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## INSTALLATION & OPERATING INSTRUCTIONS

### KALPAVRIKSHA HYBRID/GRID-TIE CONTROLLER



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## CHAPTER 1 : SAFETY INSTRUCTIONS

**⚠ WARNING!** Ignoring the following instructions can cause physical injury or damage to the equipment or death.

### 1.1 Pre-Installation Safety Measures

1. Before using the unit, read all instructions and cautionary markings on the unit and all the sections of this manual.
2. The gross weight of the equipment is close to 25-30 Kg. Kindly lift the hybrid controller carefully to avoid any physical injury.
3. Please check the package for any sign of damage to ensure personal safety. Don't use the damaged or incomplete hybrid controller.
4. Customers are NOT authorized to open the hybrid controller or to do any kind of modification, or repair; otherwise, there is a danger of shock and loss of warranty.
5. To store the hybrid controller, kindly follow instructions given in Chapter 2 "INTRODUCTION".

### 1.2 Installation Safety Measures

1. Installation should be done in presence of a professional technician. Safety equipment like safety shoes, helmets, and gloves should be used by the technician. Only licensed person, who has been trained in design, installation, commissioning, and operation of hybrid controller, is permitted to operate this equipment.
2. To prevent risk of shock during installation and maintenance, please make sure that all AC and DC terminals are plugged out.
3. Installation of the hybrid controller should be carried out on a solar structure with proper ground clearance & specified nuts & bolts.
4. Install the hybrid controller on metal or other non-flammable material, and keep it away from any combustible material.
5. The hybrid controller should not be installed inside a closed chamber. Ventilation is required to ensure proper heat dissipation. Ignoring this will result in malfunctioning of the unit and loss of warranty.
6. Before starting wiring and connections make sure that PV panels, hybrid controller, motor, grid, and all other accessories are properly fitted on their designated place.

7. Ensure that the hybrid controller, motor, and adjoining equipment are properly earthed to reduce electromagnetic emission and interference.
8. Unit must be earthed using appropriate wire size diameter and its diameter should be equal to or higher than that input power supply wires (refer regional safety standard specific to your location).
9. Make sure that the voltage grade of the power supply is consistent with the hybrid controller's voltage. Also, note that all PV panels are connected in series or parallel as per system's requirement in order to have required voltage fed to the drive.
10. There must not be any loose connection. Make sure that all insulations are proper in order to prevent any damage/injury. Also periodically inspect insulation in case of a bad weather.
11. Check whether the wiring is correct and firm, there should not be any short circuit in the peripheral equipment's circuit.
12. Ensure that the output of the hybrid controller is turned off while setting all the required parameters.
13. Ensure that no unauthorized filter is connected to the output of the hybrid controller. It may cause loss of warranty.

### 1.3 Safety during Operation

1. Make sure that the ratings of the pump, motor, PV panels, grid, and hybrid controller comply with each other.
2. The heat sink should not be touched otherwise there is a danger of getting burnt.
3. Do not operate or touch the hybrid controller with the wet hand.
4. Do not put any of your belongings like mobile etc. on the hybrid controller.
5. Disconnect PV power from the hybrid controller under the supervision or presence of a trained electrician.
6. Before opening the housing, the hybrid controller must be disconnected from all the energy sources like Grid and PV.
7. After the input is disconnected from the hybrid controller, wait for at least five minutes so as to allow the internal capacitors to get discharged for the safety of operation.
8. Ensure polarity, tightness and wire size are correct, before energizing the hybrid controller.

9. At over 2,000 metres altitude, the hybrid controller's heat dissipation function deteriorates, therefore, use proper derating.
10. Untrained workers are banned to check the signals in the running stage.
11. Remove the PV power supply only after the electric machine stops running.

#### Attention

1. The DC connection terminals PV+ and PV- carry a dangerous DC voltage of up to 800V.
2. At the hybrid controller input, the photovoltaic cells generate DC voltage even at low intensity of sunlight.
3. While cabling, make sure that it does not come in the path of any other work e.g. harvesting or digging.
4. If there is any abnormality contact customer care.
5. Hybrid controller and its heat sink may be relatively at high temperature than the atmosphere.
6. Improper wiring and utilization or unauthorized alteration may result in damage to hybrid controller and other equipments. Users will be responsible for the cause and there will be a loss of warranty.
7. The KLPHYB/KLPGT and KLPHYB-H/KLPGT-H products are not recommended for elevators, emergency operation, medical products etc.

## CHAPTER 2 : INTRODUCTION

### 2.1 Product Overview

The KALPAVRIKSHA Hybrid (KLPHYB) Controller is a hybrid pumping solution designed for maximum utilization of solar power available at the site. The product is a unique combination of a solar-powered VFD and a grid-tied inverter in a single product. This product comes with two operating modes i.e. Standalone and Hybrid mode. Standalone mode ensures only one operation at a time i.e. either VFD or grid-tied operation. In hybrid mode, the additional power available is fed back to the grid while VFD is operational. This product is designed and developed in India and comes with an IP 65 ingress protection. This product can also be configured as a pure grid-tie inverter whenever/wherever required. The plug and play installation and electrically safe user handling are the additional attractions of this product.

### 2.2 Storage Instructions

The Hybrid Controller should be stored properly in the original shipping package or crate when not in use especially for extended period of time to retain warranty.

#### Measures to be taken for Hybrid Controller's storage

- ✓ Storage area should be clean, dry, and free from direct sunlight or corrosive fumes.
- ✓ Storage area has an ambient temperature range of -20 °C to 60 °C.
- ✓ Storage area has a relative humidity range of 0% to 90% and non-condensing environment.
- ✓ Storage area has an air pressure range of 85kPa to 107kPa.

#### DO NOT store


- ✗ In an area with the rapid change in temperature (condensation and frost may be caused).
- ✗ In a place with significant water leakage.
- ✗ In a place which has a high risk of fire ignition.

**NOTE:** If storage of drive is for more than 3 months then ensure that temperature should not be more than 30° C. Storage for more than a year may reduce the lifespan of the product.

### 2.3 Receiving and Inspection

The Hybrid Controller has gone through rigorous quality control tests before shipment. After receiving the drive, please check if the part no. indicated on the name plate corresponds with part no. of your order.

#### ● Serial Number Explanation from Left to Right

Model Number	69
Serial Number & Barcode	69-0001-0-04-10-19  69-0001-0-04-10-19
Software Version	MAINKLP_X.XX

Digits	Description
69	Model number
0001	Serial number for the batch
0	Batch number
04	Date of manufacturing
10	Month of manufacturing
19	Year of manufacturing



CHAPTER 3 : PACKAGE CONTENTS

Inspection

Note: Never install or operate any unit which is damaged or has missing components. Doing so can result in injury.

Check the following items when unpacking the Inverter:

1. Inspect the entire exterior of the Inverter to see if there are any scratches or other damage resulting from shipping.
2. Ensure there is operation manual and warranty card in the packing box.
3. Ensure the nameplate is correct as ordered.
4. Ensure the optional parts are as per order, if ordered.
5. Contact the customer care if there is any damage to the unit or the optional parts.

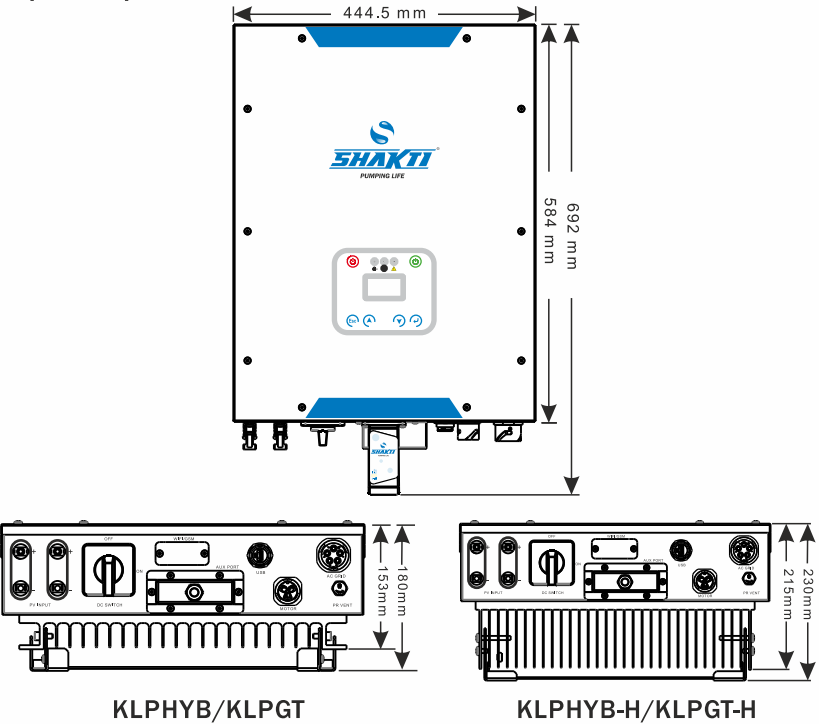


Fig. 3.1 Kalpavriksha Hybrid /Grid-tie Controller - KLPHYB/KLPGT

Following is the list of items in the packaging.

