AC/DC Converter
MBP Series

MORNSUN®

300 - 500W, 165 - 264VAC Input, Dual output
AC/DC battery charging module power supply



RoHS

FEATURES

- Low stand-by power consumption,
- Maximum instantaneous power up to 702W (MBP500)
- With charging function, the 24V/48V output Lead-acid battery can be charged, when system connected with battery, it can be used as uninterrupted power supply
- With charge and discharge management, battery status display, battery activation, external communications and control functions
- Output over-current, over-voltage protection
- 2.5KVAC high isolation voltage
- Industrial grade operating temperature: -40℃ to +70℃
- Chassis mounting

MBP Series are AC/DC battery charge power converter offered by Mornsun. It features wide input voltage range, taking both DC and AC input voltage, output over-current, over-voltage protection, strong ability in adapting power grid. This product has power working status display and Intelligent charging function, it can used to charge the 24V/48V lead-acid battery, when AC is power-off, the battery can supply power to the load; it has battery activations and over discharge protection function, the activation maintenance of battery can be done manual or automatic through external signals. Designed specifically for distribution automation terminal (DTU / FTU). It is widely used in the power industry switch substations, power substation, RMU, Intelligent Package Substation, Intelligent Switch Controller and other industries which need uninterrupted power supply.

Selection Guide

Part No.	Output Power	Nominal Output Voltage and Current		Maximum Output Power	Efficiency (220VAC, %)
		(Vo/Io)	(VB/IB)		
MBP300-2A27D27	108W	27V/3.0A	27V/1.0A	432W	86(Po=108W)
MBP500-2A27D27	162W	27V/4.5A	27V/1.5A	702W	86(Po=162W)
MBP500-2A54D54	135W	54V/1.0A	54V/1.5A	702W	86(Po=135W)

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range	AC input		165	220	264	VAC
	DC input		200	310	370	VDC
Input frequency			40	50	60	Hz
Input current	220VAC, Typical load	MBP300	--	1.0	--	A
		MBP500	--	1.6	--	
Inrush current	220VAC		--	55	--	
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Current	Input voltage range, charge current (IB=1.0A)	MBP300-2A27D27	--	4	13(30S)	A
					16(1S)	
	Input voltage range, charge current (IB=1.5A)	MBP500-2A27D27	--	6	20(30S)	
					26(1S)	
		MBP500-2A54D54	--	2.5	10(30S)	
					13(1S)	
Output Voltage Accuracy	Input voltage range		--	±2	--	%
Line Regulation	Full load		--	±0.5	--	
Load Regulation	10%-100% load		--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	27V output	--	--	200	mV
		54V output	--	--	400	

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Battery charge current	MBP300		0.9	1	1.1	A
	MBP500		1.35	1.5	1.65	
Battery discharge cut-off point	Typical load	27V output	20.5	21	21.5	V
		54V output	41	42	43	
Battery activation finished point	Typical load	27V output	22.0	22.5	23.0	
		54V output	44	45	46	
Battery under voltage alarm point	Typical load	27V output	22.0	22.5	23.0	
		54V output	44	45	46	
Battery discharge cut-off delay time	MBP300		--	2	--	s
	MBP500		--	40	--	
Remote control contact time	Remote control activating function on/off		--	0.5	--	
	Remote control battery exit		--	4	--	
Stand-by Power Consumption	MBP300-2A27D27	Input voltage range, Po=7W	--	--	15	VA
		Input voltage range, Po=14W	--	--	25	
	MBP500-2A27D27	Input voltage range, Po=14W	--	--	25	
		Input voltage range, Po=20W	--	--	40	
	MBP500-2A54D54	Input voltage range, Po=10W	--	--	20	
		Input voltage range, Po=20W	--	--	40	
Short Circuit Protection	Input voltage range, disconnect the battery		Hiccup, Continuous, self-recovery			
Over-current Protection	MBP300-2A27D27		16	--	--	A
	MBP500-2A27D27		26	--	--	
	MBP500-2A54D54		13	--	--	
Over-voltage Protection	Input voltage range, do not connect the battery, When the fault disappears, the power supply is self-recovery working	27V output	--	31	--	V
		54V output	--	60	--	
Hold-up Time	Input voltage range, Po=14W	MBP300	--	1.5	--	s
	Input voltage range, Po=20W	MBP500	--	1	--	

Note: *Ripple and noise are measured by "parallel cable" method, please see AC-DC Converter Application Notes for specific operation

