

This battery controller (in the following called BCM) makes the monitoring of your battery plant for you possible. A 16bit-Mikrocontroller seizes consumer and charging currents with very high accuracy over an active precision precision shunt. On the large, lit display the current charge status of the service battery can be read off at any time. Additionally load/discharge current or the battery voltage is indicated. Additionally up to two starting batteries voltage can be supervised and displayed. If the service battery reaches the adjustable capacity threshold or the additional batteries the adjustable voltage thresholds, then an acoustic alarm sounds and on the display an appropriate warning reference appears.

## 1. Safety references

- o No change in the equipment may be made, otherwise the CE sign expires
- o The installation of the BCM may be made only by electrical specialists.
- o Before the connection of the BCM the battery inlets are to be clamped. To the correct polarity of the batteries pay attention!
- o The inlet of the current supply shunt must be secured

The assembly and operating instruction is a component of the component supply. It must be kept - importantly for later maintenance work - well and be passed on to possible subsequent owners of the measuring instrument.

## Non-liability

Both the adherence to the operating instruction, and the conditions and methods during installation, using and maintenance the BCM cannot be supervised of philippi electrical systems. Therefore we do not take any responsibility and adhesion for losses, damage or costs, which develop themselves from incorrect installation and inappropriate enterprise.

## Warranty

We carry out due to our "general trading conditions - paragraph 7" warranty for the supplied devices. These trading conditions are basis of all sales and delivery offers, them are printed and attached to all offers and confirmation of orders in our catalogs.

## CE indication



this equipment fulfills the requirements of the European Regulation: 89/336/EWG "electromagnetic compatibility" the conformity of the equipment is confirmed by the CE sign.

## 2. Scope of supply

Batteriecontroller BCM  
operating instructions

Plug in clamps for the connection line to the shunt and the measuring lines for the additional voltages

Accessories (to be ordered separately)

Active shunt           SHA 150, SHA 600

Cables for the connectonal of the measuring lines for the additional voltages.

## 3. Technical data

<b>BCM</b>	
Measuring range voltage	7-60 Volt (0,01-V resolution)
Measuring range current	0-600 Amps (0,01A resolution)
Measuring range Amphours	0-6000 Ah ( 1 Ah resolution)
Remaining time	0-99,9 hours (6-Minuten- resolution)
Power supply	7-60 Volts DC
Power consumption	<5 mA during operation, 55mA with illumination (für 12V-Betrieb)
Abmessungen:	105x105x40 mm

### SHA 150 / SHA 600, active shunt 150 A /60 mV or 600 A/60 mV

Accuracy voltage:	± 0,6% ± 1 digit
Accuracy current:	± 0,8 % ± 1 digit

## 4. Installation

### 4.1 necessary equipment

for the installation of the BCM the following parts are needed:

- o an active shunt type SHA 150 or SHA 600

- o In case the distance between battery monitor BCM and shunt than 6m is longer, a shielded cable 5x0,25mm<sup>2</sup>

- o 2 cables with min.1 mm<sup>2</sup> cross section long enough to connect the BCM with the starting batteries

- o 2 fuse holders with 1 amps fuses to fuse to wires from the two starting batteries

- o a battery cable, which is as short as possible, to connect the shunt and the negative pole of the main battery leads. The cross section of this cable should be usually 35 to 70 mm<sup>2</sup>.

Despite the small power input of the BCM it can be meaningful (e.g. during the "winter camp"), to reduce the power input. Therefore a switch should be installed into the measuring wire of the main battery to switch the BCM off. This you should do only during longer downtimes (> 1 month), because after switching on the automatic functions (CEF -, capacity determination) are only again after a new, complete load cycle be available.