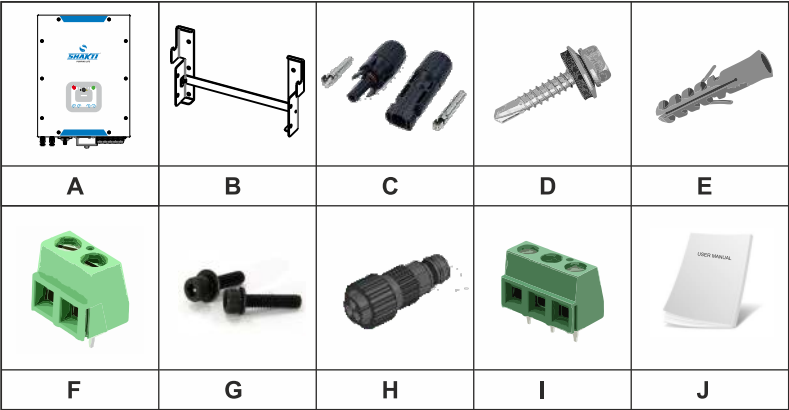


Fig. 3.2 Images of list of Items in Kalpavriksha Packaging

Table 3.1 List of Items

S. No.	Name	Qty	Unit
A	Kalpavriksha Unit	1	Set
B	Wall Mount Bracket Set	1	EA
C	PV connectors	2	EA
D	M6 50 Hex Head Tapping Screw	3	EA
E	Anchor - Expansion tube	3	EA
F	Conn. Ext Fan 2 POS	1	EA
G	M6 X 15 HEX Head Screw	4	EA
H	AC connector	1	EA
I	Conn. Dry Contact 3 POS	1	EA
J	User Manual	1	EA

## CHAPTER 4 : SPECIFICATIONS

Parameters	KLPHYB/KLPGT		KLPHYB-H/KLPGT-H	
PV INPUT				
PV Voltage Range	220 - 770 VDC		220 - 770 VDC	
Max. PV Current	10A		20 A	
MPPT Range	250 - 650 VDC		250 - 650 VDC	
Nominal PV Voltage	600 VDC		600 VDC	
Number of PV Inputs	1		1	
Max. Power	5000W		10000W	
PV Start Voltage	220 VDC		220 VDC	
VFD OUTPUT *				
Voltage range	0 - 415 VAC		0 - 415 VAC	
Max. Current	12 A		16 A	
Frequency range	0 - 200 Hz		0 - 200 Hz	
Power factor range	0.8 (lag) ~ 0.8 (lead)		0.8 (lag)~ 0.8 (lead)	
Motor Types	IPMSM, PMSM, BLDC, ACIM			
Peak Efficiency	> 96%		> 96%	
Protection	Shortcircuit, Dryrun, Overtemperature, Overload, etc			
GRID - TIE OUTPUT				
Voltage Range	337 - 440 V <sub>LL</sub> AC			
Topology	Transformer less 3 leg inverter			
Max. Current	8.5 A		16 A	
Rated AC Power (@230V,50Hz)	3kW	5kW	7.5kW	10kW
Rated AC Current	5A	7.5A	10.5A	14A
Nominal Frequency	50Hz		50Hz	
Power Factor, adjustable	0.8 leading~0.8 lagging			
Peak MPPT Accuracy	> 99.5%			
Feed-in Grid	3L+N+PE			
Total Harmonic Distortion (THDI)	< 5% (at nominal power)			
Peak Efficiency	> 96%		> 96%	
Protection	Anti islanding , grid monitoring, Shortcircuit, Over voltage, Overtemperature, Overload, etc			
DISPLAY & COMMUNICATION				
Display Type	Graphical LCD			
Status Indicator	LEDs			
Serial Communication	RS232 & RS485			
	(MODBUS)			
Aux Ports	3 nos -1 Input port & 2 Output ports (Optional)			
Remote Monitoring	Yes (Optional)			
WiFi	Yes (Optional)			
USB	Yes			
PHYSICAL				
L X W X H	584.5 x 444.5 x 182.4 mm <sup>3</sup>		584.5 x 444.5 x 230 mm <sup>3</sup>	
Net Wt. / Gross Wt.	23kg/27kg		26kg/30kg	
OTHER INFO				
Pollution Degree	PD3			
Over Voltage Category	Category II			
Protection Class	Class I			
Operating Temperature	-10 to 60°C			
Relative Humidity	0~95% RH (Non-condensing)			
Altitude	3000 m (> 2000 m power derating)			
IP Degree of Protection	IP 65 (Indoor & Outdoor Installation)			
Cooling	Natural Convection			
Standards	BIS16221-1/2, IEC61683, IEC60068-2-(1,2,14,30), IEC 60529 ISI16169			

\* For pure grid tie product (KLPGT & KLPGT-H) all parameters, settings, specification etc related to VFD output and motors are not applicable.

## CHAPTER 5 : INSTALLATION

Mounting Method, Installation Position and Mounting Procedure of the Hybrid Controller is illustrated as follows:

### 5.1. Mounting Method

1. The equipment employs natural convection cooling, and it can be installed indoor or outdoor.
2. Please install the equipment under the guidance of Figure 5.1. Vertical installation on floor level is recommended. Mount vertically or tilted backwards by max. 15°. Never install the hybrid controller tilted forwards, sideways, horizontally or upside down.
3. Install the hybrid controller at eye level for convenience when checking the LCD display and possible maintenance activities.
4. When mounting the hybrid controller please consider that disassembly for service work may be required.

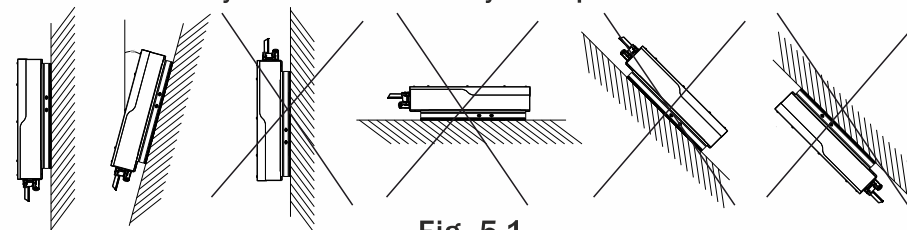


Fig. 5.1

### 5.2. Installation Position

Do not expose the hybrid controller to direct solar irradiation as this could cause power derating due to overheating. The ambient temperature should be between -25fiC ~ 60fiC (-13fiF ~ 140fiF) to ensure optimum operation. Choose locations with sufficient air exchange. Ensure additional ventilation, when necessary. To make sure the installation spot is suitably ventilated, if multiple grid-tie solar inverter units are installed in same area, the following safety clearance shall be followed for proper ventilation conditions.

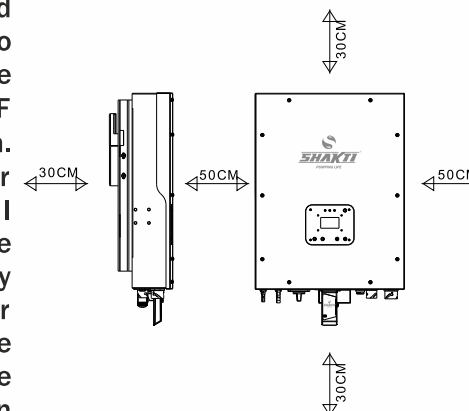


Fig. 5.2

### 5.3. Mounting Procedure for Kalpavriksha

This section provides the mounting procedure and drawings for Kalpavriksha unit.

1. Connect the mounting plate strip to the mounting brackets and then mark the Positions of the Drill Holes of the wall mount bracket. The mounting position should be marked as shown in Figure 5.3 & 5.6

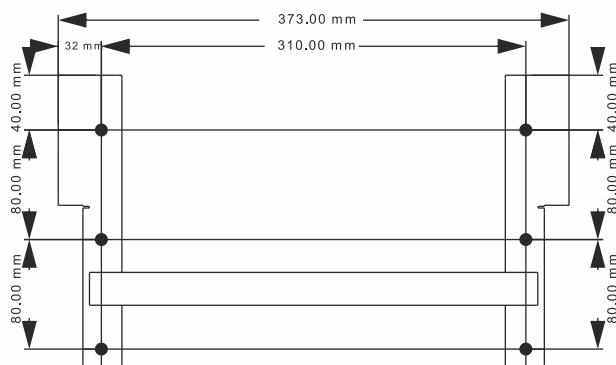


Fig. 5.3 Mounting Brackets for KLPHYB/KLPGT

### 2. Drill Holes and Place the Expansion Tubes

According to the guides, drill 6 holes in the wall (in conformity with position marked in Figure 5.4 & 5.7) and then place expansion tubes.

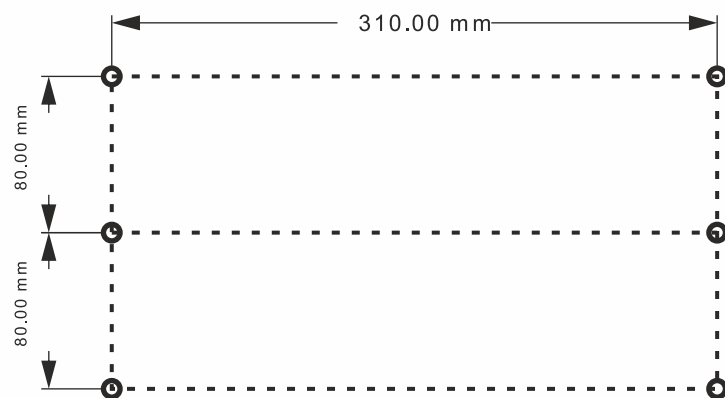


Fig. 5.4 Drilling drawing for KLPHYB/KLPGT

### 3. Mount the Kalpavriksha

Carefully mount the Kalpavriksha to the mounting bracket following the steps shown in figure 5.5 & 5.8 Make sure that the rear part of the equipment is closely mounted to the mounting bracket .

