



ENC

Programmable Smart Charger

Instruction Manual

0. Product Description

The ENC-120/180/360 family is Mean Well's new generation smart desktop charger, The ENC-120/180/360 family is Mean Well's new generation smart desktop charger, equipped with many of the protective features including battery over voltage, battery under voltage and reverse polarity. The latest high efficiency switching topology and microcontroller power management are utilized in their design. The family offers four selectable charging curves. With these pre-defined charging curves, the chargers are able to accommodate different battery brands and types, such as lead-acid batteries (Gel, flooded and AGM) or lithium-ion batteries (lithium-iron and lithium-manganese), by manually setting the DIP switch on the rear panel. In addition, users are allowed to build desired charging curves as well as adjusting parameters of the charger through the communication interface of the SBP-001 (not included in the package) to fulfill various specific charging applications. The factory charging curves are designed for lead-acid batteries. For other types of battery charging requirements, please contact Mean Well or our local distributors.

1. Safety Guidelines

- ⊙ Designed for charging lead-acid batteries (flooded, Gel and AGM) and some of the lithium chemistry batteries (lithium-iron and lithium-manganese).
- ⊙ The charger must be installed in a dry and well ventilated area. It should not be exposed to rain or open field.
- ⊙ The cables between charger and battery should be kept as short as possible to prevent excessive voltage drop (suggested cable length: 50cm - 100cm). Too much voltage drop will lead to longer charging period.
- ⊙ Temperature raising on case during charging is a normal behavior.
- ⊙ Dismantling or changing components of the charger is forbidden.
- ⊙ Make sure charging voltage and current meet battery specification.
- ⊙ Refrain from connecting new and old batteries in series.
- ⊙ Charger should be in the OFF mode before making battery connection or disconnection.
- ⊙ Three years warranty is provided under normal operating conditions. If failure results from improper operation, the warranty will not apply to the defective units.

2. Appearance

2.1 Front panel

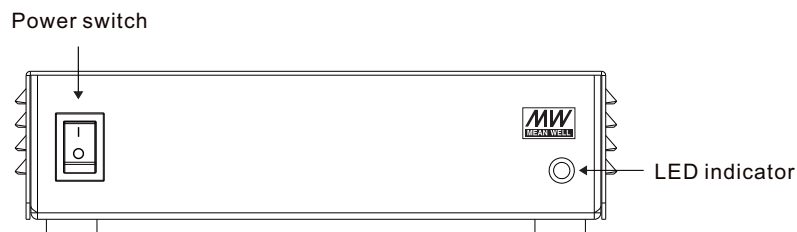


Figure 2.1 Front panel of ENC charger

2.1.1 LED indicators

LED	Description
Green(flashing)	Float (stage 3)
Orange(flashing)	Charging (stage 1 or stage 2)
None	Abnormal status (OTP or SCP)

2.2 Rear panel

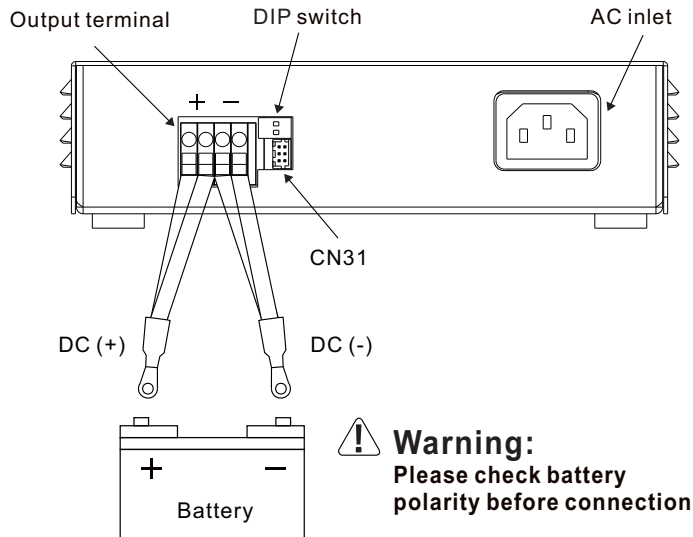


Figure 2.2 Rear panel of ENC charger


2.2.1 Pin assignment(CN31)



Pin No.	Function	Description
1	Prog- +3.3V	Installation for communication interface
2	Prog- GND	
3	Prog- RX	
4	Prog- TX	
5	RTH+	Installation for battery temperature sensor
6	RTH-	

2.2.2 Charging curve selection

ENC chargers provide a DIP switch on the rear panel used to switch different factory charging parameters. Please refer to the table below for corresponding curves on different positions of the DIP switch.