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output	Test time: 1min	2500	--	--	VAC
	Input-Case		2500	--	--	
	output-Case		2500	--	--	
Impulse Voltage	Input-output	Apply 5kV impulse test voltage between input and output. Add 1.2/50us impact waveform, including three positive impulse and three negative impulse whose time interval is no less than 5 seconds. And there should not have disruptive discharge during the test.	5000	--	--	V
	Input-Case		5000	--	--	
	output-Case		5000	--	--	
Isolation Resistance	Input-output	Room temperature	50	--	--	MΩ
	Input-Case	Room temperature	50	--	--	
	output-Case	Room temperature	50	--	--	
Operating Temperature*			-40	--	+70	℃
Storage Temperature			-40	--	+105	
Shell Operation temperature*			--	--	+80	
Storage Humidity			--	--	95	%RH
MTBF			MIL-HDBK-217F@25℃＞100,000 h			

Note: *When the ambient temperature exceeds 50 ℃, it should be taken the cooling method of force air cooling or post cooling to ensure that the module shield temperature is not more than 80℃.

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Physical Specifications

Casing Material		Metal
Package Dimensions		168.00*110.00*45.00 mm
Weight	MBP300	1.20Kg (Typ.)
	MBP500	1.25Kg (Typ.)
Cooling method		Free air convection

EMC Specifications

EMS	ESD	IEC/EN61000-4-2	Contact ±8KV /Air ±15KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	30V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	Power port ±4KV	perf. Criteria B
		IEC/EN61000-4-4	Signal port ±2KV	perf. Criteria B
	Surge	IEC/EN61000-4-5	Power port line to line ±2KV/line to ground ±4KV	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A
	PFM	IEC/EN61000-4-8	100A/m	perf. Criteria A
	Pulse magnetic field immunity	IEC/EN61000-4-9	1000A/m	perf. Criteria A
	Damped oscillatory magnetic field immunity	IEC/EN61000-4-10	100A/m	perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-11	0%,70%	perf. Criteria B
	Ring wave immunity	IEC/EN61000-4-12	Common mode 2.5KV/ Differential mode 1.25KV	perf. Criteria A
	Oscillatory waves immunity	IEC/EN61000-4-18	Common mode 2.5KV/ Differential mode 1.25KV	perf. Criteria A