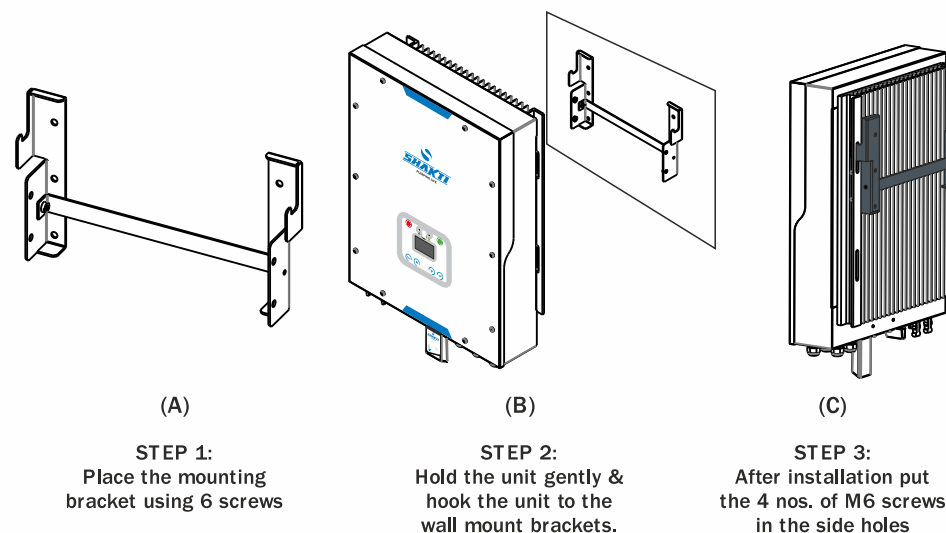


Fig. 5.5 Mounting Procedures for KLPHYB/KLPGT

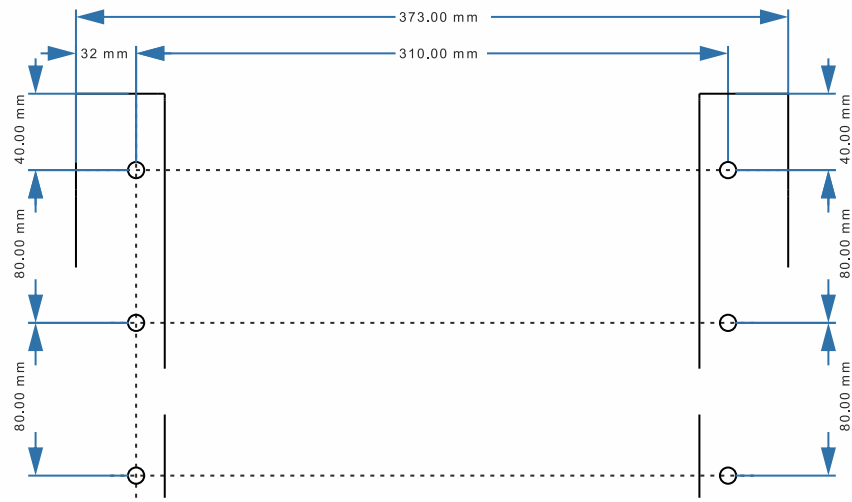


Fig. 5.6 Mounting Brackets for KLPHYB-H/KLPGT-H

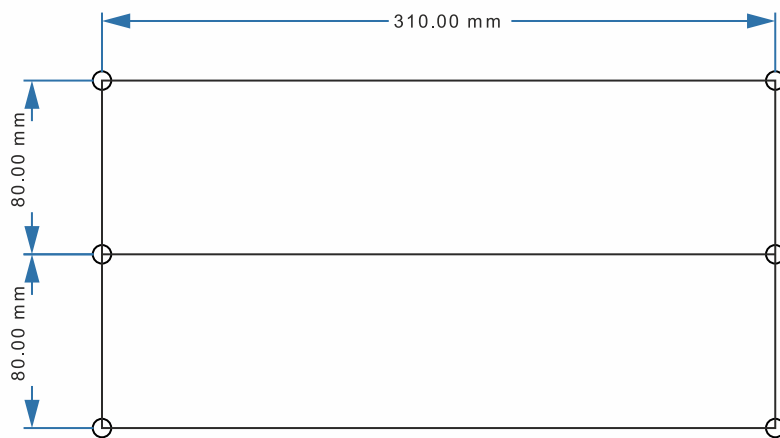


Fig. 5.7 Drilling drawing for KLPHYB-H/KLPGT-H

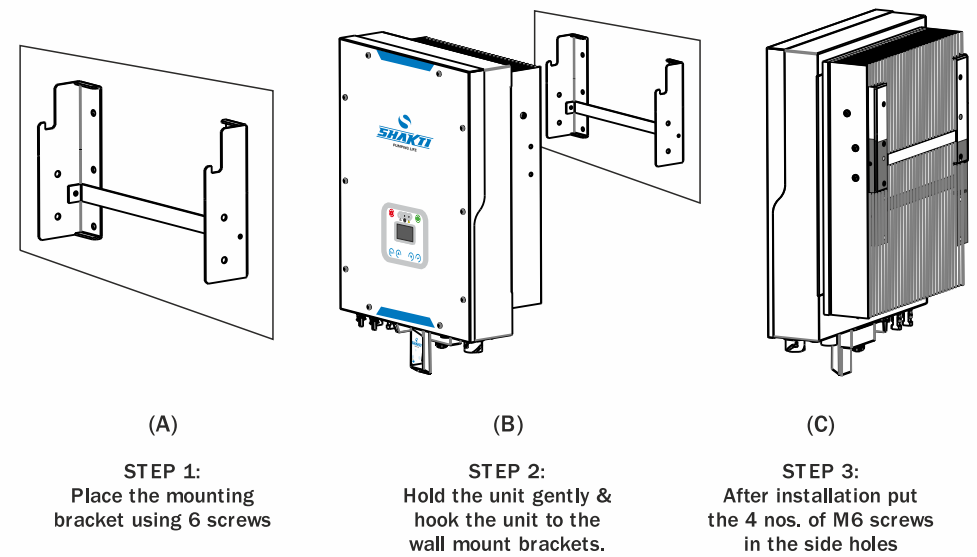


Fig. 5.8 Mounting Procedures for KLPHYB-H/KLPGT-H



CHAPTER 6 : CONNECTIONS & CONNECTING PROCEDURE

6.1. Rear Panel  
Rear Panel view with Aux covers

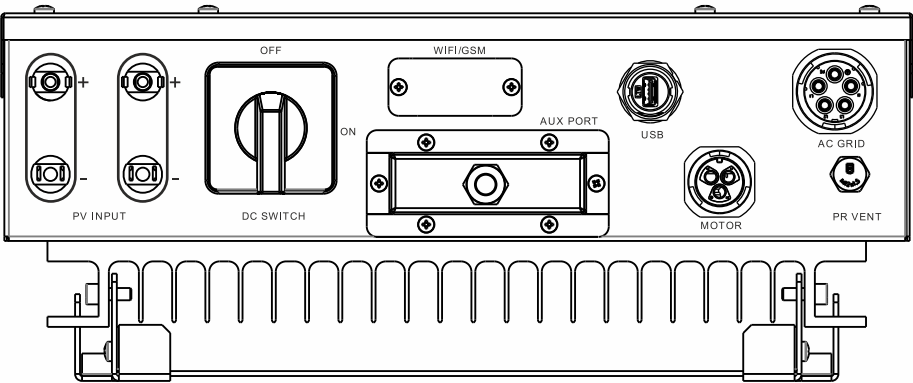


Fig. 6.1

Rear Panel view with Aux cover & Dongle Connected

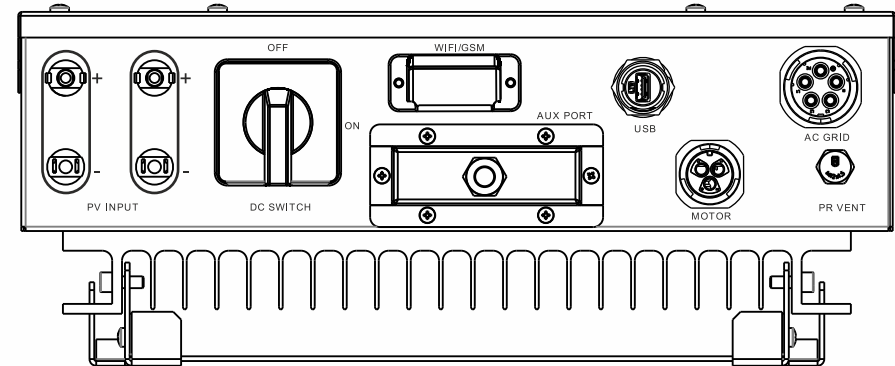


Fig. 6.2

Rear Panel view without Aux and dongle cover

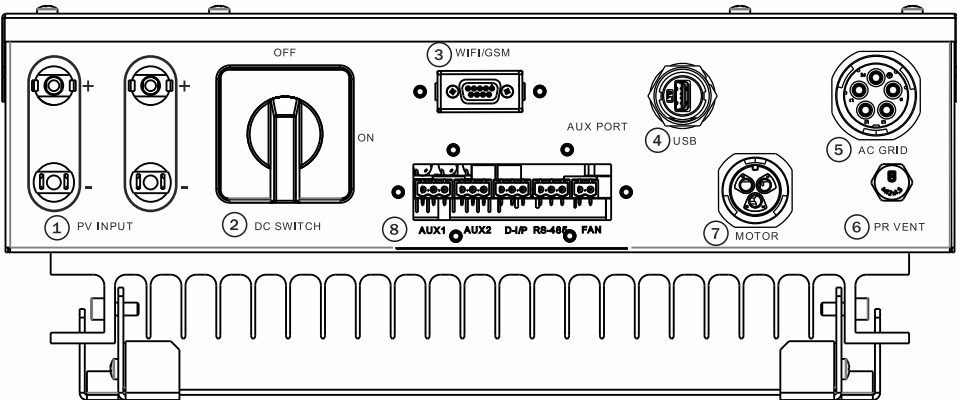


Fig. 6.3

Table 6.1

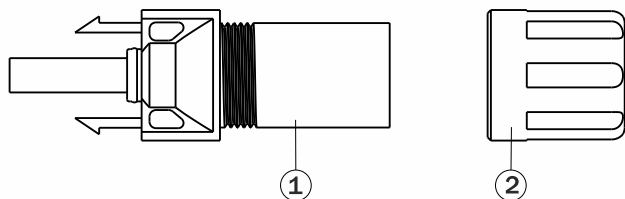
Marking	Description
1	PV Input Connectors
2	PV DC Disconnect Switch
3	WIFI/GPRS DB9 Connector
4	USB Connector
5	5 pin AC Input Connector
6	Pressure Relief Vent
7	Motor Connector
8	Aux Input/ Output Connectors

### 6.1.1 PV Input Connectors

Table 6.2

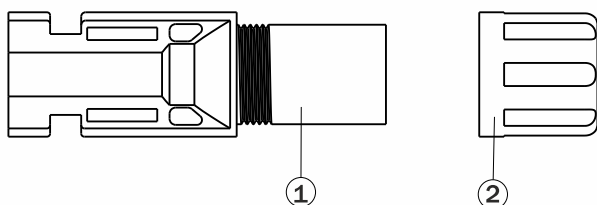
Cross - Sectional Area of Cables (mm <sup>2</sup> )		Outside Diameter of the Cables (mm)
Scope	Recommended Value	
4.0-6.0	4.0	4.2 ~5.3

DC connector is made up of a positive connector and a negative connector as shown in figure 6.4 & 6.5



1. Insulated Enclosure 2. Lock Screw

Fig. 6.4 Positive Connector

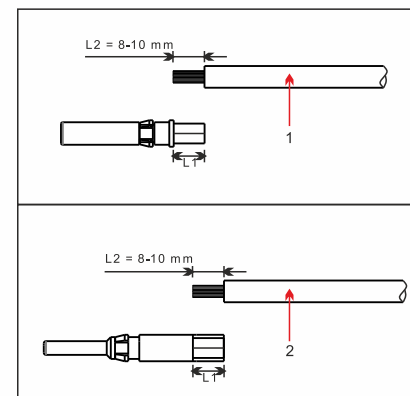


1. Insulated Enclosure 2. Lock Screw

Fig. 6.5 Negative Connector

#### Connecting Procedure

1. Tighten the lock screws on positive and cathode connector.
2. Use specified strip tool to strip the insulated enclosure of the positive and cathode cables with appropriate length.

