**ADELSYSTEM**

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Instruction Manual CB60_REV4.docx

# CB60

Charge & Testing Battery Charger

# Instruction Manual

Thank you for choosing one of our products for your work.
We are certain that it will give the utmost satisfaction and be a notable help on your job and application.

## Product Description

The Smart Battery Charger CB60 is available in two versions: 12V 5A and 24V 3A (5A Max). The CB60 series is a family of battery chargers based on the "Switching technology" and "Battery Care philosophy" that have been part of Adel System's know-how for 30 years. This experience has led to the development of this advanced multi-stage, fully automatic battery charger, which is suitable for meeting the most advanced requirements of battery manufacturers. The Battery Care concept is based on algorithms that implement fast and automatic charging, optimization of battery charging during all charging stages, recovery of discharged battery, and real-time diagnostics during installation and operation. The real-time diagnostics system discreetly monitors the battery and detects its faults, such as shorted elements, accidental reverse polarity connections, battery disconnection, and incorrect voltage. Such faults are indicated by intuitive flashing of the diagnostic LED. Each device is suitable for all battery types: default curves can be set for open lead-acid, AGM, Gel and NiCd batteries. A rugged enclosure with bracket for DIN rail and wall mounting provides IP20 protection.

## 1    Safety and warning notes

**WARNING** – Explosion Hazard. Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
**WARNING** – Explosion Hazard. Substitution of components may impair suitability for class I, Division 2.
**WARNING** – Switch off the system before connecting the module. Never work on the machine when it is live. The device must be installed according to EN61010 or EN62368-1. It must be possible to disconnect the device with a suitable isolating facility outside the power supply unit. Danger of fatal Injury!
**WARNING** – The device is equipped whit an internal fuse. If the internal fuse blows up (fails opens) most likely there is a fault in the device. If this failure occurs, the device must be returned to the factory.

## 2    How to Install
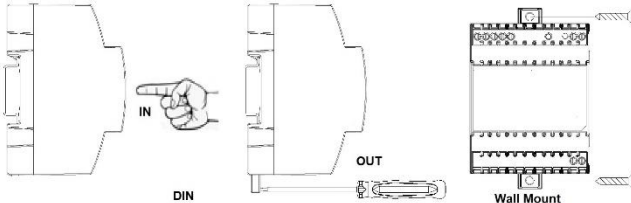
### 2.1    Mounting



Fig. 1 – Drawing of the CB60 series battery chargers

### 2.2    Din Rail or Panel Mounting

Fig. 1 shows a dimensional drawing of the CB60. It is possible to mount the device on Din rail or panel and fix it by 2 screws 2.9x8-16. There is no limit to the Panel thickness.

### 2.3    How to Supply the device

The CB60 battery chargers have a single-phase input and can operate in the range 90 to 305 VAC; therefore, they are suitable for standard 110, 230 and 277 VAC systems.

### 2.4    Device Connection (Fig.2)
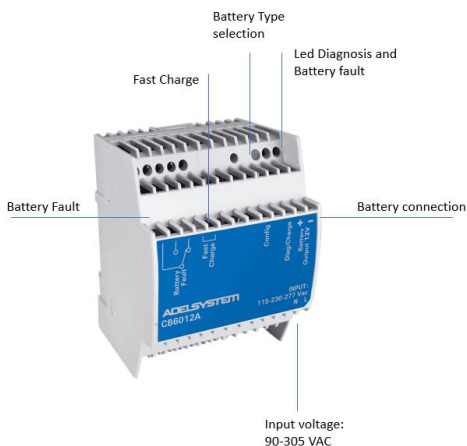


### 2.5    Connection terminal and wiring

The following cable cross-sections may be used:

| | Solid (mm2) | Stranded (mm2) | AWG | Torque (Nm) | Stripping Length |
|---|---|---|---|---|---|
| In: | 0.2 – 2.5 | 0.2 – 2.5 | 24 – 14 | 0.5 – 0.6 Nm | 7 mm |
| Out: | 0.2 – 2.5 | 0.2 – 2.5 | 24 – 14 | 0.5 – 0.6 Nm | 7 mm |

Screw type terminal block, 2.5 mm$^2$. Wiring terminal shall be marked to indicate the proper connection for the power supply. For supply connections use copper cables only, use wires suitable for at least 75°C.

