BENTON
CAR ACCESSORIES

9 STEP

- A Unique Battery Charger
- Fully Automatic
- Electronically safe against user errors!
- Electronically safe against battery charging and management!
- Smart Option for computerized battery charging and management!

SWITCH MODE BATTERY CHARGER

SAA091120EA

14.7V / 25A 12V/24V
14.4V / 25A 12V
29.4V / 12.5A 24V
28.8V / 12.5A 24V
13.6V / 5A SUPPLY
1.5A 16V/32V BOOST

BX-5

Product Features

All major starter battery manufacturers recommend to keep your battery fully charged during idle period.

Standby feature- Monitors current drawn by battery

No risk of over-charging

Electronically safe against user errors

Overheat protection

Fully protected against short circuit & wrong connections

Provides Manual Special Maintenance Charge(13.6V / 5A)

Spark-proof

Rescues drained batteries over 4.5V (for 12V batteries) and 16V (for 24V batteries)

Works as power Generator (13.6V/5A)

Boosts deep discharged batteries

12 Stage charging strategy – Pulse charge, 25.0A, 12.5A, 10.0A, 5.0A, 1.5A, 1.0A, Night mode charge, Boost charge (12V battery), Boost charge (24V battery), Manual Special Maintenance charge & Power Supply

BENTON® BX-5 is a unique 9-Step fully automatic switch mode battery charger and maintainer, designed for charging a variety of 12V and 24V lead-acid and 12V Lead-Calcium rechargeable batteries, widely used in boats, cars, trucks, agriculture and several other vehicles. The batteries may be of various types i.e. WET/Flooded (Liquid Electrolyte), GEL (Gelatin type Electrolyte, absorbed into the plates), AGM (Absorbed Glass Mat), MF , VRLA (Valve Regulated Lead Acid), Lead-Calcium batteries. Their capacity range from 50-500Ah (12V), 25-250Ah (24V); Lead-Calcium batteries 25-100Ah (12V). The **BENTON® BX-5** battery charger also charges batteries in cold conditions. Using state-of-the art technology, the charger enables the recharging of the batteries to almost 100% of their original capacity. It recovers slightly sulfated batteries. It diagnoses and rescues drained battery. It provides trickle charge and maintenance charging which increases battery life and gives superb performance. The **BENTON® BX-5** battery charger provides ten output options to meet numerous requirements i.e. 28.8V, 29.4V, 14.4V, 14.7V, 16V/CALCIUM, 14.4/NIGHT, 16V/BOOST, 32V/BOOST, 13.6V/MANUAL and 13.6V/SUPPLY. It has 12 Stage charging strategy i.e. Pulse charge, 25.0A, 12.5A, 10.0A, 5.0A, 1.5A, 1.0A (max), Night mode charge, Boost charge (12V battery), Boost charge (24V battery), Manual Special Maintenance charge & Power Supply. The charger also features low back current drain and low ripple.

Memory Function: The charger has unique memory function. The charger returns to last selected mode automatically when power is switched on (this feature is unavailable for SUPPLY and BOOST modes). For repetitive charging process, this is a very useful feature. However different charging mode could be selected by pressing the "MODE" button.

Night charge mode: The **BENTON® BX-5** is provided with Night charge mode. This is silent mode in which charging is performed at reduced current. After remaining in this mode about 9 hours (max), charger returns to normal charge mode. This is important feature for boat and caravan users.

Product Safety Feature

- Electronically safe against user errors. The charger will not damage vehicle electronics. It is totally safe for months-long connections and maintenance of irregularly or seasonally used batteries even while the charger is still connected to the vehicle. It provides optimal condition without damage. **No risk of over-charging!**
- Full protection against wrong connection and against short circuit ensures safe charging operation.
- Provided with Spark protection mechanism. This feature does not activate when the charger is in Supply mode. The charger will not begin operation upon connection to the battery unless charging mode has been selected. This embedded feature eliminates the possibility of a spark that often appears during connections.
- Fully controlled by internal MCU (Micro-Computer-Unit), which makes it faster, powerful, reliable and smarter. It detects the state of charge of the battery plugged into it and initiates charging.
- Splash proof (IP44). Approved for outdoor use.
- Double insulated

Battery Type & Settings

The following recommendations should only be referred to as guidelines. For precise details, you must refer to battery manufacturer for instructions.

