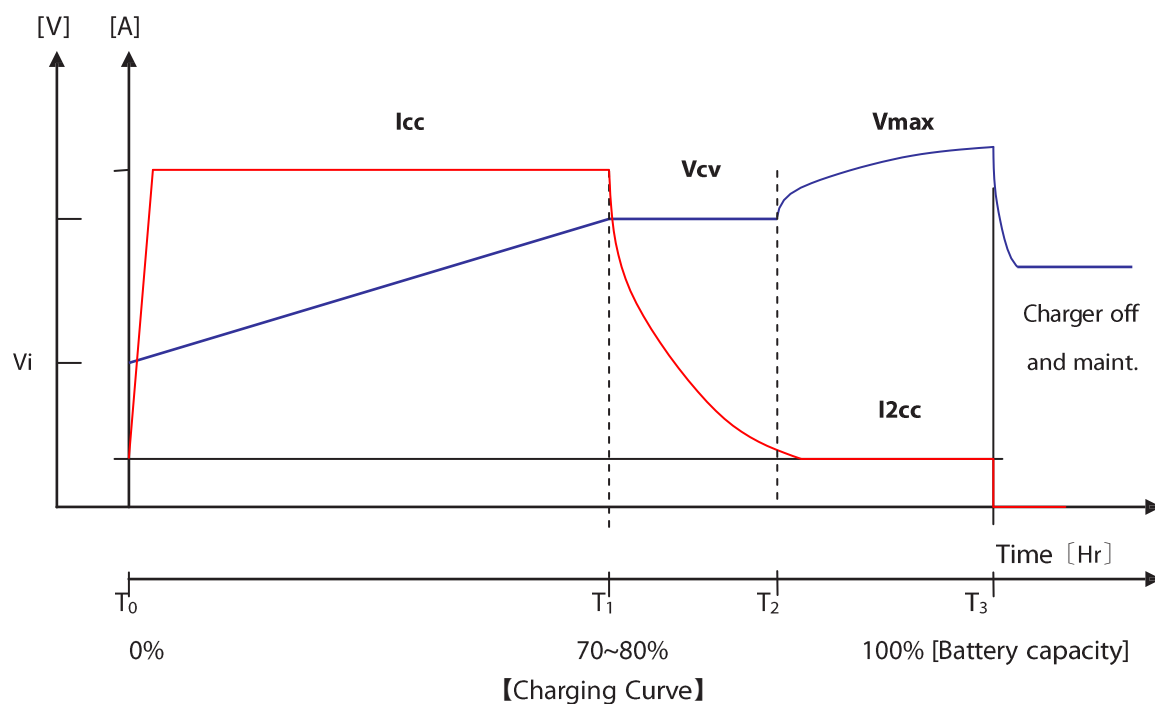


Max. Output Power/Nominal Voltage		1200Watt / 24V	
Main Technology		Switching Mode (ZVS)	
Mechanical Max. Size, Weight		286L *180W*165H(mm), 7.5Kg	
The Number of Charging Profiles		Two profiles for flooded lead acid and sealed AGM battery	
AC Input	Input Voltage	Single Phase, Auto selectable Dual AC input	
		Rated	AC 100 – 240V
		Operating	85~137VAC / 170 ~264VAC
	Frequency	50/60 Hz Operating 45 to 65 Hz	
	Input Current	17A_max at 96VAC, 8.5A_max at 192VAC	
DC Output	Output Voltage	31.8V_max, for Flooded Lead-acid Batteries 28.8V_max, for sealed AGM Batteries	
	Output Current	40A max ( Derated output current with <95VAC)	
	Current Ripple	Less than 25%	
Efficiency		89%	
Features	Current limiting	Yes	
	No spark	Yes	
	Bad cell discrimination	Yes	
	AC line connection interlock Maintenance	10A, normally closed contact	
	charging restart	25V	
Protective Function		Output is open-circuit warning (triggers when output or battery is below 4V) Output high voltage protection and warning (triggers when battery voltage is above 33.3V) Reverse polarity protection Short circuit protection Over temperature protection (Charging power is reduced when charger gets too hot) AC Input Over voltage /Under voltage protection	

LED Display	Charging cycle progress / Bad cell discrimination / Fault display
Cooling & Sealing	Convection cooling / Water-proof
Additional Features	<p><u>Reduction of output power due to internal temperature:</u> The Charger starts to reduce the output current gradually when the internal temperature gets too high. The charger stops at excessive temperature, and restarts automatically when the internal temperature decreases to a normal range.</p> <p><u>Extremely low voltage charging:</u> As long as the battery voltage is at least 4V the charger will start. Deeply discharged batteries take a longer time to charge than normal batteries and may require two charge cycles.</p>
Regulation & Standard Marking	UL, CSA, CE after customer approval of samples

## Charging profile for flooded lead acid



Voltage  $V_i$  is the initial battery voltage when charging starts.

