TBB POWER

Version: A1.0

MASTER POWER

USER MANUAL

EMP30D

WARNINGS

- Explosive gases. Prevent flames and sparks. Provide adequate ventilation during charging
- Before charging, read the instructions
- For indoor use. **Do not** expose to rain
- For charging Lead Acid and $LiFePO_4$ batteries **only** (of the size & voltage specified in the specification table)
- Always charge the battery on the correct voltage setting. Never set the charger to a higher voltage than the battery specifications state
- Disconnect the 240V mains supply before making or breaking the connections to the battery
- The battery charger must be plugged into an earthed socket outlet
- Connection to supply mains is to be in accordance with nationa wiring rules
- Do not attempt to charge non-rechargeable batteries
- Never charge a frozen battery
- If the AC cord is damaged, do not attempt to use. It must be replaced or repaired by a qualified technician
- Corrosive substances may escape from the battery during charging and damage delicate surfaces. Store and charge in a suitable area
- Where possible, ensure all vehicle accessories including lights, heaters, appliances etc. are turned off prior to charging
- If the recreational vehicle is to be put in to storage without power, please turn off the BATTERY MASTER SWITCH. If the recreational vehicle is to be put in to long term storage without power, disconnect ALL cabling from the battery

Content

1. General Safety Instruction

1.1 Safety Instruction

As dangerous voltages and high temperature exist within the EMP30D Master Power Unit, only qualified and authorized maintenance personnel are permitted to open and repair it. Please make sure the unit is turned off before open and repair it.

This manual contains information concerning the installation and operation of EMP30D Master Power Unit. All relevant parts of the manual should be read prior to commencing the installation. Please follow the local stipulation meantime.

Any operation against safety requirement or against design, manufacture, safety standard, and are out of the manufacturer warranty.

1.2 General Precaution

1) Do not expose to dust, rain, snow or liquids of any type，it is designed for indoor use. DO NOT block off ventilation, otherwise the EMP30D Master Power Unit would be overheating.

2) To avoid fire and electric shock，make sure all cables selected with right gauge and being connected well. Smaller diameter and broken cable are not allowed to use.

3) Please do not put any inflammable goods near to this unit.

4) Never place this unit directly above batteries, gases from a battery will corrode and damage EMP30D Master Power Unit.

5) Do not place battery over EMP30D Master Power Unit.

1.3 Precaution regarding battery operation

1) Use plenty of fresh water to clean in case battery acid contacts skin, clothing, or eyes and consult with doctor as soon as possible.

2) The battery may generate flammable gas during charging. NEVER smoke or allow a spark or flame in vicinity of a battery.

3) Do not put the metal tool on the battery, spark and short circuit might lead to explosion.

4) REMOVE all personal metal items such as rings, bracelets, necklaces, and watches while working with batteries. Batteries can cause short-circuit current high enough to make metal melt, and could cause severe burns.

2. Product Instruction

2.1 Features

EMP30D

EMP30D unit has below features：

- Smart battery charger 12V 35A(30A for charging current)
  - -Multi stage adaptive charging algorithm
  - -Active Power Factor Correction(PFC) charging
  - -Temperature compensation charging
- Float charge for starter battery
- Solar charge controller (PWM/MPPT),30A
- 15 built in fused outputs
- Built in voltage sensing Relay
  - -12V 60A continues
- Battery low voltage protection
- Built-in battery switch to isolate the battery when in storage
- Built-in shunt for precise battery measurement
- Supporting 4 Water Tank sensors
- Built-in Master bluetooth for bluetooth sensors
- Built-in RF for wireless switches
- Water connector and screw terminal
- RS485&CAN compatible

