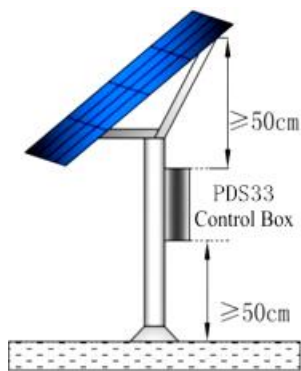


Figure 3-3-1 Control Box Location

3.4 Electrical Installation

3.4.1 Terminals

The following are typical figures of terminal blocks.

Note: Terminals are different in shapes and combinations, depending on different sizes of PDS33 Solar Controllers.

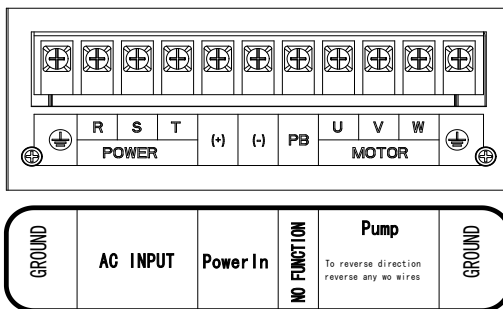


Figure 3-4-1 Main terminals (The sequence may be different from actual product)

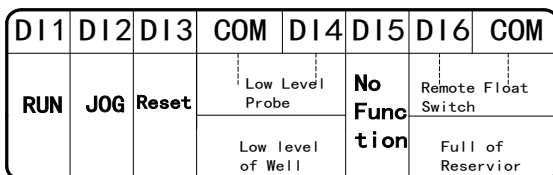


Figure 3-4-2 Control terminals (The sequence may be different from actual product)

3.4.2 DC Input Wiring

For solar pumping systems, a two-pole DC breaker switch must be installed between the solar array and the PDS33 solar pump controller.


Connect the cables which comes from the two-pole DC breaker switch downstream terminals marked with “+” and “-” (positive and negative poles of Solar panel output), to PDS33 solar pump controller’s terminals block labeled as “+”, “-”.

Note: The R, S, T terminals are with anti reverse connection protection; DC power supply can be connected in the R, S, T terminals, no need to consider the phase sequence.

3.4.3 Junction box connection

If there are a large number of solar modules, it is necessary to use a junction box to converge the bus to the solar array. The junction box need to install fuses, lightning protection device and DC switch. The fuse and the DC switch can prevent the short circuit protection; the lightning protection device can play the direct current side the lightning protection function. The junction box must be sealed, and water can not enter

3.4.4 Ground Wiring

Ground terminal (GND) is labeled as this icon . Please refer to the instruction to this icon, or other equivalent icon or sign by local electrical codes or international standard. Correct grounding helps to prevent shock hazard if there is a fault in the motor.

3.4.5 Motor Wiring

Connect the cable with four wires from the Motor to the controller terminal block to terminals U, V, W, and GND .Check motor lead color to ensure correct installation.

Note: To reverse direction of motor rotation, reverse any two wires

US	Black (BLK)	Red (RED)	Yellow (YEL)	Ground (GND)
International	Gray (GRY)	Black (BLK)	Brown (BRN)	Ground (GND)

Sheet 3-4-1 Motor Wiring Guide

3.4.6 Low water level probe wiring (optional)

In order to avoid dry pumping lead to pump damage can be connected a wells probe to the terminals of the PDS33 solar pump controller, so as to detect the water level in wells and the wire maximum length can not more than 50m. If there is no water level probe for the detection of the water level, please keep the two terminals of the controller short. The controller can also detect water through the built-in software water detection function.

3.4.7 Water tank level float switch wiring (optional)

Use a floating ball switch to prevent reservoir overflow is recommended. When the reservoir is full, the pump will stop; when the water level is lower than the low level, the pump will be restarted. It can prevent the overflow, limit the unnecessary pump wear. The PDS33 controller allows the use of small signal line to connect to remote float switch, even if the position of the reservoir is far away.

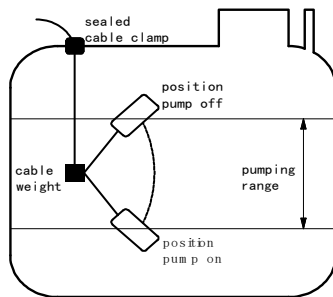
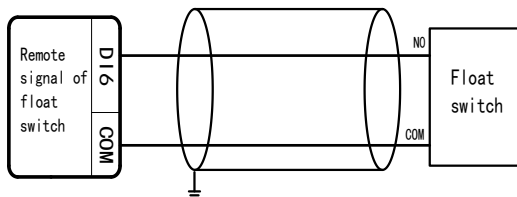


Figure 3-4-3 Floating Ball Diagram

Float switch request:

1. The minimum requirements for 1 mm² line diameter, the distance up to 50m
2. If the application is in a long distance transmission, the need to use the shielded wire. The end of the shielding layer close to the controller needs to be grounded, the end close to the floating ball switch; the end close to the float switch is not required to be grounded.



If the cable is shielded, just connect to ground

Figure 3-4-4 Float ball wiring diagram

3.4.8 Electrical conduit

When the system installed in the outdoor, electrical conduit can be used to protect the outdoor electric wires, so as to avoid the impact from the weather, human activities, chewing animals. If you do not use the electrical conduit, use the higher quality outdoor wire.

3.4.9 System Wiring Diagram

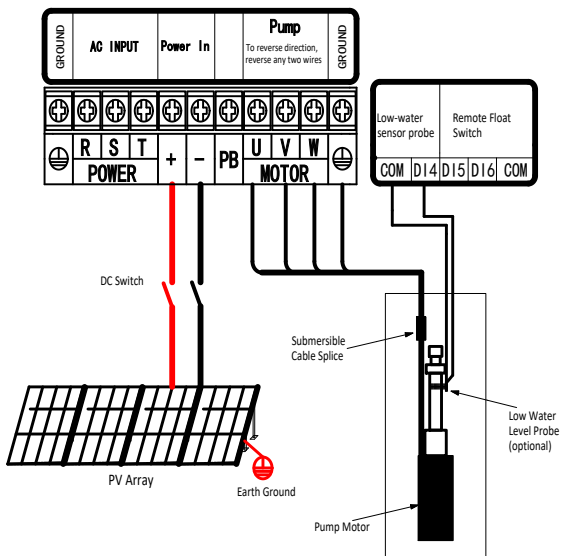


Figure 3-4-5 System Wiring Diagram

NOTE:

In the case of conventional 250W polycrystalline components, the peak voltage is 30.6V and the open circuit voltage is 37V. Description of the number of input components in series:

The PDS33-4T series controller is connected in series with the serial number of the input components of the 18~20 blocks, and the 250W DC 500~750V (MPPT) is satisfied.

Chapter 4 Display and Operation

4.1 Keypad Description



Figure 4-1-1 Keypad Schematic Diagram

Item	Name	Function
Indicator light	Unit indicator light	Hz: Frequency unit; A: Current unit; V: Voltage unit; RPM (Hz+A) : Speed unit; % (A+V) : Percentage
	Status indicator light	RUN: On/Running; Off/Stopped FWD/REV: On/FWD; Off/REV; Flashing/Switching between FWD & REV TUNE/TC: Flashing /Fault status LOCAL/REMOTE: On/Terminal control; Flashing /Communication control; Off/Keypad control
Key	PRG (Programming key)	Enter or exit first class parameters
	ENT (Enter key)	Enter next class menu and confirm parameter setting
	△ (Up key)	Increment of data and function codes

Item	Name	Function
	▽ (Down key)	Decrement of data and function codes
	>> (Shift key)	In the stop display interface and the running display interface, the display parameters can be selected cyclically; when the parameters are modified, the modified bits of the parameters can be selected.
	RUN	In keypad control mode, it can start the controller
	STOP/RESET	Can be used for stop running or fault reset
	MF.K	Function switching
Knob	Pulse potentiometer	Can be source of set frequency

Sheet 4-1-1 Keypad Description

4.2 Keypad Operation Process

4.2.1 Parameter Setting

Three levels of menu are as following:

- Function code group (first-class)
- Function code (second-class)
- Setting parameter of function code (third-class)

In order to set up the electric automatic start function $FD.07=1$ as an example, the modified parameter flow chart is as follows:

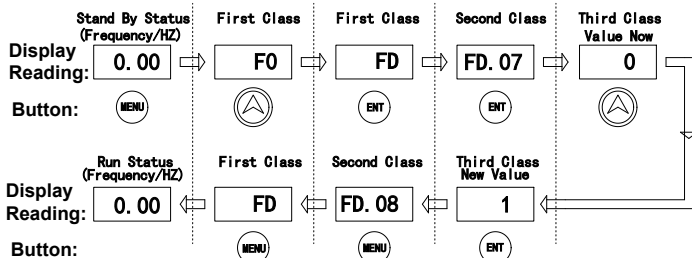


Figure 4-2-1 Schematic Diagram of Function Parameters

4.3 Trial operation

- Check and make sure wiring are correct. If needed, take a megger to test the insulation of motor, cable, etc.;
- Use a multimeter to test the PV output voltage at the DC switch.;
- Power on the controller by switch the DC switch.

● If necessary, modify and set the parameters of motor to the controller

For Example, if the motor which rated frequency is 60Hz, these parameters need modification:

High limit of running frequency F0.12=60;

Other related parameters are: motor rated power F2.01, motor rated frequency F2.04=60, motor rated speed F2.05, motor rated voltage F2.02, motor rated current F2.03.

Note: default motor rated frequency setting is 50Hz.

Slowly start to check the direction

Pressing the RUN/STOP key to start the motor shortly and slowly, and check the direction of the pump.

If the pump is in dry-run state, the maximum operating time cannot exceed 15s, otherwise it may cause damage to the pump.

If the pump is in dry-run, the maximum operating time cannot exceed 15seconds; otherwise it may cause damage to the pump. If the pump steering error, close the DC switch, according to the pump / motor wiring to change the wiring of the motor section of the two leads.

After the above parts are complete, you can try to run the system.

Let the system work for an hour, check the water supply capacity.

Commissioning finish

When the light is insufficient, the solar power module output power will be reduced, and the pump operation speed will be very slow until stop. The controller will attempt to start every 300 s, and during the trial run, the running indicator is always on.