Principle block diagram

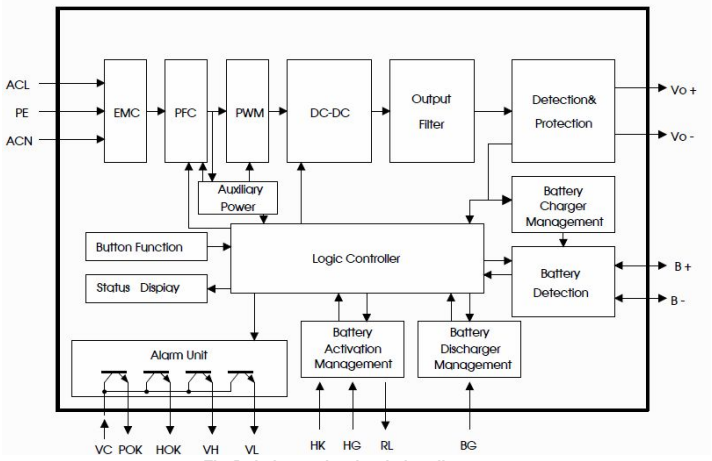


Fig1. Internal principle diagram

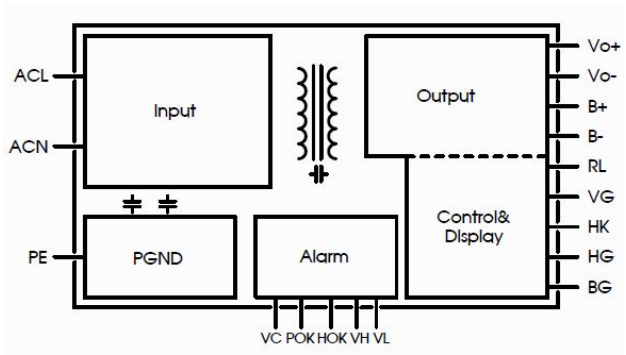
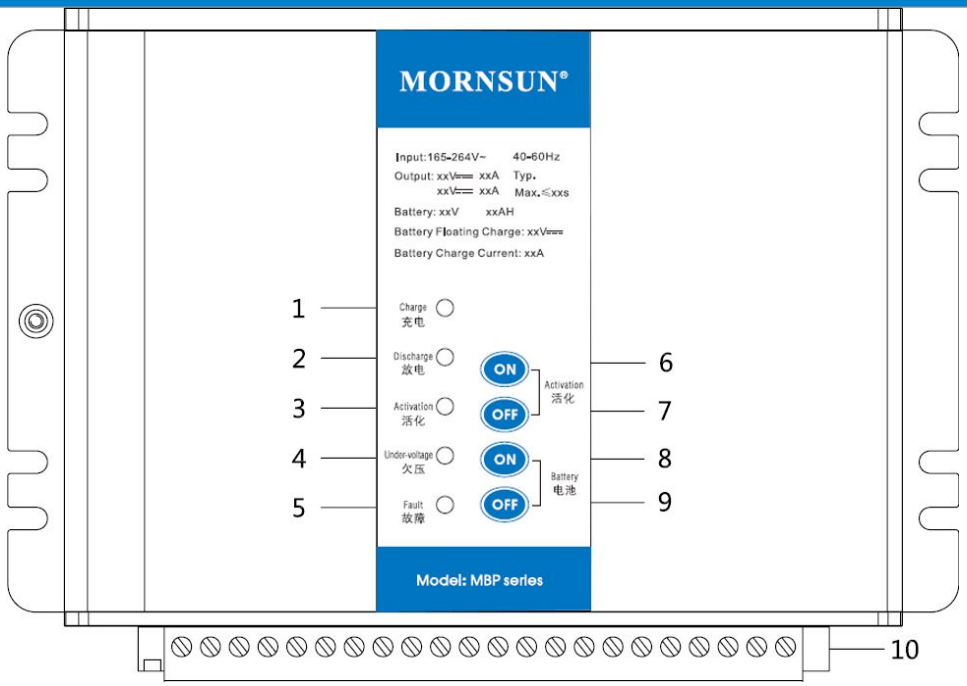


Fig2. Internal isolation diagram

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Panel description



1.Charging and operation indicator light 2.Battery discharge indicator light 3.Battery activation indicator light
4.Battery under-voltage indicator light 5.Battery fault indicator light 6.Manual activation start button
7.Manual activation quit button 8.Manual battery input button 9.Manual battery quit button 10.Terminal

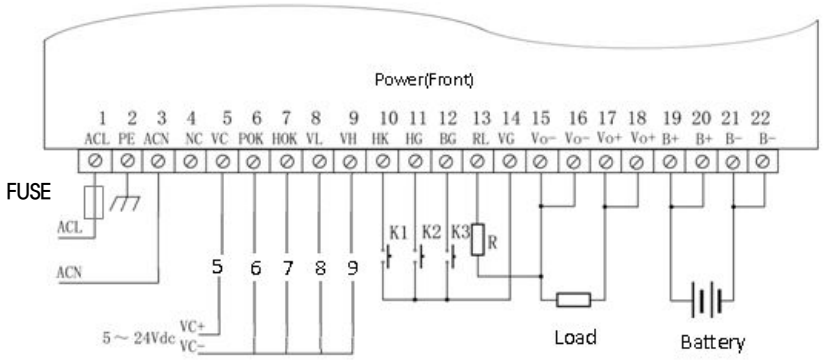
Wiring Description

1.Terminal Definition

Terminal No.	Terminal name	Definition	Terminal No.	Terminal name	Definition	Terminal No.	Terminal name	Definition
1	ACL	AC input L phase	9	VH	Power supply fault alarm signal output terminal	17	Vo+	Load output (+)
2	PE	Protective grounding	10	HK	Remote activation start contact terminal	18	Vo+	Load output (+)
3	ACN	AC input N phase	11	HG	Remote activation quit contact terminal	19	B+	Battery input (+)
4	NC	No electrical connection	12	BG	Remote battery quit contact terminal	20	B+	Battery input (+)
5	VC	Power supply for alarm unit (+5v to +24V DC)	13	RL	Power supply for active discharge resistor (+)	21	B-	Battery input (-)
6	POK	Input loss alarm signal output terminal	14	VG	Remote public contact terminal	22	B-	Battery input (-)
7	HOK	Battery Activated state signal output terminal	15	Vo-	Load output (-)			
8	VL	Battery under-voltage alarm signal output terminal	16	Vo-	Load output (-)			

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2.Wiring diagram



Wiring Description: K1 K2 K3 are the contact points for the user's CPU and other control , R is the battery activated discharge resistance, load is the user's normal load, the battery is 24V or 48V battery pack. Terminal capacity is 300V/15A. The specific use please refer to the Using Manual instructions

Manual Instruction

1. Power supply status indicator

Charge, lights Green, Battery Charge indication, It lights when the battery is charging and off when the battery is discharging or activated.