$V_{cv} = 29V$  (Flooded lead acid),  $V_{max} = 31.8V$ ,  $I_{2cc} = 15A$

1) At start-up time  $T_0$  the charger does a check to see if the battery is in such poor condition that it will not charge or if the battery is lower voltage than the intended 24V. This is done by first determining if the battery voltage is above 18V. If the battery voltage is above 18V the charger goes into normal charging mode and proceeds to quickly ramp-up to constant current charging as defined in step 2). However, if the battery voltage is lower than 18V the charger charges at 10A for 5 minutes and monitors the battery voltage rise during this time. If the battery is a 24V battery and in good enough condition to charge the battery voltage will rise above 18V during the 5 minutes and normal charging as defined in steps 2 and on will proceed. If the battery voltage is still below 18V at the end of 5 minutes then charging will stop and the red "FAULT" LED will be lit

=> Battery voltage under 18V → FAULT LED ON--→Charge to 5minute charge.

Above 18V battery voltage UP--→Increased above 18V--→LED still ON (If Battery Voltage not increase above 18V Still LED ON). WHY?--→Notify to User battery voltage go down under 18V.

User have to check Battery Pack. Because, Battery Voltage got down under 18V.

Please, Check your Battery Pack.

2) During bulk mode from  $T_0$  to  $T_1$ , approximately 70 - 80% of battery capacity is returned. During this part of the charge cycle the charging current is held constant while the battery voltage rises.

The charging current  $I_{cc}$  generally varies between 38-40A with most batteries during this portion of charging. There is some variation of charging current due to AC input voltage and low AC voltages (less than 95VAC) may result in decreased charging current. The charger smoothly increases the charging current to the constant current value when charging starts.

3) Absorption mode charging, also called "constant voltage charging, takes place from  $T_1$  to  $T_2$ .

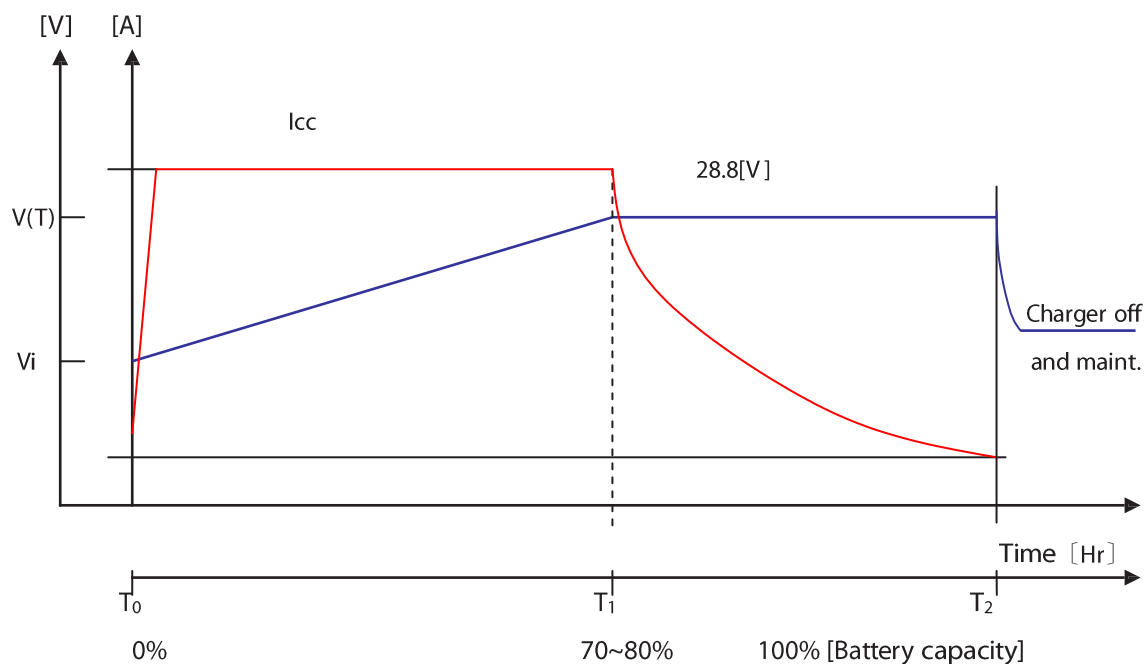
During the constant voltage phase, the charge voltage limit is regulated to  $V_{cv}$ , and the current is allowed to gradually drop.

