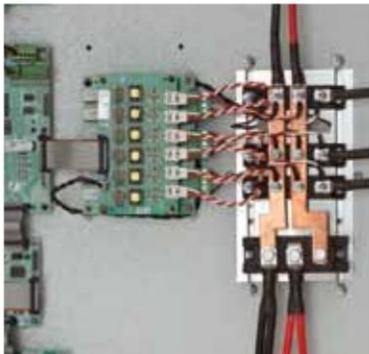




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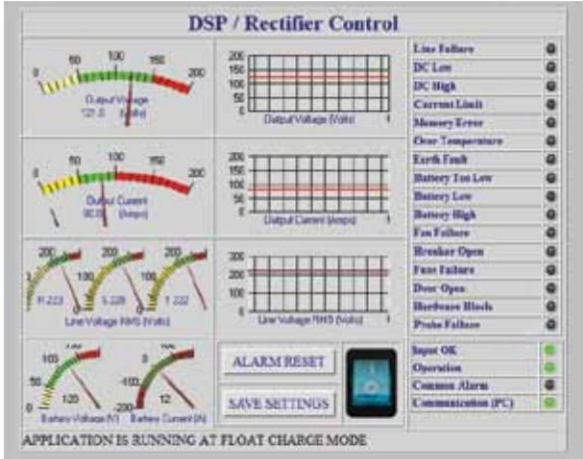
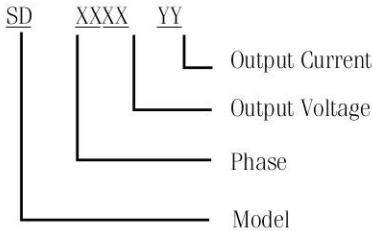
MC-MAK Series Rectifiers

10 - 10,000 A, 10 - 1000 V



Options

- ▶ Separated outputs for loads and batteries
- ▶ Battery temperature compensation
- ▶ Advanced control and monitoring software program through RS232 connection
- ▶ Earth fault recognition
- ▶ Active parallel working (current sharing operation) and measurable ability for
- ▶ More than one module
- ▶ 12 pulse option



Communication Interface



MC-MAK Series Rectifiers

Rectifier and Battery Charger Selection Table

	Standard	Optional
INPUT		
Surge Suppressor	●	
MCC Type Input Termic Magnetic Breaker	●	
MCCB Type Input Termic Magnetic Breaker		●
RFI Filter		●
5th Harmonic Filter for 6 Pulse Devices		●
11th Harmonic Filter for 12 Pulse Devices		●
Input Inductor	●	
Notr Input Avaliable	●	
Notr Input Not Avaliable		●
RECTIFIER		
Input Transformer (Isolated)	●	
6 pulse Control	●	
12 pulse Control	●	
Forced Cooling (Fans)	●	
Natural Cooling		●
DC Inductor		●
DC Capacitor	●	
Output Serial Diode	●	
OUTPUT		
MCB Type Output Termic Magnetic Breaker		
MCB Type Output Termic Magnetic Breaker	●	
Fuse Type Output Termic Magnetic Breaker		●
Separate Battery Output (OPS-05)		●
Diod Dropper for Load Output Voltage Limiter (OPS-05)		●
Chopper Dropper for Load Output Voltage Limiter (OPS-05)		●
CONTROL & MONITORING		
Rectifier Output Voltage(DC) (On LCD Display)	●	
Rectifier Output Current(DC) (On LCD Display)	●	
Rectifier Input Voltage(AC) (On LCD Display)	●	
Battery Voltage(DC) (On LCD Display)		●
Battery Voltage(AC)		●
Gauges(72*72) (OPS-04)		●
LCD Interface & Keypad	●	
Audible Alarm	●	
RS 232 Communication (Modbus)	●	
Alarm Terminals (Dry Contacts)	●	
Input Breaker Trip & Status Monitoring		●
Output Breakers Trip & Status Monitoring		●
Battery Voltage Temperature Compansation (OPS-06)		●
DC Power Supply (OPS-03)		●
Internal LVD for Battery Deep Discharge Protection (OPS-05)		●
Earth Fault Monitoring (OPS-02)	●	
Voltage and Current Transducers		●



Analog and LCD panel



MC-MAK Series Rectifiers

Operating parameters

Unless specified in the customers technical specification, the battery parameters are determined by EPC Industrial Systems in full respect with the customers application and the choice of battery type.