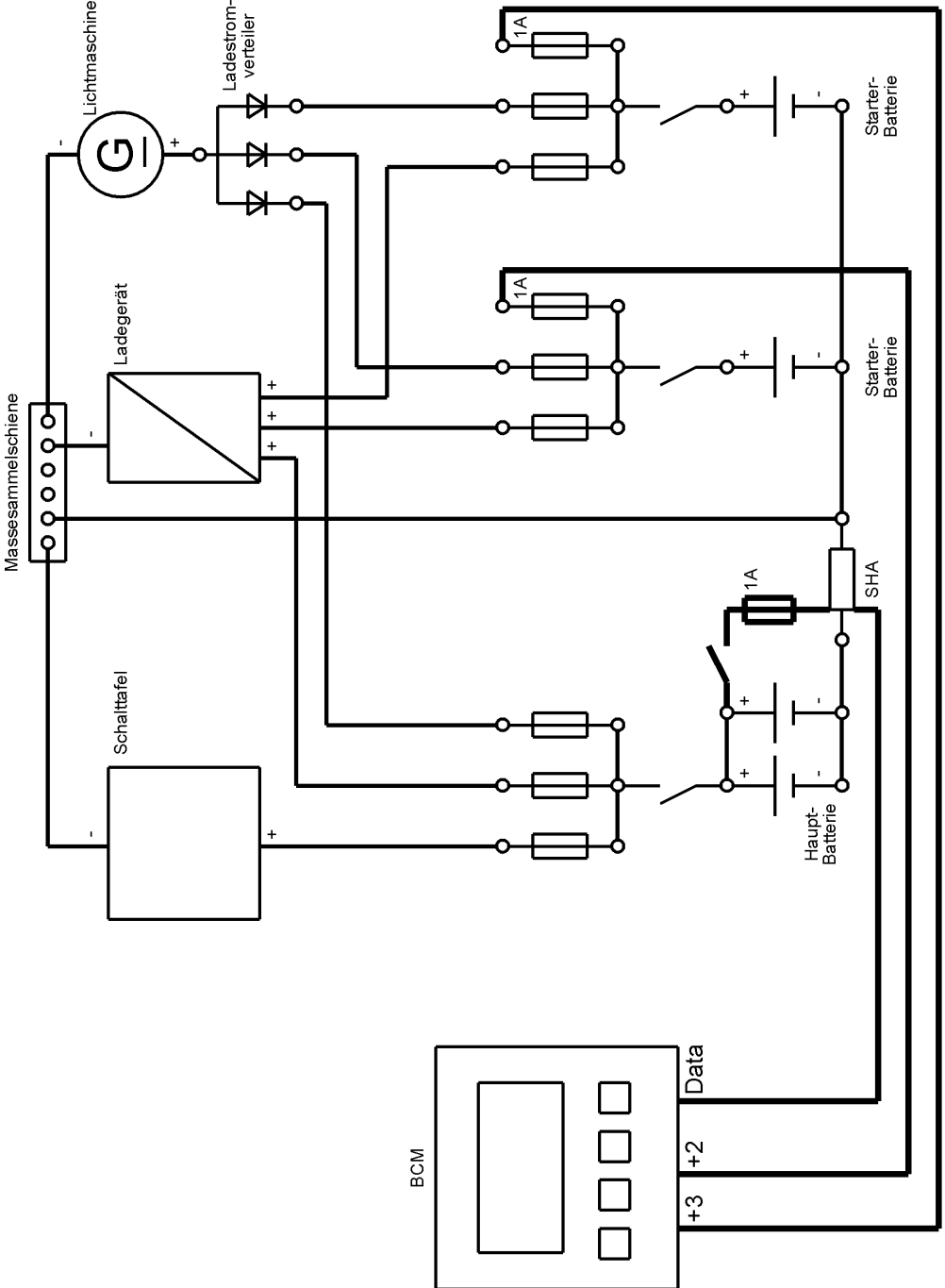
### 4.2 installation and connection

- Please install the BCM in a well visible place, so that it can be read off at any time. The necessary installation cutout is 90x90mm, the necessary minimum depth is 40mm. Install the active shunt SHA as close as possible at the service battery. Avoid however that the shunt has contact with the plus - connection of the batteries. Connect the B- marked side of the shunt with the minus connection of the main battery by a short, thick cable (35-70 mm<sup>2</sup>). Connect the negative pole of the up to two starting batteries with the other side the shunt. Note: If the main battery consists of several parallel switched batteries, then their negative poles must be attached all at by B- marked the side shunt. The negative cables of the starting batteries are attached at the other side (V -) shunt. We recommend all minus connections of the consumers and charging units and the negative poles of the starting batteries on a mass bus bar and to put from there a short line into the V- connection of the shunt.