When a shadow suddenly passes through the battery array, the controller will lose track of the input voltage, and the pump will stop working. But the controller does not show the fault, the controller will try to restart the pump.

Chapter 5 Parameters List

- : The parameters can be modified at stop or running status.
 ● : The parameters cannot be modified at running status.
 ◎ : The parameters which are actual-detecting record value and cannot be modified.

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F0 Group: Basic Function						
F0.00	Motor Driving Mode	0: SVC 1: V/F	1	1	●	F000
F0.01	Start/Stop Source Option	0: Start/Stop Button on Keypad 1: DI Terminal 2: RS485 Communication	1	0	●	F001
F0.02	Basic Point of UP/DOWN Button	0: Running Frequency 1: Set Frequency	1	1	●	F002
F0.03	Main Frequency Source X	0: Keypad, not retained after power-off 1: Keypad, retained after power-off 2: AI1 Terminal 3: AI2 Terminal 4: Reserved 5: PULSE Set (DI6 Terminal) 6: Multi-Stage Speed 7: Easy PLC 8: PID 9: RS485 Communication	1	8	●	F003
F0.04	Auxiliary Frequency Source Y	0: Keypad, not retained after power-off 1: Keypad, retained after power-off 2: AI1 Terminal 3: AI2 Terminal 4: Reserved	1	0	●	F004

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		5: PULSE Set (DI6 Terminal) 6: Multi-Stage Speed 7: Easy PLC 8: PID 9: RS485 Communication				
F0.05	Auxiliary Frequency Source Y Range Selection When Superimposing	0: Maximum Output Frequency 1: Main Frequency Source X	1	0	○	F005
F0.06	Auxiliary Frequency Source Y Range When Superimposing	0% ~ 150%	1%	100%	○	F006
F0.07	Frequency Calculation Selection	Ones Digit: Frequency Source Selection 0: Main frequency source X 1: X and Y calculation result 2: Switchover between X and Y 3: Switchover between X and calculation result of X & Y 4: Switchover between Y and calculation result of X & Y Tens digit: X and Y Calculation Selection 0: X+ Y 1: X- Y 2: Max (X,Y) 3: Min (X,Y)	11	0	○	F007
F0.08	Keypad Set Frequency	0.00Hz ~ F0.10	0.01Hz	50.00Hz	○	F008
F0.09	Running Direction	0: FWD 1: REV	1	0	○	F009

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F0.10	Maximum Output Frequency	0.00Hz ~ 400.00Hz (SVC Mode) 0.00Hz ~ 1000.00Hz (VF Mode)	0.01Hz	50.00Hz	●	F00A
F0.11	Source of Maximum Running Frequency	0: F0.12 1: AI1 2: AI2 3: Reserved 4: PULSE Set 5: RS485 Communication	1	0	●	F00B
F0.12	Maximum Running Frequency	F0.14 ~ F0.10	0.01Hz	50.00Hz	○	F00C
F0.13	Maximum Running Frequency Offset	0.00Hz ~ F0.10	0.01Hz	0.00Hz	○	F00D
F0.14	Minimum Running Frequency	0.00Hz ~ F0.12	0.01Hz	0.00Hz	○	F00E
F0.15	Running Mode When Achievable Frequency is Below F0.14	0: Run at F0.14 1: Stop 2: Run at 0Hz (Sleep)	1	0	○	F00F
F0.16	Carrier Frequency	0.5kHz ~ 16.0kHz	0.1kHz	Due to VFD Model	○	F010
F0.17	Reserved	-	-	-	○	F011
F0.18	Acceleration Time1	0.0s ~ 6500.0s	0.1s	Model determination	○	F012
F0.19	Deceleration Time1	0.0s ~ 6500.0s	0.1s	Model determination	○	F013
F0.20	Recovery Option	0: No Option 1: Recover all default settings except F2 group 2: Clear all error(alarm)	1	0	●	F014

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		records				
F0.21	Parameter Lock	0: Invalid 1: Valid	1	0	○	F015
F0.22	Memorable Option of Keypad Set Frequency	0: Invalid 1: Valid	1	1	●	F016
F0.23	Unit of Acceleration/Deceleration Time	0: 1 s 1: 0.1 s 2: 0.01 s	1	1	●	F017
F0.24	Maximum Frequency for Acceleration/Deceleration Time	0: F0.10 1: Set Frequency 2: 100Hz	1	0	●	F018
F0.25	Option of Fan	0: Keep running when output frequency is above 0 1: Keep running when powered-on	1	0	○	F019
F0.26	Unit of Frequency Display	1: 0.1Hz 2: 0.01Hz	1	2	●	F01A
F1 Group Start & Stop Control						
F1.00	Startup Mode	0: Direct Startup 1: Speed tracing before startup 2: Pre-excitation before startup only available for asynchronous motor	1	0	○	F100
F1.01	Speed Tracing Mode	0: Tracing from the running frequency of latest stop 1: Tracing from 0Hz 2: Tracing from F0.12	1	0	●	F101
F1.02	Gain of Speed	1 ~ 100	1	20	○	F102

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Tracing					
F1.03	Startup Frequency	0.00Hz ~ 10.00Hz	0.01Hz	0.50Hz	○	F103
F1.04	Holding Period of Startup Frequency	0.0s ~ 100.0s	0.1s	0.0s	●	F104
F1.05	DC Braking/ Pre-excitation Current of Startup	0% ~ 100% * Rated Current	1%	0%	●	F105
F1.06	DC Braking/ Pre-excitation Period of Startup	0.0s ~ 100.0s	0.1s	0.0s	●	F106
F1.07	Acceleration/ Deceleration Mode	0: Linear 1: S-Curve A 2: S-Curve B	1	0	●	F107
F1.08	Beginning Time Percentage of S-Curve	0.0% ~ 70.0%	0.10%	30.00%	●	F108
F1.09	Ending Time Percentage of S-Curve	0.0% ~ 70.0%	0.10%	30.00%	●	F109
F1.10	Stop Mode	0: Decelerate to Stop 1: Free Stop	1	0	○	F10A
F1.11	DC Braking Beginning Frequency at Stop	0.00Hz ~ F0.12	0.01Hz	0.00Hz	○	F10B
F1.12	Delay Time of DC Braking at Stop	0.0s ~ 100.0s	0.1s	0.0s	○	F10C
F1.13	DC Braking Current at Stop	0% ~ 100% * Rated Current	1%	0%	○	F10D
F1.14	DC Braking Period at Stop	0.0s ~ 100.0s	0.1s	0.0s	○	F10E

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F1.15	Inner Brake Unit Working Rate	0% ~ 100%	1%	100%	○	F10F
F1.16	Output at 0Hz	0: Outputs normally 1: Shuts down output	1	1	●	F110
F2 Group: Motor Parameters						
F2.00	Type of Motor	0: Ordinary 3-Phase Asynchronous Motor 1: Variable Frequency 3-Phase Asynchronous Motor 2: Single Phase Motor	1	0	◎	F200
F2.01	Motor Rated Power	0.1kW ~ 400.0kW	0.1kW	Due to VFD Model	●	F201
F2.02	Motor Rated Voltage	1V ~ 440V	1V	Due to VFD Model	●	F202
F2.03	Motor Rated Current	0.01A ~ 655.35A (<=55kW) 0.1A ~ 6553.5A (>55kW)	0.01A/ 0.1A	Due to VFD Model	●	F203
F2.04	Motor Rated Frequency	0.01Hz ~ F0.10	0.01Hz	Due to VFD Model	●	F204
F2.05	Motor Rated Speed	1rpm ~ 36000rpm	1rpm	Due to VFD Model	●	F205
F2.06	Motor Stator Resistance	0.001Ω ~ 65.535Ω (<=55kW) 0.0001Ω ~ 6.5535Ω (>55kW)	0.001Ω / 0.0001 Ω	Due to VFD Model	●	F206

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F2.07	Motor rotor resistance	0.001 Ω ~ 65.535 Ω (\leq 55kW) 0.0001 Ω ~ 6.5535 Ω ($>$ 55kW)	0.001 Ω / 0.0001 Ω	Due to VFD Model	●	F207
F2.08	Motor Leakage Inductance	0.01mH ~ 655.35mH (\leq 55kW) 0.001mH ~ 65.535mH ($>$ 55kW)	0.01mH/ 0.001mH	Due to VFD Model	●	F208
F2.09	Motor Mutual Inductance	0.1mH ~ 6553.5mH (\leq 55kW) 0.01mH ~ 655.35mH ($>$ 55kW)	0.1mH/ 0.01mH	Due to VFD Model	●	F209
F2.10	Non-load Current of Asynchronous Motor	0.01A ~ F2.03 (\leq 55kW) 0.1A ~ F2.03 ($>$ 55kW)	0.01A/ 0.1A	Due to VFD Model	●	F20A
F2.11	Tuning Option	0: No Option 1: Full Tuning (for the motors which can be totally removed from its load) 2: Quiet Tuning (for the motors which cannot be totally removed from its load)	1	0	●	F20B
F2.12	G/P Type Option	1: G Type (Constant Torque) 2: P Type (Square Curve Torque)	1	1	●	F20C
F2.13	Single-phase Motor Turns Ratio	50~200	1	140	●	F20D
F3 Group Vector Control Parameters						
F3.00	Speed loop proportional gain 1	1 ~ 100	1	30	○	F300
F3.01	Speed loop integral time 1	0.01s ~ 10.00s	0.01s	0.50s	○	F301