2.2 Block diagram

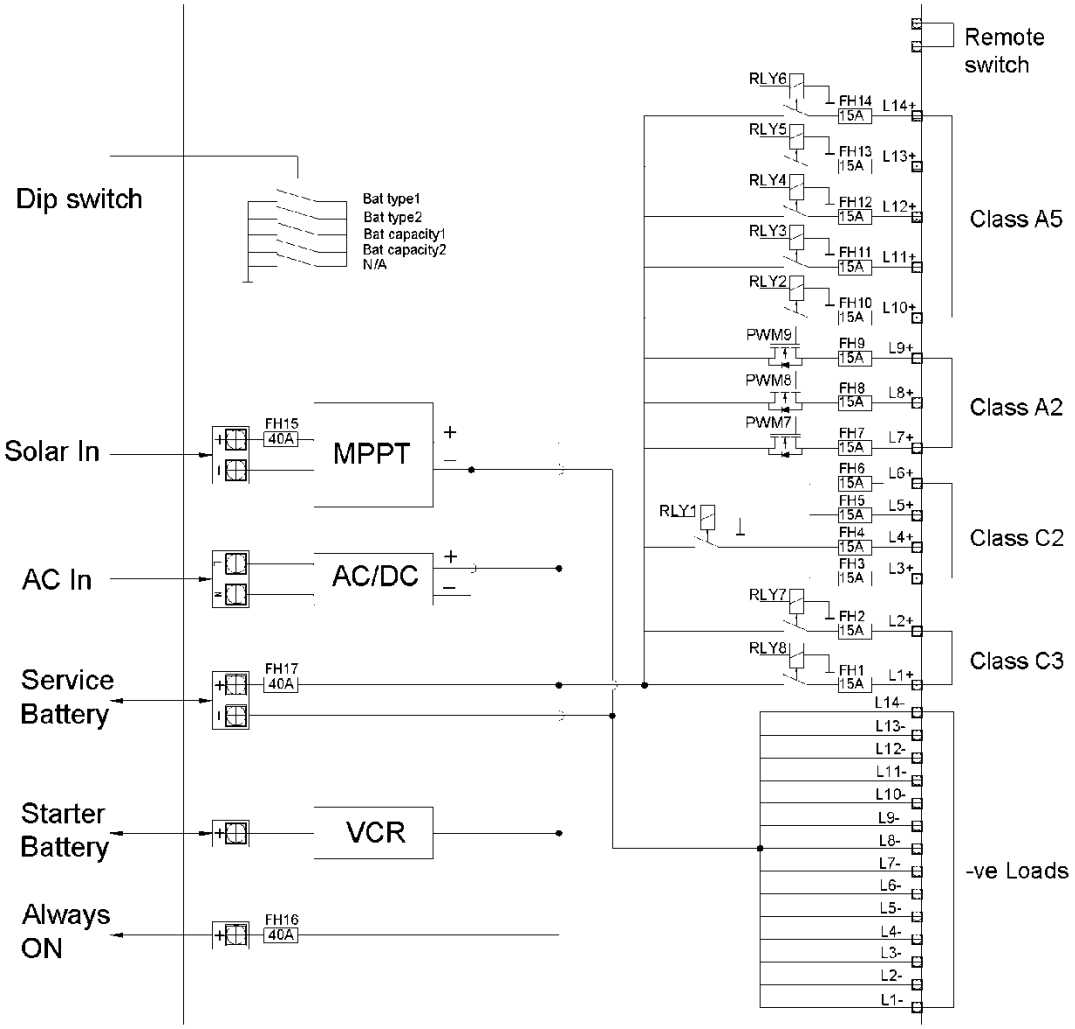


Figure 1 Unit Schematic

3. Key Feature and Functions

3.1 Multiple Inputs

EMP30D Master power unit may have multiple charging sources at any one time.These sources include AC mains, Solar and starter battery (Vehicle)
Charging priorities are listed within the table to the right.

AC MAINS	X	X	
SOLAR	X		X
STARTER BATTERY		X	X
CHARGING PRIORITY	AC MAINS	AC MAINS	COMBINED

3.2 Battery Charger Of Stationery/Service Battery

The charger automatically starts when the appropriate qualified power is connected, either from grid, generator or solar. With multiple charging stages (soft start-bulk absorption float-recycle), EMP30D is designed to fully charge battery quickly. To guarantee the optimal charging for batteries of different states, the EMP30D features Microprocessor-controlled charging algorithm. The Float and Recycle charging programs guarantees that the battery condition does not change despite being connected for a longer period.
When the Charger is at float Stage,If input a new source(AC Mains or Solar),the charger will return to the BULK stage.