- Connect the red measuring and supply line of the shunt with the in-line switch to the positive terminal of the main battery. This wire is already equipped with an in-line safety device (1A). Over this line the voltage of the main battery is measured and at the same time the battery controller BCM is supplied. This line is put in at the connector at pin No. 6 (+).

- Put the plug of the provided 5-pole cable at the shunt and on the back of the BCM into the suitable counterparts. when the line must have to be extended or shortened the contacts (1,2,3,4,5) with same number had to be connected to each other. At the plug connector of the shunt side the lines must be stripped 8 mm and be slid into the appropriate pin. For release of the individual lines the respective orange colored pusher beside the cable entry must be pressed.

- Install a positive measuring cable from the BCM to the additional starter and/or further groups of batteries, whose voltages are to be supervised. Insert the fuse holders in the plus wires of the measuring wires as close at the battery as possible. Insert the safety devices into the holder and control whether the display indicates values for the additional batteries.



## 5 start-up of the BCM

### 5.1 Synchronisation with the battery

To initialize the BCM the first time it is necessary to make some setup so that the battery controller works correctly. In order to synchronize the battery controller with the main battery, the main battery must be full-loaded with a modern battery charger, in order to guarantee that the batteries are loaded 100%. We recommend the modern digital controlled philippi - battery chargers series AL. That the main battery one is full-loaded, recognizes after the first operation of the BCM by the fact that the BCM set the capacity independently to 100 %. The BCM is now synchronized with the main battery.



### 5.2 Setup the parameters

For normal function it is necessary to adapt the BCM to the existing battery plant to

#### A) CAPACITY: Set the batteries capacity

The basic adjustment of battery capacity amounts to 100 ah. To get a meaningful accuracy of the remainder time function as well as the proportional charge announcement, the capacity of the installed main battery must be adjusted. The capacity is stored in the SETUP menu. Please note that the capacity of the battery should be set only, if the batteries are loaded 100%, during this procedure the actual capacity is set to 100% and all other internal values are set to 0.

#### b) CHARGING VOLTAGE:

The automatic battery full identification supervises several parameters which must be fulfilled, so that the BCM recognizes the battery as completely loaded. One the parameter is the charging voltage, which must be achieved. The "charging voltage" must be lower than the minimum charging voltage, which rests against the batteries during the absorption charge. This voltages is with 12V systems between 12V and 15V, with a 24V system must according to the double values be adjusted. We recommend 13.6 V for 12V plants and for 24V plants 27,2V.

#### C) ALARM %: attitude capacity alarm of the main battery

The BCM supervises the charge of the main battery and produces an alarm, if the main battery falls below an adjustable capacity threshold. If battery capacity falls below the adjusted threshold or if the voltage measured by the active shunt (= service battery) sinks for a fixed time during load under a fixed value, then a warning appears in the display and at the same time sounds a buzzing signal, which can be acknowledged by you.

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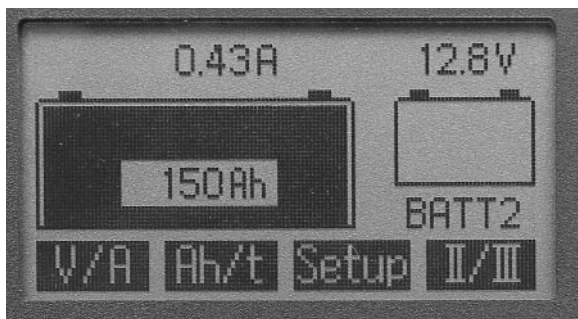
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The alarm for the amp hours is pre-setted to 45% of the overall capacity of the battery. For an average application this value normally is correct; the alarm can be adjusted however according to the requirements of the application. The voltage thresholds during different load for the battery empty identification are however by the factory fixed and cannot not be changed.