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F3.02	Switchover frequency 1	0.00 ~ F3.05	0.01Hz	5.00Hz	○	F302
F3.03	Speed loop proportional gain 2	1 ~ 100	1	20	○	F303
F3.04	Speed loop integral time 2	0.01s ~ 10.00s	0.01s	1.00s	○	F304
F3.05	Switchover frequency 2	F3.02 ~ F0.10	0.01Hz	10.00Hz	○	F305
F3.06	Slip Compensation Coefficient	50% ~ 200%	1%	100%	○	F306
F3.07	Speed Loop Filter Time Constant	0.000s ~ 0.100s	0.001s	0.000s	○	F307
F3.08	Torque Upper Limit of Speed Control	0.0% ~ 200.0%	0.10%	150.00%	○	F308
F3.09	Speed / Torque Control Option	0: Speed Control 1: Torque Control	1	0	●	F309
F3.10	Torque Upper Limit Source of Torque Control	0: Keypad Set (F3.11) 1: AI1 2: AI2 3: Reserved 4: PULSE Set 5: RS 485 Communication 6: MIN(AI1,AI2) 7: MAX(AI1,AI2)	1	0	●	F30A
F3.11	Torque Upper Limit of Torque Control	-200.0% ~ 200.0%	0.10%	150.00%	○	F30B
F3.12	Maximum FWD Frequency of Torque Control	0.00Hz ~ F0.10	0.01Hz	50.00Hz	○	F30C
F3.13	Maximum REV frequency of	0.00Hz ~ F0.10	0.01Hz	50.00Hz	○	F30D

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Torque Control					
F3.14	Acceleration Time of Torque Control	0.00s ~ 650.00s	0.01s	0.00s	○	F30E
F3.15	Deceleration Time of Torque Control	0.00s ~ 650.00s	0.01s	0.00s	○	F30F
F3.16	Torque Stiffness Coefficient	10.0%~120.0%	0.10%	100.00%	●	F310
F3.17	M Axis Current Loop Proportional Gain	0 ~ 60000	1	2000	○	F311
F3.18	M Axis Current Loop Integral Gain.	0 ~ 60000	1	1300	○	F312
F3.19	T Axis Current Loop Proportional Gain	0 ~ 60000	1	2000	○	F313
F3.20	T Axis Current Loop Integral Gain	0 ~ 60000	1	1300	○	F314
F3.21	Speed Loop Integral Separation	0: Invalid 1: Valid	1	0	○	F315
F3.22	Vector Control Overexcitation Gain	0~200	1	64	○	F316
F3.23	Speed Control Torque Upper Limit Source	0~7	1	0	○	F317
F3.24	Torque Control Static Friction Compensation Coefficient	100~300	1	100	●	F318
F3.25	Torque Control	0~100.0	0.1	0	●	F319

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Static Friction Compensation Time					
F4 Group: VF control						
F4.00	V/F Curve	0: Linear V/F Curve 1: Multi-point V/F Curve 2: Square V/F Curve 3~9: Reserved 10: V/F Complete Separation Curve 11: V/F Half Separation Curve	1	3	●	F400
F4.01	Torque Boost	0.0% ~ 30.0%	0.10%	Due to VFD Model	○	F401
F4.02	Cut-off Frequency of Torque Boost	0.00Hz ~ F0.10	0.01Hz	50.00Hz	●	F402
F4.03	Multipoint V/F Frequency 1	0.00Hz ~ F4.05	0.01Hz	3.00Hz	●	F403
F4.04	Multipoint V/F Voltage 1	0.0% ~ 100.0%	0.10%	10.00%	●	F404
F4.05	Multipoint V/F Frequency 2	F4.03 ~ F4.07	0.01Hz	5.00Hz	●	F405
F4.06	Multipoint V/F Voltage 2	0.0% ~ 100.0%	0.10%	15.00%	●	F406
F4.07	Multipoint V/F Frequency 3	F4.05 ~ F2.04	0.01Hz	8.00Hz	●	F407
F4.08	Multipoint V/F Voltage 3	0.0% ~ 100.0%	0.10%	22.00%	●	F408
F4.09	V/F Slip Compensation	0.0% ~ 200.0%	0.10%	0.00%	○	F409
F4.10	V/F	0 ~ 200	1	0	○	F40A

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Over-Excitation Gain					
F4.11	V/F Oscillation Suppression Gain	0 ~ 100	1	Due to VFD Model	○	F40B
F4.12	Voltage Source for V/F Separation	0: Keypad Set (F4.14) 1: AI1 2: AI2 3: Reserved 4: PULSE Set (DI6) 5: Multi-Stage Speed Set 6: Easy PLC 7: PID 8: RS485 Communication	1	0	○	F40C
F4.13	V/F Separation Voltage Set Value	0V ~ Motor Rated Voltage	1V	0	○	F40D
F4.14	V/F Separation Voltage Rise Time	0.0s ~ 1000.0s (The time from 0V to Motor Rated Voltage)	0.1s	0	○	F40E
F4.15	Oscillation Suppression Gain Mode	0~11	1	0	○	F40F
F4.16	Auto Voltage Regulation (AVR) Option	0: Invalid 1: Only valid during deceleration 2: Only valid at constant speed 3: Valid	1	3	●	F410
F5 Group: Input Terminals						
F5.00	DI1 Terminal Function Option	0: None 1: Forward running (FWD)	1	1	●	F500
F5.01	DI2 Terminal Function Option	2: Reverse running (REV) 3: 3 Wire Running Control	1	11	●	F501
F5.02	DI3 Terminal	4: Forward JOG (FJOG)	1	9	●	F502

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Function Option	5: Reverse JOG (RJOG)				
F5.03	DI4 Terminal Function Option	6: Terminal UP 7: Terminal DOWN	1	44	●	F503
F5.04	DI5 Terminal Function Option	8: Free Stop 9: Alarm Reset (RESET)	1	13	●	F504
F5.05	DI6 Terminal Function Option	10: Running Pause 11: External Alarm(NO signal) Input	1	45	●	F505
F5.06 -F5.09	Reserved	12: Multi-Stage Speed Terminal 1 13: Multi-Stage Speed Terminal 2 14: Multi-Stage Speed Terminal 3				
F5.10	VDI Terminal Function Option	15: Multi-Stage Speed Terminal 4 16: Acceleration/Deceleration Option 1 17: Acceleration/Deceleration Option2 18: Frequency Source Switch 19: UP/DOWN Setting Clear 20: Start/Stop Order Source Switch 21: Acceleration/Deceleration Forbid 22: PID Pause 23: PLC Status Reset 24: Wobble Pause 25: Counter Input 26: Counter Reset 27: Length Count Input 28: Length Reset 29: Torque Control Forbid 30: PULSE Input (Only Valid for DI6) 31: Reserved 32: Immediate DC Brake 33: External Alarm(NC signal) input 34: Set Frequency Taking Effect	1	0	●	F50A

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		35: Invert PID Direction 36: External Stop 1 37: Terminal & Communication Start/Stop Switch 38: PID Integration Pause 39: Frequency Source X & Set Frequency Switch 40: Frequency Source Y & Set Frequency Switch 41 ~ 42: Reserved 43: PID Parameters Switch 44: User-defined error 1 45: User-defined error2 46: Speed/Torque Control Switch 47: Emergent Stop 48: External Stop 2 49: DC Brake at Stop 50: Accumulated Running Time Stop 51: Timing Enabling 52: Timing Reset 53: MPPT Switch				
F5.11~ F5.14	Reserved					
F5.15	DI Filter Time	0.000s ~ 1.000s	0.001s	0.010s	○	F50F
F5.16	Terminal Start/Stop Mode	0: 2-Wire Mode 1 1: 2-Wire Mode 2 2: 3-Wire Mode 1 3: 3-Wire Mode 2	1	0	●	F510
F5.17	UP/DOWN Accuracy	0.01Hz ~ 6553.5Hz	0.01Hz	0.50Hz	○	F511
F5.18	AII Minimum Input	0.00V ~ F5.20	0.01V	0.00V	○	F512

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F5.19	AI1 Minimum Percentage Referring to F5.18	-100.0% ~ +100.0%	0.10%	0.00%	○	F513
F5.20	AI1 Maximum Input	F5.18 ~ +10.00V	0.01V	10.00V	○	F514
F5.21	AI1 Maximum Percentage Referring to F5.20	-100.0% ~ +100.0%	0.10%	100.00%	○	F515
F5.22	AI1 Filter Time	0.00s ~ 10.00s	0.01s	0.10s	○	F516
F5.23	AI2 Minimum Input	0.00V ~ F5.20	0.01V	0.00V	○	F517
F5.24	AI2 Minimum Percentage Referring to F5.23	-100.0% ~ +100.0%	0.10%	0.00%	○	F518
F5.25	AI2 Maximum Input	F5.18 ~ +10.00V	0.01V	10.00V	○	F519
F5.26	AI2 Maximum Percentage Referring to F5.25	-100.0% ~ +100.0%	0.10%	100.00%	○	F51A
F5.27	AI2 Filter Time	0.00s ~ 10.00s	0.01s	0.10s	○	F51B
F5.28~ F5.32	Reserved					
F5.33	DI1 Enable Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F521
F5.34	DI2 Enable Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F522
F5.35	DI1 Disable Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F523
F5.36	DI2 Disable Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F524
F5.37	DI Input Terminal Enable Setting 1	0: High Level (Open) 1: Low Level (Closed) Ones Digit: DI1 Tens Digit: DI2	11111	0	●	F525

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		Hundreds Digit: DI3 Thousands Digit: DI4 Ten Thousands Digit: DI5				
F5.38	DI Input Terminal Enable Setting 2	0: High Level (Open) 1: Low Level (Closed) Ones Digit: DI6 Tens Digit: Reserved Hundreds Digit: Reserved Thousands Digit: Reserved Ten Thousands Digit: Reserved	11111	0	●	F526
F5.39	AI1 Zero Drift Adjustment Coefficient	0~50.00	0.01	0	○	F527
F5.40	AI2 Zero Drift Adjustment Coefficient	0~50.00	0.01	0	○	F528
F6 Group: Output terminals						
F6.00	FM Terminal Output Option	0: Pulse Output (FMP) 1: Relay Output (FMR)	1	0	○	F600
F6.01	FMR Output Option	0: None 1: VFD Running 2: VFD Alarming	1	0	○	F601
F6.02	Relay Terminal T1 Output Option	3: Frequency Detection Level FDT1 Reached	1	2	○	F602
F6.03	Relay Terminal T2 Output Option	4: Frequency Reached Set Frequency ±F8.21	1	1	○	F603
F6.04~F6.05	Reserved	5: VFD Running at 0Hz (No Output at Stop Status)				
F6.06	VDO Output Option	6: Motor Overload Pre-alarm 7: VFD Overload Pre-alarm 8: Maximum Counting Value Reached	1	0	●	F606
F6.07~F6.10	Reserved	9: Set Counting Value Reached 10: Length Reached 11: PLC Cycle Finished				