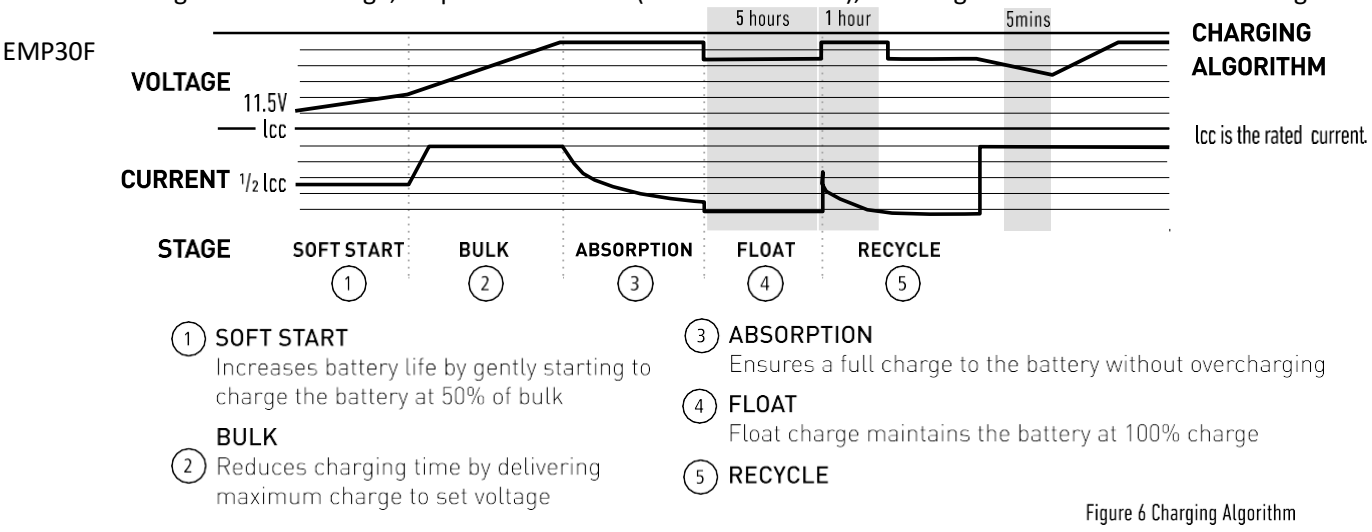


Figure 6 Charging Algorithm

Voltage compensation Charging

With a voltage sensor the EMP30D can automatically adjust its output to compensate the voltage drop caused by a cable. This assures the right voltage is being delivered for optimal charging.

Adjustable Chargin Capacity

Users can adjust the charging current by specifying the battery capacity. The charging current is set at threshold rate of 10% the of the battery capacity (I = 0.1C) by default

Lithium Battery Charging

The EMP30D can be configured to charge Lithium batteries. With Lithium batteries, the max charging current will automatically be set at 30% of battery capacity (Imax=0.3C)

3.3 Vehicle Battery Charger

Along with a powerful charger for service battery, EMO30F offers a float charge of up to 3A to keep the starter battery charged, whether connected to the AC main or PV. When the starter battery is less than 12.4V, the EMP30D starts charging after 30 minutes delay and stops charging when voltage reaches 12.8V

3.4 Power Supply Mode

If no battery is attached to EMP30D Unit.It will work as a power supply automatically with a 12.8VDC output.

3.5 MPPT Solar Charger Controller

EMP30D has a built-in MPPT charger for the service battery with:

- Max input voltage 42VDC
- Max charging current 30A
- Max supply current 30A

3.6 Voltage charging relay(VCR or commonly known as a VSR)

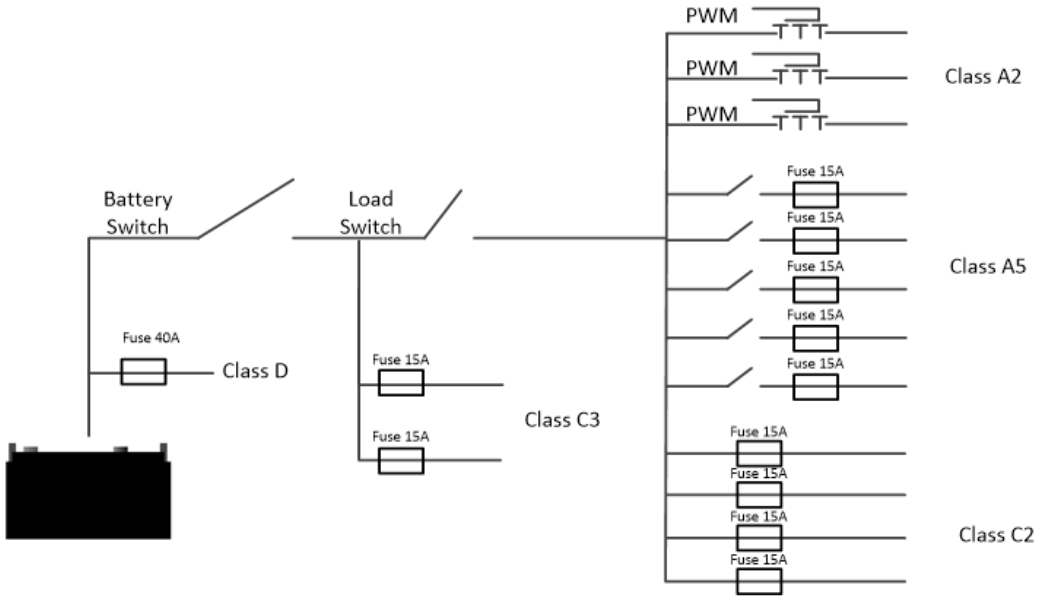
EMP30D master power unit has a built-in voltage charging relay (VCR), which offers a convenient source to charge the service battery by alternator whilst engine is running.
LEAD ACID BATTERY – When the starter battery reaches 13.4VDC with threshold time delay, the VCR will charge the service battery from the alternator. The VCR will continue the charging until the starter battery voltage drops under 12.8VDC.

NOTE: The EMP30D, when charging from the starter battery, does not provide the 5 stage charge.
It simply takes whatever power and charging is available from the alternator

NOTE: EMP30D If your vehicle is fitted with a smart charging system (Variable Voltage or Temperature Compensating), the VCR charge system may not function correctly and DC-DC chargers are recommended.

3.7 Categorised Outputs

The 15 outputs are categorised into groups and controls as per below:



Type	Qty	DESCRIPTION	POSSIBLE LOAD SUITABLE
Class A5	5	Relay controlled output with fuse，Protected by main master switch relay	Water Pump，HWS,TV etc.
Class A2	3	PWM controlled，protected by master switch relay	General lighting，such as ceiling light,Dining light,Bedroom light
Class C2	4	Fused outputs,protected by master switch relay	Ventilation fan etc.
Class C3	2	Always alive load	Fridge,security alarm etc.
Class D	1	Permanent on load	Auto sleep

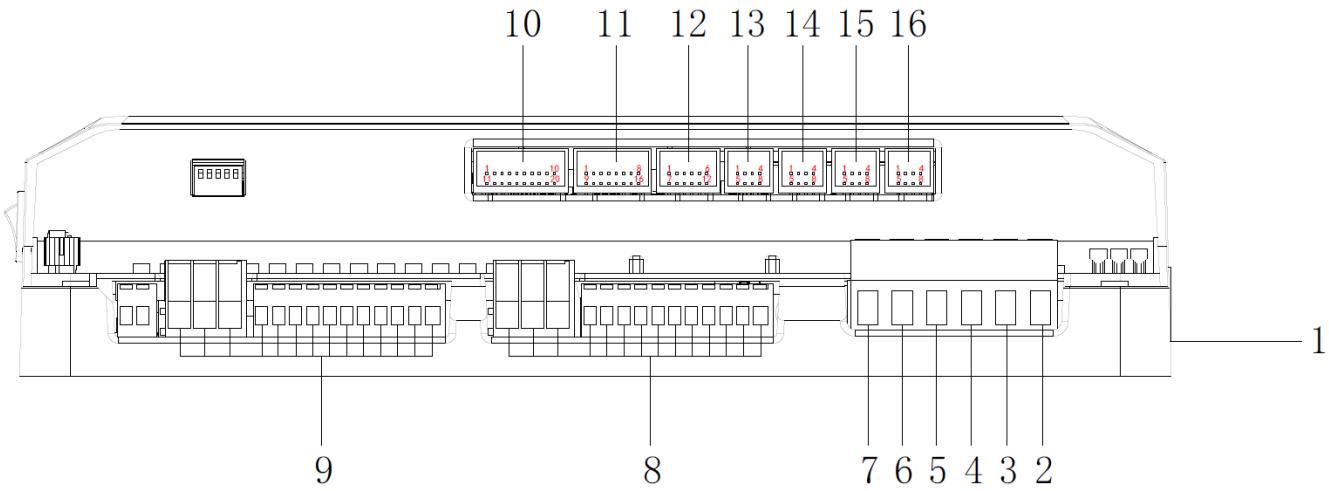
3.8 Battery Low voltage protection (BLVP or commonly known as an LVD)

