POWERTECH PLUS

- A Unique Battery Charger
- Automatically Diagnoses, Recovers, Charges, Maintains your battery for months.....
- Fully Automatic
- Electronically safe against user errors!

7 STEP

SWITCH MODE BATTERY CHARGER

- Charges 12V & 24V Batteries
- MCU controlled, fully INTERACTIVE
- Returns to last selected Mode when restarted
- Fully automatic from Charge to Maintenance!!
- Charges WET/Flooded, GEL, AGM type Sealed Acid Batteries
- Automatically Diagnoses, Recovers, Charges & Maintains batteries for months....
- Six Options – 28.8V, 29.4V, 14.4V, 14.7V, 13.6V/SUPPLY and 16V BOOST

24V 12V

3.5 Amp 14-120 Ah | 7.0 Amp 14-230 Ah

APP.No:Q080734

N287

Outdoor IP65

28.8V/3.5A 24V | 29.4V/3.5A 24V | 14.4V/7A 12V | 14.7V/7A 12V | 13.6V/5A SUPPLY | 16V/1.5A BOOST

MB-3606

* = 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. **MB-3606** 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 upto 400%, **MB-3606** 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.

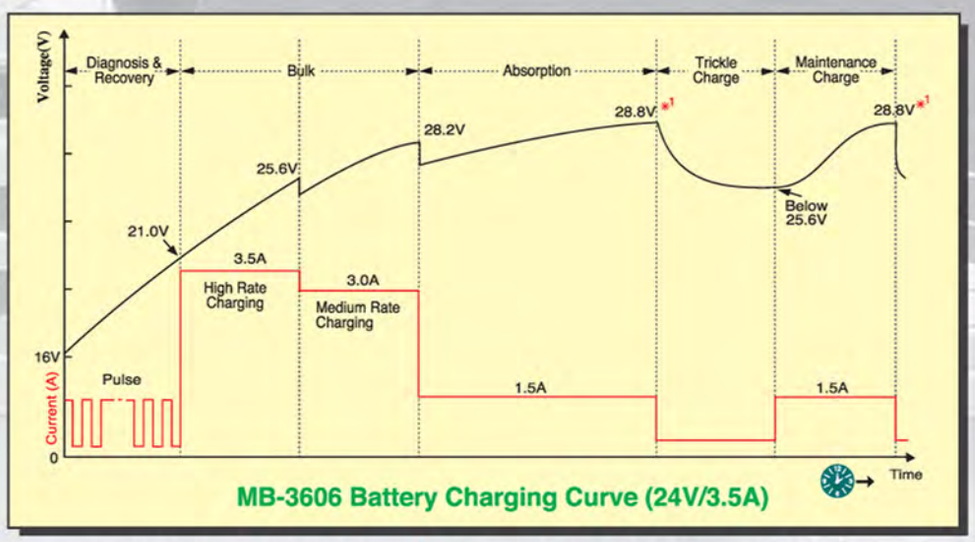
Bulk Charging Time

Battery Size (Ah)	For about 80% Charge (hours) 12V	24V
14	2.5	4.9
60	7.5	15
100	12	24
120	15	30
230	29	

Charging Phases

POWERTECH PLUS **MB-3606** charger performs 7-step fully automatic charging cycle.

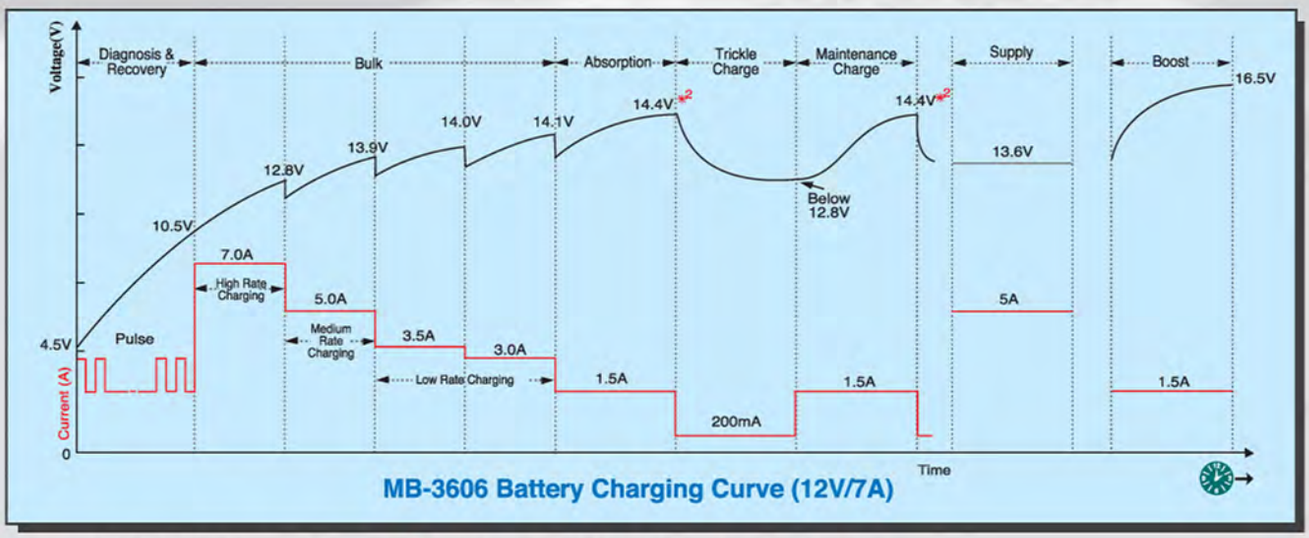
MODE	SETTINGS	SYMBOL
1	28.8V/3.5A	
2	29.4V/3.5A	
3	14.4V/7A	
4	14.7V/7A	
5	13.6V/5A SUPPLY	
6	16V/1.5A BOOST	