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		12: Accumulated Running Time Reached				
		13: Set Frequency Out of Range(F0.14~F0.12)				
		14: Torque Limited				
		15: Ready for Running				
		16: AI1>AI2				
		17: Running Frequency Reached F0.12				
		18: Running Frequency Reached F0.14				
		19: Low Input Voltage				
		20: Communication Set				
		21: Reserved				
		22: Reserved				
		23: VFD Running at 0Hz (Do Output at Stop Status)				
		24: Accumulated Power-on Time Reached				
		25: Frequency Detection Level FDT2 Reached				
		26: Frequency Reached F8.30				
		27: Frequency Reached F8.32				
		28: Current Reached F8.38				
		29: Current Reached F8.40				
		30: Running Time Reached F8.44				
		31: AI1 Input out of range				
		32: Load Loss				
		33: VFD Running Reversely				
		34: Zero-Current Detection Reached F8.34				
		35: IGBT Temperature Reached F8.47				
		36: Software Overcurrent Detection Reached F8.36				
		37: Running Frequency Reached F0.14				
		38: VFD Kept Running				

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		after Alarm 39: Motor Overheat Pre-alarm 40: Reserved 41: User-defined Output 1 42: User-defined Output 2 43: Timer Output 44: Software Dry Run Alarm				
F6.11	FMP Output Option	0: Running Frequency	1	0	○	F60B
F6.12	AO1 Output Option	1: Set Frequency	1	0	○	F60C
F6.13	AO2 Output Option	2: Output Current 3: Output Torque 4: Output Power 5: Output Voltage 6: Reserved 7: AI1 8: AI2 9: Reserved 10: Length 11: Counter 12: Communication Set 13: Motor Speed 14: Output Current (100.0% Rated Value) 15: Output Voltage (100.0% Rated Value) 16: Reserved	1	1	○	F60D
F6.14	FMP Maximum Output Pulse Frequency	0.01kHz ~ 100.00kHz	0.01kHz	50.00 kHz	○	F60E
F6.15	AO1 Zero Drift Adjustment Coefficient	-100.0% ~ 100.0%	0.10%	0.00%	○	F60F
F6.16	AO1 Gain	-10.00 ~ 10.00	0.01	1	○	F610
F6.17	AO2 Zero Drift Adjustment Coefficient	-100.0% ~ 100.0%	0.10%	0.00%	○	F611
F6.18	AO2 Gain	-10.00 ~ 10.00	0.01	1	○	F612
F6.19	FMR Close Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F613

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F6.20	Relay Terminal T1 Close Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F614
F6.21	Relay Terminal T2 Close Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F615
F6.22	VDO Close Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F616
F6.23	FMR Open Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F617
F6.24	Relay Terminal T1 Open Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F618
F6.25	Relay Terminal T2 Open Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F619
F6.26	VDO Open Delay	0.0s ~ 3600.0s	0.1s	0.0s	○	F61A
F6.27	DO (Digital Output) Terminal Output Logic	0: Truth Output 1: False Output Ones Digit: FMR Tens Digit: Relay Terminal T1 Hundreds Digit: Relay Terminal T2 Thousands Digit: Reserved Ten Thousands Digit: Reserved	11111	0	○	F61B
F6.28	User-defined Output 1 Option (EX1)	0: Running Frequency 1: Set Frequency 2: Bus Voltage 3: Output Voltage 4: Output Current 5: Output Power 6: Output Power 9: AI1 Input 10: AI2 Input 11: Reserved 12: Counter Value 13: Length Value	1	0	○	F61C
F6.29	Compare & Output Option of EX1	Ones Digit: Compare Option 0: Equal (EX1 = F6.31) 1: Equal and above (EX1 ≥ F6.31) 2: Equal and below (EX1 ≤	11	0	○	F61D

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		F6.31) 3: Within Range ($F6.31 \leq EX1 \leq F6.32$) 4: Bit Test (EX1 & F6.31=F6.32) Tens Digit: Output Option 0: False Output 1: Truth Output				
F6.30	Dead Zone of EX1	0 ~ 65535	1	0	○	F61E
F6.31	Compare Value 1 of EX1	0 ~ 65535	1	0	○	F61F
F6.32	Compare Value 2 of EX1	0 ~ 65535	1	0	○	F620
F6.33	User-defined Output 2 Option (EX2)	0: Running Frequency 1: Set Frequency 2: Bus Voltage 3: Output Voltage 4: Output Current 5: Output Power 6: Output Power 7 ~ 8: Reserved 9: AI1 Input 10: AI2 Input 11:Reserved 12: Counter Value 13: Length Value	1	0	○	F621
F6.34	Compare & Output Option of EX2	Ones Digit: Compare Option 0: Equal ($EX2 = F6.36$) 1: Equal and above ($EX2 \geq F6.36$) 2: Equal and below ($EX2 \leq F6.36$) 3: Within Range ($F6.36 \leq EX2 \leq F6.37$) 4: Bit Test (EX2 & F6.36=F6.37)	11	0	○	F622

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		Tens Digit: Output Option 0: False Output 1: Truth Output				
F6.35	Dead Zone of EX2	0 ~ 65535	1	0	○	F623
F6.36	Compare Value 1 of EX2	0 ~ 65535	1	0	○	F624
F6.37	Compare Value 2 of EX2	0 ~ 65535	1	0	○	F625
F6.38	Timer Set Value	0-100.00	0.01	10	○	F626
F7 Group: Display Interface parameters						
F7.00	Reserved	-	-	-	-	F700
F7.01	MF.K Button Option	0: Invalid 1: Switch between keypad start/stop control and mode of F0.01 2: Switch between FWD & REV running 3: FWD JOG 4: REV JOG 5: Reserved	1	0	●	F701
F7.02	STOP/RESET Button Option	0: Valid Only When F0.01=1 1: Valid Permanently	1	1	○	F702
F7.03	LED Displays 1 when Running	0000 ~ FFFF Bit00: Running Frequency (Hz) Bit01: Set Frequency(Hz) Bit02: Bus Voltage(V) Bit03: Output Voltage(V) Bit04: Output Current(A) Bit05: Output Power(kW) Bit06: Output Torque(%) Bit07: DI Input Status Bit08: DO Output Status	1111	17	○	F703

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		Bit09: AI1 Voltage (V) Bit10: AI2 Voltage (V) Bit11: AI3 Voltage (V) Bit12: Counter Value Bit13: Length Value Bit14: Load (Motor) Speed Display Bit15: PID Set Value				
F7.04	LED Displays 2 when Running	0000 ~ FFFF Bit00: PID Feedback Status Bit01: PLC Stage Bit02: Reserved Bit03: Reserved Bit04: Rest of Accumulated Running Time Bit05: AI1 Voltage before Correction Bit06: AI2 Voltage before Correction Bit07: AI3 Voltage before Correction Bit08: Line Speed Bit09: Present Powered-on Time Bit10: PresentRunning Time Bit11: Pulse Input Frequency, Unit 1Hz Bit12: Communication Set Value Bit13: Reserved Bit14: Main Frequency Source X Bit15: Auxiliary Frequency Source Y	1111	0	○	F704
F7.05	LED Displays when Stopped	0000 ~ FFFF Bit00: Set Frequency (Hz) Bit01: Bus Voltage (V)	1111	33	○	F705

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		Bit02: DI Input Status Bit03: DO Output Status Bit04: AI1 Voltage (V) Bit05: AI2 Voltage (V) Bit06: AI3 Voltage (V) Bit07: Counter Value Bit08: Length Value Bit09: PLC Status Bit10: Load Speed Bit11: PID Set Value Bit12: PULSE Input Frequency Unit 0.01kHz				
F7.06	Load Speed Display Ratio	0.0001 ~ 6.5000	0.0001	0.3	○	F706
F7.07	IGBT Temperature	0°C~ 100°C	1°C		⊙	F707
F7.08	Rectifier Temperature	0°C~ 100°C	1°C		⊙	F708
F7.09	Accumulated Running Time	0h ~ 65535h	1h		⊙	F709
F7.10	Product Code	-		.	⊙	F70A
F7.11	Software Version	-		.	⊙	F70B
F7.12	Load Speed Display Accuracy	0: 0 Digits after decimal point 1: 1 Digit after decimal point 2: 2 Digits after decimal point 3: 3 Digits after decimal point	1	0	○	F70C
F7.13	Accumulated Powered-on Time	0h ~ 65535h	1h	.	⊙	F70D
F7.14	Accumulated Energy Consumption	0 ~ 65535 kWh	1 度	.	⊙	F70E
F7.15	Performance Software Version	-	-	-		F70F

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F8 Group Auxiliary Parameters						
F8.00	JOG Running Frequency	0.00Hz ~ F0.10	0.01Hz	2.00Hz	○	F800
F8.01	JOG Acceleration Time	0.0s ~ 6500.0s	0.1s	20.0s	○	F801
F8.02	JOG Deceleration Time	0.0s ~ 6500.0s	0.1s	20.0s	○	F802
F8.03	Acceleration Time2	0.0s ~ 6500.0s	0.1s	Due to VFD Model	○	F803
F8.04	Deceleration Time2	0.0s ~ 6500.0s	0.1s	Due to VFD Model	○	F804
F8.05	Acceleration Time3	0.0s ~ 6500.0s	0.1s	Due to VFD Model	○	F805
F8.06	Deceleration Time3	0.0s ~ 6500.0s	0.1s	Due to VFD Model	○	F806
F8.07	Acceleration Time4	0.0s ~ 6500.0s	0.1s	Due to VFD Model	○	F807
F8.08	Deceleration Time4	0.0s ~ 6500.0s	0.1s	Due to VFD Model	○	F808
F8.09	Jumpover Frequency 1	0.00Hz ~ F0.10	0.01Hz	0.00Hz	○	F809
F8.10	Jumpover Frequency 2	0.00Hz ~ F0.10	0.01Hz	0.00Hz	○	F80A
F8.11	Jumpover Frequency Margin	0.00Hz ~ F0.10	0.01Hz	0.01Hz	○	F80B
F8.12	Forward and	0.0s ~ 3000.0s	0.1s	0.0s	○	F80C