4) The finishing or  $dV/dt$  charging mode takes place from  $T_2$  to  $T_3$ . Once the current drops to the finish rate setting  $I_{2cc}$  the charging will change from constant voltage to constant current. The value of current  $I_{2cc}$  varies depending on the charging profile selection. The charging current is held constant while the battery capacity is fully returned. Charging stops when the battery voltage is no longer increasing showing that the battery has accepted all the charge that it can.

5) After charging is complete (after  $T_3$ ), the charger is turned off and goes into maintenance mode. The batteries are maintained above the 85% charge condition when the batteries are in storage for long periods of time. If the voltage drops below 25V due to self-discharge during storage, the charger will restart and complete a charge cycle.

6) Weak battery indication after charging – if the charger has turned-off and the battery voltage drops below 25V in less than 30 minutes the red "FAULT" LED is lit indicating a bad battery. The battery is still maintained as in step 5).

### **Charging profile for sealed valve regulated AGM**



**【Charging Curve】**

Voltage  $V_i$  is the initial battery voltage when charging starts

- 1) At start-up time  $T_0$  the charger does a check to see if the battery is in such poor condition that it will not charge or if the battery is lower voltage than the intended 24V. This is done by first determining if the battery voltage is above 18V. If the battery voltage is above 18V the charger goes into normal charging mode and proceeds to quickly ramp-up to constant current charging as defined in step 2). However, if the battery voltage is lower than 18V the charger charges at 10A for 5 minutes and monitors the battery voltage rise during this time. If the battery is a 24V battery and in good enough condition to charge the battery voltage will rise above 18V during the 5 minutes and normal charging as defined in steps 2 and on will proceed. If the battery voltage is still below 18V at the end of 5 minutes then charging will stop and the red "FAULT" LED will be lit
- 2) During bulk mode from  $T_0$  to  $T_1$ , approximately 70 - 80% of battery capacity is returned. During this part of the charge cycle the charging current is held constant while the battery voltage rises. The charging current  $I_{cc}$  generally varies between 38-40A with most batteries during this portion of charging. There is some variation of charging current due to AC input voltage and low AC voltages (less than 95VAC) may result in decreased charging current. The charger smoothly increases the charging current to the constant current value when charging starts.
- 3) Absorption mode charging, also called "constant voltage charging, takes place from  $T_1$  to  $T_2$  and returns about 20% of the battery charge. During constant voltage charging the charge voltage is regulated to  $V_{cv}$ , and the current is allowed to gradually drop.
- 4) When the charging current drops below 2 to 4A charging stops and the charger goes into maintenance mode. If the voltage drops below 25V due to self-discharge during storage, the charger will restart and complete a charge cycle.
- 5) Weak battery indication after charging – if the charger has turned-off and the battery voltage drops below 25V in less than 30 minutes the red "FAULT" LED is lit indicating a bad battery. The battery is still maintained as in step 4).

**CAUTION: USER MUST CHECK THE BATTERY MANUFACTURER'S RECOMMENDED CHARGING PROFILE.**

## Procedure for Selecting Charging Profile

Before turning the charger on, unscrew the small cover on the rear of the charger to expose the charge profile selector switch.

Flooded Lead acid ←  → Sealed

Determine whether flooded or sealed type batteries are being charged and set the switch for the appropriate battery type – to the left for flooded (standard) and to the right for sealed. Replace the cover when done. The profile can be changed by turning-off AC power off (unplugging), then changing the switch, then reconnecting AC power.