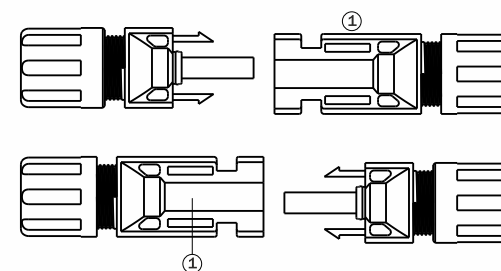


1. Positive Cable

2. Cathode Cable

Fig. 6.6 Connecting Cables

3. Feed the positive and cathode cables into corresponding lock screws.
4. Put the metal positive and cathode terminals into positive cable and cathode cable whose insulated enclosure has been stripped, and crimp them tightly with a wire crimper. Make sure that the withdrawal force of the pressed cable is bigger than 400N.
5. Plug the pressed positive and cathode cables into relevant insulated enclosure, a "click" should be heard or felt when the contact cable assembly is seated correctly.
6. Fasten the lock screws on positive and negative connectors into respondent insulated enclosure and make them tight.
7. Connect the positive and cathode connectors into positive and negative DC input terminals of the inverter, a "click" should be heard or felt when the contact cable assembly is seated correctly.



1. Connection Port

Fig. 6.7

### 6.1.2 PV DC Disconnect switch

This switch is provided to isolate the PV DC input from the hybrid controller during servicing of the inverter or any other maintenance work on the PV panels.

### 6.1.3 WIFI/GPRS DB9 Connector

Connect IoT dongle or RS 232 to USB converter cable to this port for recording and observing data from the hybrid controller on online portal. When the dongle is connected it sends recorded data of all the parameters used in operation of the unit. But if some specific parameter is required to be observed RS 232 to USB converter cable can be connected and data corresponding to a particular address according to the table 6.2 can be accessed.

**NOTE:** The Pins 1 & 5 of the DB9 Connector are the source pins of 5 V at few milliamperes current. These pins cannot be used as sink even for a single milliampere current.

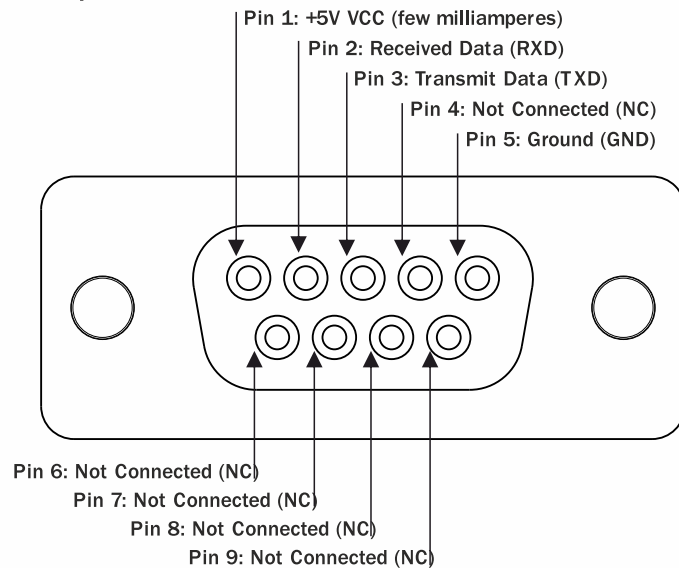


Figure 6.8 RS232 Connector

### 6.1.4 SHAKTI RMS/IoT DONGLE

Remote Monitoring and Control  
 In-built Data Logger & RTC  
 Compatible with GSM, WiFi & Bluetooth

#### 1. Product Appearance

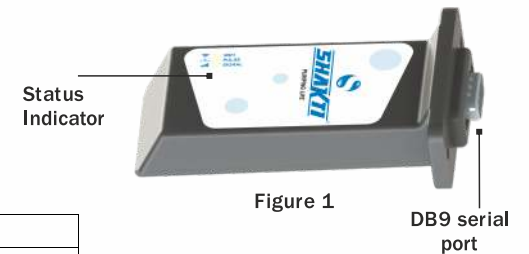


Figure 1

#### Status Indicator:

Pulse LED(Green)	Blink in every second	Normal
	Constant ON/OFF	Abnormal
Signal LED (RED)	ON	Normal (signal strength good)
	OFF	Abnormal (Signal low / Zero)
Wi-Fi LED (yellow)	ON/ Blink	Normal
	OFF	No WiFi Network

#### 2. Installation and Connection:

For installing the SHAKTI IoT dongle, Follow these steps :

**Step1:** Remove the cover and take out the motherboard.



Figure 2

**Step2:** Insert SIM card as per the correct direction marked.

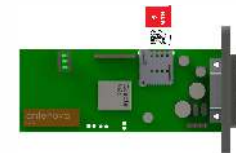


Figure 3

**Step3:** Put the motherboard back into the enclosure.



Figure 4

**Step 4:** Insert the dongle into DB9 port and use two M3x10 screws to fix the dongle along with gasket.

#### 3. Configuration

**Step1:** Connect the "Shakti IoT dongle" to the main device and check the "pulse LED" (green) blinking in every second.

#### Step2:

If the SIM card is present in the "Shakti IoT dongle" and 2G network is available in that area the Signal LED (RED) will be ON.

(\*Note\* it will be ON only in good signal strength).

## INSTALLATION & OPERATING INSTRUCTIONS

### Step3:

To configure the Wi-Fi follow these steps:3.1)

Turn ON Wi-Fi on your Mobile and select "SHAKTI\_DONGLE" and connect it with the password "shakti123".

An HTML page will open in your browser otherwise browse <http://192.168.4.1>. You will get the HTML page like this:



Figure 6

3.2) Now "Configure Wi-Fi" now new page will open like this:



Figure 7

3.3) Select your preferred WiFi with proper password and then save. In case your WiFi network is not visible in the list scan again.

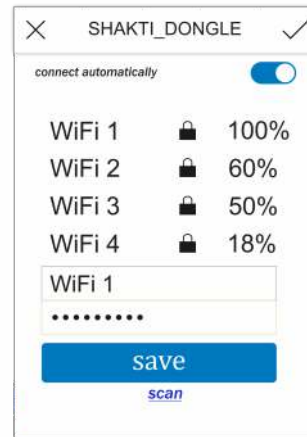


Figure 8

On successful configuration, WiFi LED (yellow) will be ON.

#### \* NOTE \*

- Shakti IoT Dongle is designed to work with GSM on priority, Wi-Fi is always secondary.
- For using Wi-Fi remove SIM card then connect shakti dongle.
- On successful TCP connection Wi-Fi yellow LED will blink in every second.

#### 4. Troubleshooting

- If Pulse LED is constantly ON/OFF, check main device power supply or restart the device.
- If signal LED not glowing, check sim card / signal strength.
- If Wi-Fi LED not glowing, check Wi-Fi network / reconfigure Wi-Fi settings.
- Contact Shakti to integrate IoT Dongle to other products & solutions.

## INSTALLATION & OPERATING INSTRUCTIONS



Table 6.2 MODBUS Address

S.No.	Cumulative Data On Server	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	Cumulative Data On Server
1	TOTAL_TIME_GSC	UINT_32	10	A	0	0	9	3	1	NA	NA	NA	TOTAL_TIME_GSC
2	TOTAL_TIME_VFD	UINT_32	11	B	4	4	9	3	1	NA	NA	NA	TOTAL_TIME_VFD
3	TOTAL_ENERGY_GSC	UINT_32	12	C	8	8	9	3	1	NA	NA	NA	TOTAL_ENERGY_GSC
4	TOTAL_ENERGY_VFD	UINT_32	13	D	12	C	9	3	1	NA	NA	NA	TOTAL_ENERGY_VFD
5	TOTAL_FLOW	UINT_32	14	E	16	10	9	3	1	NA	NA	NA	TOTAL_FLOW
6	SWITCHING_FREQ	UINT_32	17	11	264	108	7	3	1	1600	16000	3200	SWITCHING_FREQ

S.No.	Configuration Parameters	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	Configuration Parameters
1	FACTORY MODE	Char	256	100	4	4	6	1	1	0	1	1	FACTORY_MODE
2	LANGUAGE	Char	257	101	5	5	6	1	1	0	0	0	LANGUAGE_SELECTED
3	INSTALL DATE	Char	259	103	10	A	6	1	1	1	31	1	INST_DATE
4	INSTALL MONTH	Char	260	104	11	B	6	1	1	1	12	1	INST_MONTH
5	INSTALL YEAR	Char	261	105	12	C	6	1	1	18	99	20	INST_YEAR
6	LCD CONTRAST	Char	262	106	13	D	6	1	1	27	39	33	LCD_CONTRAST
7	PVGFD	Char	263	107	15	F	6	1	1	0	1	1	PVGFD_ENABLE
8	ELCFD	Char	264	108	17	11	6	1	1	0	1	1	ELCFD_ENABLE
9	RS232 BAUD RATE	Char	271	10F	19	13	6	1	1	1	6	2	RS232_BAUD_RATE
10	RS485 BAUD RATE	Char	272	110	20	14	6	1	1	1	6	2	RS485_BAUD_RATE
11	GRID_POWER_DRAWN_RESTRICT	Char	273	111	30	1E	6	1	1	0	1	1	GRID_POWER_DRAWN_RESTRICT
12	ROLLING PAGE ENABLE	Char	274	112	31	1F	6	1	1	1	2	1	ROLLING_PAGE_ENABLE
13	MODBUS ADD RS232	UINT_16	275	113	64	40	7	2	1	1	99	1	MODBUS_ADD_RS232
14	MODBUS ADD RS485	UINT_16	277	115	180	84	7	2	1	1	99	1	MODBUS_ADD_RS485
15	RUN FROM SS	Char	280	118	32	20	6	1	1	0	1	0	RUNFROMSS_ENABLE