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Reverse Dead-zone Time					
F8.13	Reverse Running Option	0: Allowed 1: Forbidden	1	0	○	F80D
F8.14	Carrier Frequency Auto Adjustment with Temperature	0: Invalid 1: Valid	1	1	○	F80E
F8.15	Droop Control	0.00Hz ~ 10.00Hz	0.01Hz	0.00Hz	○	F80F
F8.16	Set Value of Accumulated Powered-on Time	0h ~ 65000h	1h	0h	○	F810
F8.17	Set Value of Accumulated Running Time	0h ~ 65000h	1h	65000h	○	F811
F8.18	Protection Option at Startup	0: Invalid 1: Valid	1	0	○	F812
F8.19	Frequency Detection Value (FDT1)	0.00Hz ~ F0.10	0.01Hz	50.00Hz	○	F813
F8.20	Frequency Detection Hysteresis value(FDT1)	0.0% ~ 100.0% * FDT1	0.10%	5.00%	○	F814
F8.21	Frequency Reached Detection Width	0.0% ~ 100.0% * F0.10	0.10%	0.00%	○	F815
F8.22	Jumprover Frequency Option During Acceleration & Deceleration	0: Invalid 1: Valid	1	0	○	F816
F8.23	Option of Accumulated Running Time Reached	0: Continue to Run 1: Alarm	1	0	●	F817

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F8.24	Option of Accumulated Powered-on Time Reached	0: Continue to Run 1: Alarm	1	0	●	F818
F8.25	Switchover Frequency of Acceleration Time 1 & 2	0.00Hz ~ F0.10	0.01Hz	0.00Hz	○	F819
F8.26	Switchover Frequency of Deceleration Time 1 & 2	0.00Hz ~ F0.10	0.01Hz	0.00Hz	○	F81A
F8.27	Terminal JOG Priority	0: Invalid 1: Valid	1	1	○	F81B
F8.28	Frequency Detection Value (FDT2)	0.00Hz ~ F0.10	0.01Hz	50.00Hz	○	F81C
F8.29	Frequency Detection Hysteresis value(FDT2)	0.0% ~ 100.0% * FDT2	0.10%	5.00%	○	F81D
F8.30	Frequency Reached Detection 1	0.00Hz ~ F0.10	0.01Hz	50.00Hz	○	F81E
F8.31	Frequency Reached Detection Width 1	0.0% ~ 100.0% (F0.10)	0.10%	0.00%	○	F81F
F8.32	Frequency Reached Detection 2	0.00Hz ~ F0.10	0.01Hz	50.00Hz	○	F820
F8.33	Frequency Reached Detection Width 2	0.0% ~ 100.0% (F0.10)	0.10%	0.00%	○	F821
F8.34	Zero-current Detection Level	0.0% ~ 300.0% * Motor Rated Current	0.10%	5.00%	○	F822
F8.35	Zero-current	0.01s ~ 600.00s	0.01s	0.10s	○	F823

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Detection Delay					
F8.36	Software Overcurrent Detection Level	0.0% (Detection Invalid) 0.1% ~ 300.0%* Motor Rated Current	0.10%	200.00%	○	F824
F8.37	Software Overcurrent Detection Delay	0.00s ~ 600.00s	0.01s	0.00s	○	F825
F8.38	Current Reached Detection 1	0.0% ~ 300.0% * Motor Rated Current	0.10%	100.00%	○	F826
F8.39	Current Reached Detection Width 1	0.0% ~ 300.0% * Motor Rated Current	0.10%	0.00%	○	F827
F8.40	Current Reached Detection 1	0.0% ~ 300.0% * Motor Rated Current	0.10%	100.00%	○	F828
F8.41	Current Reached Detection Width 1	0.0% ~ 300.0% * Motor Rated Current	0.10%	0.00%	○	F829
F8.42	Timing Function Option	0: Invalid 1: Valid	1	0	●	F82A
F8.43	Timing Function Set Value Source	0: F8.44 1: AI1 2: AI2 3: Reserved	1	0	●	F82B
F8.44	Timing Function Set Value	0.0Min ~ 6500.0Min	0.1Min	0.0Min	●	F82C
F8.45	Lower Limit of AI1 Input Voltage Protection	0.00V ~ F8.46	0.01V	3.10V	○	F82D
F8.46	Upper Limit of AI1 Input Voltage Protection	F8.45 ~ 10.00V	0.01V	6.80V	○	F82E
F8.47	IGBT Temperature Reached Detection Value	0°C ~ 100°C	1°C	75°C	○	F82F

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F8.48	CBC Current Limit Option	Ones Digit 0: Invalid 1: Valid Tens Digit 0: ERR40 Alarm Forbidden 1: ERR40 Alarm Allowed	1	11	○	F830
F8.49	Random Carrier Mode	0: None 1: Random Carrier Mode 1 2: Random Carrier Mode 2 3: Random Carrier Mode 3 4: Random Carrier Mode 4 5: Random Carrier Mode 5 6-10: Reserved	1	0	○	F831
F9 Group PID Parameters						
F9.00	PID Set Value Source	0: F9.01 1: AI1 2: AI2 3: Reserved 4: MPPT 5: RS485 Communication 6: Multi-Stage Speed	1	4	○	F900
F9.01	PID Set Value Percentage	0.0% ~ 100.0%	0.10%	50.0%	○	F901
F9.02	PID Feedback Source	0: AI1 1: AI2 2: Reserved 3: AI1-AI2 4: MPPT 5: RS485 Communication 6: AI1+AI2 7: MAX(AI1 , AI2) 8: MIN(AI1 , AI2)	1	4	○	F902
F9.03	PID Direction	0: Positive 1: Negative	1	1	○	F903
F9.04	PID Value Range	0 ~ 65535	1	1000	○	F904
F9.05	Proportional Gain	0.0 ~ 1000.0	0.1	150	○	F905

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	P1					
F9.06	Integration Time I1	0.00s ~ 10.00s	0.01s	3.0s	○	F906
F9.07	Differential Time D1	0.000s ~ 10.000s	0.001s	0.000s	○	F907
F9.08	PID Invert Cutoff Frequency	0.00 ~ F0.10	0.01Hz	0.00Hz	○	F908
F9.09	PID Deviation Limit	0.0% ~ 100.0%	0.10%	0.0%	○	F909
F9.10	PID Differential Clipping	0.00% ~ 100.00%	0.01%	0.10%	○	F90A
F9.11	PID Set Value Change Delay	0.00 ~ 650.00s	0.01s	0.00s	○	F90B
F9.12	PID Feedback Filtering Time	0.00 ~ 60.00s	0.01s	0.05s	○	F90C
F9.13	PID Output Filtering Time	0.00 ~ 60.00s	0.01s	0.00s	○	F90D
F9.14	Proportional Gain P2	0.0 ~ 100.0	0.1	80	○	F90E
F9.15	Integration Time I2	0.00s ~ 10.00s	0.01s	0.50s	○	F90F
F9.16	Differential Time D2	0.000s ~ 10.000s	0.001s	0.001s	○	F910
F9.17	PID Parameters Switch Option	0: None 1: DI Terminal 2: According to F9.18 & F9.19	1	0	○	F911
F9.18	PID Parameter Switching Deviation 1	0.0% ~ F9.19	0.10%	0.5%	○	F912
F9.19	PID Parameter Switching Deviation 2	F9.18 ~ 100.0%	0.10%	1.0%	○	F913

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F9.20	PID Initial Value	0.0% ~ 100.0%	0.10%	0.0%	○	F914
F9.21	PID Initial Value Keeping Period	0.00 ~ 650.00s	0.01s	0.00s	○	F915
F9.22	The maximum value of the positive direction of the two output deviations	0.00% ~ 100.00%	0.01%	100.00%	○	F916
F9.23	The maximum value of the negative direction of the two output deviations	0.00% ~ 100.00%	0.01%	100.00%	○	F917
F9.24	PID Integration Option	Ones Digit: Integration Separation 0. Invalid 1. Valid Tens Digit: Whether to stop integration when output reaches maximum or minimum value 0. Continue to Integration 1. Stop Integration	11	0	○	F918
F9.25	PID Feedback Loss Detection Level	0.0%: Detection Invalid 0.1% ~ 100.0%	0.10%	0.0%	○	F919
F9.26	PID Feedback Loss Detection Delay	0.0s ~ 20.0s	0.1s	0.0s	○	F91A
F9.27	PID Calculation at Stop Status	0: Invalid 1: Valid	1	0	○	F91B
F9.28	PID Option	0: Common PID 1: PID with Sleep Function	1	0	○	F91C
F9.29	PID Sleep Threshold	0.0% ~ 100.0%	0.10%	60.0%	○	F91D
F9.30	PID Sleep Delay	0.0 ~ 3600.0s	0.1s	3.0s	○	F91E

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
F9.31	PID Wakeup Threshold	0.0% ~ 100.0%	0.10%	20.0%	○	F91F
F9.32	PID Wakeup Delay	0.0 ~ 3600.0s	0.1s	3.0s	○	F920
F9.33	PID Minimum Output Frequency	0: F0.14 1: 0Hz	1	0	●	F921
F9.34	Overtemperature drop point	0: Disable overtemperature underclocking 1~100: Overtemperature drop point	1	0	○	F922
F9.35	Underclocking ratio	0~100%	1	10%	○	F923
F9.36	Reserve	-	-	-	○	F924
F9.37	PID output limiting	0~100%	1	5%	○	F925
FA Group: Errors and protection						
FA.00	Motor Overload Protection	0: Invalid 1: Valid	1	1	○	FA00
FA.01	Motor Overload Protection Gain	0.20 ~ 10.00	0.01	1	○	FA01
FA.02	Motor Overload Pre-warning Coefficient	50% ~ 100%	1%	80%	○	FA02
FA.03	Overvoltage Stall Gain	0 ~ 100	1	0	○	FA03
FA.04	Overvoltage Stall Protection Level	120% ~ 150% * Motor Rated Voltage	1%	130%	○	FA04
FA.05	Overcurrent Stall Protection Gain	0 ~ 100	1	0	○	FA05
FA.06	Overcurrent Stall Protection Level	100% ~ 200% * VFD Rated Current	1%	150%	○	FA06
FA.07	Short-circuit to Ground Protection Option	0: Invalid 1: Valid	1	1	○	FA07
FA.08	Automatic Reset	0 ~ 20	1	5	○	FA08