SYMBOL	MODE	SETTINGS	DETAILS
24V	1	28.8V/12.5A	This mode is normally suitable for 24V WET, MF and GEL batteries.
24V	1 (Cold Temperature)	29.4V/12.5A	This mode is recommended for several 24V AGM batteries. It is also suitable for charging batteries in sub-zero temperatures.
Boost 24V	2	32V/1.5A BOOST	This mode is mainly applied for recovering 24V batteries with capacity range from 25-250Ah in normal condition. To recover severely discharged batteries due to stratified acid, this mode is useful. High voltage (32V max) at 1.5A is applied for a maximum period of 2 hours. Battery must be fully charged. **Caution!** High voltage may cause some water loss. For optimal efficiency, battery must be disconnected. NOT SUITABLE TO BOOST LEAD-CALCIUM BATTERY!
12V	3	14.4V/25A	This mode is normally suitable for 12V WET, MF and GEL batteries.
12V	3 (Cold Temperature)	14.7V/25A	This mode is recommended for several 12V AGM batteries. It is also suitable for charging batteries in sub-zero temperatures.
12V	4	14.4V/5A NIGHT	This mode is suitable for 12V WET, MF and GEL batteries during night time. This is normal charge mode, in which charging is performed at reduced 5A current. In order to maintain almost silence, the cooling fan is disabled. 9 Hours after remaining in this mode, charger returns to normal mode. Embedded memory feature enables charger to return in Night charge mode even in event of power failure.
Boost 12V	5	16V/1.5A BOOST	This mode is mainly applied for recovering 12V batteries with capacity range from 50-500Ah in normal condition. To recover severely discharged batteries due to stratified acid, this mode is useful. High voltage (16V max) at 1.5A is applied for a maximum period of 4 hours. Battery must be fully charged. **Caution!** High voltage may cause some water loss. For optimal efficiency, battery must be disconnected. NOT SUITABLE TO BOOST LEAD-CALCIUM BATTERY!
Manual	6	13.6V/5A MANUAL	This mode is suitable for manually maintenance of 12V batteries with a capacity range from 50-500 Ah. The charger delivers a constant voltage of 13.6V. This is maintenance mode for applications where maximum capacity from the battery is required such as Golf Carts, Floor Sweepers etc. This mode would not work, if battery is not connected with the charger.

SYMBOL	MODE	SETTINGS	DETAILS
Power Supply	7	13.6V/5A SUPPLY	BENTON® BX-5 battery charger is also used as a power supply, without attaching a battery in this mode. The charger delivers 13.6V/5A. Spark free function is inactivated. Reverse polarity protection still works.
Ca 12V	8	16V/5A Ca	This mode is suitable for 12V Lead-Calcium rechargeable batteries with a capacity range from 25-100Ah. NOT RECOMMENDED TO CHARGE A NON-CALCIUM BATTERY!

Rescuing Drained Battery
When charger is connected to a battery, before the start of charging process, the charger automatically detects the voltage of the battery. It can recover deeply discharged & drained batteries with pulse charging if the voltage is in the range of 4.5-10.5V for 12V battery or 16V-21V for 24V battery.

Abnormality Protection
In case of short-circuit, open circuit, reversed polarity connection or battery voltage below 4.5V (for 12V battery) or 16V (for 24V battery), the charger will turn-off the electronic system and will immediately reset the system back to basic position to avoid damage to battery and charger.

Overheating Protection
BENTON® BX-5 charger is protected by NTC control. During the charging process, if the charger becomes too hot, the power output is automatically reduced to protect itself from damage. The charger continues to work trickle charge. Charger increases power automatically when the ambient temperature drops.

Temperature Compensation
BENTON® BX-5 charger is supplied with temperature sensor cable which monitors the temperature of the battery. Any increase of temperature from 25°C is managed by a reduced charging voltage, and vise-versa. This ensures battery is fully charged, maintaining gassing threshold while protecting the battery from "boiling" due to over charging at high temperature or under charging of battery at low temperature.

Identification of Overlap Voltage
To treat a 14.6-21V±0.29V battery if it may be a fully charged 12V battery or deep-discharged 24V battery. **BENTON® BX-5** charger smartly identifies correct nature of battery and provides appropriate course of action. Once the selection button is pressed, charging LED shall flash "on-off" cycle in 0.5 second. Within 1-2 minutes the embedded MCU would detect change in battery voltage. If battery voltage remains at original value or rises to a higher level, system would treat it as a 24V battery, if voltage falls, it is treated as a 12V battery.