MB-3606 Battery Charging Curve (24V/3.5A)

* In case of cold weather charging , *1 voltage refers to 29.4V, instead of 28.8V

Packing Illustration



MB-3606 Battery Charging Curve (12V/7A)

* In case of cold weather charging, *2 vol tage refers to 14.7V, instead of 14.4V

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.
- Dust and splash proof (IP65) approval. Outdoor use.
- Double insulated

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. If voltage is below 8V (for 12V battery) and 16V (for 24V battery) the **MB-3606** charger will not start due to its internal safety circuit. It initiates pulse charging mode if the voltage is in the range of 4.5V±0.5V to 10.5V±0.25V (for 12V battery) and 16V±0.25V to 21V±0.25V (for 24V battery). Once voltage of battery rises to 10.5V±0.25V (for 12V battery) or 21V±0.25V (for 24V battery) charger changes over to previously selected charging mode. Now the battery can be charged faster and safely. Most drained batteries can be charged and used again using this procedure.

Abnormality Protection

In case of short-circuit, open circuit, reversed polarity connection or battery voltage below 4.5V±0.5V (for 12V battery) or 16V±0.25V (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

MB-3606 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.

Identification of Overlap Voltage

To treat a 14.6-21V±0.25V battery if it may be a fully charged 12V battery or deep-discharged 24V battery. **MB-3606** charger smartly identifies correct nature of battery and provides appropriate course of action. Once the selection button is pressed, 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	MB-3606
Input Voltage AC	220-240VAC, 50/60Hz
Output Voltage	12V & 24V (Auto-select)
Input Current	1.5A RMS max
Efficiency	>75%
Charging Voltage	28.8V±0.25V or 29.4V±0.25V or 14.4V±0.25V or 14.7V±0.25V or 13.6V±0.25V or 16.5V±0.25V
Charging Current	7.0A±10% or 5.0A±10% or 3.0A±10% or 1.5A±10%
Back Current Drain*	<5mA
Ripple**	Max 150mV, 0.3A
Ambient Temperature	-20°C to +50°C/-4°F to +122°F, Reduced output power at higher temperature
Type of Charger	Seven step, fully automatic, switch mode with maintenance charging
Type of Batteries	12V & 24V Lead-acid batteries (WET, MF, AGM and GEL)
Battery Capacity	14-230Ah (for 12V), 14-120Ah (for 24V)
Dimensions (LxWxH)	201x91x51mm
Housing Protection	IP65 (Dust and Splash proof) Outdoor use
Weight	0.912kg
Noise Level	<50 dB (Tested from a distance of 50cm)

Product Features

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

Standby feature- Monitors current drawn by battery

No risk of over-charging

Electronically safe against user errors

Spark-proof

Overheat protection

Fully protected against short circuit & wrong connections

Works as power Generator (13.6V/5A)

Boosts deep discharged batteries (4.5V)

10 Stage charging strategy – Pulse charge, 7.0A, 5.0A, 3.5A, 3.0A, 1.5A, 200mA, Boost charge, Maintenance & Power Supply

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

POWERTECH PLUS **MB-3606** is a unique 7-Step fully automatic switch mode battery charger and maintainer, designed for charging a variety of 12V and 24V SLA (sealed lead acid) batteries, widely used in boats, cars, trucks 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) batteries. Their capacity range from 12V/14Ah to 12V/230Ah and 24V/14Ah to 24V/120Ah. The **MB3606** 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 sulphated batteries. It diagnoses and rescues drained battery. It provides trickle charge and maintenance charging which increases battery life and gives superb performance. The **MB-3606** battery charger provides six output options to meet numerous requirements i.e. 14.4V, 14.7V, 28.8V, 29.4V, 13.6V/SUPPLY and 16V/BOOST. It has memory function. The charger returns to last selected mode automatically when power is switched on (this feature is unavailable for 13.6V/SUPPLY and 16V/BOOST mode). For repetitive charging process, this is a very useful feature. However different charging mode could be selected by pressing the "MODE" button. It also features low back current drain and low ripple.