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Times					
FA.09	DO Action Option during Alarm Auto Reset	0: Invalid 1: Valid	1	0	○	FA09
FA.10	Delay of Alarm Auto Reset	0.1s ~ 100.0s	0.1s	60	○	FA0A
FA.11	AC Input Phase Loss Protection Option	Ones Digit: AC Input Phase Loss Protection Option 0: Invalid 1: Valid Tens Digit: Inner Main Circuit Contactor Failure Detection Option 0: Invalid 1: Valid	1	10	○	FA0B
FA.12	AC Output Phase Loss Protection Option	0: Invalid 1: Valid	1	1	○	FA0C
FA.13	Action Option 1 after Alarm	0: Free Stop 1: Stop Due to F1.10 2: Continue to Run Ones Digit: Motor Overload(Err11) Tens Digit: Input Phase Loss(Err12) Hundreds Digit: Output Phase Loss(Err13) Thousands Digit: External Error(Err15) Ten Thousands Digit: Communication Failure(Err16)	11111	0	○	FA0D
FA.14	Action Option 2 after Alarm	0: Free Stop 1: Stop Due to F1.10 2: Continue to Run	11111	10100	○	FA0E

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		Ones Digit: Reserved Tens Digit: Parameter R/W Failure(Err21) Hundreds Digit: Dry Run Alarm (Err24) Thousands Digit: Reserved Ten Thousands Digit: Running Time Reached(Err26)				
FA.15	Action Option 3 after Alarm	0: Free Stop 1: Stop Due to F1.10 2: Continue to Run Ones Digit: User-Defined Alarm 1(Err27) Tens Digit: User-Defined Alarm 2(Err28) Hundreds Digit: Reserved Thousands Digit: Phase Loss (Err30) Ten Thousands Digit: PID Feedback Offline(Err31)	11111	10011	○	FA0F
FA.16	Overcurrent Stall Integration Coefficient	0~2000	1	500	○	FA10
FA.17	Reserved					FA11
FA.18	Low Voltage Level	60.0% ~ 140.0% * VFD Rated Voltage	0.10%	64.00%	○	FA12
FA.19	Over Voltage Level	200.0V ~ 810.0V	0.1V	810.0V	○	FA13
FA.20	The Frequency Option When Continuing to Run	0: Run at the present frequency 1: Run at set frequency 2: Run at maximum frequency	1	0	○	FA14

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	After Alarms	3: Run at minimum frequency 4: Run at backup frequency FA.21				
FA.21	Set Backup Frequency	0.0% ~ 100.0% * Present Set Frequency	0.10%	100.00%	○	FA15
FA.22	Option of Sudden Poweroff	0: None 1: Decelerate 2: Decelerate to Stop	1	1	○	FA16
FA.23	Sudden Poweroff Pause Detection Voltage	10.0% ~ 100.0%	0.10%	90.00%	○	FA17
FA.24	Sudden Poweroff Recovery Delay	0.00s ~ 100.00s	0.01s	0.01s	○	FA18
FA.25	Sudden Poweroff Detection Voltage	10.0% ~ 100.0%	0.10%	61.00%	○	FA19
FA.26	Load Loss Protection Option	0: Invalid 1: Valid	1	0	○	FA1A
FA.27	Load Loss Protection Detection	0.0 ~ 100.0%	0.10%	10.00%	○	FA1B
FA.28	Load Loss Protection Delay	0.0 ~ 60.0s	0.1s	1.0s	○	FA1C
FA.29	Accuracy of Frequency at Error	1: 1 Bit after decimal point 2: 2 Bis after decimal point Ones Digit: Accuracy of Frequency at Third to Latest Error Tens Digit: Accuracy of Frequency at Second to Latest Error Hundreds Digit: Accuracy of Frequency at Latest Error	1	222	○	FA1D
FB Group Anti-freeze & Flushing Funtion Parameters						

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
FB.00	Extra Function Option	0: None 1: Interval Running Mode 2: Pump Flushing Mode	1	0	○	FB00
FB.01	Circles of Interval Running	0~1500	1	0	○	FB01
FB.02	Running Period in One Circle (min)	0~3000.0	0.1Min	1	○	FB02
FB.03	Stopping Period in One Circle (min)	0~3000.0	0.1Min	1	○	FB03
FB.04	Memorable Option of Interval Running	Ones Digit 0: Unmemorable after Powered Off 1: Memorable after Powered Off Tens Digit 0: Unmemorable after Stopped 1: Memorable after Stopped	1	10	○	FB04
FB.05	Flushing Frequency	F0.14~F0.12	0.01	25	○	FB05
FB.06	Forward Running Period in One Circle (min)	0~3000.0	0.1Min	0.5	○	FB06
FB.07	Reverse Running Period in One Circle (min)	0~3000.0	0.1Min	0.5	○	FB07
FB.08	Circles of Pump Flushing	1 ~ 60	1	5	○	FB08
FB.09	Option after Circles Ending	0: Stop 1: Continue to Run	1	0	○	FB09
FB.10	Pressure of Pipe Explosion Detection	0~10.00	0.01V	10	○	FB0A

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
FB.11	Delay of Pipe Explosion Detection	0~300.00	0.01s	0	○	FB0B
FB.12	Pressure Deviation of Pipe Explosion Detection	0~10.00	0.01V	0	○	FB0C
FC Group: Communication parameters						
FC.00	Address of Controller	1 ~ 247, 0 for upper host device	1	1	○	FC00
FC.01	Baud Rate	0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS	1	5	○	FC01
FC.02	Data Format	0: (8.N.2) 1: (8.E.1) 2: (8.O.1) 3: (8.N.1)	1	0	○	FC02
FC.03	Response Delay	0ms ~ 20ms (0~200ms?)	1ms	2	○	FC03
FC.04	Delay of Communication Out-of-time Detection	0.0 (Invalid) , 0.1s~60.0s	0.1s	0	○	FC04
FC.05	Communication Read Current Resolution	0: 0.01A 1: 0.1A	1	0	○	FC05
FD Group: Special parameters for solar pump controller						
FD.00	Solar Pump VFD	0: Invalid	1	1	○	FD00

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Option	1: Valid				
FD.01	MPPT voltage set selection	0: Keyboard set 1: Automatic MPPT set mode 1 2: Automatic MPPT set mode 2 3: Fast MPPT given mode	1	2	○	FD01
FD.02	MPPT Voltage Keypad Set Value	FD.14~FD.15	0.1V	85%	○	FD02
FD.03	Delay of Weak Sunshine Detection	0~1000.0	0.1s	100.0s	○	FD03
FD.04	Light weak restart time	0~3600.0	0.1s	10.0s	○	FD04
FD.05	MPPT Initial Voltage Percentage	70.0%~100.0%	0.10%	85.00%	○	FD05
FD.06	MPPT Open Circuit Voltage	250.0~800.0	0.1V	750.0V	○	FD06
FD.07	Auto Start Function	0: Invalid 1: Valid	1	0	○	FD07
FD.08	Delay of Auto Start	0.0~100.0	0.1s	5	○	FD08
FD.09	MPPT Initial Voltage Range	0.0V ~ 50.0V	0.1V	30	○	FD09
FD.10	Water shortage detection time	0~3600.0	0.1s	60	○	FD0A
FD.11	Running Frequency of Dry Run Detection	1.00~F0.12	0.01Hz	45	○	FD0B
FD.12	Motor Current Percentage of Dry Run Detection	0~100.0	0.10%	40	○	FD0C
FD.13	Auto Reset Delay of Dry Run Detection	0~9000	1min	20	○	FD0D
FD.14	MPPT Minimum	150.0 ~ FD.15	0.10%	85%	○	FD0E

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	Voltage					
FD.15	MPPT Maximum Voltage	FD.14 ~ 800.0	0.10%	120%	○	FD0F
FD.16	MPPT frequency output lower limit	0.0% ~ FD.17	0.10%	50	○	FD10
FD.17	MPPT Upper Limit of Running Frequency Percentage	FD.16 ~ 100.0%	0.10%	100	○	FD11
FD.18	MPPT Fast Down Speed	0 ~ 200	1	100	○	FD12
FD.19	MPPT Deceleration Time	0.0 ~ 6500.0	0.1s	0.5	○	FD13
FD.20	Initial Disturbance Voltage	0.0~50.0	0.1V	10	○	FD14
FD.21	Initial Enabled Voltage	-	-	-	○	FD15
FD.22	Enabled Voltage	-	-	-	●	FD16
FD.23	Open Circuit Voltage	-	-	-	●	FD17
FD.24	MPPT Sign	-	-	-	●	FD18
FD.25	MPPT Voltage Increment 1	0~5.0	0.1V	0	○	FD19
FD.26	MPPT Voltage Increment 2	0~10.0	0.1V	2	○	FD1A
FD.27	MPPT voltage increment 3	0~100.0	0.1V	10	○	FD1B
FD.28	Bias Voltage 1	0~100.0	0.1V	30	○	FD1C
FD.29	Bias Voltage 2	0~100.0	0.1V	10	○	FD1D
FD.30	MPPT Voltage Increment 4	0~1.0	0.1V	0	○	FD1E

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
FD.31	VFD Efficiency	0.75~1.25	0.01	1	○	FD1F
FD.32	Voltage/Frequency Ratio Option	0:Invalid 1: Valid	1	0	○	FD20
FD.33	Photovoltaic pump working mode	0: Photovoltaic mode 1: Photovoltaic priority mode 2: Power priority mode	1	1	○	FD21
FD.34	MPPT tracking step size	0 ~ 6553.5	0.1	3.0	○	FD22
FE Group: Parameters management						
FE.00	User Password	0 ~ 65535	1	0	○	FE00
FE.01	Displayed Quantity of Error Record Groups	0 ~ 15	1	5	○	FE01
A0 Group: Firewood control						
A0.00	Number of poles	0 ~ 65535	1	10	○	A000
A0.01	AC Detection count	0 ~ 65535	1	20	○	A001
A0.02	PV Detection count	0 ~ 65535	1	20	○	A002
A0.03	ACPV Intelligent switching	0 ~ 65535	1	0	○	A003
A0.04	PV minimum frequency	0 ~ 65535	0.01	30	○	A004
A0.05	PV minimum frequency duration (min)	0 ~ 65535	1	5	○	A005
A0.06	PV power sufficient judgment time (min)	0 ~ 65535	1	5	○	A006
A0.07	Virtual tracking voltage coefficient	0 ~ 65535	1	4600	○	A007
A0.08	Misconnection detection	0 ~ 65535	1	0	○	A008
A0.09	PV cycle detection	0 ~ 65535	1	0	○	A009