Discharge, lights Red, Battery Discharge indication, It lights when the battery is discharging or activated. It goes off when the battery is charging or complete discharging.

Activate, lights Red, It lights when the battery is activated. If not, it goes off.

Under Voltage, lights Red, It lights when the battery or the output converter under-voltage output. If not, it goes off.

Fault, lights Red, In the fail case of over-voltage output, over-current, short circuit, It lights after the output is cut-off. If not, it goes off.

2. Button functions and use

Activation Start, Press-button, Battery activation manually start.

Activation Stop, Press-button, Battery activation manually quit.

Battery Start, Press-button, Battery manually put into.

Battery Stop, Press-button, Battery manually quit.

Activated button, press the activated start-button then the converter will get into the battery activated state, and the discharged and activated indication lights on, and the battery discharge to the load and the discharged resistance. It is able to quit battery activated state when press the activated stop-button. If not, the converter will automatically finish battery activation

Battery button, Press the battery start-button when project debugging or firstly connect the battery but no output, then the battery is used to supply power to the load. Now the discharge indication lights. It is able to manually press the battery stop-button 5 seconds to cut off the battery, or the battery will be automatically cut off after the battery discharge into the under-voltage breakpoint. Hold the battery start-button can urgently force the battery to output for the load when the battery voltage is lower than the under-voltage breakpoint.

Note: The function of battery touch-button does not work when AC power. The time of forcing output should not be too long, so as not to damage the battery.

3. Use of Power

The power supply can work when input is AC the alternating current. The power input current to load is powered by power supply, meanwhile charge battery in constant current and voltage. After the battery is charged, power supply to floating charge state automatically, this moment, the power supply float voltage and current to normal self discharge of battery.

When AC power down, the battery can also supply power, 0 switch time. When the battery discharge to under voltage alarm, output battery under voltage signal point, at the same time under voltage indicator lamp light. When the battery discharge is lower than the under-voltage protection, the power shut off load output automatically. If need to shut off battery output in advance, can press the Manual battery quit button of the battery for manual operation in 5 seconds or remote control the relay controlled by the CPU to make the battery remote pin BG and VG in short circuit (not less than 5 seconds), then the battery shut off in advance.

4. Activation of Battery

When the battery is in floating charge state for a long time, the battery should to be activated to avoid battery plate passivation. It can use the relay controlled by the CPU to make the power activation pin HK and VG in short circuit (not less than 0.5 seconds), then the power into activation state, the battery discharge and supply power to the load. When the battery discharged to the battery activation,

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the power automatic starting work to supply the load and charge the battery. When need to withdraw from activation halfway, can press the Manual activation quit button to withdraw from activation, or use the relay controlled by the CPU to make the power pin HG and VG in short circuit (not less than 0.5 seconds), then withdraw from activation in advance.

Note: The activation function does not work when the power supply is not connected to the battery or the battery voltage is lower than the battery activation.

5. Application of activated discharge terminal RL

Refer to the wiring diagram. The terminal is designed to accelerate the discharge of the battery when the battery is activated, please select the discharge resistance according to different battery capacity. When the power supply works normal, the resistance does not work, When the power source is in the activated state, the resistance is connected to the battery discharge. Choice of discharge current (recommended):

Discharge current (A) = 0.1 * battery capacity (AH) - regular load current (A). If the discharge current value is negative, then the discharge resistance can not be added. When the discharge resistance is hot, should be properly cooled down and away from the power module.