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
	1	28.8V/3.5A	This mode is normally suitable for 24V WET, MF and GEL batteries.
	2	29.4V/3.5A	This mode is recommended for several 24V AGM batteries. It is also suitable for charging batteries in sub-zero temperatures.
	3	14 4V/7A	This mode is normally suitable for 12V WET, MF and GEL batteries.
	4	14.7V/7A	This mode is recommended for several 12V AGM batteries. It is also suitable for charging batteries in sub-zero temperatures.
	5	13.6V/5A SUPPLY	a) Maintenance of 12V SLA batteries: This mode is suitable for maintenance of 12V batteries with capacity range from 14-230Ah. 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. b) Power source: **MB-3606** 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. However reverse polarity protection function still works.
	6	16V/1.5A BOOST	This mode is mainly applied for recovering 12V batteries with capacity range from 14-230Ah in normal condition. To recover severely discharged batteries due to stratified acid, this mode is useful. High voltage (17V max) at 1.5A is applied for a maximum period of 3 hours. A fully charged battery gives faster result. High voltage may cause some water loss, hence this mode should be handled carefully. For optimal efficiency, battery must be disconnected

1) Diagnosis & Recovery :

As soon charging instruction is given to the charger, the unique diagnostic function automatically checks status of battery (detects voltage). If a deeply discharged battery's voltage is over 4.5V±0.5V (for 12V battery) or 16V±0.25V (for 24V battery), charger begins pulse charging with 3A high current and 1.5A low current to recover it, which terminates when voltage reaches to 10.5V±0.25V (for 12V battery) or 21V±0.25V (for 24V battery). At this stage or if voltage of a battery is over 10.5V±0.25V (for 12V battery) or 21V±0.25V (for 24V battery) at the beginning of the process, the charger skips pulse charging and it switches over to pre-selected charging mode.

2) Bulk :

80% of energy is returned in this phase of charging. Here charger performs in multi-stages:

For 24V battery

a) **High Rate Charging:** Charger delivers constant current of 3.5A until the voltage reaches to 25.6V

b) **Medium Rate Charging:** Charger delivers constant current of 3.0A until the voltage reaches to 28.2V at which point the charger switches to Absorption phase.

For 12V battery

a) High Rate Charging: Charger delivers constant current of 7.0A until the voltage reaches to 12.8V

b) Medium Rate Charging: Charger delivers constant current of 5.0A until the voltage reaches to 13.9V, at this level constant current is 3.5A until voltage reaches to 14.0V. Finally charger delivers 3.0A current until voltage reaches to 14.1V at which point the charger switches to Absorption phase. Since current is not delivered at highest constant level, **MB-3606** charger will minimize the heating up of the battery, and hence will eliminate the build up of gases. This ensures more efficient and safer performance.

3) Absorption :

Use of a constant high current for extended periods of time risks gassing the battery. Therefore a constant low charging current is given at 1.5A to raise voltage from 28.2V to 28.8V (for 24V battery) and 14.1V to 14.4V (for 12V battery). 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) Trickle Charge :

Battery is fully charged and ready to use. The battery will signal to the charger and will only take enough current to sustain small loads such as alarms etc or current leaks in the vehicle wiring circuit. Very low current of 200mA is given to the battery. When voltage drops below 25.6V (for 24V battery) or 12.8V (for 12V battery), monitoring circuit senses that battery needs more current to maintain its charge than available in trickle charge phase. The charger switches to Maintenance charge phase.

5) 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 25.6V (for 24V battery) or 12.8V (for 12V battery), the charger starts maintenance charging pulse at constant 1.0A until voltage reaches to 28.8V (for 24V battery) or 14.4V (for 12V battery). Now maintenance charging is discontinued. Cycle of trickle charging and maintenance charging is repeated indefinitely to keep battery in good condition when it is not in use and enables charger to be left connected indefinitely.