S.No.	VFD Parameters	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	VFD Parameters
1	MASTER ON OFF	Char	1000	3E8	1	1	6	1	1	0	1	0	MASTER_ON_OFF
2	CONTROL MODE	Char	1001	3E9	2	2	6	1	1	1	4	2	SPEED_MODE_SELECT
3	DIRECTION	Char	1002	3EA	3	3	6	1	1	1	2	1	SPEED_DIRECTION_SELECT
4	APPLICATION	Char	1003	3EB	6	6	6	1	1	0	1	0	APP_MODE
5	CONTROL TYPE	Char	1005	3ED	16	10	6	1	1	0	1	0	CONTROL_TYPE
6	MIN POWER VFD	UINT_16	1006	3EE	46	2E	7	2	1	100	9999	700	MIN_PV_POWER_VFD
7	MAX CURRENT	Char	1008	3F0	108	6C	7	2	10	5	16	8	MAX_CURRENT
8	OVER CURRENT VFD	UINT_16	1010	3F2	58	3A	7	2	1	5	13	9	OVER_CURR_VFD_LIMIT
9	DRY RUN CURRENT	UINT_16	1012	3F4	52	34	7	2	1	1	10	3	DRY_RUN_LIMIT
10	DRY RUN POWER	UINT_16	1014	3F6	82	52	7	2	1	100	9999	200	DRY_RUN_POWER
11	DC BUS OVER VOLTAGE	UINT_16	1016	3F8	60	3C	7	2	1	500	800	790	DC_BUS_OV_LIMIT
12	OVER TEMPERATURE VFD	UINT_16	1018	3FA	54	36	7	2	1	100	130	115	VFD_OVER_TEMP_LIMIT
13	THERMAL DERATING	UINT_16	1020	3FC	86	56	7	2	1	0	200	100	THERMAL_DERATING_FACTOR
14	MAX FREQ	UINT_16	1022	3FE	62	3E	7	2	1	1	400	240	MAX_FREQ_SET
15	Reserved2	UINT_16	1032	408	48	30	7	2	1	0	0	0	Reserved2
16	Reserved3	UINT_16	1034	40A	122	7A	7	2	1	0	0	0	Reserved3

S.No.	PUMP Parameters	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	PUMP Parameters
1	PUMP TYPE	Char	3000	BB8	9	9	6	1	1	0	2	1	PUMP_TYPE
2	PUMP HEAD	UINT_16	3001	BB9	80	50	7	1	1	5	999	50	PUMP_HEAD
3	POW1	UINT_16	3003	BBB	88	58	7	2	1	0	9999	500	POW1
4	D1	UINT_16	3005	BBD	90	5A	7	2	1	0	1000	40	D1
5	POW2	UINT_16	3007	BBF	92	5C	7	2	1	100	9999	1500	POW2
6	D2	UINT_16	3009	BC1	94	5E	7	2	1	0	1000	80	D2
7	POW3	UINT_16	3011	BC3	96	60	7	2	1	200	9999	3000	POW3
8	D3	UINT_16	3013	BC5	98	62	7	2	1	0	1000	120	D3
9	POW4	UINT_16	3015	BC7	100	64	7	2	1	300	9999	4000	POW4
10	D4	UINT_16	3017	BC9	102	66	7	2	1	0	1000	160	D4
11	POW5	UINT_16	3019	BCB	104	68	7	2	1	400	9999	5000	POW5
12	D5	UINT_16	3021	BCD	106	6A	7	2	1	0	1000	200	D5



## INSTALLATION & OPERATING INSTRUCTIONS

S.No.	Motor Parameters	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	Motor Parameters
1	MOTOR TYPE	Char	2000	7D0	7	7	6	1	1	0	2	2	MOTOR_TYPE
2	TORQUE PERCENT	UINT_16	2001	7D1	0	0	7	2	100	0	2	2	TORQUE_PERCENT
3	RATED CURRENT	UINT_16	2003	7D3	4	4	7	2	10	5	18	14	MOTOR_RATED_I
4	RATED POWER	UINT_16	2005	7D5	24	18	7	2	10	3	5	5	MOTOR_POWER
5	RATED VOLTAGE INDUCTION	UINT_16	2007	7D7	26	1A	7	2	1	40	460	380	MOTOR_VOLTAGE_IND
6	RATED VOLTAGE S4RM	UINT_16	2009	7D9	28	1C	7	2	1	40	460	380	MOTOR_VOLTAGE_S4RM
7	RATED VOLTAGE PMSM	UINT_16	2011	7DB	30	1E	7	2	1	40	460	360	MOTOR_VOLTAGE_PM
8	RATED FREQUENCY INDUCTION	UINT_16	2013	7DD	66	42	7	2	1	0	120	50	MOTOR_RATED_FREQ_IND
9	RATED FREQUENCY S4RM	UINT_16	2015	7DF	68	44	7	2	1	0	120	50	MOTOR_RATED_FREQ_S4RM
10	RATED FREQUENCY PMSM	UINT_16	2017	7E1	70	46	7	2	1	0	250	100	MOTOR_RATED_FREQ_PMSM
11	NO OF POLES INDUCTION	UINT_16	2019	7E3	72	48	7	2	1	2	8	2	IND_MOTOR_POLES
12	NO OF POLES S4RM	UINT_16	2021	7E5	74	4A	7	2	1	2	8	2	S4RM_MOTOR_POLES
13	NO OF POLES PMSM	UINT_16	2023	7E7	76	4C	7	2	1	2	8	4	PMSM_MOTOR_POLES
14	REFERENCE SPEED	UINT_16	2025	7E9	78	4E	7	2	1	100	3600	500	SPEED_REF_INPUT_DISPLAY
15	POWER FACTOR	UINT_16	2027	7EB	112	70	7	2	100	0.6	1	0.75	POWER_FACTOR
16	LEAKAGE INDUCTANCE	UINT_16	2029	7ED	114	72	7	2	10000	0.0005	0.0999	0.0056	Ls
17	MAGNETIC INDUCTANCE	UINT_16	2031	7EF	116	74	7	2	10000	0.002	0.9999	0.0881	Lm
18	ROTOR RESISTANCE	UINT_16	2033	7F1	118	76	7	2	100	0.2	99.99	0.33	Rr
19	STATOR RESISTANCE	UINT_16	2035	7F3	120	78	7	2	100	0.2	99.99	0.43	Rs
20	START TIME	UINT_16	2037	7F5	184	B8	7	2	1	1	60	15	MOTOR_START_TIME
21	STOP TIME	UINT_16	2039	7F7	186	BA	7	2	1	1	60	15	MOTOR_STOP_TIME

S.No.	GRID_PARAMETERS	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	GRID_PARAMETERS
1	RATED GRID FREQ	UINT_16	4000	FA0	110	6E	7	2	1	50	60	50	RATED_GRID_FREQ
2	MIN VOLTAGE	UINT_16	4012	FAC	132	84	7	2	10	150	230	195	V_GRID_RMS_MIN
3	MAX VOLTAGE	UINT_16	4014	FAE	134	86	7	2	10	230	285	253	V_GRID_RMS_MAX
4	VOLT HYSTERESIS	UINT_16	4016	F80	136	88	7	2	1	5	40	5	V_GRID_HYS
5	MIN FREQUENCY	UINT_16	4026	F8A	146	92	7	2	10	45	59.5	47	GRID_FREQ_MIN
6	MAX FREQUENCY	UINT_16	4028	F8C	148	94	7	2	10	50.5	65	52	GRID_FREQ_MAX
7	FREQ HYSTERESIS	UINT_16	4030	F8E	150	96	7	2	10	0.1	5	0.1	GRID_FREQ_HYS
8	BOOST VOLTAGE REF	UINT_16	4036	FC4	156	9C	7	2	1	550	700	620	BOOST_VDC_REF
9	BOOST VOLTAGE KP	UINT_16	4038	FC6	158	9E	7	2	1000	0.001	9.999	0.001	BOOST_VDC_KP
10	BOOST VOLTAGE KI	UINT_16	4040	FC8	160	A0	7	2	1000	0	9.999	0.005	BOOST_VDC_KI
11	BOOST CURRENT KP	UINT_16	4042	FCA	162	A2	7	2	1000	0	9.999	0.005	BOOST_KP_CURR
12	BOOST CURRENT KI	UINT_16	4044	FCC	164	A4	7	2	1000	0.05	9.999	0.1	BOOST_KI_CURR
13	VOLTAGE REF	UINT_16	4046	FCE	166	A6	7	2	1	550	780	650	GSC_VDC_REF
14	VOLTAGE KP	UINT_16	4048	FD0	168	A8	7	2	1000	0	9.999	0.1	GSC_VDC_KP
15	VOLTAGE KI	UINT_16	4050	FD2	170	AA	7	2	1000	0	9.999	0.001	GSC_VDC_KI
16	CURRENT KP	UINT_16	4052	FD4	172	AC	7	2	10	5.5	99.9	25	GSC_KP_CURR
17	CURRENT KI	UINT_16	4054	FD6	174	AE	7	2	10	1	999.9	400	GSC_KI_CURR

S.No.	CONTROL PARAMETERS	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	CONTROL PARAMETERS
1	SPEED KP	UINT_16	5000	1388	42	2A	7	2	100	0	10	0.05	Speed_ErrorPl_PM_Kp
2	SPEED KI	UINT_16	5002	138A	44	2C	7	2	100	0	10	0.02	Speed_ErrorPl_PM_Ki
3	DRYRUN RPM LIMIT	UINT_16	5004	138C	50	32	7	2	1	0	9999	2500	DRYRUN RPM LIMIT
4	TORQUE BOOST PER	UINT_16	5006	138E	56	38	7	2	1000	0	0.1	0.05	INIT_VOLTPERCENT_FACTOR
5	Id REF PMSM	UINT_16	5008	1390	22	16	7	2	10	0	20	0	Id_ref_PM
6	PMSM THETA FACTOR	UINT_16	5010	1392	188	BC	7	2	1	0	4	0	PMSM THETA FACTOR
7	MIN RPM PMSM	UINT_16	5012	1394	38	26	7	2	1	200	999	500	MIN RPM PMSM
8	RAMP TIME PMSM	UINT_16	5014	1396	40	28	7	2	10	3	40	3	INIT_RAMP_TIME_PMSM

S.No.	PV PARAMETERS	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	PV PARAMETERS
1	MPPCR VFD	UINT_16	7000	1B58	14	E	7	2	1	50	5000	3600	VFD_MPPT_CALL_RATE
2	MPPCR GSC	UINT_16	7002	1B5A	20	14	7	2	1	100	9999	3600	GSC_MPPT_CALL_RATE
3	VOLTAGE TOLERANCE	UINT_16	7004	1B5C	16	10	7	2	1	0	300	50	TOL_V
4	CURRENT TOLERANCE	UINT_16	7006	1B5E	18	12	7	2	1	0	4999	60	TOL_I
5	PVO FACTOR	UINT_16	7008	1B60	32	20	7	2	100	0.01	3	0.2	VFD_VDC_KP
6	I VO FACTOR	UINT_16	7010	1B62	34	22	7	2	100	0	5	0.5	VFD_VDC_KI
7	DVO FACTOR	UINT_16	7012	1B64	36	24	7	2	100	0.2	7	3	VFD_VDC_STEP
8	Reserved4	UINT_16	7018	1B6A	176	B0	7	2	1	0	0	0	Reserved4