6. Application of alarm terminal

The alarm output terminal is the electronic node (see the internal diagram), and the +5V to +24V DC voltage is required to be input at the VC terminal. When an alarm occurs, the alarm node is on or off. Alarm node load capacity is 0 - 15mA, and the voltage derating is 0.1-3V. This alarm node is not suitable for the load of a large power, The alarm node must be isolated from the power input, output, housing, and protection (see Figure 2), and the insulation strength is 2500VAC voltage, insulation resistance is 100MΩ. Alarm status is as follows:

Alarm terminal	The alarm	Normal (or non-active)	Alarm (or activation)
VC	Positive input alarm	--	--
POK	Input loss alarm	on	off
HOK	Activated state	off	on
VL	Battery under voltage alarm	off	on
VH	Fault alarm(over-voltage)	off	on

7. Use of Battery

The power supply can be equipped with 6 - 30AH lead acid battery or colloidal maintenance-free battery, The battery is connected to the battery terminal(B+、B-) of the power supply. When the load current is less than 16A (MBP300)/20A (MBP500), the load is connected to the output terminal of the power supply. When the instantaneous load current exceeds 16A (MBP300)/20A (MBP500), the load can be directly connected to the battery, at this time, the power supply of discharge protection function is failure.

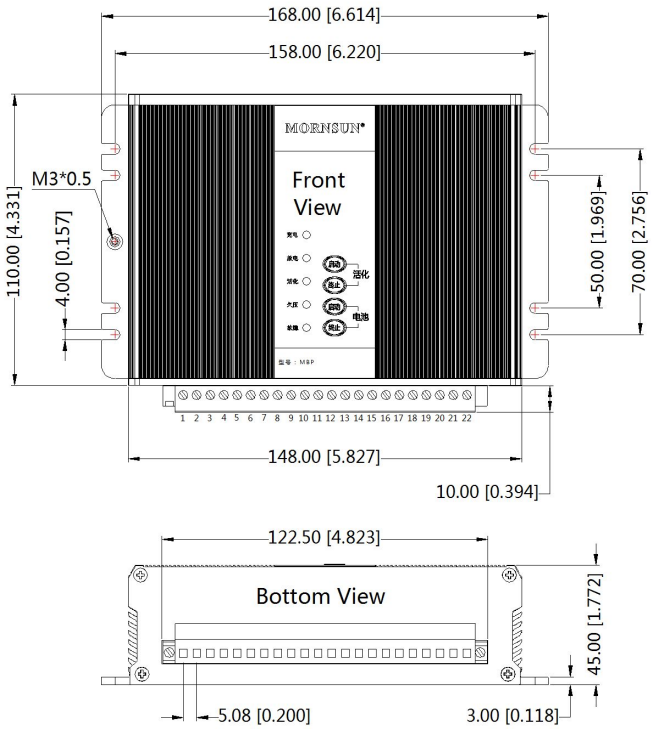
Charge current selection of the power supply: Generally, The charge current of the battery is selected according to the battery capacity of 10% or parameters provided by battery manufacturers. The following table is for reference:

battery capacity (AH)	10-15	15-20
charging current (A)	1	1.5

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Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Pin-Out			
Pin	Function	Pin	Function
1	ACL	12	BG
2	PE	13	RL
3	ACN	14	VG
4	NC	15	Vo-
5	VC	16	Vo-
6	POK	17	Vo+
7	HOK	18	Vo+
8	VL	19	B+
9	VH	20	B+
10	HK	21	B-
11	HG	22	B-

Note:
Unit: mm[inch]
Wire range: 28-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.039]

Attention Matters in Application

（1）Output please use wire that cross area is more than 2.5mm², input terminal should add 10A/250VAC Fuse.
（2）Please correct connection according to the wiring diagram, do not connect wrongly, battery output terminal is strictly prohibited to connect reversely, AC input terminal is strictly prohibited connected with other terminals wrong, otherwise will cause permanent damage to power.
（3）The installation method is installed on the vertical direction with terminal down, and identification right.
（4）Connecting terminal capacity is 15A, the output and the battery terminal is applied to two terminals, otherwise it is easy to burn the connecting terminal.
（5）Alarm terminal is prohibited from overload and short-circuit, otherwise it will burn down the electronic alarm contact.
（6）To further reduce the output ripple noise, the user can parallel connection with one 470 - 1000F/50V electrolytic capacitor and 1F multilayer Ceramic Capacitor.
（7）The output of this product is not allowed to work in parallel.
（8）The PE terminal of this product should be reliably connected to the earth, in order to improve the capability of anti-interference.
（9）Casing will distribute heat when the power is during operating, in order to ensure the power dissipation is good, please keep a certain gap around the power supply to ensure the air flow smoothly, the temperature sensitive device as far as possible from the power.

Note:
1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. Packing bag number:58220034;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our Company's corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Specifications are subject to change without prior notice.

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