6) Supply 13.6V :

MB-3606 charger provides a constant voltage at 13.6V and current upto 5A. This is suitable for maintenance of 12V battery using Float charge approach at 100% of charge. **MB-3606** 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. It has electronic overload protection, which activates if output voltage from the charger falls below 4.5V and current to around 6A (max).

7) Boost 16V :

To recover severely discharged 12V batteries this mode is useful. High voltage (17V max) at 1.5A is applied for a maximum period of 3 hours. At finish of this stage it would switch to normal charging setting (14.4V).

Standby feature :

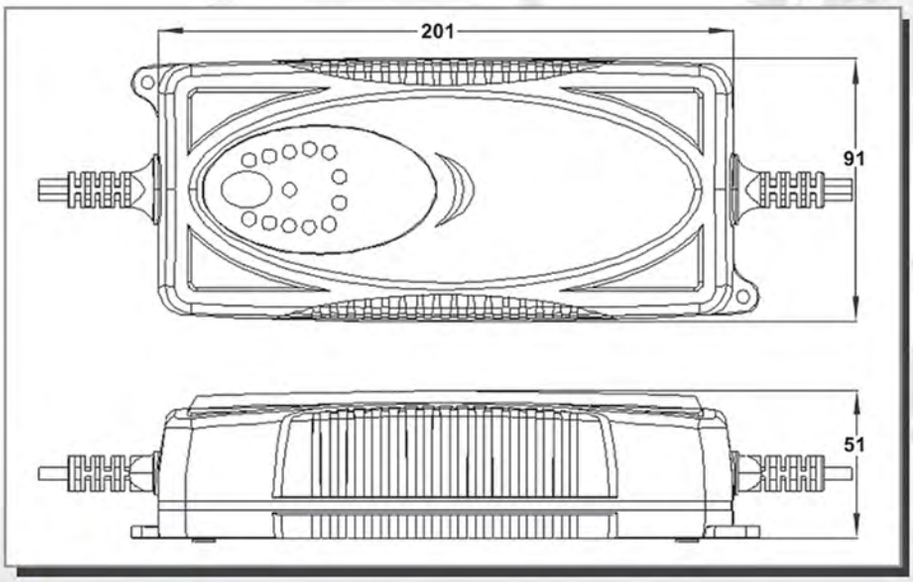
When battery remains connected with vehicle's wiring system, during the trickle mode, circuits continuously monitor the current drawn by the battery.

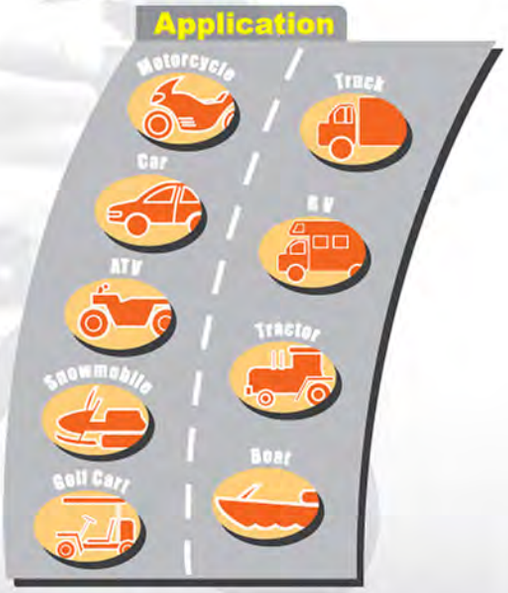
POWERTECH PLUS MB-3606 is fully interactive

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

Mounting & Product dimensions

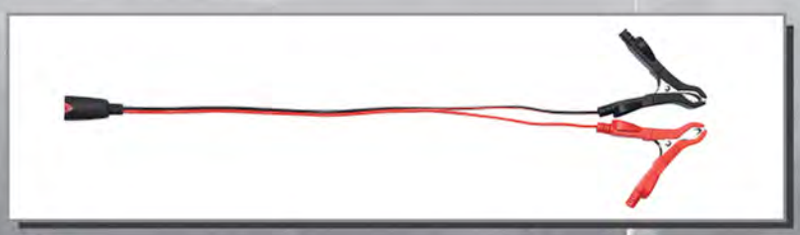
The charger is easy to fix using two screws. Please refer to product drawing.





Equipment

MB-3606 charger is supplied with two detachable and interchangeable colour coded lead sets- one with clamps for bench charging and other with eyelet terminals (Ø6.3mm) with in-line battery protection plug-in fuse (10A) for permanent attachment to the battery posts to allow quick connection/disconnection through snap-connector.



Declaration of Compliance

Tested and approved by TÜV GS and conforms to AN/NZS 60335.2.29 2004, with certificate of approval Q080734

POWERTECH PLUS

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