The battery parameters to be determined and set up in the DC UPS are:

- ▶ High voltage alarm (V)
- ▶ Float voltage (V)
- ▶ Battery discharging alarm (V)
- ▶ Minimum battery test voltage (V)
- ▶ Shutdown imminent alarm (V)
- ▶ End of discharge voltage (V)*

Automatic Battery Test

The operating conditions of the batteries are automatically tested by the control unit at selectable intervals, e.g. weekly, fortnightly or monthly. A short-time discharge of the battery is made to confirm that all the battery blocks and connecting elements are in good working order. In order to avoid a faulty diagnosis, the test is launched 24 hours after the last battery discharge at the earliest.

The battery test is performed without any risk to the user, even if the battery is wholly defective. A detected battery fault is alarmed to the user. The battery test does not cause any degradation in terms of expected life of the battery (ops).

Ambient temperature compensated battery charger

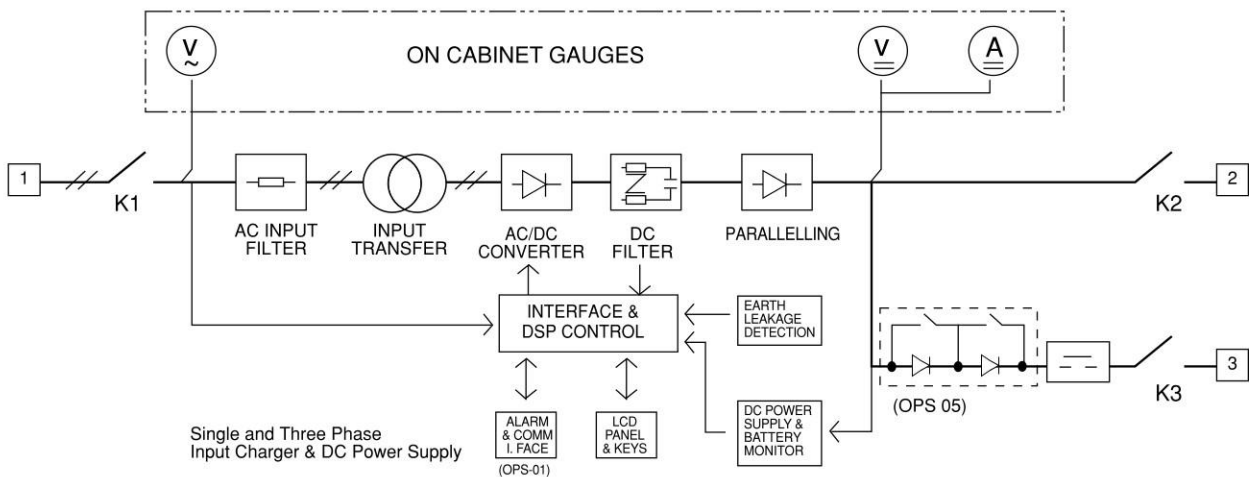
The rectifier-charger output voltage operates within narrow limits according to the battery manufacturer's technical data. In order to ensure an optimum battery charging, regulation is automatically adjusted to the ambient temperature.

The float voltage and the discharge voltage of the battery are automatically adjusted as a function of the temperature in the battery compartment in order to maximise battery operating life.