Technical Data

MODEL	BX-5
Input Voltage AC	220-240VAC, 50/60Hz
Input Operational Voltage AC	170-260VAC, 50/60Hz
Output Voltage	12V & 24V (Auto-Detect)
Input Current	4A RMS max
Efficiency	>75%
Charging Voltage	28.8V, 29.4V, 14.4V, 14.7V, 13.6V, 16.0V, 32V
Charging Current	25.0A, 12.5A, 10.0A, 5.0A, 1.5A and <1.0A
Back Current Drain *	5mA
Ripple**	Max 300mV, 0.15A
Ambient Temperature	-20°C to +50°C/-4°F to +122°F Reduced output power at higher temperature
Cooling	Fan
Type of Charger	Nine step, fully automatic, switch mode with maintenance charging
Type of Batteries	12V & 24V Lead-acid batteries (WET, MF, AGM and GEL) 12V Lead-Calcium batteries
Battery Capacity	50-500Ah (for 12V), 25-250Ah (for 24V), 25-100Ah (for 12V Lead-Calcium batteries)
Dimensions (LxWxH)	260x135x70mm
Housing Protection	IP44 (Splash proof) Outdoor use
Weight	2.600kg
Noise Level	<50 dB (Night Mode, tested from a distance of 50cm)

* = Back current drain is the amount of current drawn by the charger from battery, when the charger is connected to the battery, without power cord connected. **BENTON® BX-5** has extremely low back current drain which corresponds to 0.7 Ah per month (1mA/hr)

** = Ripple refers to interference of current and voltage. A high current ripple heats up battery and reduces life of battery. Against a linear charger, which has a current ripple of up to 400%, **BENTON® BX-5** charger's current ripple is below 2% (0.15/12V or 0.3/24V battery voltage), which is much lower than the max 5% for a sealed acid battery. Equipments connected to the battery could be damaged by high voltage ripple.

Bulk Charging Time

Battery Size (Ah)	For about 80% Charge (hours)		
	12V	24V	12V Calcium
25		5	13
50	5	10	25.5
75	7.5	15	38
100	10	20	50.5
150	15	30	
200	20	40	
250	25	50	
350	35		
500	50		

Note: Above table for reference only. Actual data may differ due to battery condition.

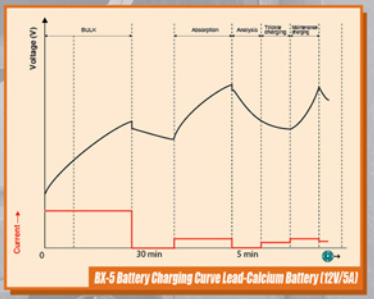
Charging Phases

BENTON® BX-5 charger performs 9-step fully automatic charging cycle.

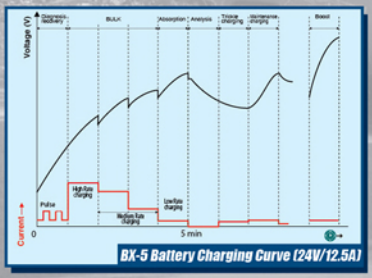
MODE	SETTINGS	SYMBOL
1	28.8V/12.5A	24V
1 (Cold Temperature)*	29.4V/12.5A	24V
2	32V/1.5A BOOST	Boost 24V
3	14.4V/25A	12V
3 (Cold Temperature)*	14.7V/25A	12V
4	14.4V/5A NIGHT	12V
5	16V/1.5A BOOST	Boost 12V
6	13.6V/5A MANUAL	Manual
7	13.6V/5A SUPPLY	Supply
8	16V/5A Ca	Ca 12V

*= Also for AGM battery under normal temperature.

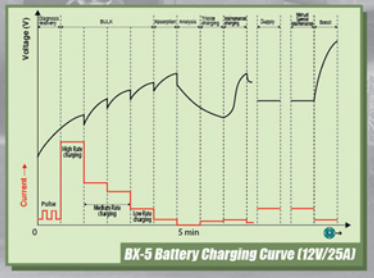
Control Panel



BX-5 Battery Charging Curve Lead-Calcium Battery (12V/5A)



BX-5 Battery Charging Curve (24V/12.5A)



BX-5 Battery Charging Curve (12V/25A)

1) Diagnosis & Recovery :

Initializes the recovery process for drained batteries by pulse charging with high & low current in order to restoring the battery capacity.