EMP30D master power unit has a built-in low voltage protection relay. It will disconnect the load once the battery voltage drops below the threshold voltage. The default setting is 10.5VDC. This switch can be manually turned On/Off via the LOAD button on the LCD display.

NOTE: Class C3 and Class D loads remain active.

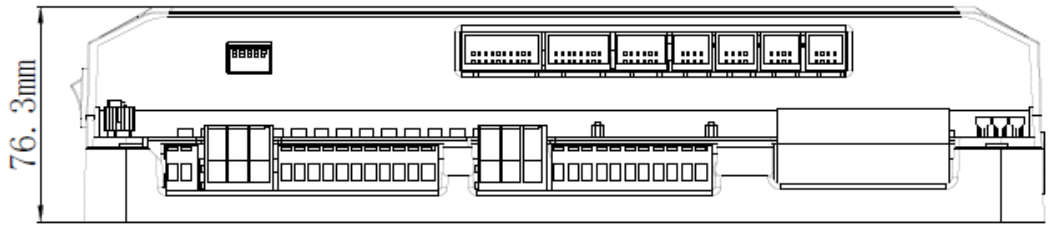
4. Structure And Installation

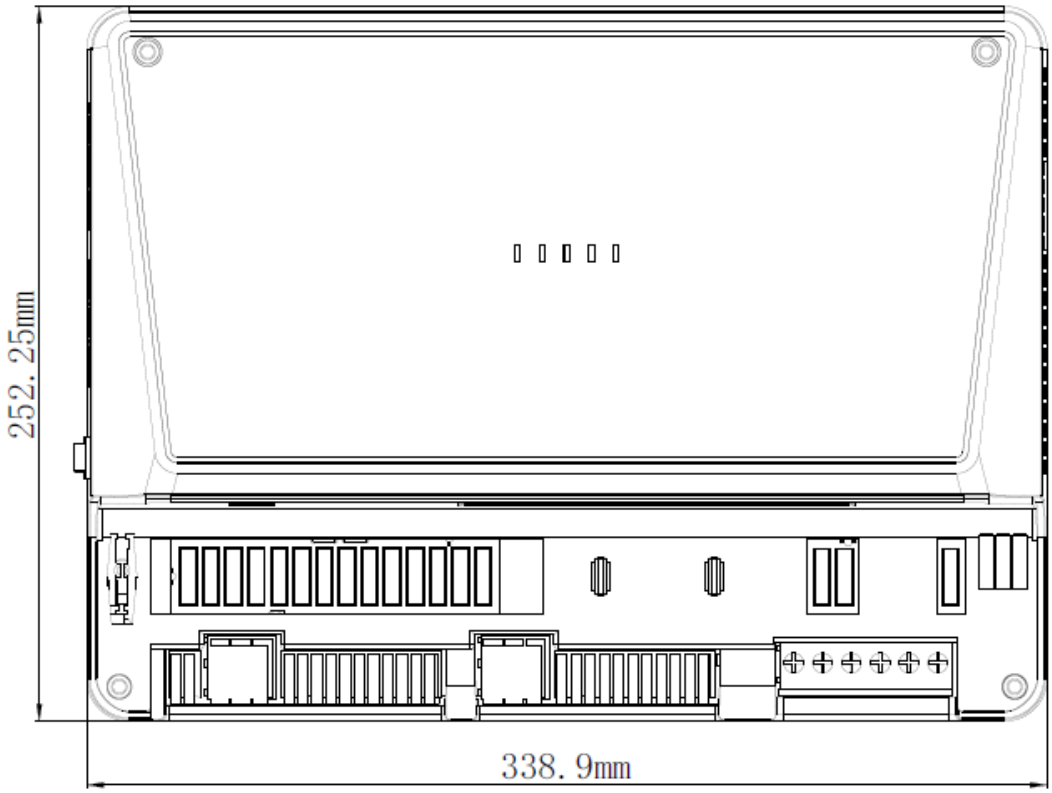
4.1 EMP30D Power Management System



No.	Name	Description	Remark
1	AC Input	AC input	IEC socket
2	Solar+	Solar input Positive	Screw terminal
3	SBAT+	Starter BATT input Positive	
4	BAT+	Service BATT input Positive	
5	Always ON+	40A Always ON output Positive	
6	Solar-	Solar input Negative	
7	BAT-	Service BATT input negative	
8	Load-	Load negative	WAGO connector
9	Load+	Load positive	