The temperature adjustments are:

- ▶ -3 mV/°C/cell for Lead Acid battery
- ▶ -2 mV/°C/cell for Nickel Cadmium battery

Rectifier-charger single line diagram





MC-MAK Series Rectifiers

Parallel (dual) operation

The battery charger systems have the capability to be connected in parallel for multi module configurations between units of the same rating.

The parallel connection of battery chargers increases reliability for the DC load.

Complete DC UPS systems in parallel configuration

System description

The range is capable of operating in parallel as shown on Figure 8.

The parallel connection of DC UPS improves reliability through redundancy.

In order to operate in such configuration, each rectifier/charger is equipped with a blocking diode.

The blocking diodes ensure 2 major functions:

- ▶ They allow the control of the recharge current of each battery.
- ▶ They avoid the connection of a

fully charged battery to a fully discharged battery. Such a situation would result in a very high current which would be dangerous for the equipment.

Common battery connected to 2 Chargers in parallel configuration

System description

In this configuration, chargers concur to charge the same battery. The DC load is equally shared between both rectifiers.

In order to ensure a safe operation of such a configuration, each rectifier/charger will be equipped with a blocking diode.

Environment-related options

External cubicle protection

According to IEC 529 (Degrees of protection provided by enclosures- IP Code), it is possible to protect the rectifier/charger cubicle from solid or liquid intrusion. The protection levels available are:

- ▶ IP 21
- ▶ IP 22
- ▶ IP 40
- ▶ IP 41
- ▶ IP 42
- ▶ IP 44

In all cases, even for standard IP 20 level, the third number shall be 7, representing mechanical protection.

It is also possible to require a higher IP code, up to IP65, upon customers' specification and request. In this case, the product is re-designed and might have new technical characteristics that are not mentioned in this document.

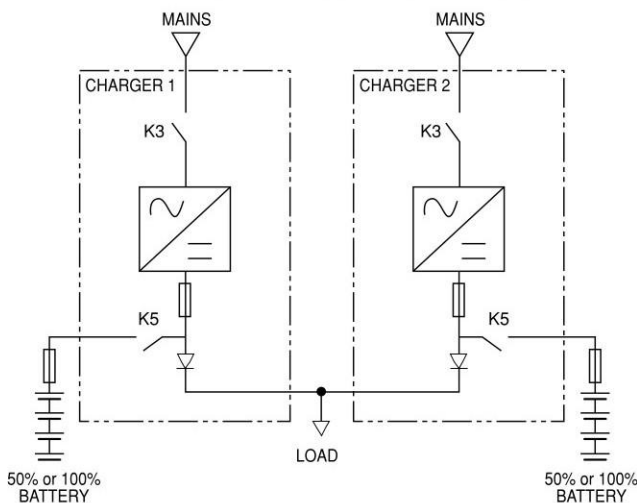
Special enclosure finishing

Standard finishing of the enclosure is RAL 7032 (grey) textured semi gloss. Any other type of painting specification is also achievable upon request, in compliance with AFNOR, RAL or BS standards.

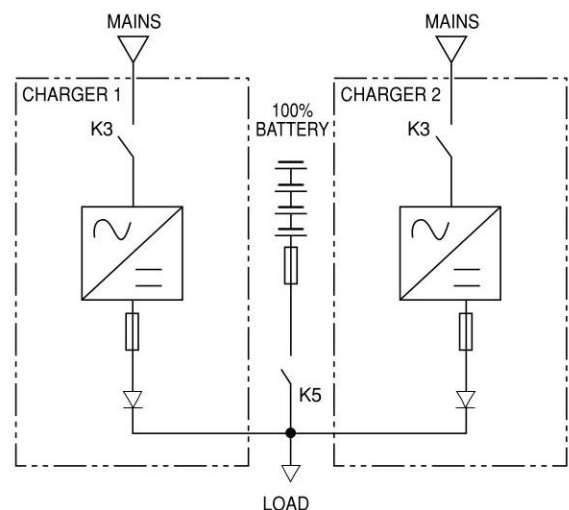
Anti-condensation heater

This option includes a heater which is fitted inside the cubicle, to prevent internal components from condensation, mainly when the rectifier-charger is stored for a long period.