2) Bulk :

80% of energy is returned in this phase of charging. Here charger performs in two states: High Rate Charging and Medium Rate Charging.

3) Absorption :

In this phase complete charging up to almost 100% is achieved. Charger switches to trickle charge phase after sensing that the battery is truly fully charged.

4) Analysis :

After absorption phase, charger analyses condition of battery for 5 minutes to confirm the battery whether can retain charge or not. Battery that cannot retain charge with warning indication by flashing of "FAL" on digital display.

5) Trickle Charge :

Battery is fully charged and ready to use. If the battery needs more current, the charger will switch to Maintenance Charge phase.

6) Maintenance Charge :

As charger continuously monitors the terminal voltage in order to determine if a maintenance charging should be initiated. If the battery is loaded and/or terminal voltage falls below 12.8V (for 12V battery) or 25.6V (for 24V battery), the charger starts a maintenance cycle until voltage reaches to 14.4V (for 12V battery) , 16V (for 12V Lead-Calcium battery) or 28.8V (for 24V battery). The maintenance charging is discontinued.

7) Boost :

To recover severely discharged batteries Boost mode is a useful feature. In this mode, lead sulfate crystals are broken down within the battery cells and become active electrolyte again, which helps extend the battery life. It is recommended to use Boost mode periodically for optimal performance of the battery.

For 24V battery

High voltage (32V max) at 1.5A is applied for a maximum period of 2 hours. Upon completion of Boost stage it would switch over to normal charging setting (28.8V).

For 12V battery

High voltage (16V max) at 1.5A is applied for a maximum period of 4 hours. Upon completion of Boost stage it would switch over to normal charging setting (14.4V).

8) Manual Special Maintenance 13.6V :

BENTON® BX-5 charger provides a constant voltage at 13.6V and current up to 5.0A. This is suitable for maintenance of 12V battery where maximum capacity from the battery is required such as Golf Carts, Floor Sweepers etc using Float charge approach at 100% of charge. Charger features electronic overload protection, which activates if battery voltage falls below 4.5V and current to around 6A (max).

9) Supply :

BENTON® BX-5 battery charger is also used as a power supply with maximum capacity of 13.6V/5A. In this mode spark free function is inactivated. However reverse polarity protection function still works. If output voltage drops to 12.0V or below, charger shall cut off output power.

Standby feature :

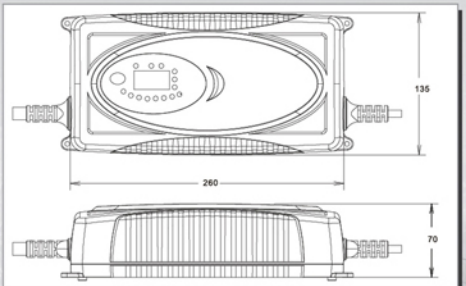
When battery remains connected with vehicle's wiring system, during the trickle mode, circuits continuously monitor the current drawn by the battery.

BENTON® BX-5 is fully interactive

charger which adjusts itself to changing current and voltage requirement to charge and maintain the battery.

Mounting & Product dimensions

The charger is easy to fix using four screws. Please refer to product drawing.



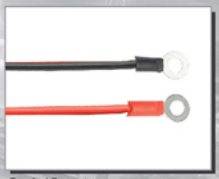
Application

Equipment

BENTON® BX-5 charger is supplied with colour coded lead with heavy duty clamps for bench charging. Or with colour coded lead with eyelet terminals (Ø8.5mm) for permanent attachment to the battery posts. The charger is equipped with long cable with temperature sensor.

Quick Contact Battery Leads with Clamps

or



Terminal Connectors

Temperature Sensor

Declaration of Compliance

Tested and approved by TÜV SÜD and conforms to EN 60335-2-29, EN 60335-1/A13, EN 62233, N 55014-1, EN 55014-2/A1, EN 61000-3-2, EN 61000-3-3/A2, AS/NZS CISPR 14.1:2003, AS/NZS 60335.2.29:2004 Inc A1.

BENTON CAR ACCESSORIES

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