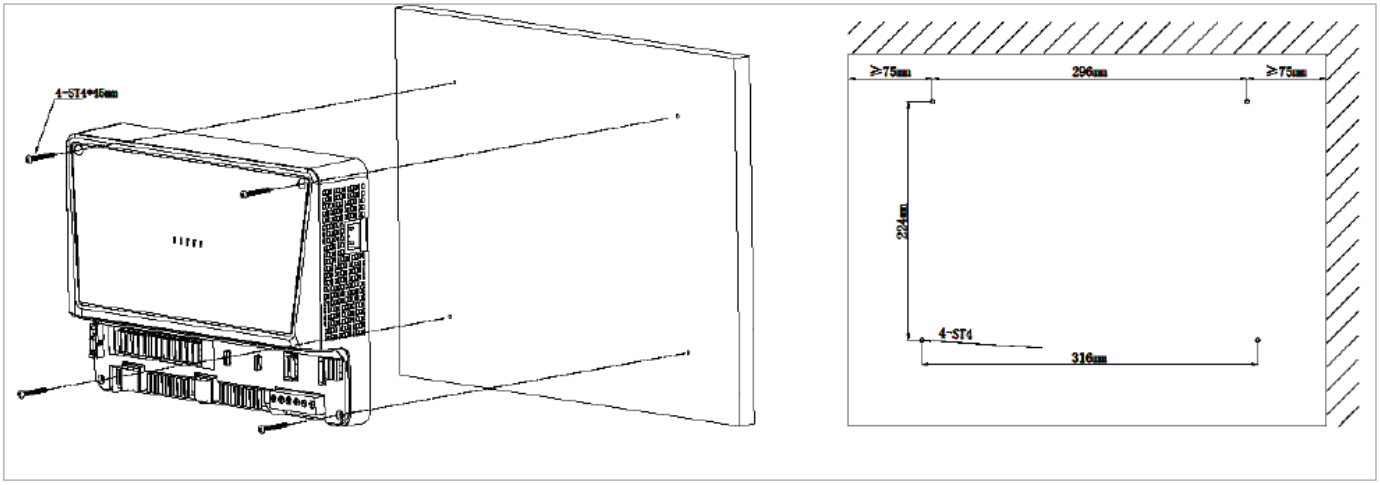
No.	Name	Description	Remark
10	Battery Sensor /Dry connact	Battery sensor and 6 set dry contact	20pin socket
11	Switch Panel/COMM	IO COMM for LED panel and 485 COM for Power module and sensors	16 pin socket
12	LCD Monitor	COM for LCD monitor	12 pin socket
13	Water1	Fresh1 Water Tank	8 pin socket
14	Water2	Fresh2 Water Tank	8 pin socket
15	Water3	Tap Water Tank	8 pin socket
16	Water4	Waste Water Tank	8 pin socket





Installation:

GEN3 PM unit adopts forced air-cooling heat dissipation method, in order to ensure good heat dissipation, it is necessary to ensure that there is enough wiring space, and it is also recommended that the installation space has a certain number of cooling holes to ensure air convection. The installation space requires a distance of ≥50mm from the left and right.