Rectifier in parallel (dual) configuration



Battery with 2 chargers in parallel





MC-MAK Series Rectifiers

DC CHARGER / RECTIFIER / 1 PHASE		1 PHASE INPUT
INPUT	Nominal Voltage	110V / 115V / 208V / 220V / 240V
	Nominal frequency	50 or 60 Hz
	Transformer	Galvanically isolated
	ITHD	<45-50% standard
	Input Protection	Thermic Magnetic Overcurrent protection MCB, Overvoltage protection
OUTPUT	Floating Output Voltage	12 VDC / 24 VDC / 48 VDC / 110 VDC / 220 VDC
	Output Voltage Adjustment	12/24VDC output: 10VDC to 30VDC, 48VDC output: 40VDC to 60VDC, 110VDC output 80VDC to 150VDC, 220VDC output: 190VDC to 290VDC
	Output Current Adjustment	0-100% of Nominal Output Current
	Battery Charger Current Adjustment	0-100% of Nominal Output Current
	Boost Charger Voltage	100% to 120% of Floating Output Current
	Boost Voltage(V/C)	2,4 lead acid battery 1,60 NiCd Battery
	Float Voltage(V/C)	2,24 lead acid battery 1,40 NiCd Battery
	Nominal Output Current	30A/60A/100A
	Max Output Current	100 % of nominal output current
Filtering	L-C Filter	
GENERAL	Boost Timer	0-600 hours adjustable
	Cooling	Forced fans with smart fan controlling system
	Isolation Voltage	1500 or 3000VAC input/chassis and output/chassis
	Efficiency at full load	>80%
	Protection level	IP20 (Standard); IP54 (Optional)
	Cable Entry	Front Bottom
	Access to Batteries	Batteries and rectifier in the same cabinet with front access (optional)
	Circuit Breakers	Thermic-magnetic circuit breakers for input, Battery and Load (up to 100A)
Reset Button	Used for re-operation in case of failure of the system.	
DISPLAY PANEL	Measurements	LCD Display for Load Output Voltage/Current, Battery Output Voltage/Current and Line Voltage/Line Current/Frequency
	Buttons	Timer Settings, Boost Voltage Setting, Float Voltage Setting, Output Current Setting, Battery Current Setting and Reset buttons.
	Time and Date	Adjustable
	Charger Failure	Open or closed free contacts
	Low Battery	Open or closed free contacts
	Rectifier over voltage	Open or closed free contacts
	Over temperature	Open or closed free contacts
	Line Failure	Open or closed free contacts
COMMUNICATION & PARALLELING	Communication	Standard RS232 communication on real time base for remote monitoring and control. Optional RS485 / Modbus
	Paralleling	Parallel Redundant (No need for extra kit for paralleling)

Availability Matrix		24V	48V	110V	220V
	15A	Size 0	Size 0	Size 0	Size1
	30A	Size 0	Size 1	Size 1	Size 2
	60A	Size 1	Size 1	Size 1	Size 2

Dimension(mm) W*D*H	Size 0	440*330*610
	Size 1	500*450*1000
	Size 2	600*600*1300
	Size 3	750*700*1600
	Size 4	800*800*1600