## 3    Functionality

The CB60 battery chargers implement a multi-stage battery charging technique to ensure optimal battery performance and health. An additional feature, the power function, can be activated via the user interface and allows the output voltage to be available even when the battery is not connected. Otherwise, when the battery is not connected, the battery output terminals of the CB60 are devoid of voltage.
The user interface of the CB60 charger consists of a button and a multicolor LED. It shows the activity of the device and allows you to view and change the configuration of the device. By default, the CB60 is configured to operate with an open lead-acid battery and the power function is disabled.

### 3.1    Charging

The normal indication of the user interface: when the battery is charging, the device signals the charging phase with a continuous GREEN flashing, with a frequency that depends on the charging phase in progress. Conversely, if a fault is active, the device displays a sequence of ORANGE flashes followed by a pause.

| Device status | State | LED Diagnosis | LED Color |
|---|---|---|---|
| Charging | Recovery | 5 blinks / sec | Green |
| | Bulk | 2 blinks / sec | Green |
| | Absorption | 1 blink / sec | Green |
| | Float | 1 blink / 2 sec | Green |
| Auto Diagnosis Fault | Reverse polarity or wrong battery voltage | 1 blink / pause | Orange |
| | Battery not connected | 2 blinks / pause | Orange |
| | Battery with shorted cells | 3 blinks / pause | Orange |

Table 1 – LED signaling and the corresponding device activity

Type of charging it is current-limited and constant-voltage, IUoU profile in conformity to DIN41773.
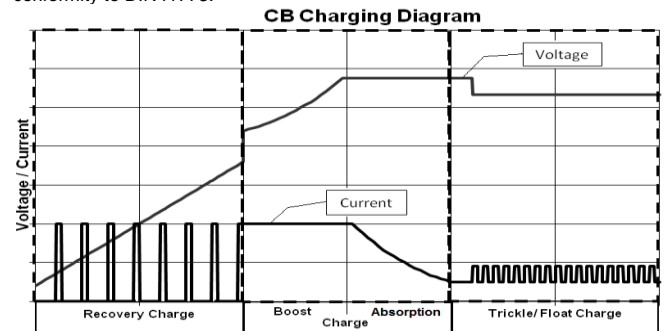


### 3.2    Displaying the current device configuration

While the user interface is showing the device activity, press briefly (less than 1sec) the pushbutton to display the Battery Chemistry. The device will display the chemistry by means of a number of GREEN LED blinks followed by a pause, immediately followed by the Power Supply configuration enabling status, by means of a number of RED blinks followed by a pause, according to Table 2:

| | State / Type | LED Diagnosis | LED Color |
|---|---|---|---|
| Chemistry | Open Lead | 1 blink / pause | Green |
| | AGM Lead | 2 blinks / pause | Green |
| | GEL Lead | 3 blinks / pause | Green |
| | NiCd | 4 blinks / pause | Green |
| Power supply function | Disabled | 1 blink / pause | Red |
| | Enabled | 2 blinks / pause | Red |

Table 2 – Device configuration display and program

The user interface then automatically resumes the normal display of device activity. The ongoing battery charging process is not interrupted or affected in any way during the device configuration display.

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3.3 **Programming the device configuration:**

Note that device programming is possible only after the device is turned on, when the battery is not connected. While the user interface shows device activity, to enter programming mode, press the button for more than 2 seconds until the LED flashes ORANGE. When you release the button, the LED flashes once in GREEN followed by a pause. This means that the battery chemistry is open lead. Press the button repeatedly to scroll through the chemistries to the desired one-the LED displays a number of GREEN flashes corresponding to the chemistry according to Table 2. Confirm by pressing the button for more than 2 seconds when the desired chemistry is displayed. The LED flashes GREEN to indicate that the chemistry has been tentatively set. Note that the chemistry must be selected: a short press of the button when NiCd is displayed will restart the chemistry selection from Open Lead. After confirming the chemistry with a long press, the enabling state of the power function can be selected with the same logic, except that the LED will flash RED. When the desired option (enabled or disabled) is displayed, long press the button to confirm the selection-the LED will flash RED for confirmation.

When programming is completed, the device summarizes the new configuration as described in "Displaying the current device configuration," then resumes the normal display of device activity.

**NOTE** that the entire programming process must be completed in order for the configuration to be confirmed and maintained even during power-cycling. If the button is not pressed for 60 seconds during the programming process, the programming process stops and the device returns to displaying device activity without changing settings.