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	(min)					
A0.10	PV cycle detection duration (minutes)	0 ~ 65535	1	0	○	A00A
A0.11	AC type	0: Mains supply 1: Diesel power generation	1	0	○	A00B
A0.12	Peak-to-peak value	0 ~ 65535	0.1	12	○	A00C
A4 Group: Constant pressure water supply						
A4.00	Water supply function selection	0: Invalid 1: Valid	1	0	●	A400
A4.01	Setting pressure	1.0~A4.19	0.1	3.0bar	○	A401
A4.02	Start-up pressure	0.0~A4.01	0.1	0.3bar	○	A402
A4.03	Sensor range	1.0~200.0bar	0.1	16.0bar	○	A403
A4.04	Sensor feedback type	0: 4~20mA (AI2) 1: 0~10V (AI1)	1	0	○	A404
A4.05	Pressure calibration factor	0.750 ~ 1.250	0.001	1	○	A405
A4.06	Proportional gain P	0.00 ~ 100.0	0.1	50	○	A406
A4.07	Integration time I	0.00 ~ 10.0	0.01	0.5	○	A407
A4.08	Differential time D	0.000s ~ 10.000	0.001	0	○	A408
A4.09	Dormancy selection	0 : OFF 1 : Dormancy mode 1 2 : Dormancy mode 2	1	1	○	A409
A4.10	Sleep delay	0.0s ~ 100.0s	0.1	5	○	A40A
A4.11	Wake up delay	0.0s ~ 100.0s	0.1	3	○	A40B
A4.12	Low-frequency hold frequency	0.0 ~ A4.14	0.01	20	○	A40C
A4.13	Low frequency maintenance frequency running time	0.0s ~ 100.0s	0.1	5	○	A40D

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
A4.14	Dormancy frequency	A4.12 ~ F0.12	0.01	25	○	A40E
A4.15	Pressure retention detection interval	0.0s ~ 600.0s	0.1	30	○	A40F
A4.16	Pressure holding test time	0.0s ~ 100.0s	0.1	2.5	○	A410
A4.17	Pressure retention detection coefficient	1 ~ 10	1	4	○	A411
A4.18	Sleep deviation pressure	0.0bar ~1.0bar	0.1	0.1	○	A412
A4.19	High voltage alarm setting value	A4.00 ~A4.03	0.1	15.0bar	○	A413
A4.20	Low voltage alarm set value	0.0 ~A4.01	0.1	0.0bar	○	A414
A4.21	Water pressure alarm delay time	0.0~ 100.0	0.1	3.0s	○	A415
A4.22	Sensor line break detection value	0.00 ~10.00V	0.1	0.2	○	A416
A4.23	Sensor disconnection detection time	0.0s ~100.0s	0.1	30.0s	○	A417
A4.24	Water shortage protection function	0: Off 1: Judging by frequency and current 2: Judging by frequency and pressure	1	2	○	A418
A4.25	Water shortage fault detection threshold	0.0 ~A4.01	0.1	0.5bar	○	A419
A4.26	Frequency of water shortage protection detection	0 ~ F0.12	0.01	48.00Hz	○	A41A
A4.27	Water shortage protection detection	0.0 ~100.0	0.1	40.00%	○	A41B

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	current percentage					
A4.28	Water shortage protection test time	0.0~200.0	0.1	60	○	A41C
A4.29	Water shortage protection automatic reset delay	0~1000	1	15	○	A41D
A4.30	Water shortage protection automatic reset times	0~100	1	10	○	A41E
A4.31	Pressure growth control function	0: Invalid 1: Valid	1	0	○	A41F

E0 Group: Current fault record

E0.00	Latest Error Type	0: No Error 1: IGBT Failure (Err01) 2: Overcurrent During Acceleration (Err02) 3: Overcurrent During Deceleration (Err03) 4: Overcurrent at Constant Speed (Err04) 5: Overvoltage During Acceleration (Err05) 6: Overvoltage During Deceleration (Err06) 7: Overvoltage at Constant Speed (Err07) 8: Buffer Resistor Overload (ERR08) 9: Bus Voltage Too Low (Err09) 10: VFD Overload (Err10) 11: Motor Overload (Err11) 12: Input Phase Loss (Err12) 13: Output Phase Loss (Err13) 14: IGBT Overheat (Err14) 15: External Error through	—	—	●	E000
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Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
		DI Terminal (Err15) 16: Communication Failure (Err16) 17: Main Circuit Contactor Failure (Err17) 18: Current Detection Failure (Err18) 19: Motor Tuning Failure (Err19) 21: Parameter Reading & Writing Failure (Err21) 22: Reserved (Err22) 23: Motor Shorted to Ground (Err23) 24: Software Dry Run Error (Err24) 25: Reserved (Err25) 26: Accumulated Running Time Reached (Err26) 27: User-defined Error1(Err27) 28: User-defined Error2(Err28) 29: Accumulated Powered-on Time Reached(Err29) 30: Offload (Err30) 31: PID Feedback Offline (Err31) 40: CBC Overcurrent (Err40) 41: Reserved				
E0.01	Running Frequency at Latest Error	—	—	—	⊙	E001
E0.02	Output Current at Latest Error	—	—	—	⊙	E002
E0.03	Bus Voltage at Latest Error	—	—	—	⊙	E003
E0.04	DI Terminal Status at Latest Error	—	—	—	⊙	E004
E0.05	DO Terminal Status	—	—	—	⊙	E005

Function Code	Function	Description	Unit	Factory setting	Modification Type	Communication Address
	at Latest Error					
E0.06	IGBT Temperature at Latest Error				⊙	E006
E0.07	VFD Status at Latest Error	—	—	—	⊙	E007
E0.08	Accumulated Running Time at Latest Error	—	—	—	⊙	E008
E0.09	Accumulated Powered-on Time at Latest Error	—	—	—	⊙	E009

Chapter 6 Protocol

The PDS33 series product provides an RS485 communication interface and supports the MODBUS-RTU communication protocol. The users can set the controller to start and stop, modify or read the function code parameters, and read the working status and fault information of the controller.

6.1 Addresses of control orders

Description	Communication address	Command content	Attributes of read or write
Communication set value	1000H	-10000~10000 (Signed number) ◆ -10000 for -100.00% ◆ 10000 for 100.00%	R/W
Control order	2000H	0001: FWD run	W
		0002: REV run	
		0003: FWD JOG	
		0004: REV JOG	
		0005: Free stop	
		0006: Decelerate to stop	
		0007: Reset	

Sheet 6-1-1 Control Orders' Addresses

6.2 Addresses of parameter status

Description	Communication address	Unit	Attributes of read or write
Running frequency	1001H	0.01Hz	R
PV voltage	1002H	0.1V	R
Output voltage	1003H	1V	R
Output current	1004H	0.1A	R
Output power	1005H	0.01kW	R
Output torque	1006H	0.1%	R
Running speed	1007H	0.01Hz	R

DI flag	1008H	1	R
DO flag	1009H	1	R
AI1 voltage	100AH	0.01V	R
AI2 voltage	100BH	0.01V	R
Set voltage	100CH	0.1V	R
PV input power	100DH	0.01kW	R
PV input current	100EH	0.1A	R
Motor speed	100FH	1rpm	R
Inverter temperature	1010H	1°C	R
Set frequency	1011H	0.01Hz	R
Max frequency	1012H	0.01Hz	R
Controller's status	1013H	0001: FWD running 0002: REV running 0003: Stand-by 0004: Fault 0005: Under voltage 0006: Exchanging between	R
Water level	1014H	0: Normal 1: Low level of well 2: High level of reservoir	R
Light status	1015H	0: Normal 1: Weak	R
Total power on hour	1016H	1H	R
Total running hour	1017H	1H	R
Inverter energy	1018H	0.01kWh	R
Fault code	101AH	Such as	R
Fault code 0	101BH	0002:Err02 0003:Err03	R
Fault frequency	101CH	0.01Hz	R
Fault current	101DH	0.1A	R
Fault voltage	101EH	0.1V	R
Fault Number	101FH	1	R

Sheet 6-2-1 Parameters' Addresses

6.3 Description of controller's status and faults

Description	Communication address	Command content	Attributes of read or write
Controller's status	3000H	0001: FWD running 0002: REV running 0003: Stand-by 0004: Alarming 0005: Under voltage 0006 : Switching between FWD & REV	R
VFD's error	8000H	0000: No error 0001: IGBT Failure 0002 : Overcurrent During Acceleration 0003 : Overcurrent During Deceleration 0004: Overcurrent at Constant Speed 0005 : Overvoltage During Acceleration 0006 : Overvoltage During Deceleration 0007: Overvoltage at Constant Speed 0008: Buffer Resistor Overload 0009: Bus Voltage Too Low 000A: VFD overload 000B: Motor overload 000C: Input Phase Loss 000D: Output Phase Loss 000E: IGBT Overheat 000F: External Error through DI Terminal 0010: Communication Failure	R

Description	Communication address	Command content	Attributes of read or write
		0011: Main Circuit Contactor Failure 0012: Current Detection Failure 0013: Motor Tuning Failure 0015: Parameter Reading & Writing Failure 0016: EEPROM Failure 0017: Motor Shorted to Ground 0018: Software Dry Run Error 001A: Accumulated Running Time Reached 001B: User-defined Error1 001C: User-defined Error2 001D: Accumulated Powered-on Time Reached 001E: Reserved 001F: PID Feedback Offline 0028: CBC Overcurrent 0029: Reserved	
Communication faults	8001H	0000: No Error 0001: Password Fault 0002: Command Fault 0003: CRC Checking Fault 0004: Invalid Address 0005: Invalid Parameter 0006: Invalid Adjustment of Parameter 0007: System Locked 0008: EEPROM Operating	R

Sheet 6-3-1 Controller Status' Addresses

Chapter 7 Diagnoses and Troubleshooting

The PDS33 solar pump controller will attempt to drive the pump to deliver water even under adverse conditions. To ensure years of reliable service, it must also protect the system components from conditions that might result in equipment damage. When adverse conditions arise, the controller will continue to deliver as much water as possible at reduced output if necessary, and will shut down only in extreme cases. Full operation will resume automatically whenever abnormal conditions subside.