NOTE: All specifications subject to change without notice



MC-MAK Series Rectifiers

DC CHARGER / RECTIFIER / 3 PHASE

3 PHASE INPUT

INPUT	Nominal Voltage	110V / 115V / 208V / 220V / 240V
	Nominal frequency	50 or 60 Hz
	Transformer	Galvanically isolated
	ITHD	<8*-30% standard (* 12 pulse)
	Input Protection	Thermic Magnetic Overcurrent protection MCB, Overvoltage protection
OUTPUT	Floating Output Voltage	12 VDC / 24 VDC / 48 VDC / 110 VDC / 220 VDC
	Output Voltage Adjustment	12/24VDC output: 10VDC to 30VDC, 48VDC output: 40VDC to 60VDC, 110VDC output 80VDC to 150VDC, 220VDC output: 190VDC to 290VDC
	Output Current Adjustment	0-100% of Nominal Output Current
	Battery Charger Current Adjustment	0-100% of Nominal Output Current
	Boost Charger Voltage	100% to 120% of Floating Output Current
	Boost Voltage(V/C)	2,4 lead acid battery 1,60 NiCd Battery
	Float Voltage(V/C)	2,24 lead acid battery 1,40 NiCd Battery
	Nominal Output Current	30A/60A/100A
	Max Output Current	100 % of nominal output current
	Filtering	LC Filter
GENERAL	Boost Timer	0-99.9 hours adjustable
	Cooling	Forced fans with smart fan controlling system
	Isolation Voltage	1500 or 3000VAC input/chassis and output/chassis
	Efficiency at full load	>85%
	Protection level	IP20 (Standard); IP54 (Optional)
	Cable Entry	Front Bottom
	Access to Batteries	Batteries and rectifier in the same cabinet with front access (optional)
	Circuit Breakers	Thermic-magnetic circuit breakers for input, Battery and Load (up to 100A)
Reset Button	Used for re-operation in case of failure of the system.	
DISPLAYPANEL	Measurements	LCD Display for Load Output Voltage / Current, Battery Output Voltage / Current and Line Voltage / Line Current / Frequency
	Buttons	Timer Settings, Boost Voltage Setting, Float Voltage Setting, Output Current Setting, Battery Current Setting and Reset buttons.
	Time and Date	Adjustable
	Charger Failure	Open or closed free contacts
	Low Battery	Open or closed free contacts
	Rectifier over voltage	Open or closed free contacts
	Over temperature	Open or closed free contacts
	Line Failure	Open or closed free contacts
COMMUNICATION & PARALLELING	Communication	Standard RS232 communication on real time base for remote monitoring and control. Optional RS485 / Modbus
	Paralleling	Parallel Redundant (No need for extra kit for paralleling)
OPTIONS & ACCESSORIES	Communication	Standard RS232 communication on real time base for remote monitoring and control. Optional RS485 / Modbus
	Paralleling	Parallel Redundant (No need for extra kit for paralleling)
	Communication	Standard RS232 communication on real time base for remote monitoring and control. Optional RS485 / Modbus
	Paralleling	Parallel Redundant (No need for extra kit for paralleling)
	Communication	Standard RS232 communication on real time base for remote monitoring and control. Optional RS485 / Modbus
	Paralleling	Parallel Redundant (No need for extra kit for paralleling)

	24V	48V	110V	220V
15A	-	-	-	Size 1
30A	-	Size 1	Size 1	Size 2
60A	Size 1	Size 1	Size1	Size 2
100A	Size 2	Size 2	Size2	Size 3
150A	Size 2	Size 2	Size 3	Size 4
200A	Size 3	Size 3	Size 3	Size 4
300A	Size 3	Size 3	Size 4	Size 4
500A	Size 4	Size 4	Size 4	Size 4

Dimension(mm) W*D*H	
Size 0	440*330*610
Size1	500*450*1000
Size 2	600*600*1300
Size 3	750*700*1600
Size 4	800*800*1600

NOTE: All specifications subject to change without notice.



MC-MAK Series Rectifiers

General Specifications

- ▶ These systems are produced in variety options.
For example; parallely working rectifiers, inverters, STS and battery group mounted in same cabin .
- ▶ SMPS, Hi-rect and rectifier systems which includes the battery group.
- ▶ Parallely working rectifiers with battery group.
- ▶ Parallely working inverters, rectifiers and static by-pass systems with battery working.
- ▶ Systems which has Battery group, rectifiers, inverters and distribution fuses.