4-ST4*16mm
≥75mm
296mm
≥75mm
224mm
4-ST4
316mm

4.2 Preparation

EMP30D system is designed with concept of 'Plug in and Play' in mind. To complete the easy installation, a screw driver and DC cables are required. Follow Table 5 recommendation for minimum wirings.

CURRENT	MINIMUN CABLE SIZE
0-5A	1.0mm2 or 18AWG
5-10A	2.0mm2 or 14AWG
10-15A	3.0mm2 or 13AWG
15-20A	4.0mm2 or 11AWG
20-25A	5.0mm2 or 10AWG
25-30A	6.0mm2 or 9AWG

When running cables, if they pass through panels or wall, ensure the cables are protected from damage by sharp edges. In such cases, it is recommended to use cable glands.

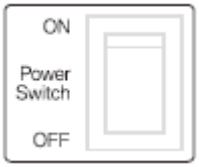
5. Wiring

5.1 EMP30D Master unit

No.	LED	COLOUR	STATUS	DESCRIPTION
1	Mains	GREEN	ON	AC input OK
			OFF	AC disconnected
			Quick flashing	AC input abnormal
2	AUX		ON	Starter battery charging the battery
			Slow flashing (once every second)	The input of the Aux is normal but battery is charged by AC Mains
			Quick flashing (twice every second)	Starter Battery input error
			OFF	Starter Battery disconnected
3	Solar		ON	Solar charging the battery
			Slow Flash (once every second)	The input voltage of the PV is normal but Battery is charged by AC Mains
			Quick flashing (twice every second)	Solar input abnormal
			OFF	Solar disconnected
4	CHG		ON	Battery charging - Float Stage
			Slow Flash (once every second)	Battery charging - BULK, ABS Stage or VSR
			Quick flashing (twice every second)	Battery discharging
			OFF	Battery disconnected
5	FAULT	RED	ON	Short circuit
			1 flash	Service battery undervoltage
			2 flash	Service battery overvoltage
			3 flash	Over temperature (heat sink)
			4 flash	Bulk charge time-out
			5 flash	VSR abnormal
			8 flash	Over temperature (Unit)
			9 flash	Over temperature (PCB or Load circuit)

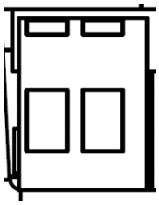
6. Operation

6.1 Manual switch



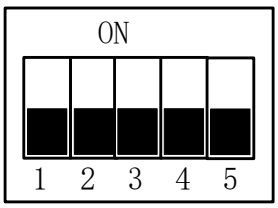
There is an ON/OFF switch on the side of the machine, which is used to control the whole machine to switch on/off when it is powered by battery alone, and to control the whole machine to enter into sleep mode when it is powered by mains power. This switch must be “ON” in order for the Remote Switch to operate.

6.2 Remote switch



The remote switch terminals are located next to the positive 14 terminal. This requires the use of an external switch and functions the same way as the manual On/Off Battery Switch on the side of the charger. The Battery switch must be “ON” in order to use the Remote Switch line. When not used both terminals must be bridged together.

6.3 Dip switch



There is 5 pin dip switch on the unit which is used for adjusting charging current and battery type. At this time, switch 5 is not used and should be in the “OFF” position

Note: These do not not to be adjusted if a digital screen is used

Pin1-2 Defination

		Lead Acid		Lithium
1	2	AC charge	Solar charge	AC/Solar charge
ON	ON	10A	20A	30A

ON	OFF	15A	30A	30A
OFF	ON	20A	30A	30A
OFF	OFF	30A	30A	30A

Pin3-4 Defination

3	4	Type	Absorption	Float
ON	ON	WET	14.7	13.7
ON	OFF	LFP	14.2	13.5
OFF	ON	GEL	14.1	13.5
OFF	OFF	AGM	14.4	13.5

6.4 Maintenance

Battery Monitor Maintenance

There is a built-in battery measurement in the EMP30D systems，To ensure accuracy，maintain the system with the following instructions:

1: Fully charge the battery from AC grid instead of Solar every 2 weeks.