## INSTALLATION & OPERATING INSTRUCTIONS



S.No.	FLOAT PARAMETERS (Not for Server)	SIZE	MODBUS ADDRESS(DEC)	MODBUS ADDRESS(HEX)	Memory Address(DEC)	Memory Address(HEX)	PAGE NUMBER	OFFSET	Scale Factor	Item min	Item Max	Item Default	FLOAT PARAMETERS (Not for Server)
1	TOTAL TIME GSC	UINT_32	6000	1770	0	0	9	3	1	NA	NA	NA	TOTAL_TIME_GSC
2	TOTAL TIME VFD	UINT_32	6004	1774	4	4	9	3	1	NA	NA	NA	TOTAL_TIME_VFD
3	TOTAL ENERGY GSC	UINT_32	6008	1778	8	8	9	3	1	NA	NA	NA	TOTAL_ENERGY_GSC
4	TOTAL ENERGY VFD	UINT_32	6012	177C	12	C	9	3	1	NA	NA	NA	TOTAL_ENERGY_VFD
5	TOTAL FLOW	UINT_32	6016	1780	16	10	9	3	1	NA	NA	NA	TOTAL_FLOW
6	MAX POWER VFD	UINT_32	6020	1784	256	100	7	3	1	1000	5500	4800	MAX_PV_POWER_VFD
7	MAX POWER GSC	UINT_32	6024	1788	260	104	7	3	1	1000	5600	4800	MAX_PV_POWER_GSC
8	SWITCHING FREQ	UINT_32	6028	178C	264	108	7	3	1	1600	16000	3200	SWITCHING_FREQ

### 6.1.5. USB Connector

This port is for mobile charging and can be used for firmware upgrade by Shakti Tuner software.

NOTE: This port is unisolated, therefore care must be taken when connecting external device for charging.

### 6.1.6 AC Input Connector

5 PIN AC connector from lit kit to be assembled to cable as per recommended gauge and connected hybrid controller as shown location.

1. Cross-sectional area of cable (mm ) - Recommended Value :4.0~6.0
2. Outside diameter of the cable (mm) : 4.2~5.3
3. Secure all the parts of the AC connectors tightly.
4. Plug in the AC connector to the equipment securely, ensuring the pins are connected directly.
5. Connect appropriate rating circuit breaker at the output terminal of AC grid.

Connect the cables according to connection marks and following connections

- i) L1 : Phase 1 of AC Input
- ii) L2 : Phase 2 of AC Input
- iii) L3 : Phase 3 of AC Input
- iv) N : Neutral of AC Input
- v) PE : Earth Connection

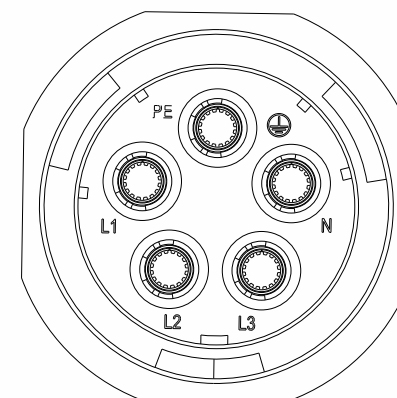


Fig. 6.9

### 6.1.7 Pressure Relief Vent

Pressure relief vent releases the internal pressure.

### 6.1.8 Motor Connector

3 PIN AC connector from kit to be assembled to cable as per recommended gauge and connected universal controller as shown in figure 6.10.

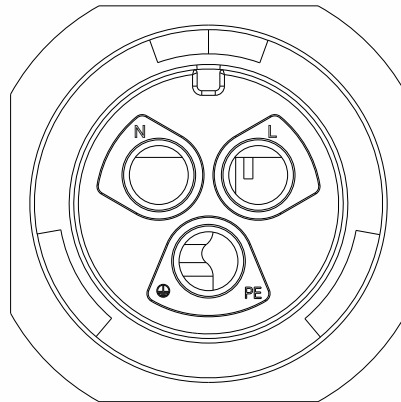


Figure 6.10

- i) L: Phase 1 of AC Input
- ii) N: Phase 2 of AC Input
- iii) PE: Phase 3 of AC Input

### 6.1.8 Aux Input/output & RS485 Communication Connectors

1. Remove the Aux terminal connector cover by removing the screws.
2. Use wire gauge from 25 AWG to 20 AWG for the connections to Terminal blocks.
3. Pass the Aux/RS485 terminal block cable through cable glands.
4. Connect the cable to terminal block receptacle.
5. Ensure IP covers are installed back after connections to ensure IP rating compliance.
6. Tightly secure the terminal block cover using the cover screws and do not disturb the gaskets.

Following are the details of terminal blocks.

- **Aux Output Ports**

1. There are three Aux ports, two output (AUX 1 & AUX 2) & one input (D-I/P) are provided.
2. The Aux Output ports are potential free contacts, which would toggle based on the configuration.

- **Aux Input Ports**

1. Normally, Pin-1 & 2 are closed and based on configuration, Pin-1 would connect with Pin-3.
2. Aux Input port can trigger an event for the hybrid controller by connecting Pin-1 & 3 by some external circuit or means. The events which can be triggered by Aux input port can be configured.
3. The Aux Input port can be also configured for firmware upgrade by service personals.

- **RS 485**

1. The RS485 MOD BUS communication connection to the hybrid controller can be done by using RS485 terminal block.
2. Connect A to Pin-1, B to Pin-3 and Ground to Pin-2

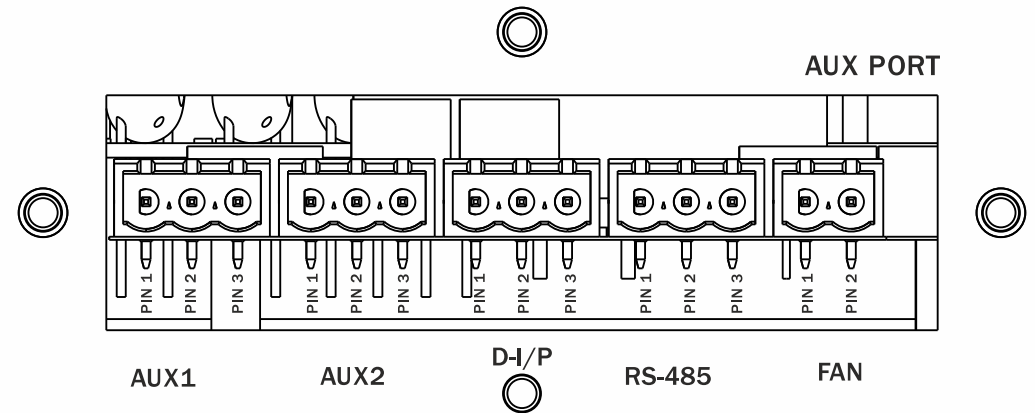


Figure 6.11 AUX Port

- **FAN**  
Do not connect or use this port.

## CHAPTER 7 : OPERATION OF UNIT

### 7.1 Display Module Description

Following figure 7.1 indicates the outer look of Display. It has five buttons, three LED indicators, one 128X64 pixel LCD Display and Buzzer.

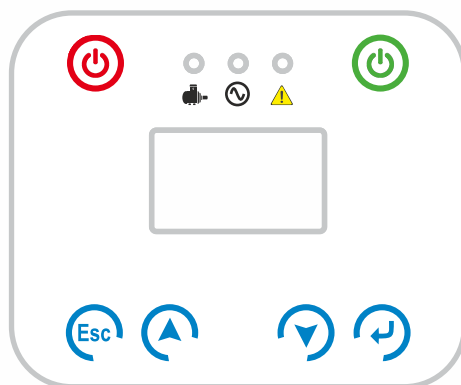












Figure 7.1 LCD display layout

### 7.2.Button Description and Operation

	Functionality
Power On 	<ul style="list-style-type: none"> <li>To Turn ON the Motor *</li> </ul>
Power Off 	<ul style="list-style-type: none"> <li>To Turn OFF the Motor *</li> </ul>
ESC 	<ul style="list-style-type: none"> <li>Previous Screen</li> </ul>
UP ARROW 	<ul style="list-style-type: none"> <li>Used for Scrolling up</li> <li>For increasing the parameter values in Configuration menu</li> </ul>
DOWN ARROW 	<ul style="list-style-type: none"> <li>Used for Scrolling down</li> <li>For decreasing the parameter values in Configuration menu</li> </ul>
ENTER 	<ul style="list-style-type: none"> <li>Selection</li> </ul>

\* NA for GT Product

### 7.3.LED Description and Indication

INDICATION	LED 1	LED 2		LED 3
	GREEN (Motor)	AMBER(Grid)	GREEN(Grid)	RED (Warning)
Motor Running				
Feeding To Grid				
Drawing Power from Grid				
Warning & Fault				

### 7.4. LCD Operation

#### ● Startup

Upon starting the unit for the first time, the LCD Display enters into Factory Setup interface. In factory setup, the user gets an option to set various parameter required for the proper functioning of the product which are illustrated in the figure 7.2.

Scroll through various options displayed on the screen with the up & down buttons and press Enter to set the parameter and Esc to exit the particular option. For example in the language setting user has an option to choose one language out of the four options available. The RTC Date is set in the format DD/MM/YY and the RTC Time in HH:MM:SS format. Other options are common to factory setup option in main menu therefore, is discussed in section C of CONFIGURE. After the successful starting of the product or whenever the LCD is not operated for a period of time, 11 status screens appears in rolling until menu button is pressed.

A RPM page based on the NOB functionality can be accessed by long pressing UP/DOWN button. The speed can be varied in multiples of 10, 50 and 100 using the same buttons.

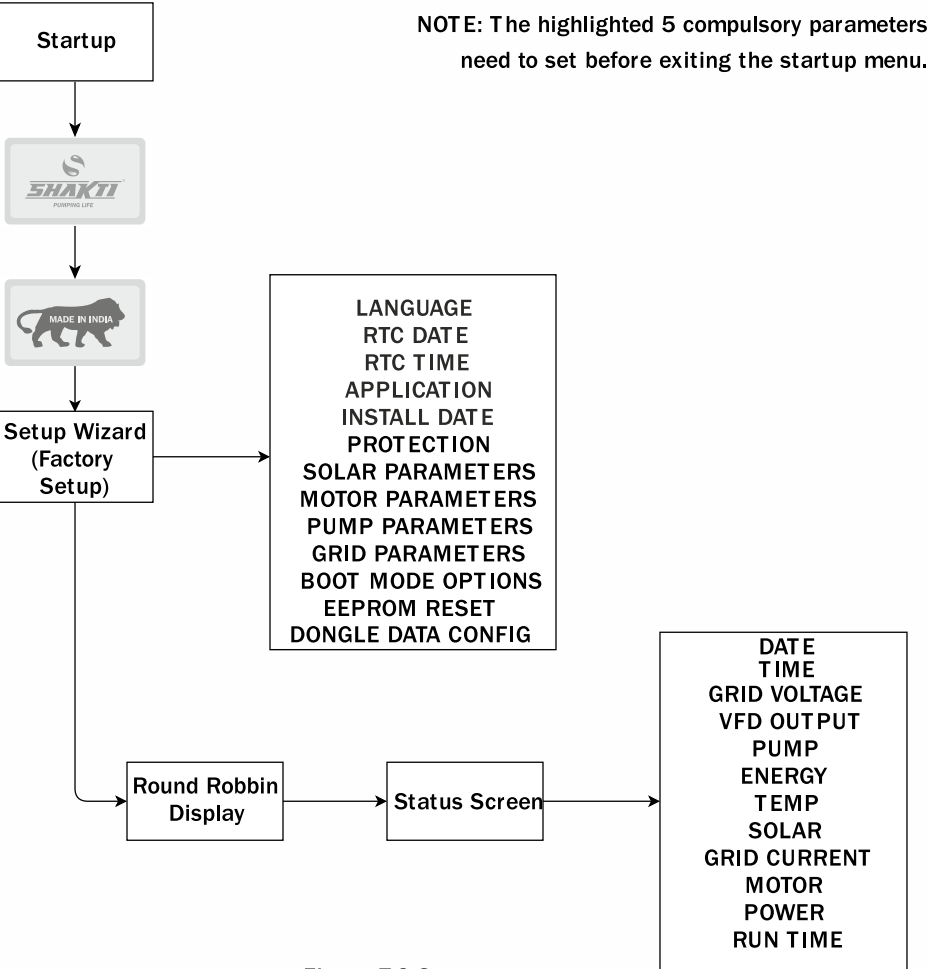


Figure 7.2 Startup menu tree

#### ● Main Menu

In the main menu user can change the setting or get information by transferring from one interface to another. The STATUS, CONTROL, and CONFIGURE, are discussed separately in further sections. FAULT, DAY, and YEAR LOGS of the product can be viewed in the LOGS. The ABOUT section provides the information of firmware version, serial number, network details.

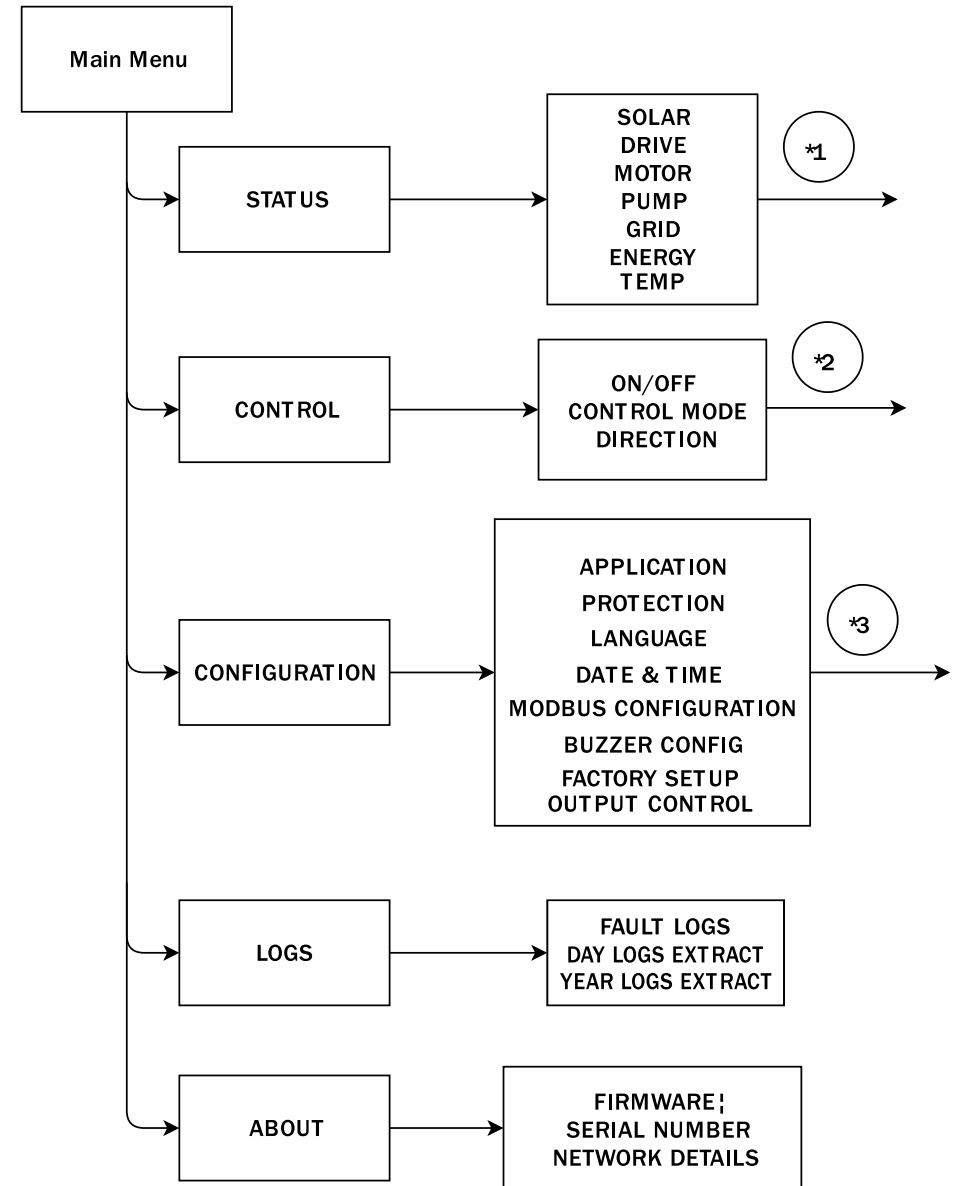


Figure 7.3 Main Menu tree



## ► STATUS<sup>\*1</sup>

### A) SOLAR

This status shows the real time PV condition of the system, such as input voltage (V), input current (A), input power (W), open circuit voltage (V), short circuit current (A), maximum power (W), MPP voltage (V), and cumulative energy (kWh).

### B) DRIVE

This status shows the real time condition of Variable Frequency Drive of the system, such as output voltage (V), output current (A), output frequency (Hz), and output power (W).

### C) MOTOR

This status shows the real time data of the Motor driving the pump, such as type of the motor selected for operation, rated voltage (V), instantaneous current (A), rated power (HP), rated frequency (Hz), and operating speed (RPM).

### D) PUMP

This status shows the real time PUMP condition connected to the system, such as type of the pump, head (m), cumulative discharge (kL), and cumulative hour (Hr).

### E) GRID

This status shows the situation of GRID connected to the system, it includes line voltages (V), line currents (A), and frequency (Hz).

### F) ENERGY

Under ENERGY the data of total energy sent to grid & VFD, today and till date with their duration is available.

GRD EDAY : Total energy sent to grid today (kWh)  
 GRD ETOT : Total energy sent to grid till date (kWh)  
 VFD EDAY : Total energy sent to VFD today (kWh)  
 VFD ETOT : Total energy sent to VFD till date (kWh)  
 GRD TTOT : Total time energy is sent to grid (Hr)  
 VFD TTOT : Total time energy is sent to VFD (Hr)

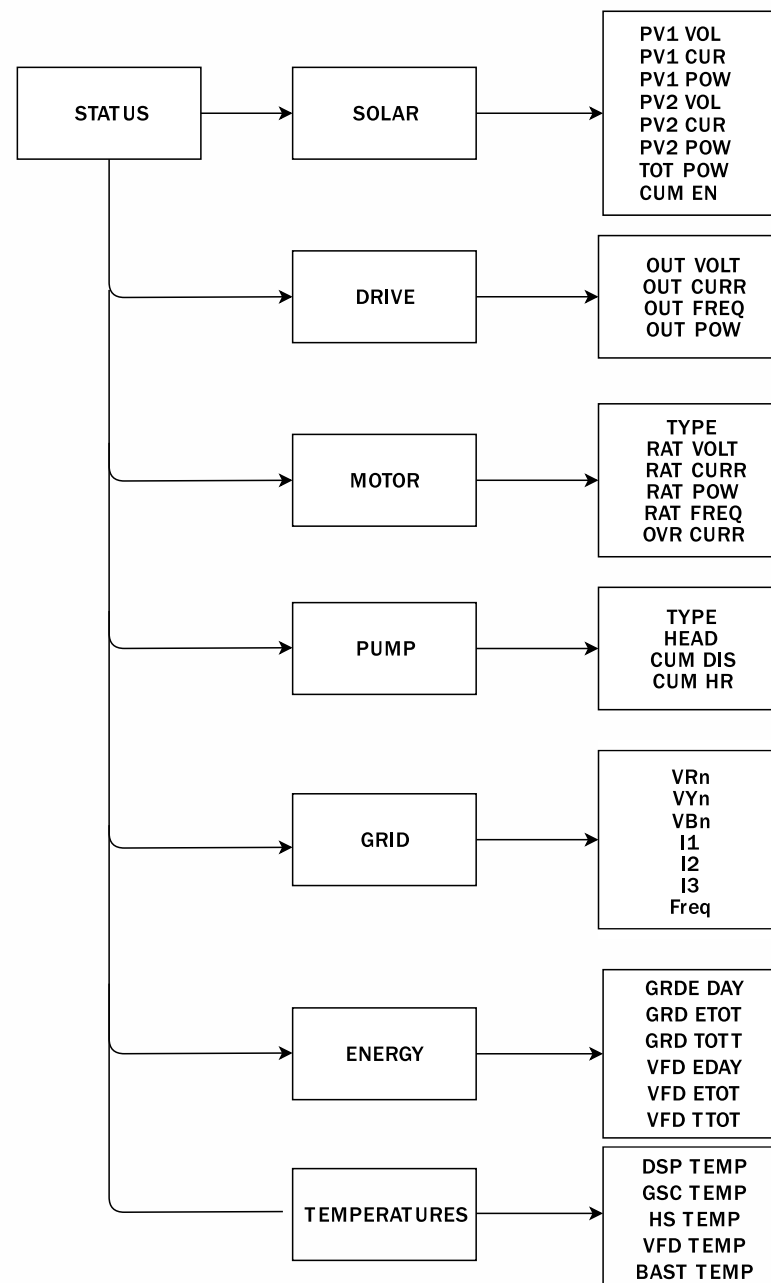


Figure 7.4 STATUS Menu tree

## ► CONTROL \*2

### A) ON/OFF

Whenever ON option is selected the motor will turn on until it is turned off manually through LCD.

