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Rhino Motion Controls

RHINO SOLAR 1HP/2HP VFD MPPT AC/DC 220VAC / 60V-450V DC 10Amp



RMCS – 2318

Operating Manual v1.0

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Contents

Introduction and features.....	3
Wiring diagram and pinouts.....	4
Motor and power connection.....	4
Display and buttons.....	6
Drive parameters.....	8
State functions.....	10
Last error value.....	11
Modbus parameters.....	12

Introduction :

The **RHINO SOLAR PUMP VFD** is designed to deliver water in remote locations where access to reliable AC power may be uncertain or non-existent also it is suitable for all the locations. This controller operates seamlessly on DC power supplied by the PV array

During sunny days, the solar pumping system can consistently and efficiently move water.

In instances where there are no batteries or other energy storage devices, it is advisable to pump water to a reservoir for future use.

Water sources can range from natural bodies like rivers, lakes, and wells to specialized waterways. To manage the pump's operation effectively, a float switch can be installed in the water tower.

This 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 a high risk of equipment damage, the controller will protect the system and display the fault condition.

The solar pump controller is a variable speed motor drive designed to operate various BLDC pump sets, specifically engineered for 1HP pumps.

Features :

- ▶ Operates AC induction motor upto 2HP using Solar Type (V/F). or Direct AC power supply from 200 to 240VAC.
- ▶ It can Run Low Voltage with TWO - THREE (MONO - Monocrystalline / POLY - Polycrystalline) Solar Panels.
- ▶ It Accepts Direct Input from Solar Panels within the Range of DC 60V To 450V.
- ▶ It can directly run on AC power supply input of 200 to 240VAC.
- ▶ Continuous and Highly Efficient Power Tracking at 99%
- ▶ Ideal for 1HP/2HP AC Induction Motor.
- ▶ Rated to Handle up to 1500W Input DC Power with 10amps of Continuous Input Current.
- ▶ Operating Flawlessly within an Ambient Temperature Range of 0 to 60 Degrees Celsius.
- ▶ This System Prioritizes Safety with Built-in Features Such as Reverse Polarity Protection, Over-Temperature Safeguards, Under-Voltage Protection, and Overload Protection.
- ▶ Float Sensor Inputs can be Connector to Control the Water Level in a fixed Tank System. In case a Float Sensor is not intended to be used
- ▶ Please Hook up a Short Circuit Wire between 0V / Reference and TL Input.

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Wiring Diagram and Pinout of the Drive:

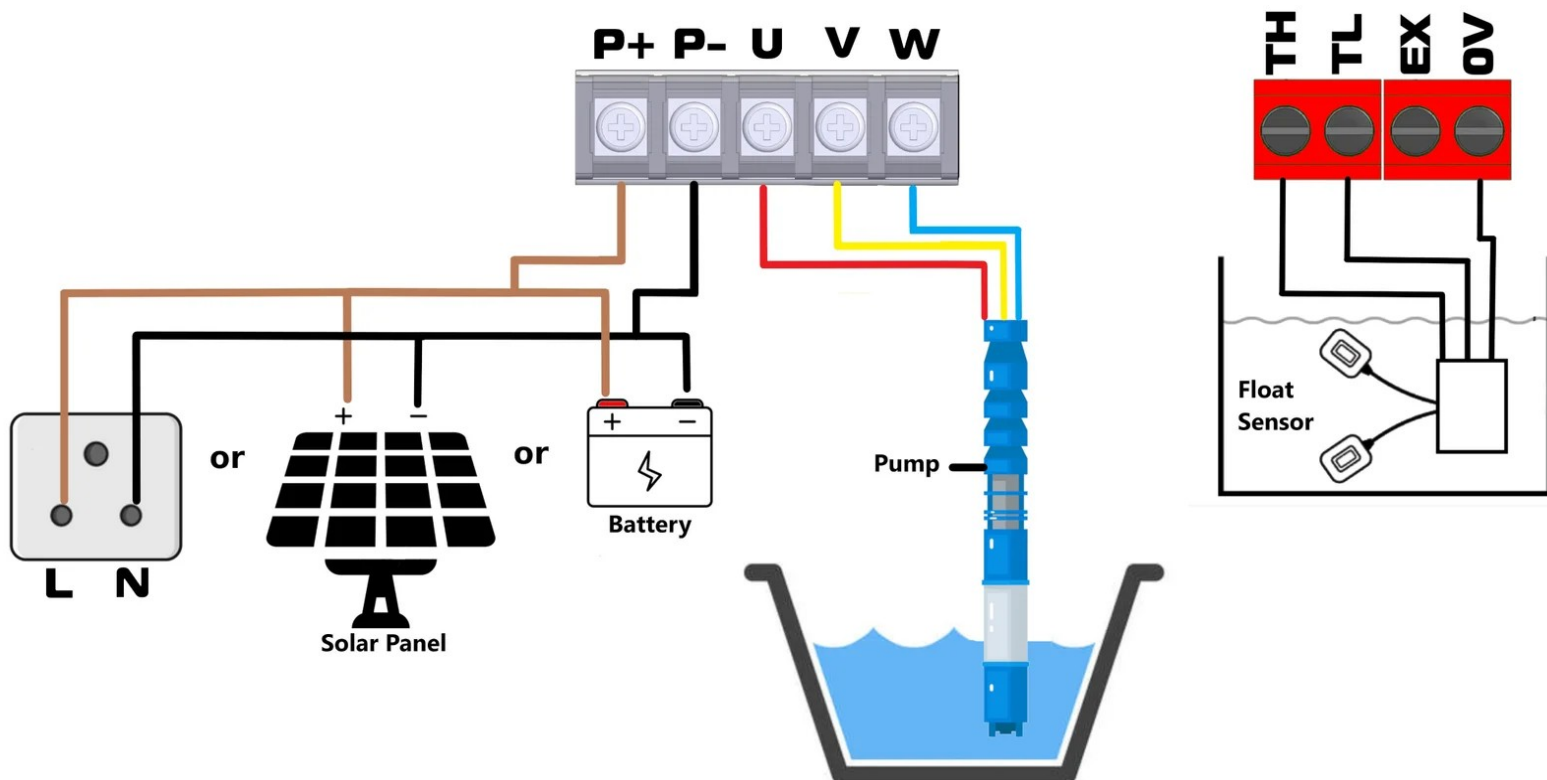


Fig 1:

Motor and Power connection:

Terminal name	Description
P+	Positive Dc Input or AC Phase Wire
P-	Negative Dc Input or AC Neutral Wire
U	Motor phase 1 (Red)
V	Motor phase 2 (Yellow)
W	Motor phase 3 (Blue)

As per the [fig 1](#). The VFD controller have following connections. The P+ and P- are the power input which needs to be connected with either the battery or the solar power output.

U, V and W are the motor phase wires that needs to be connected with respective of the motor's U,V and W terminal.

The other connection are for the float switch if you are using one. The TH and TL are for the input of water level high and low signal.

If you don't want to use the float switch then you can manually turn on and off the VFD controller from the switches. For that you will require to short the TL and 0V terminals of the VFD.

The other connections TH, TL and 0V are for the float switch. TH and TL are for high and low water level input signals based on which The controller will get on and off. If you want to use the VFD manually then you can simply short the TL and 0V.

Name	Description
TH	Tank high input
TL	Tank low float sensor input
EX	External voltage
GND	Gnd reference for float sensor

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Display and Buttons :