ON  OFF

DIP SW position		12V model		
1	2	Description	Vboost	Vfloat
OFF	OFF	Default, programmable	14.4	13.8
ON	OFF	Pre-defined, gel battery	14.0	13.6
OFF	ON	Pre-defined, flooded battery	14.2	13.4
ON	ON	Pre-defined, AGM battery	14.5	13.5
DIP SW position		24V model		
1	2	Description	Vboost	Vfloat
OFF	OFF	Default, programmable	28.8	27.6
ON	OFF	Pre-defined, gel battery	28.0	27.2
OFF	ON	Pre-defined, flooded battery	28.4	26.8
ON	ON	Pre-defined, AGM battery	29.0	27.0
DIP SW position		48V model		
1	2	Description	Vboost	Vfloat
OFF	OFF	Default, programmable	57.6	55.2
ON	OFF	Pre-defined, gel battery	56.0	54.4
OFF	ON	Pre-defined, flooded battery	56.8	53.6
ON	ON	Pre-defined, AGM battery	58.0	54.0

NOTE: Voltage tolerance: $\pm 2\%$

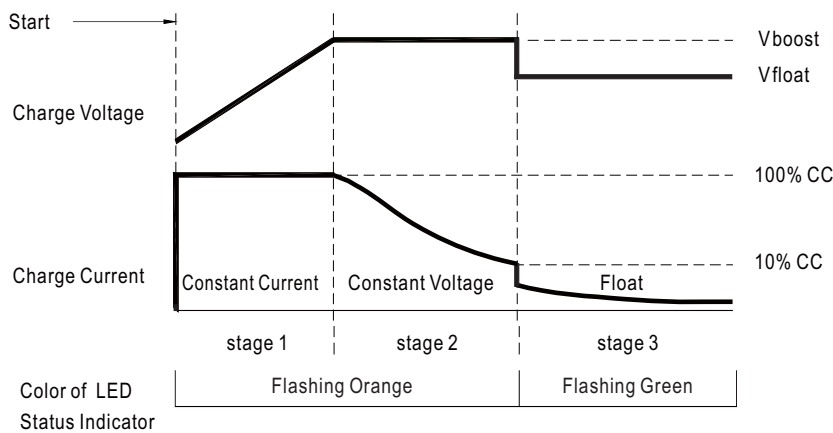
3. Assembly Procedure

- ⊙ Choose a cable with suitable wire gauge according to the charging current to connect between the charger and the battery.
- ⊙ Please make sure the charger is OFF before connecting the battery to the output terminal. (Please note that there may be a small spark when connecting).
- ⊙ Battery polarity must be connected correctly: Terminal(+) to Battery(+); Terminal(-) to Battery(-), and take notice that the positive and negative polarities are not shorted.
- ⊙ Turn the charger ON after applying AC to the charger. If the LED indicator is flashing in orange, then the battery is being charged; if the LED is flashing in green, meaning the battery is already fully charged.

4. Operation Procedure

4.1 General operation

At the beginning stage of operation, the charger provides the largest current (e.g. 8 amps for the ENC-120-12) with 14.4Vdc of output voltage (e.g. default setting of the ENC-120-12) to charge batteries, the LED indicator will flash in orange. After a period of time (probably a couple of hours, based on the capacity of the batteries), the charging current will decrease gradually. After reducing to 10% of its maximum value, the charger will go into "float charge" stage. Output voltage will drop to 13.8V (e.g. default setting of the ENC-120-12) and the LED indicator will flash in green. The relationship between charging current and charging voltage for each operation stage is shown in the curves below:



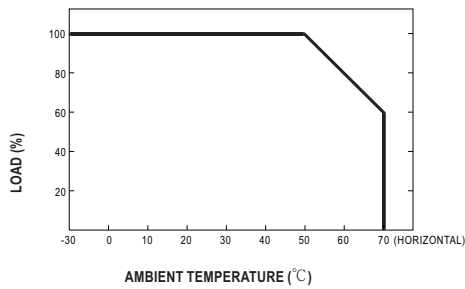
Model	Constant Current(Max.)	Constant Voltage	Float
ENC-120-12	8A	14.4V	13.8V
ENC-120-24	4A	28.8V	27.6V
ENC-120-48	2A	57.6V	55.2V
ENC-180-12	12A	14.4V	13.8V
ENC-180-24	6A	28.8V	27.6V
ENC-180-48	3A	57.6V	55.2V
ENC-240-12	16A	14.4V	13.8V
ENC-240-24	8A	28.8V	27.6V
ENC-240-48	4A	57.6V	55.2V
ENC-360-12	24A	14.4V	13.8V
ENC-360-24	12A	28.8V	27.6V
ENC-360-48	6A	57.6V	55.2V

Figure 4.1 Factory three stage charging curve setting

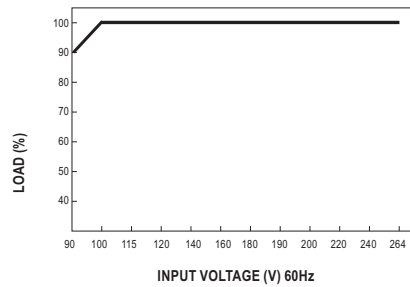
NOTE: Voltage tolerance: $\pm 2\%$, Current tolerance: Rated current $\pm 10\%$

4.2 Derating curve

4.2.1 Charging current VS ambient temperature



4.2.2 Charging current VS input voltage



4.3 Temperature compensation

The temperature sensor (NTC NSG05C250J5-500V) which comes with the charger can be connected to pin Rth+ and pin Rth- on CN31 of the rear panel to allow temperature compensation of the charging voltage, default setting is $-3\text{mV}/\text{Cell}/^\circ\text{C}$. Compensated voltages are shown as below:

	Vboost		
	TA=0°C (RTH≈17KΩ)	TA=25°C (RTH≈5KΩ)	TA=50°C (RTH≈1.73KΩ)
ENC-120-12	14.85V	14.4V	13.95V
ENC-120-24	29.7V	28.8V	27.9V
ENC-120-48	59.4V	57.6V	55.8V

NOTE: Voltage tolerance: $\pm 2\%$

5. Custom Charging Curve and Battery Temperature Compensation

The ENC chargers provide a programmable interface for the users ([SBP-001, the Smart Battery Charging Programmer](#), is required for the function). All of the charging parameters, including constant current, constant voltage, float voltage and taper current, and characteristics of battery temperature compensation can be adjusted and set.

Adjustable ranges for each model are shown as the table below:

Model	Constant Voltage		Float Voltage		Constant Current		Tapper Current		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
ENC-120	12	9V	15V	9V	$\leq \text{CV}$	2.4A	8A	0.8A	2.4A
	24	18V	30V	18V	$\leq \text{CV}$	1.2A	4A	0.4A	1.2A
	48	36V	60V	36V	$\leq \text{CV}$	0.6A	2A	0.2A	0.6A
ENC-180	12	9V	15V	9V	$\leq \text{CV}$	3.6A	12A	1.2A	3.6A
	24	18V	30V	18V	$\leq \text{CV}$	1.8A	6A	0.6A	1.8A
	48	36V	60V	36V	$\leq \text{CV}$	0.9A	3A	0.3A	0.9A
ENC-240	12	9V	15V	9V	$\leq \text{CV}$	4.8A	16A	1.6A	4.8A
	24	18V	30V	18V	$\leq \text{CV}$	2.4A	8A	0.8A	2.4A
	48	36V	60V	36V	$\leq \text{CV}$	1.2A	4A	0.4A	1.2A
ENC-360	12	9V	15V	9V	$\leq \text{CV}$	7.2A	24A	2.4A	7.2A
	24	18V	30V	18V	$\leq \text{CV}$	3.6A	12A	1.2A	3.6A
	48	36V	60V	36V	$\leq \text{CV}$	1.8A	6A	0.6A	1.8A

NOTE: Voltage tolerance: $\pm 2\%$, current tolerance: rated current $\pm 10\%$ (tolerance of the output current will be $\pm 10\%$ of the rated current no matter what current levels are set), e.g. rated current of ENC-120-12 is 8A, then there will be $\pm 0.8\text{A}$ tolerance on the setting of constant current and taper current.

6. Output Wire Gauge Selection

☉ Select an appropriate wire gauge based on rated charging current of the charger. The minimum requirements are in the table below.

AWG	CROSS SECTION(mm ²)	Max.Current(A) UL1015(600V 105°C)
12	3.309	22
14	2.081	12
16	1.309	8
18	0.823	6
20	0.517	4

7. Recommended Capacity of Battery

Model	Suggested battery capacity
ENC-120-12	30-80Ah
ENC-120-24	15-40Ah
ENC-120-48	10-20Ah
ENC-180-12	45-125Ah
ENC-180-24	25-65Ah
ENC-180-48	13-35Ah
ENC-240-12	60-170Ah
ENC-240-24	30-85Ah
ENC-240-48	15-45Ah
ENC-360-12	85-250Ah
ENC-360-24	45-125Ah
ENC-360-48	25-65Ah

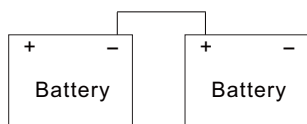
Note:

1. When the capacity of battery is larger than the recommended value, charging time will become longer but no harm will come to the battery.
2. If there are doubts on the allowable charging current for the battery, please refer to the technical data provided by the battery manufacturer or inquire the battery manufacturer.

8. Series and Parallel Connection of Batteries

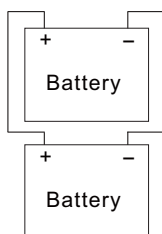
8.1 Batteries in series

Voltage can be doubled when 2 batteries are connected in series. However, the capacity (Ah) will remain the same.
For example, 2 x 12V 100Ah batteries connected in series = 24V 100Ah.



8.2 Batteries in parallel

When 2 batteries are connected in parallel, voltage remains the same and the capacity (Ah) doubles.
For example, 2 x 12V 100Ah batteries connected in parallel = 12V 200Ah



9. Troubleshooting

Failure state	Possible Cause	Suggested Solutions
Unable to charge the battery	Power switch is in the OFF position	Switch to the ON position
	Input AC voltage is too low	Make sure input source is between 90~264VAC
LED indicator does not turn Green after a long charging period	Battery is old or damaged	Replace with a new battery
	Output cables are too thin	Replace with an appropriate wire gauge

If you are not able to clear the failure condition according to the instructions, please contact Mean Well or your nearest distributors for repair service.