If the controller has stopped to indicate a fault code on the display, the associated time-out delay will vary depending on the nature of the fault. The number following the “Err” symbol corresponds to the error code for the offending condition.

7.1 Error Codes

Code	Description	Possible Causes	Suggestions
Err02	Overcurrent During Acceleration	Output grounded or shorted	Check output cables and motor insulation
		Too fast acceleration	Increase acceleration time
		Lower-rating controller	Replace with higher-rating controller
Err03	Overcurrent During Deceleration	Output grounded or shorted	Check output cables and motor insulation
		Too fast deceleration	Increase deceleration time
Err04	Overcurrent at Constant Speed	Output grounded or shorted	Check output cables and motor insulation
		Lower-rating controller	Replace with higher-rating controller
Err05	Overvoltage During Acceleration	Input voltage too high	Adjust input voltage to normal value
		Too fast acceleration	Increase acceleration time
		Lack of brake unit & brake resistor	Add brake unit & brake resistor

Code	Description	Possible Causes	Suggestions
Err06	Overvoltage During Deceleration	Input voltage too high	Adjust input voltage to normal value
		Too fast deceleration	Increase deceleration time
		Lack of brake unit & brake resistor	Add brake unit & brake resistor
Err07	Overvoltage at Constant Speed	Input voltage too high	Adjust input voltage to normal value
Err08	Buffer Resistor Overload	Input voltage not in proper range	Adjust input voltage to proper range
Err09	Bus Voltage Too Low	Input voltage not in proper range	Adjust input voltage to proper range
		Failure of bus voltage detection/buffer resistor/control board/power board	Seek for technical support
Err10	VFD Overload	Load too large or motor stuck	Decrease the load and check the motor
		Lower-rating controller	Replace with higher-rating controller
Err11	Motor Overload	Improper settings of FA.01 & FA.02	Correctly set them
		Load too large or motor stuck	Decrease the load and check the motor
Err12	Input Phase Loss	Abnormal input power source	Check input power source and wirings
		Failure of control board/power board	Seek for technical support
Err13	Output Phase Loss	Motor Inner Failure	Check the coil winding
		Abnormal Output Cables	Check the wirings
		Imbalance of 3-phase Output	Check the motor coil winding and output circuit
		Failure of control board/power board	Seek for technical support

Code	Description	Possible Causes	Suggestions
Err14	IGBT Overheat	Ambient Temperature Too High	Lower the ambient temperature if possible
		Air Duct Blocked	Clear air duct
		Fan Failure	Replace the fan
		Failure of inner thermistor/IGBT	Seek for technical support
Err15	External Error through DI Terminal	External Error Signal through DI Terminals	Check external signal
Err16	Communication Failure	Failure of Upper Device	Check upper device
		Abnormal RS485 Wirings	Check the wirings
		Incorrect settings of FC Group Parameters	Correctly setting them
Err17	Main Circuit Contactor Failure	Main Circuit Contactor Fails to Close	Replace the contactor or seek for technical support
Err18	Current Detection Failure	Detecting Circuit Failure	Seek for technical support
		Control Board Failure	Seek for technical support
Err19	Motor Tuning Failure	Incorrect settings of F2 Group Parameters	Correctly setting them according to motor nameplate
Err21	Parameter Reading & Writing Failure	Control Board Failure	Seek for technical support
Err22	EEPROM Failure	EEPROM Chip Failure	Seek for technical support
Err23	Motor Shorted to Ground	Motor/Output Cables Shorted to Ground	Check the insulation of them
		Control Board Failure	Seek for technical support
Err24	Software Dry Run Error	Water Shortage	Check the water source
		FD.12 Set Too Large(When FD.10 is set above 0)	Decrease set value of FD.12
Err26	Accumulated	Accumulated running time	Clear the time record

Code	Description	Possible Causes	Suggestions
	Running Time Reached	has reached set value	
Err29	Accumulated Powered-on Time Reached	Accumulated powered-on time has reached set value	Clear the time record
Err31	PID Feedback Offline	PID Feedback Signal Loss	Check the feedback signal source
		PID Feedback Below Minimum Detection Value	Correctly set F9.25 & F9.26
Err40	CBC Overcurrent	Load too large or motor stuck	Decrease the load and check the motor
		Lower-rating controller	Replace with higher-rating controller
E098/ E099	Inner Communication Failure	Poor connection between keypad and control board	Re-connect the keypad and control board
		Keypad Failure	Seek for technical support
Lou	Low Level of Water Inlet	Float switch/level sensor outputs close signal at inlet	Check whether the water level is too low at inlet
FULL	High Level of Water Outlet	Float switch/level sensor outputs close signal at outlet	Check whether the water level is too high at outlet

7.2 Common Faults and Remedies

Order	Fault phenomenon	Possible cause	Remedy
1	No display on keypad	Abnormal input voltage	Check whether input voltage is in normal range
		Poor contact between keyboard and control board	Check connect cable
		Inner instrument failure	Look for technical support
2	Pump cannot run	Lack of input power (light)	Increase panel power or restart at enough light
		Motor failed or stuck	Replace the motor or check mechanical fault
		Incorrect wiring of motor	Confirm whether wiring is correct

Order	Fault phenomenon	Possible cause	Remedy
3	DI terminal failure	Incorrect setting of parameters	Check and reset F5 group parameters
		External fault	Reconnect signal wire, and clear external faults
		Control board failure	Look for technical support
4	Controller interference	Abnormal carrier frequency	Reduce carrier frequency properly
		Incorrect ground method	The controller and pump shall both be grounded (not together with other external devices)
		Cable too long between controller and motor	Install output reactor or reduce length of cable
5	Big noise of motor	Motor failed or stuck	Replace the motor or check mechanical fault
		Abnormal carrier frequency	Increase carrier frequency properly
6	Switch trip	Installed leakage switch or air switch overload	Replace the air switch (without leakage) or replace the air switch with a larger capacity
		Abnormal input power	Check input power and eliminate short circuit
		Internal instrument failure	Look for technical support

Chapter 8 Backup AC power

In case of insufficient light or rainy weather, AC and DC power supplies will complement each other to ensure continuous water supply. The standby AC power supply can be either the local power grid or the diesel generator (please refer to Sheet 2.6 Product Selection Sheet).

Warning: To ensure that the controller preferentially starts the water pump driven by the DC power supply, it is recommended that the DC input voltage range of the three-phase 380V machine is DC 580-750V, and the AC input voltage range is AC 380V; The range of DC input voltage for single-phase and three-phase 220V machines is DC 350-360V, and the range of AC input terminal voltage is AC 220V.

Taking the use of three-phase 380VAC AC power supply as an example, its wiring is shown in the figure below:

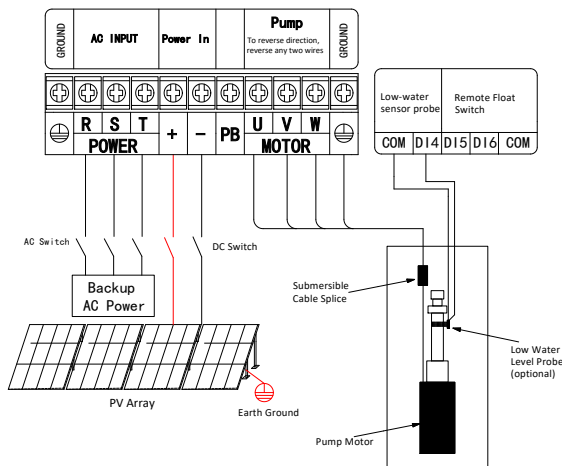


Figure 8-1-1 schematic diagram of alternate AC power supply

If the pump motor rated voltage is three-phase AC 220-240V, then the single-phase AC 220V standby power supply L/N power line, need to be connected to the main terminal R/T of the controller.

Chapter 9 Warranty Policy

Standard Warranty Period:

The pump controller manufacturer grants a standard warranty period of 18 months (1.5 years) for the pump controllers, starting from the date of shipment from manufacturer factory or 12 months (1 year) starting from the date of purchased invoice marked (whichever is longer).

Warranty Conditions:

If your pump controller gets fault and requires troubleshooting, please contact your distributor or dealer directly. Alternatively, feedback briefly to manufacture service hotline for logging and send your warranty card to our service department by fax/email to process the warranty claim.

During the warranty period, the pump controller manufacturer covers all costs for replacing any product or parts of the product proved to be defective in design or manufacture. To claim the warranty under the warranty policy of pump controller manufacturer, you need to supply us with the following information and documentation regarding the faulty pump controller:

1. Product model No.(e.g. PDS33-4T5R5) and serial No. (e.g.C121661B280H000292YA).
2. Copy of the invoice and warranty certificate of the controller.
3. Copy of the installation report and installation date.
4. Error message on LED screen (if available) or any information which would be helpful to determine the defect
5. Detailed information about the entire system (modules, circuits, etc.).
6. Documentation of previous claims/exchanges (if applicable).

After receiving above information, The pump controller manufacturer will decide how to proceed the service:

- Repaired by manufacture factory, or
- Repaired on-site by manufacture service center, or
- Offer a replacement device of equivalent value according to model and age.

In the case of an exchange, the remaining portion of the original warranty period will be transferred to the replacement device. You will not receive a new certificate, as your entitlement is documented at pump controller manufacturer.

If the pump controller needs to be replaced following assessment, manufacture will send a replacement unit immediately. The defective pump controller should be sent back to the closest manufacture service center by packing in its original package if possible.

Product warranty Card

Customer info.	Company name:	
	Company address:	
	Contact:	Tel.:
	Fax:	Zip code:
Product info.	Product model:	SN code:
	Buying date:	Fault date:
	Motor power:	Application situation:
Fault info.	Fault description:	
	Signature:	Date:

