USER MANUAL

SOLAR CONTROLLER
(Without Grid Option)

0.5 Hp – 10 Hp

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Scope:
- all models of only solar controllers for capacity ranges of 0.5 HP to 10 HP

Refer the support section for any clarifications regarding this document

CONTENTS

This manual consists of installation, commissioning and troubleshooting process for Roto Energy Systems Limited solar product offering namely – only solar controller.

The manual is intended for the use by technicians, contractors and other stakeholders that are involved in deployment and operation of Roto Energy Systems Limited products on field.

The following is covered in this document:

1. General information

Introduction

We wish to express our sincere thanks to you for choosing our product Only Solar Controller, manufactured and supplied by ROTO ENERGY SYSTEMS LIMITED.

It is scientifically designed and built to give you long and dependable service. Carefully selection of material and manufacturing assures you a satisfactory performance as per the controller rating. The controller will give you years of trouble-free performance if it is handled with due care.

Roto Energy Systems Limited make energy efficient and environmentally friendly solar controllers are used with submersible positive displacement/centrifugal pumps which satisfies the requirement for handling clear cold and fresh water. It is designed for best in class efficiency which helps in solving the water problem for irrigation, houses, as well as for livestock or other water requirements.

'ROTO ENERGY SYSTEMS LIMITED' Solar Controllers are easy to install, however detailed installation and operation manual is on following pages, for easy understanding and comprehensive first-hand information on these controllers.

Follow safety instructions carefully. Improper use and operation may cause lethal electrical shocks and/or damage to equipment.

Our products are meant for pumping water and they do not have any significant effect on environment during their use, if properly selected and used as per instructions given in the manual. Customers are advised to dispose off unusable components through appropriate disposal agencies to avoid the harmful impact (if any) on environment.

Instructions

Purchasers are cautioned to go through carefully the detailed instructions given for proper installation, use and servicing of the product and genuine spare parts as detailed in company's published literature, manuals, pamphlets or other official publications. Any deviation, if made by the customers, will void the warranty obligations and/or manufacturer's liability, if any, for any compensation consequential or otherwise. Use of trained mechanics will get you better results.

'ROTO ENERGY SYSTEMS LIMITED' Solar Controllers are assured to give delivery output as per the specifications. However, if the specifications and instructions are

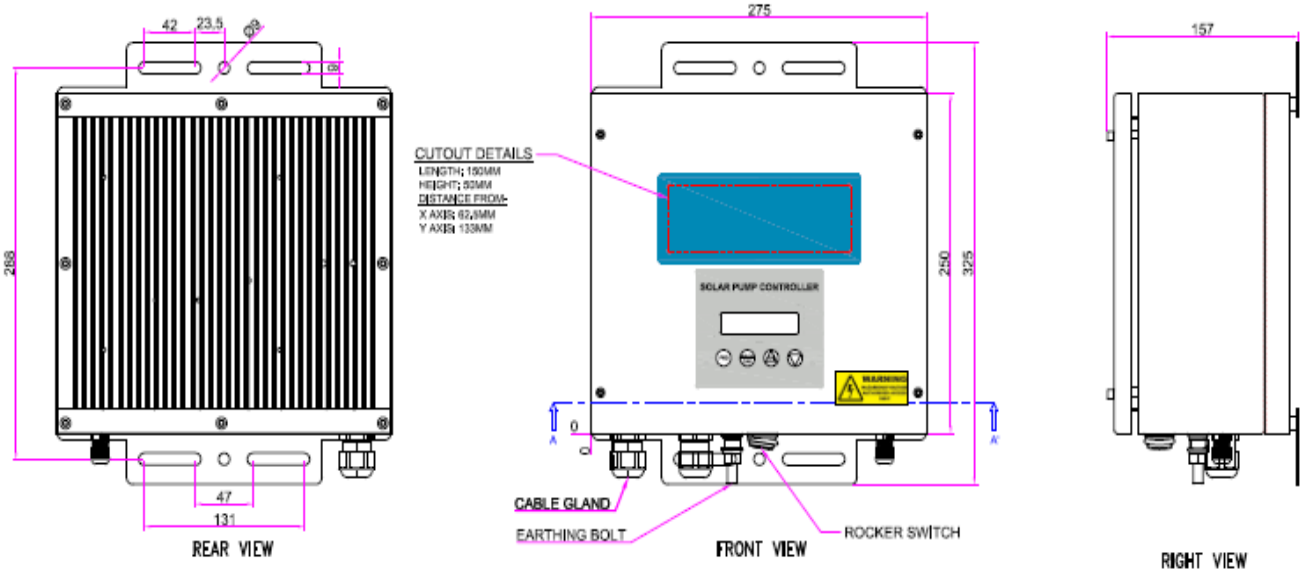
not followed correctly, the life of controller may reduce and also the performance of pump may get hampered.
The controllers are for pumps which in turn are for clear and cold fresh water for drinking purpose.
During installation and while starting the system, hand gloves should be worn for safety purposes.

All controller units are pre-configured with setting specific to a solar panel and motor combination. It is necessary to adhere to the requirements for correct operation.

Warning
Always take help of a qualified mechanic/electrician while commissioning and starting the system for the first time.
Ensure that the pump is properly connected with the motor and the motor is properly connected with controller.
Ensure all electric joints as well as connections are water proof and covered.
Install controller with the pump set properly as per the rated head range.
Before going for any service of the system, disconnect the power supply.
Ensure that proper earthing is given to the controller.

2. Construction

Solar Controller without Grid Option



The outer body of RESL Controllers is made with rugged, high Quality steel and is powder coated. The main external parts of the controller include:

- A LCD display with 4 press keys.
- Cable gland with DC supply wires with connectors.
- Cable gland with motor connection wires
- Cable gland with water level sensor wires (for overhead tank and for dry run protection)
- Motor toggle switch.
- Earthing bolt.
- Heat Sink.
- Mounting clamps.
- A branding sticker.
- A warning sticker.
- A product name plate sticker.

3. Technical specifications

The controllers are designed for the operation and speed control of a PMSM (DC) Motors. Input DC supply is through current regulated source such as SOLAR panels or SOLAR simulators. The control strategy is based on sensor-less speed control of a permanent magnet synchronous motor (PMSM). The controller can also be configured to work in open loop V/F control mode for AC Induction motor control.

Only Solar Controller (Common box - from 1 HP to 10 HP with change in heat sinks as per HP ratings)

(i) 1 HP/2 HP

(ii) 3 HP/5 HP

(iii) 7.5 HP/10 HP

Application:

3-phase permanent magnet synchronous motors for pumping applications at river bed locations/Borewells/Agriculture/Sprinklers/Drip Irrigation/Rural & Urban water supply schemes/ High-rise building/ Livestock/ Fountains/ Fishery Ponds Water Circulation, etc.

Parameter	Only Solar Controller		
Rating			
HP Rating	1 HP /2 HP	3 HP/ 5 HP	7.5 HP /10 HP
Controller Input			
DC Power (Wp)	1000/2000	3000/5000	7000/9000
Maximum PV Array/ DC Bus Voltage (V)	225	450	900
Max. Input DC Current (A)	15	15	15
Input AC Voltage (V)	NA	NA	NA
MPPT Range (V)	70-175	180-300	300-750
Controller Output			
Maximum Three Phase Output Voltage (V rms)	120	300	380

Max. Output Current Rating (A)	15	15	15
Max. Output Fault/ Short Circuit Current (A)	25	25	25
Output Frequency (Hz)	0-300	0-300	0-300
Overload	150% for 1 minute	150% for 1 minute	150% for 1 minute
Motor types which can beused	PMSM (DC)/ Induction Motor	PMSM (DC)/ Induction Motor	PMSM (DC)/ Induction Motor

PROTECTIONS	
DC Input	Over/Under Voltage, Reverse Polarity
Output	Output Short Circuit, Over Current
	Output Open Circuit
	Un-balance in the output
	Dry Run, dry-run-external
Temperature	Thermal Overload, Over Temperature
Operational	Water Level
PV input MCB	25A, 500V, 6kA
PV Input Surge Protection	20kA, 600V
Communication and Interface	
Communication	TTL Rx and Tx signals available for RMU
	(RMU not included)
User interface	Two-line LCD, 4 Keys, Remote monitoring system(2G/4G)
OTHERS	
Operating Ambient Temperature	-20℃ to +50℃
Humidity Range	0 to 95% RH
Protection level	IP65

Cooling	Natural Cooling
Maximum Altitude	1000 m from Sea level
Suitability for wet locations	Suitable
Modes of Operation	1. MPPT mode
	2. KEYPAD mode
Frequency of operation	1. MPPT Mode: Minimum operating frequency – 20Hz, Base Frequency for Motor is programmable.
	2. KEYPAD Mode: Output frequency variable from 1Hz to Maximum frequency.
V/F curve pattern	Linear with Base Voltage at Base Frequency. Base Voltage, Base Frequency and Maximum Frequency are programmable
Start-up Sequence	1. Variable Frequency using Keypad for testing purposes.
	2. Based on the Input DC Voltage for Solar interface: Inverter will wait until the input DC Voltage reaches Open circuit voltage. There is a Start-up Delay time of 5 seconds and wait delay of 2 minutes in case of low intensity.
	3. Grid Presence: Max. speed.
Stop sequence	1. For both modes of Operation, inverter will stop if the input voltage is less than Minimum Input Voltage.
	2. For Keypad operation, the inverter will stop by pressing the BACK/ RESET key.
Restarting sequence	1. In KEYPAD mode, frequency is reset to minimum operating frequency of 1Hz. The User can increase or decrease the output frequency using display keypad interface.
	2. In MPPT mode, the will start when the input voltage is more than the Open Circuit Voltage and the Start-up delay is elapsed.

4. Installation

- Ensure that proper selection of the controller along with the solar modules and the pump set is done based on site conditions.

Unpacking:

- Open the controller's carton box. The contents of the box are packing materials and the controller itself. Take out the controller carefully.
- Check for physical damages. If there any visible damages to the unit, do not use it. Damages may have resulted in internal problems.
- Check and note the serial number of the controller. Verify that the specifications and material code are correct for the purposes of the installation.

Controller Mounting:

- Using the correct U clamps at the top and bottom of the controller to ensure a secure fit.
- If wall mounted, examine the wall's rigidity and construction details.
- Ensure proper earthing and Attach the drive's earthing system.

Controller connection with the DC Input:

- Connect solar panel input connectors correctly. It has to be ensured that positive and negative marked MC4 connectors are connected to same respective polarities of the solar panels. Use multimeter to verify the same.
- If solar input is connected, the controller's LCD should light up with rolling displays. If it doesn't recheck voltage and polarity of solar panels. (Incase the system still does not switch on, then open the box and check the DC MCB inside the box. Please note that DC MCB inside the box is normally kept in switch on condition only, but due to some fault during installation or during operation it can trip). Discard the unit if power input is correct and the system still doesn't turn on.

Controller connection with Motor-Pump Set:

- Verify that the motor name plate is compliant with controller name plate for correct operation.
- Before assembling the motor and pump, connect motor terminals to the output cables of the controller by matching the colour codes. It is advised to

check the resistance of all three phase of motor before the motor is connected. There should not be a variation of more than 5% per phase. The motor should otherwise be discarded.

- Connect motor cable terminals to the motor output cable of the controllers in correct R-Y-B sequence. Connecting in wrong sequence will lead to opposite rotation and may lead to damages in certain types of pumps.
- Ensure proper earthing for the controller and the motor.

Not connecting the earthing properly may lead to motor leakage current shocks to the user and also may damage the drive in the long run.

- In case of only solar controller, start the motor by operating the toggle switch in the controller and by operating the ON key which will give run command to the motor and display shows running.
- Ensure that the motor is running in the correct direction as per the arrow marked in the motor. (in case the motor runs in opposite direction interchange any 2 wires from the controller output to motor input)
- If the motor starts spinning without issues, ensure that it is turned off within 30 seconds. The unit may turn off the motor with Dry Run Fault on the LCD. This is normal.
- Check for current consumption when the motor was running. It should be well under the rated current limit.
- The motor and pump can now be coupled properly.
- The cable from the controller to be connected with cable from the motor using proper joining kit so that there is no short circuit.
- For overhead tank overflow protection yellow and black wire from the controller to be connected with suitable sensor. The sensor to be placed in a suitable position in the overhead tank. Do ensure that setting in the controller for the parameter 71 is kept as 000. 000 ensures the NO contact which is desired for overhead tank overflow protection.
- For dry run protection white and black wire from the controller to be connected with suitable sensor. The sensor to be placed atleast 1 meter over the pump delivery nozzle. Do ensure that setting in the controller for the parameter 72 is kept as 001. 001 ensures the NC contact which is desired for dry run protection.

Fault Selection	Parameter	NO Connection	NC Connection	Wire used
Water Level 1 (Overhead Tank Overflow Protection)	71	000	001	BLACK and Yellow
Water Level 2 (Dry Run Protection)	72	000	001	BLACK and White

- The motor and pump can now be installed inside the bore.
- Turn on the system again to observe water output and proper operation.

In case the pump set fails to run properly or controller shows over current, it could be a controller tuning issue. Verify motor-controller configuration or Contact service.

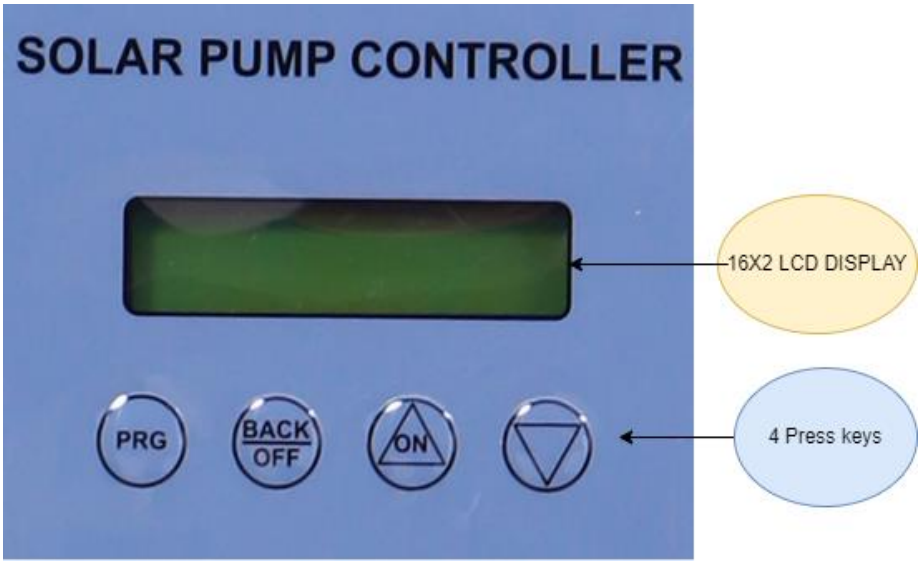
5. Operation

For an end user, operating the system is quite straightforward.

Following are the key points:

- Motor can be turned on or off by toggling/flipping the motor switch on the controller or by pressing the on/off key in the controller.
- For the first time operation and if the controller is operated after a long time, ensure that load is connected to the controller after switching on the controller for 10 minutes.
- While, Roto Energy Systems Limited controller and submersible positive displacement pumps do not require day-to-day maintenance if properly selected and installed, it is a good practice to monitor the conditions and performance of the system. This diagnosis may be carried out by checking the maximum pressure (shut valve for a very short period) generated by the pump, and by checking the current drawn by the motor at standard duty flow rate. Both these figures should be compared to pressures and current drawn recorded when the unit was initially installed. Any reduction in pressure may indicate wear in the pump, while any increase in motor current indicates a possible overload condition. Consult the pump service chart for further diagnosis of possible causes.
- If system fails to run, report the issue on the telephone number provided. Serial number and model of the controller, motor & pump along with the Invoice serial number should be kept handy while reporting the issue. If there is a fault on the LCD display of the controller, it should be noted down and reported on the call.
- Alternatively, end user may report the issue to their respective system integrators/dealer who in turn can report the issue to Roto Energy System Limited.

Understanding LCD Display and Keys



Display Sticker

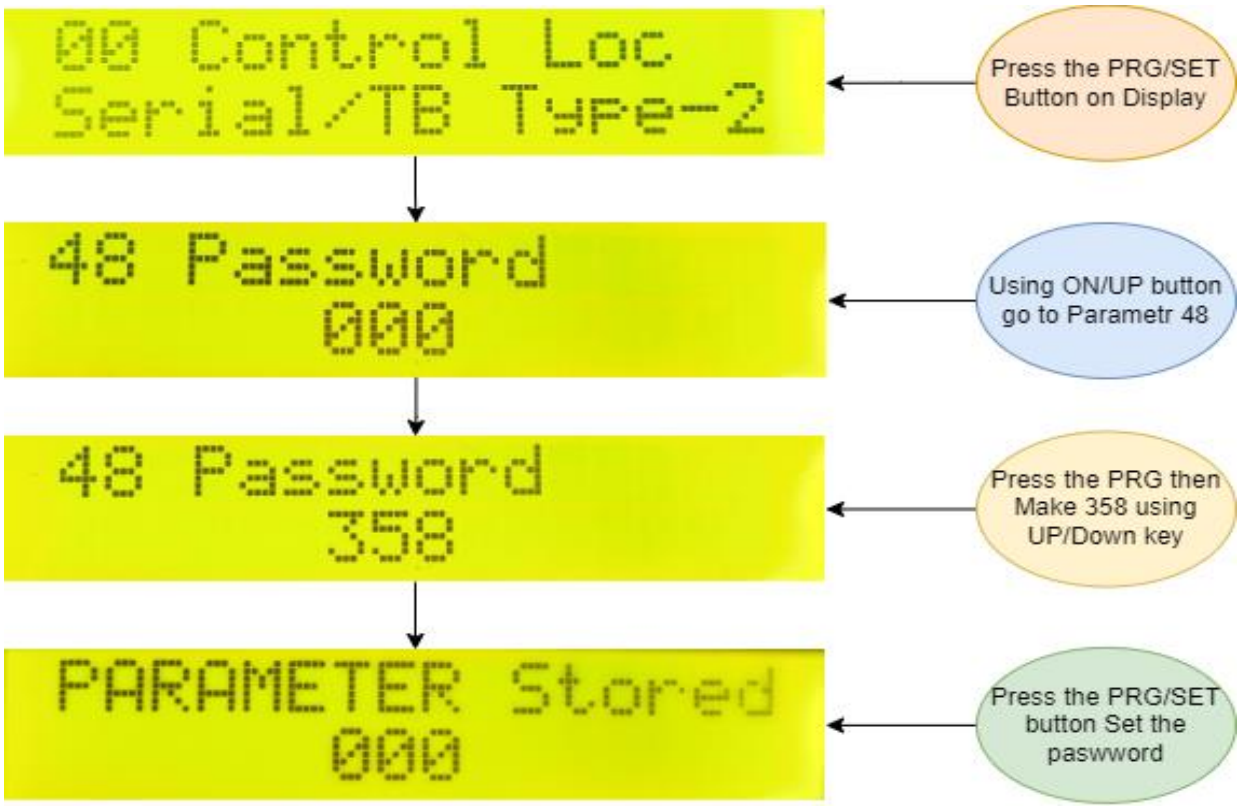
The drive has an in-built LCD Display with 4 functional keys for monitoring and updating parameters. On start-up, controller enters READY mode if input voltages are sufficiently within the range as per the specification.

DISPLAYED MESSAGES	DESCRIPTION
IOUT= A	Indicates Motor Current
FREQ= Hz	Indicates output running frequency
DC= Volts	PV Voltage / DC Bus Voltage
IPV= Amps	PV Current for DC input only
IGBT= DegC	Device case temperature
VOUT= V	Output RMS Voltage
RPM=	Motor RPM
PWR= kW	DC Power in kW
FLOW= LPM	Estimated Water Flow in Liters per Minute
KWH=	Total Energy (Accumulated)
Signal=	In case of RMU along with SIM are installed, this indicates signalstrength available. Less than 10 can be considered as LOW and 0 indicates no Signal

After entering programming mode, pressing PRG key again will enable parameter updating. Pressing ▲/▼ keys in this mode will alter the parameters to the desired value. Press PRG for storing the new value to the parameter and pressing BACK will return to scrolling mode.

The parameter can be changed only after password is entered in the controller (default password setting is 358)

Keys	Description
PRG	Used as Program and Set Key • This Key is used to enter into Programming mode • When the drive is running, this key is used to scroll through monitoring parameters such as Output Voltage,Output real power, PF, etc • After modifying the parameters pressing this key for atleast 3sec will save the parameter value.
BACK/ OFF	Back Key is used as Return Key. • This may be used for returning to the previous menu. • Used for clearing the keypad resettable faults
▲	Used as UP key • When the Parameter “Mode Select” is from Keypad, UP key is used for increasing the reference frequency/ speed when the VFD is running in Motor mode of operation. • In programming mode, UP key is used to select parameter OR increment the data value for the selected Parameter.
▼	Used as DOWN key • When Parameter “Mode Select” is from Keypad, DOWN key is used for decreasing the reference frequency/ speed when the drive is running in Motor mode of operation. • In programming mode, DOWN key is used for selecting the Parameter OR decreasing the data value for the selected parameter.
ON	In MPPT mode pressing this key is START Command to the drive.
BACK/ OFF	In MPPT mode this key STOPs the motor.



Note:
After setting the password, select a parameter, press the PRG key, then use the UP/DOWN key to change the value in the parameter, Hold the PRG Key so that changed value is stored in that parameter.

List of Parameters:

Parameter	Parameter Name	Default	Settable Range	Selection and Significance of Parameter
00	Control Loc	Serial/TB Type-2	• Serial Input • TB Input • **Serial/TB Type-1**	Serial input means commands from key pads on display units TB input means external switch/toggle switch. **Serial/TB Type 1** – to be selected for Automatic switch on of the motor every time system starts. This selection means that motor can be started or

				stopped using serial and TB input. Serial/TB Type 2 – to be selected if we want to switch on the system manually every day. This selection means that motor can be started or stopped using serial and TB input. S/TB Type2 Latch – In this it will work same as Serial/TB Type 2, but in this condition the drive will store the last state of the controller. It means that if the controller was in motor running mode and power goes off, next time when power is provided, motor will run automatically. Vice versa this means that if the controller was in motor off mode and power goes off, next time when power is provided, the motor will be in off condition only. In this case we need to give run command to motor manually.
			• Serial/TB Type-2 • S/TB Type2 Latch	
01	Main Speed Ref	Remote	• Remote • Keypad	Remote selection ensures system runs in MPPT mode. Keypad selection to be done for manual testing and for increasing frequency of the motor manually
02	Freq Maximum	250.0 Hz	30 - 300Hz	It can be set upto 300 Hz incase sufficient power is available.
03	Base Freq	50.0 Hz	30 - 300Hz	This parameter is normally used for Solar AC

				Motors and is not significant for PMSM/BLDC (DC) Motors
04	Rating	0.7 Kw	0.01 – 7.46Kw	As per motor output to optimize the performance
05	Control Type	Sensor less PMSM	• V/F Control • Sensor less PMSM	V/F control is used normally for Solar AC Motors. In case it is used for PMSM/BLDC (DC) Motors, then motor frequency will not go beyond 50 Hz. Sensor less PMSM to be used for PMSM/BLDC (DC) Motors
06	Rated Current	12Amps	1.0 - 15Amps	As per motor used
07	Rated Voltage	70Volts	0.0 – 380Volts	As per motor used
08	Freq Minimum	1.00 Hz	1.0 - 240.0 Hz	It is kept 1 for PMSM/BLDC (DC) Motors.
09	Ramp Up Time	20.0 Sec	0.1 - 120.0 Sec	It can be set as per HP rating. Higher HP ratings should have more ramp up time in order to have soft starting and avoid in rush current during starting. Normally default settings will be done from factory suitable to motor used.
10	Ramp Dn Time	05.0 Sec	0.1 - 120.0 Sec	It should be less in order to avoid stoppage during cloud passing or due to accidental shading
11	Min DC Level	70.0 Volts	70.0 Volts -210.0 Volts	To be selected as per Open Circuit Voltage of Solar Modules used in series (System Voc)
12	Low DC Limit	70.0 Volts	70.0 Volts -210.0 Volts	To be selected as per Peak Power Point Voltage of Solar Modules used in series (System Vmp)
13	Torque Boost	002%	01 – 20%	For providing starting extra boost to the motor in case there is any jamming issue

14	Delta V Step	0.8 Volts	0.1 – 6.0 Volts	This parameter is used for MPPT and have been optimised for 0.8 Volts
15	PM Control	23	1 - 9999	Used for enabling and disabling different controls in the controller
16	O/P Cur Limit	130.0%	80 – 150.0%	Incase the motor is consuming higher current due to any jamming issue, then o/p cur limit ensures that controller does not operate beyond certain limit to ensure that motor winding does not get damaged. This setting also restricts the frequency of the motor.
17	OL Percent	120%	80 – 150.0%	Used for motor protection.
18	RS 485 Time Out	0 Sec	0 – 60Sec	It is used for providing any delay in transfer of data
19	Pole Pairs	005	01 - 06	Our PMSM/BLDC (DC) motors are 10 pole.
20	Rs Resistance	0.50 Ohm	0.01 – 99.99 Ohm	As per motor rating used
21	Ld Inductance	0.80 mH	0.01 – 99.99 mH	As per motor rating used
22	Lq Inductance	1.09 mH	0.01 – 99.99 mH	As per motor rating used
23	Ke Constant	0.27 V. s/r	0.01 – 99.99 V.s/r	As per motor rating used
24	Kt Constant	0.28 Nm/A	0.01 – 99.99 Nm/A	As per motor rating used
25	Rotor Inertia	3.93 Kg CM^2	0.01 – 99.99 Kg CM^2	This parameter is normally used for Solar AC Motors and is not significant for PMSM/BLDC (DC) Motors
26	Speed Kp Gain	18208	0.01 – 99.99	As per motor rating used
27	Speed Ki Gain	23488	0 - 32767	As per motor rating used
28	D Cur Kp Gain	02642	0 - 32767	As per motor rating used
29	D Cur Ki Gain	18258	0 - 32767	As per motor rating used
30	Q Cur Ki Gain	02887	0 - 32767	As per motor rating used
31	Q Cur Ki Gain	00579	0 - 32767	As per motor rating used