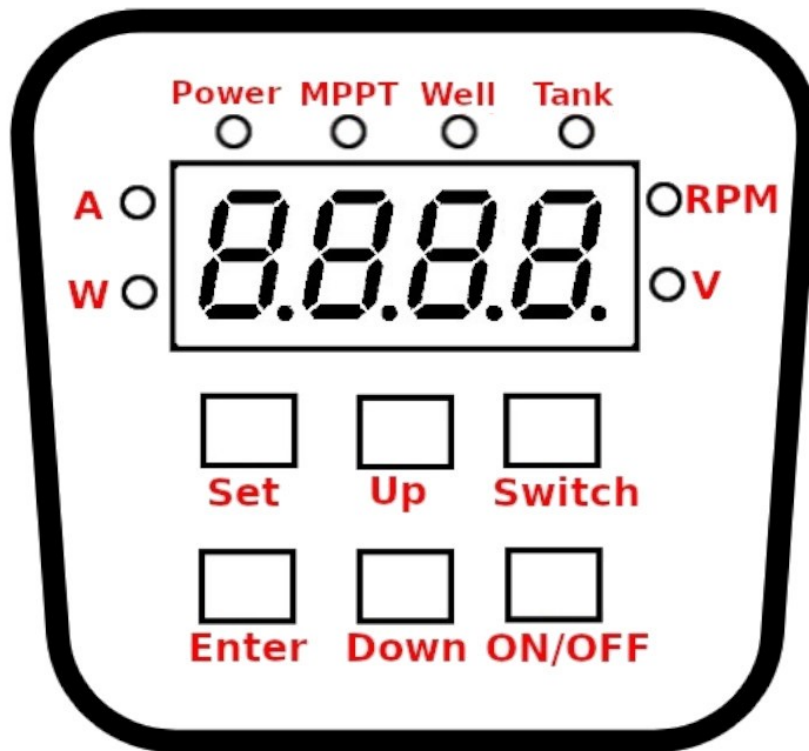


Fig 2 :

Button	Function
Set	Saves the parameter to the memory
Enter	Moves to the next parameter
Up	Increases the parameter value
Down	Decreases the parameter value
Switch	Changes the LED segment display parameters as per the above
On/Off	To turn on and off the inverter

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Name	Description	Unit
Input DC voltage	Shows input voltage	Volt(V)
Motor phase current	Shows input current of the motor	Ampere (A)
Motor running frequency	Shows the frequency of the motor	Hertz(Hz)
Motor running power	Shows the power required by the motor	Watt(W)
Drive temperature	Shows drive's temperature	Celcius(C)
PWM	Input power control	-
ID	Shows out of sync current	-
VD	Shows correction voltage	-
IQ	Shows sync active current	-
VQ	Shows sync active voltage	-

Drive Parameters :

Parameter	Name	Description	Default value
P1	MPPT tracking start offset	MPPT tracking start level	4
P2	No load frequency	Frequency at no load error	40
P3	Switchover frequency level	Frequency at which open loop switched to closed loop	10
P4	Startup torque command	The torque setting for open-loop start up	240
P5	Motor peak current limit	Sets the peak current for the motor coil	310
P6	Motor type	Sets the inductance of the motor coil	1
P7	PI loop overall gain	Peak gain setting for the PI loop	515
P8	Hold time for FOC synchronization	Sets the hold time during syncing of the motor from open loop to closed loop	40

Drive Parameters :

Parameter	Name	Description	Default value
P9	Torque limit setting	Maximum torque command given to FOC loop	480
P10	V/F motor rated voltage	Voltage at the rated frequency	80
P11	V/F motor rated frequency	The rated frequency of the motor	50
P12	Select closed loop operation type	FOC-0, V/F-1	1

State Function :

Note- For this function register no. will be fixed at 40002, address at 1, Lower Byte and access will only be read only

State	Name	Description
0	MOTOR_STATE_STANDBY	Motor will shut down
1	MOTOR_STATE_STARTUP	Motor will start
2	MOTOR_STATE_SYNCRON	Motor will be in sync
3	MOTOR_STATE_CSLDSPD	Motor will be in closed loop
5	MOTOR_STATE_MPPTRON	Motor will in MPPT mode
4	MOTOR_STATE_SHUTDWN	Motor will shut down
6	MOTOR_STATE_VFCNTRL	Motor will be in V/F mode

Last Error Value :

Note- For this function register no. will be fixed at 40002, address at 1, Higher Byte and access will only be read only

Error	Name	Description
OFF	ERROR_STATE_NOERROR	Motor is off, no error
LOWP	ERROR_STATE_LOWPWR	Inverter auto shut due due to low input power
LOWV	ERROR_STATE_LOWVLT	Inverter auto shut due due to low input voltage
MTRJ	ERROR_STATE_MTRJAM	Inverter auto shut due due to motor overload
CFL	ERROR_STATE_CFAULT	Inverter circuit failure due to high current
VFLD	ERROR_STATE_VFAULT	Inverter circuit failure due to high voltage
NLD	ERROR_STATE_NOLOAD	Motor not drawing sufficient power
HEAT	ERROR_STATE_OVHEAT	Inverter auto shut due to over temperature
INEEF	ERROR_STATE_INEFFI	Inverter auto shut due to incorrect operation
LOWS	ERROR_STATE_LOWSTR	Inverter auto shut due to low start power
PHS	ERROR_STATE_PHASE	Incorrect motor connections

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