### B) CONTROL MODE

The motor can be controlled in either of the four modes, namely AUTO, MANUAL, JOG and SPEED MODE. In the JOG mode, the speed and the direction can be set. To start the motor Enter into ENTER THE JOG and press the power button, until the power button is pressed motor is in running state. Releasing the power button will lead to the stopping of the motor.

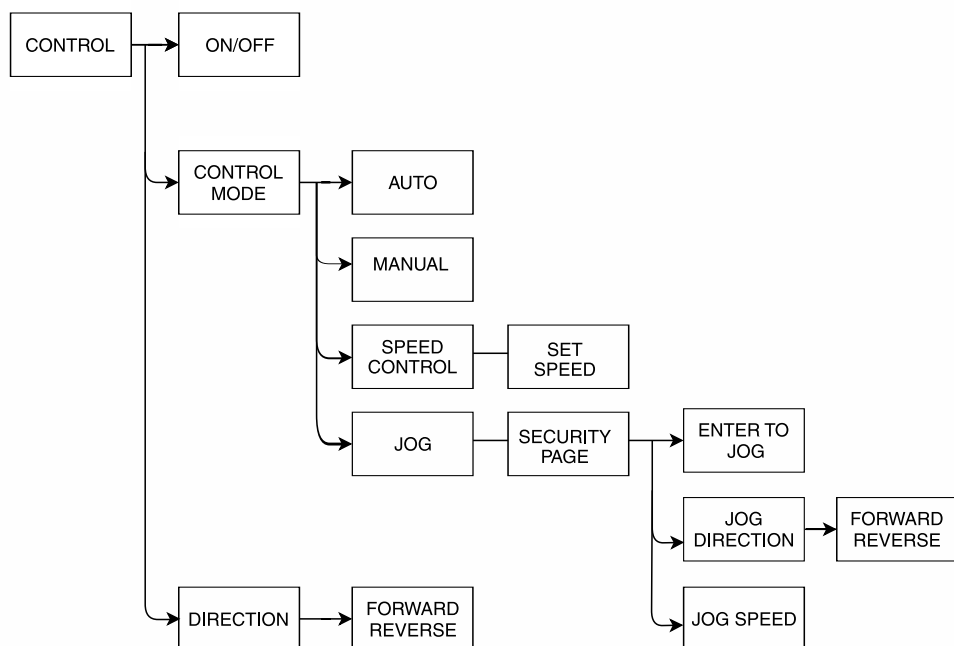


Figure 7.5 CONTROL Menu tree

## ► CONFIGURE \*3

### A) APPLICATION

This system can work for two applications: Standalone & Hybrid.

### B) PROTECTION

The protection limit for various parameters can be set according to the user's requirements.

### C) FACTORY SETUP

A security password is required to access this menu block.

#### i. SOLAR PARAMETERS

According to PV panels connected to the system parameters shown in the figure 7.6 can be set.

#### ii. MOTOR PARAMETERS

First the type of the motor is selected and by entering into the selected motor the rated parameters of that specific motor can be set. For all the three motors i.e. INDUCTION, S4RM, and PMSM same parameters options are available for configuring.

#### iii. PUMP PARAMETERS

After selecting the pump to be operated the parameters specific to that pump can be configured.

#### iv. GRID PARAMETERS

If required the parameters can be set according to the local GRID, keeping in mind the safety regulation specific to that area.

#### v. BOOT MODE OPTIONS

This functionality requires another security password to upgrade the firmware of the system by USB or SERIAL BOOT MODE.

#### vi. EEPROM RESET

EEPROM can be reset only by authorized technician/service personnel. Users are not allowed to reset the EEPROM since it may cause malfunctioning of the unit.

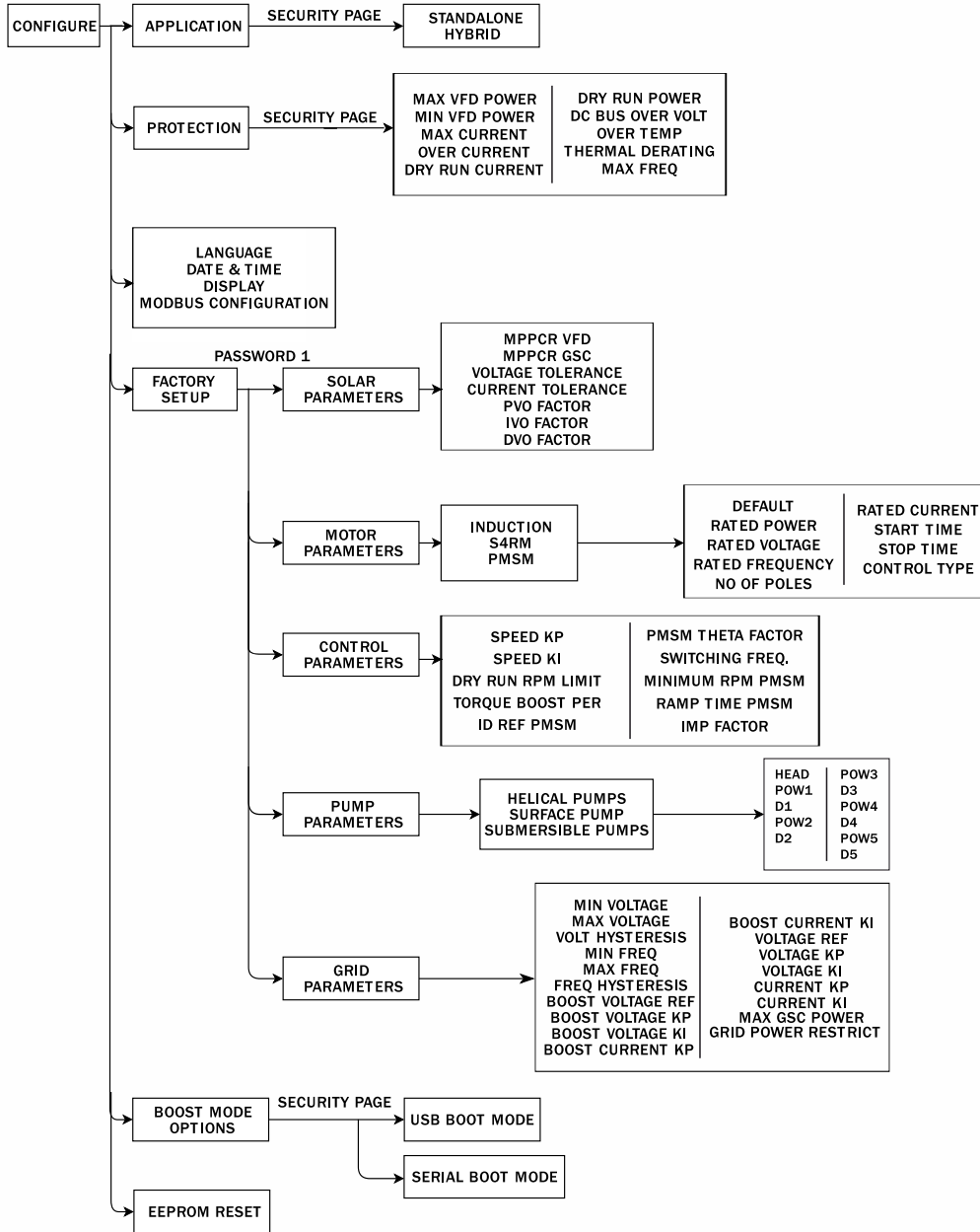


Figure 7.6 CONFIGURE Menu tree

## CHAPTER 8 : RECYCLING & DISPOSAL

Electrical & electronic waste should not be thrown out in open or buried or fired. They must never be treated as residential waste. A unit which was reached end of its life or is not needed any more should be returned to the dealer or to the company. A user may also act as per the government norms prevailing in the area.

# WARRANTY CERTIFICATE

Dear Customer. Congratulation. for purchasing our product.

Pump and Motor are warranted against defects in workmanship and material under normal use, service & specified duty conditions. We provide one time warranty service for twelve months from the date of purchase by the first user.

Shakti Pumps (India) Limited warrants this product to be free from damage/ defects in material and workmanship under normal use and service for Twelve Months from the date of purchase by the first user. The user shall produce valid and original copy of invoice for availing warranty. The user shall carry defective pump set to nearest authorized service center .

This warranty does not cover any loss or damage/ defect of any nature resulting from wrong product selection/ improper installation or installation by unauthorized/ untrained person/ sandy condition/ dry running and improper use of the pump sets. The warranty also does not cover consequential losses/ damages arising due to failure of pump/ motor. No warranty will be provided on mechanical seal, rubber parts, fasteners, cables in pump motor / pump sets. Our obligation is limited to recycling or repairing or replacing product/ parts exi factory. Equipment for repairs should be returned free of cost to us. The forgoing is subject to the provision that the user does not open the unit and make any change or repair without prior approval of authorized service center during the warranty period. This warranty excludes every condition whether statutory or otherwise, whatsoever not herein expressly set out.

# WARRANTY CARD

Customer to fill following details

Name : .....  
 Address : .....  
 City/Village : .....  
 District : .....  
 State : .....  
 Country : .....  
 Pin Code : .....  
 Mobile no. : .....  
 Email id : .....

Information on Device:

Model no : .....  
 Serial no. : .....  
 Invoice no. : .....  
 Commissioning date : .....  
 Fault date and time : .....  
 Message related to fault on display : .....  
 Brief fault description and photo of display : .....  
 Sign : .....  
 Date : .....  
 Place : .....

Installer to fill following details

Modules Used : .....  
 Modules per string : .....  
 Number of strings : .....  
 Dealer license Number : .....  
 Company : .....  
 City/Village : .....  
 State : .....  
 Country : .....  
 Pin Code : .....  
 Mobile no. : .....  
 Email id : .....  
 Sign : .....  
 Date : .....  
 Place: : .....



INSTALLATION & OPERATING INSTRUCTIONS

BOOK-POST

To,  
SHAKTI PUMPS (INDIA) LIMITED  
Plot No. 401, 402, & 413, Industrial Area, Sector - 3, Pithampur - 454774,  
Dist. - Dhar, (M.P.) - INDIA. Toll Free. 1800 103 5555  
E-mail : info@shaktipumps.com, sales@shaktipumps.com  
Visit us at : www.shaktipumps.com

Stamp