32	Current Calibration AC	7400	05730 - 09999	This parameter is used for the display of AC Current going into the motor, on the controller screen
33	START Delay Cnt	1	01 - 024	Used for display on the controller screen.
34	PMSM PWR Calb	2951	2000 - 4000	This parameter is used for the display of Power consumed by the motor, on the controller screen
35	DC CUR Calibration	1404	1000 - 4000	This parameter is used for the display of DC Current from the Solar Modules, on the controller screen
36	Closed Loop TO	40	001 - 400	Used for display on the controller screen
37	DCV Calib	****	***	The controller shows that exact power from the Solar Modules so no calibration is done here
38	Start Up Current	060%	005 - 100%	For controlling the inrush current especially in AC motors
39	FOC Start Ramp	20.0 Sec	01.0 – 120 Sec	It is the delay which is used for building the current upto to the rated value. In case FOC Start Ramp is reduced, the inrush current will be higher and may damage the motor.
40	SPD Merg Coeff	4	00.1 – 25.0	This is the delay used for protection in case of surges.
41	Min RPM PMSM	600 RPM	0 - 1000 RPM	This rpm ensures that system does not operate at very low power at which the we will not be getting any discharge from the pump set. This help is protection the pump motor set.
42	Obsrv ErrCnt	1000	0 - 10000	Used for fault displays on the controller
43	Closed Loop BO	200 Hz	01 – 600Hz	Used for controller logics.

44	Speed Damping	0.65	0.01-1.00	Used to avoid the undue stoppage in the motor due reduction is power in the controller because of passing clouds or shadows.
45	Current Frequency	400 Hz	080 – 600Hz	For getting optimised waveforms
46	Current Damping	1.0	0.01 – 1.00	For avoiding harmonics
47	ID Run	000	0 - 002	At present this parameter is not used. It is kept for future developments
48	Password	000	358	The password has to be entered to change any other parameter in the controller
49	Max EMF Volts	68.0 Volts	0.01 – 380.0	As per motor rating used
50	Mode Select	000	0 - 001	0 for Automatic MPPT 1 for manual increase of frequency using keypad mode.
51	Set Default	000	0 – 001	Incase all the parameters have to be changed to default factory settings, then this selection to be changed to 1 and after this the controller has to be powered off. When the controller is powered on again the parameters will change to original default values.
52	Motor Direction	Forward Direction	• Forward Direction • Reverse Direction	The motor should always rotate in the direction of the arrow marked on the motor. In case the motor rotation has to be changed, it can be done by interchanging any 2 wires from the motor to controller or by changing the motor direction by choosing the suitable option here.

53	Fault Enable	06135	0 - 32767	Used for various faults in the controller
54	MPPT Start Rate	4096	02048 - 32767	It is fixed for all of the controllers
55	DC Stable Voltage	50 Volts	0 – 2000 Volts	It is used for MPPT of the controller
56	Phase Loss dV	100	050 - 1000	It is used for MPPT of the controller
57	DRY RUN Power	0.1kW	0 – 10.0 kW	This is used for sensor less dry run settings in the centrifugal pump sets and can be set based on no load power as per pump set ratings. For helical pump sets sensor based dry run protection is given.
58	DRY RUN Frequency	260.0 Hz	01.0 – 310.0	This is used for sensor less dry run settings in the centrifugal pump sets For helical pump sets sensor based dry run protection is given.
59	D Pul Kp Gain	19278	0.0 - 32767	As per motor rating used
60	D Pul KI Gain	22047	0.0 - 32767	As per motor rating used
61	Q Pul Kp Gain	18223	0.0 - 32767	As per motor rating used
62	Q Pul KI Gain	22245	0.0 - 32767	As per motor rating used
63	MPPT Method	009	0.0 - 32767	Different MPPT methods are used for optimising the MPPT and input power to the system. Default value to be kept as 9.
64	MPPT-P-Gain	19032	0.0 - 32767	Specific to RESL controller
65	MPPT-I-Gain	21105	0.0 – 32767.0	Specific to RESL controller
66	Dry Run Reset	900	0.0 – 3600sec	This is the time for which the controller waits for the water to resume after dry run. This process repeats for 3 times. In case the water is still not available, then systems show fault and has to be reset manually.

67	Rated Flow	1.9 m^3/h	0.0 – 350.0	It can be set as per pump set rating. In case the flow meter is not connected, then in order to get an idea of the flow at different frequencies, the rated value of the pump set can be entered. It will help is giving the idea of the approximate discharge of the system.
68	Rated Head	70.0 m	0.0 – 999.9	It can be set as per the pump set rating.
69	Reset Counts	No Action	0 – No action 1 - Reset Total Flow 2 - Reset Total kWH 3 - Reset Run hours	After resetting the Flow, kWh, Run hours, the display once again goes back to default 0 value.
70	UP Link Time	120 Sec	0 – 9999 Sec	Used for remote monitoring
71	Switch_DI3	0	0 – 1.0 (set value is 0 then NO if set value is 1 then NC)	Can be used for protection of overflow in overhead tanks Or for dry run protection of the motors
72	Switch_DI4	0	0 – 1.0 (set value is 0 then NO if set value is 1 then NC)	Can be used for protection of overflow in overhead tanks Or for dry run protection of the motors
73	Srt MRG Dly	16384	0.0 – 32767.0	This is related to delay used for protection in case of surges.

★ The parameter will change depending upon the HP Rating

6. Precautions

Apart from the precautions mentioned in the rest of the sections, the following should be followed for correct and hassle free operation:

- Handle the controller with care. Follow instructions on packaging carefully for correct handling.

- Do not stack for a more than 3 units in a column during storage or transport.
- In any case applied voltage should not exceed the permitted voltage range, it can harm the controller.
- Connect wires with standard connection procedures to avoid short circuits, voltage drops and other electrical problem. All connections should be properly done to avoid any sparking
- Ensure earthing is done correctly.
- Use correctly size cable gauges for DC, Motor and Earth connections
- Ensure that cabinet is not left open and that IP65 is not compromised due to damages of gaskets and the body.
- It is advisable to mount controller under the shadow of any object like solar panel.
- Do not cover the controller by any material like polythene, cloths etc. as it may cause over heating of the controller.
- The wiring work should be done by qualified electricians
- High voltages exist inside the enclosure. Wait for 10 minutes after disconnecting the power source (PV Panel input) before accessing the circuits. All LED's inside the controller should be off.

7. Faults

Sl. No.	LCD Display	Cause for the fault	Fault reset/ Clearing method	Fault reset time
1	DC UV Fault	Input DC < Rated	Input DC reaches rated value	Automatic
2	DC OV Fault	Input DC > Rated	Input DC reaches rated	Automatic

			value	
3	!Over Temp!	Heatsink Temperature > 85℃	Heatsink Temperatureis less than 85℃	1 Min
4	!Water Level!	Fault set when “EXT Input Set”is set to Water level sensing and it is activated	Deactivating external fault inputs	Automatic
5	!Surge PV!	PV Surge Suppressor board failure/ improper wiring	Replace PV surge Suppressor / proper wiring	After 6 seconds
6	!DRY RUN!	When output power is less than set at Parameter “03NL Pwr Base”	Time based	After 1 hour
7	!DRYRun/EXT!	When parameter “FAULTInputSel”is chosen to be ACTHi or ACTLo, Internal DRYRUN measurement is disabled and drive trips for external signal input	When external input command clears	Automatic
8	!Unbalance!	Output motor cable open	Proper wiring	After 1hour
9	Inverse OL	Overload fault following an inverse curve with the limits 110% for 30min and 130% for 10sec	Reducing the load within 110%	After 10minutes
10	OC in Acceln	When motor is locked or pump jammed	Clearing Lock or Jam	After 1 hour
11	OC in RUN	Current crosses rated value while running	Clearing the Lock or JAM Proper motor wiring	After 1 hour

12	!Output SC!	Output Short Circuit	Clear Short Circuit	Power recycles
13	!Door Open!	Module door is open	Door to be closed	1Minute
14	!Over Speed!	For PMSM only. Estimated speed is more than 3800rpm	Motor tuning parameters to be rechecked	After 1 hour
15	!OUTPUTOPEN!	For PMSM only. Motor is not connected	Check motor connection	After 1 hour
16	Motor Stall	Motor draws excessive current at lower speed than minimum speed	Mechanical assembly to be checked	After 1 hour
17	AC SURGE	AC Surge Suppressor fused	--	--

The warranty is void for the following conditions:

Sl No.	Conditions
1	Repair, modification or movement of the product or parts by buyer oranyone other than seller or its authorised representative or incorrect attachment to other products not provided by seller.
2	Damage resulting from Power Surges and acts of nature, including but not limited to storms, lightning, over voltage, fire, flood, pests, or other events outside the control of Seller.
3	Damage resulting from abuse, misuse, negligence, accident, action of third parties, improper or non-compliant use of operation including inadequate ventilation and circulation, improper installation, commissioning, and maintenance.
4	Damage resulting from improper start up, storage, excessive pollution,and dirt or dust intrusion into the product.
5	Installation in a highly corrosive environment.
6	Abnormal or unintended use.
7	Damage during transportation.
8	Damage resulting from the external connected equipment.
9	Damage resulting from failure to properly maintain the products.

8. Support

For sales related enquiry:
Visit www.rotoenergy.com

For service support:
Call Number: +91 (0) 120 2567946

If you are business customer:
To monitor and manage your systems, go to solarpump-manager.com and log in with the credentials provided to you.

For other queries:
Send an email to info@rotoenergy.com