# 4 Standards and Certification

**4.1 Immunity and Emission**

The CE mark in conformity to EMC 2014/30/EU: Electromagnetic Compatibility Directive; 2014/35/EU: Low Voltage Directive; ROHS 2011/65/EU: Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS), as amended by 2015/863/EU

- EMC Immunity: EN61000-6-2
- EMC Emission: EN61000-6-3, EN 55022 Class B

**4.2 Electrical Safety for mounting**

According to:

- Electrical Equipment for Machinery EN 60204
- Electrical safety (of information technology equipment) IEC/EN EN62368-1.
- Safety requirements for electrical equipment for measurement, control and Laboratory use IEC/EN 61010

# ADELSYSTEM

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## 5  Technical Data CB6024A

| | |
|---|---|
| Nominal Input Voltage | 100 – 240 – 277 Vac |
| UL ratings | 100 – 240 Vac |
| Input Voltage range | 90 – 305 Vac |
| Inrush Current | ≤ 50  A |
| Frequency | 47 – 63 Hz |
| Input Current | 1.3 A (100 Vac) 0.7 A (240 Vac) 0.65 A (277 Vac) |
| Internal Fuse | 2.5 A |
| External Fuse (recommended) | 10 A (MCB curve C) |

### 5.1  Battery Charger Output

| | |
|---|---|
| Fast/Boost Charge | 28.2 V (Lead) 29 V (Ni-Cd) |
| Recovery Charge | 2 – 20 V |
| Charging Current In (Tª ≤ 40°C) | 3 A ± 5% (5 A max) |

### 5.2  Battery Tester

| | |
|---|---|
| Battery Detection of element in short circuit | Yes |
| Reverse polarity protection | Yes |
| Battery Disconnected (Protection No Spark) | Yes |
| Battery Voltage Wrong | Yes |
| End of charge control | Yes |

### 5.3  Generic Output Data

| | |
|---|---|
| Max. time Bulk-Absorption Charge (typ. At In) | 16 h |
| Min. time Bulk Charge (typ. At In) | 2  min. |
| Float Charge: Battery type can be configured pushing the button at switch-on. (V/cell) | 2.23 V (Open Lead) 2.25 V (AGM) 2.30 V (Gel) 1.4V (Ni-Cd)"20 cell" |
| End of charging current to Float (Bulk & Absorption charge) | 300 mA |
| Charging current limiting $I_{adj}$ | No |
| Quiescent Current (Input main Voltage ON) | ≤ 5mA |
| Quiescent Current (Input main Voltage OFF) | 0mA (Vbat < 26.3V) |
| Remote Charge Input Control Fast/Boost charge | Terminal Block Contact |
| Power Supply function can be configured pushing the button at switch-on | Yes |
| Efficiency (50% of In) | 89% |
| Dissipation Power load max (W) | 9 |
| Residual Ripple | ≤ 50 mVpp |
| Charging Curve automatic:  IUoU | 4 stage |
| Short-circuit protection) | Yes |
| Over Load protection | Yes |
| Overheating Thermal Protection | Yes |
| Over Voltage Output protection | (Typ. 35Vdc) |
| Max. time Bulk-Absorption Charge (typ. At In) | 16 h |
| Min. time Bulk Charge (typ. At In) | 2  min. |

### 5.4  Connection and Monitoring
#### 5.4.1  Signal Output (voltage-free contact)

| | |
|---|---|
| Mains not available | Yes |
| Low Battery | Yes |
| Faulty Battery | Yes |

| | |
|---|---|
| **Type of Signal Output Contact (free switch contact)** | |
| Max. current can be switched (EN60947.4.1): Max. DC1: 30 Vdc 1 A; AC1: 60 Vac 1A Min.1mA at 5 Vdc | |

### 5.5  General Data

| | |
|---|---|
| Insulation voltage (In / Out) | 4000 Vac |
| Protection Class (EN/IEC 60529) | IP20 |
| Protection class | II |
| Reliability: MTBF IEC 61709 | > 300.000 h |
| Pollution Degree Environment | 2 |
| Connection Terminal Blocks screw type | 2.5mm² (24–14AWG) |
| Housing material | Polycarbonate |
| Dimensions (w-h-d) | 72x90x61 mm |
| Weight | 0.30 Kg approx. |