2: Do a full charge to the battery every 3 months.

▪ Charge the battery with AC grid until the “CHG” LED on EMP30D unit or “Float” shows on the monitor.

Daily Maintenance

▪ Confirm the Power switch is turned ON when you want to charge the battery with AC grid

▪ Check the nominal battery is 12VDC

▪ Ensure the Space(5mm each side) beside the EMP30D unit for the appropriate ventilation

▪ When replacing and existing battery,Please fully charge via AC grid to Float Stage to ensure SOC% is accurately calibrated.

Only the energy consumption of the loads connected on the PM435C is measured and calculated in the data on the Monitor

Upon long time parking,you are recommended to switch off the local Power Switch on main unit or remote switch to cut off the consumption of the service battery

7. SPECIFICATION

Model		EMP30D	
ELECTRICAL SPECIFICATIOINS			
Grid	Nominal input voltage（V）	240V±10%VAC 50/60Hz	
	Power factor	0.95	
	Input current at full load	2.5A	
Battery	Starter Battery	12VDC	
	Starter battery voltage range	12.8-16VDC	
	Service battery	12VDC	
	Service battery Voltage range	10.5V-16VDC	
PV	Charge Type	MPPT	
	Open circuit voltage	50VDC	
	Max supply current	30A	
	MAX charging curent	30A	
Charging Relay	Relay specification	12VDC 60A continuous,Peak current,100A,3mins	
	Connect Voltage	Lead Acid:13.4VDC,LiFePO4 14VDC	
	Connect delay time	10sec	
	Disconnect voltage	Lead Acid :12.8V,LiFePO4: ＜ 2A	
	Disconnect delay time	60sec	
	High voltage limit	16VDC	
Charger Mode	Charge Algorithms	5 Stages	
	Battery Type	AGM/GEL/LFP(LiFePO4)/WET	
	Start Voltage	＞2A	
	BULK Current	30A(Max)	
	Absorption voltage	14.4/14.1/14.2/14.7VDC	
	Float voltage	13.5/13.5/13.5/13.7VDC	
	Battery Type	AGM/GEL/LFP(LiFePO4)/WET	
	Number of Battery	2000Ah (Maximun) Number depends on the battery capacity	
	Rated capacity	100Ah	
Power Supply Mode	Nominal output voltage	12.4VDC	
	Rated output current	35A(Continuous)	
Efficiency		88%	
Working Temperatre		-40℃-- +60℃（40℃-60℃ derating）	
Battery Disconnect	Disconnect voltage	Lead Acid	10.5VDC (Default)
		LFP(LiFePO4)	11.2VDC(Default)
	Delay off time	60sec	
	Reconnect voltage	Lead Acid	11.5VDC (Default)
		LFP(LiFePO4)	12.2VDC(Default)

Model		EMP30D
ELECTRICAL SPECIFICATIOINS		
Current Draw on Battery	Only Battery and Load switch ON	700mA
	Only Battery and Load switch ON	300mA
	Only Battery, Voltage ＜ LVD	180mA
	Power Switch OFF	＜ 1mA
Fuse Outputs	Numbers	11
	Rated Current	15A
	Lights outputs	L7,L8,L9 5A x 3
Protection	Short circuit on outputs	Fuse blown
	Reverse polarity	Diode reverse isolation
	Overload protection	Derate the output until overload is removed
	Battery charger over temperature	Shut down EMP30D
	Ambient over temperature	Alarm
	Battery over voltage limits	Battery charger disconnected,Load disconnected
PHYSICAL SPECIFICATION		
Dimension	339mm*252mm*76mm	
Weight	3.3KG	
Enclosure	Metal+Plastic	
Battery connector	M4 Screw (16mm²)	
Load connector	Wago2604-111(4mm²) Wago2604-1103(6mm²)	
Cooling	Forced cooling	
Protection Category	IP20	
Approvals		
Electrical	AS/NZS 60335.2.29	
EMC	CISPR14	

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