### **Normal operation**

1. Connect the DC output wires to the battery.
2. Connect the power supply cord to a properly grounded 100VAC/50 or 60 Hz, 115/120VAC/60 Hz, or 230 or 240VAC/50 or 60 Hz. socket. This charger automatically senses and adjusts to the AC input voltage.
3. The charger will start automatically within a few seconds. Once the charging starts, the LED's indicate the charging progress as described in the following **Operating and Fault Codes** table. The charger will start even with severely discharged batteries (down to 4V or lower terminal voltage).
4. The charger goes into maintenance mode after the batteries are fully charged, and the 100% LED is steady "on". In this mode, the charger no longer supplies power to the batteries, but it continues to monitor battery voltage. If the voltage drops below 25V due to self-discharge during storage, the charger will re-start and complete a charge cycle.
5. Turn off the charger by disconnecting the AC cord.

Note 1) Re-starting the charge cycle with AC connection – The charger starts or re-starts with AC connection /reconnection (AC plug). The charger must be disconnected from the AC source (ALL LED's will be OFF) for about 1 minute for the charge cycle to reset and start over. If the charger is left unplugged for less than 1 minute then indeterminate or fault conditions may occur. Short AC interruptions, such as might occur during a storm, do not usually affect the charge cycle as the charger has large capacitors inside that keep voltage stored for brief periods.

Note 2) Re-starting the charge cycle with DC connection/reconnection (battery connection) - With the AC remaining plugged-in, the charger must be disconnected from the DC output (battery connection) for a minimum of 5 seconds for the charge cycle to be re-set. During the 5 seconds the charger will flash the FAULT LED indicating an output open circuit. Disconnect times less than 5 seconds result in indeterminate or fault condition

- ⇒ Battery connection open-→ 5 Sec flash.
- ⇒ Also, Charger FAULT LED→Output open warning→ 1 FLASH,
- ⇒ User check it 1 Flash and connect Battery.

Note 3) The charger is not damaged if the equipment is operated while charging. The charger's current limit function and over voltage protection allows this operation. Any and all safety issues  
GACELL A/S Sletten 17, DK-7500 Holstebro [www.gacell-power.dk](http://www.gacell-power.dk)

related to operation of the equipment while charging must be examined before use.

Note 4) The charging time is affected by numerous factors including battery Amp-Hour capacity, depth of discharge, battery temperature, and battery condition (new, old, or defective).

<b>CHRG YLW LED</b>	<b>80% GRN LED</b>	<b>100% GRN LED</b>	<b>Fault RED LED</b>	<b>CONDITION</b>
Off	Off	Off	Off	No AC power to charger
On	Off	Off	Off	Normal operation, charger is charging
On	On	Off	Off	Normal, battery is over 80% charged
Off	Off	On	Off	Normal, battery is 100% charged
X	X	X	On	Battery pack probably bad or 12V batteries. One of two situations has occurred: 1) Battery voltage was under 18V at the start of charging and did not rise above 18V after 5 minutes of charging (Note 2) 2) Charge cycle was completed but battery voltage dropped under 25V within ½ hr. (Note 3).
Off	Off	Off	One flash	Output (connection of charger to battery.) open circuit or short circuit or reverse polarity Battery voltage is too high (may be connected to wrong voltage battery)
Off	Off	Off	Two flash	Charger has timed-out at 22 hrs – battery pack probably bad or a bad cell.

Note 1) X in the table means “don’t care. LED may be off or on

Note 2) If the battery voltage is lower than 18V the charger charges at 10A for 5 minutes and monitors the battery voltage rise during this time. If the battery is a 24V battery and in good enough condition to charge the battery voltage will rise above 18V during the 5 minutes and normal charging will proceed.

If the battery voltage is still below 18V at the end of 5 minutes then charging will stop and the red “FAULT” LED will be lit. => **Do not RESTART.**

**=> FAULT LED ON under 18V→Not related 5minute charging ,Under 18V LED ON**

Note 3) If the charger has turned-off and the battery voltage drops below 25V in less than 30 minutes the red “FAULT” LED is lit indicating a bad battery. The charger will still restart a charge cycle when the voltage drops below 25V as this may help the battery to recover.

**=> CHARGER DO RESTART-→Keep on FAULT LED ON.**