### 5.6  Climatic Data

| | |
|---|---|
| Ambient temperature Operation | -25 ÷ +70°C |
| Ambient temperature Storage | -40 ÷ +85°C |
| Humidity at 25 °C  no condensation | 95% to 25°C |
| Cooling | Auto Convection |
| Vibration IEC60068-2-6 | 15-150 Hz: 1g 1 oct/min X,Y,Z axes |
| Shock IEC 60068-2-27 | 10g 6ms 3 bumps / direction |

## 6  Technical Data CB6012A

| | |
|---|---|
| Nominal Input Voltage | 100 – 240 – 277 Vac |
| UL ratings | 100 – 240 Vac |
| Input Voltage range | 90 – 305 Vac |
| Inrush Current | ≤ 50 A |
| Frequency | 47 – 63 Hz ±6% |
| Input Current | 1.3 A (100 Vac) 0.7 A (240 Vac) 0.65 A (277 Vac) |
| Internal Fuse | 2.5 A |
| External Fuse (recommended) | 10 A (MCB curve C) |

### 6.1  Battery Charger Output

| | |
|---|---|
| Fast/Boost Charge | 14.1 V (Lead) 14.5 V (Ni-Cd) |
| Recovery Charge | 2 – 10 V |
| Charging Current In | 5 A ± 5% |

### 6.2  Battery Tester

| | |
|---|---|
| Battery Detection of elements in short circuit | Yes |
| Reverse polarity protection | Yes |
| Battery Disconnected detection (Protection No Spark) | Yes |
| Wrong battery voltage detection | Yes |
| End of charge control | Yes |

### 6.3  Generic Output Data

| | |
|---|---|
| Max. time Bulk-Absorption Charge (typ. At In) | 16 h |
| Min. time Bulk Charge (typ. At In) | 2 min. |
| Float Charge: Battery type can be configured pushing the button at switch-on. (V/cell) | 2.23 V (Open Lead) 2.25 V (AGM) 2.30 V (Gel) 1.4V (Ni-Cd) "10 cell" |
| End of charging current (Bulk & Absorption charge) | 300mA charging current |
| Charging current limiting $I_{adj}$ | No |
| Quiescent Current (Input main Voltage ON) | ≤ 5mA |
| Quiescent Current (Input main Voltage OFF) | 0mA (Vbat < 26.3V) |
| Remote Charge Input Control Fast/Boost charge | Terminal Block Contact |
| Power Supply function can be configured pushing the button at switch-on | Yes |
| Efficiency (50% of In) | 84% |
| Dissipation Power load max (W) | 9 |
| Residual Ripple | ≤ 50 mVpp |
| Charging Curve automatic:  IUoU | 4 stage |
| Short-circuit protection) | Yes |
| Over Load protection | Yes |
| Overheating Thermal Protection | Yes |
| Over Voltage Output protection | (Typ. 35Vdc) |
| Quiescent Current (Input main Voltage ON) | ≤ 5mA |
| Quiescent Current (Input main Voltage OFF) | 0mA (Vbat < 26.3V) |

### 6.4  Connection and Monitoring
#### 6.4.1  Signal Output (voltage-free contact)

| | |
|---|---|
| Mains not available | Yes |
| Low Battery | Yes |
| Faulty Battery | Yes |

| | |
|---|---|
| **Type of Signal Output Contact (free switch contact)** | |
| Max. switching current (EN60947.4.1): Max. DC1: 30 Vdc 1 A; AC1: 60 Vac 1A Min.1mA at 5 Vdc | |

### 6.5  General Data

| | |
|---|---|
| Insulation voltage (In / Out) | 4000 Vac |
| Protection Class (EN/IEC 60529) | IP20 |
| Protection class | II |
| Reliability: MTBF IEC 61709 | > 300.000 h |
| Pollution Degree Environment | 2 |
| Connection Terminal Blocks screw type | 2.5mm² (24–14AWG) |
| Housing material | Polycarbonate |
| Dimensions (w-h-d) | 72x90x61 mm |
| Weight | 0.30 Kg approx. |

### 6.6  Climatic Data

| | |
|---|---|
| Ambient temperature Operation | -25 ÷ +70°C |
| Ambient temperature Storage | -40 ÷ +85°C |
| Humidity at 25 °C  no condensation | 95% to 25°C |
| Cooling | Auto Convection |
| Vibration IEC60068-2-6 | 15-150 Hz: 1g 1 oct/min X,Y,Z axes |
| Shock IEC 60068-2-27 | 10g 6ms 3 bumps / direction |