### D) tension alarm for the groups of batteries of 2/3

The BCM supervises the battery voltage of the groups of batteries of 2 and 3 and produces an alarm, if the battery voltage fall for a fixed time (4min) under an adjustable value. A warning appears and at the same time sounds a buzzing signal by you to be acknowledged can in the display. The pre-setting for the voltage alarm amounts to 11.5 V. If the battery is strongly loaded, then the tension alarm can be stopped somewhat lower, for example to 10.8 V. If different battery systems (12V/24V) are connected so the thresholds have to be adapted according to the rated voltages. If no groups of batteries of 2 and/or 3 are attached, then the alarm threshold can be arbitrarily adjusted, since this recognizes the BCM and it can come to no alarm appears.

## 6. Operation



The large operated, background-lit display informs you about the charge of your main battery. The bar height of the main battery points to a view, how much remainder capacity is still present. At the same time still the available remainder capacity is indicated to the battery in Ah and the voltage.

Alternatively can by pressing the key the load/discharge current and/or the remainder time be displayed.

The remaining time is the time, while the main battery with the current current consumption can be used, before it is completely empty and must be loaded latest. During charging the remaining time indicates 99.9 h. The maximum value during a discharge process amounts to 99.9 hours (> 4 days). The remainder time is corrected automatically with consideration of the Peukert function, if the battery will unload more strongly than the C20 rate.

A battery is classified as completely loaded (100%), if:

- 1) all taken amp hours are back charged into the battery
- 2) the charging voltage has reached (normally adjusted to 13.6/27.2 V)
- 3) the charging current sinks under 2% of preselected battery capacity.

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If all specified parameters (1, 2 and 3) are fulfilled for 4 minutes, then the value is put back for the used up ampere-hours to 100%.

If two further groups of batteries (starting batteries) are attached, then their voltages are automatically display. If two further groups of batteries are attached then by depressing the button it can switched over between the two voltages, since in each case one can be indicated.

### Button V/A: Voltage or current of the main battery

Display shows the main battery voltage or the load/discharge current. The current is displayed dynamically, i.e. to better readability only 3 numbers (e.g. 120A, 45,0A or 0.01 A) are represented. A minus sign before the amperage means that the battery will be unloaded. If no minus sign is present, then the battery will be charged with the amperage shown.

### Button Ah/t: Amp hours or remaining time of the main battery

The charge of the main battery is indicated in Ah of the still available battery capacity. During loading the charge efficiency factor (C.E.F.) is automatically computed into calculation

### Taste Setup

In the Setup menu all necessary set can be adjusted:

Batteriekapazität:	(Battery capacity) Nominal capacity of the battery in AH
Ladespannung	(Charging voltage) for battery 1 for battery full identification
Alarm %	Threshold for capacity alarm battery 1 in % (ext. switching contact "on", used for" generator")
Generator aus	(Generator off) threshold with that the external contact switches off (generator out), <b>(generator in/out only with appropriate hardware available.)</b>
Alarm U2	Threshold for voltage alarm, battery 2 alarm
Alarm U3	Threshold for voltage alarm, battery 3 alarm

Further informations about the battery can be queried. This can be very useful, in order to experience something over the history of your battery. The following values can be queried.

CEF	Charging efficiency factor
Peukert	Peukertfaktor
Kontrast	Brightness of display
Zyklen	Number of cycles
Tiefentladung	(deep-discharge )Number of deep-discharge
Sprache	(language)

All data are stored also while power failure and will never lost.

### CEF: Charge Efficiency Factor

Each battery has an efficiency. That means it had be loaded more ampere-hours into the battery than can be used. The efficiencies of lead batteries lies between 80% and 99%. If the CEF worsens during the lifetime under 70%, then this means by the fact that the battery reached the end of its life span and must be renewed.

The factory-installed pre-setting is 95%. The CEF is adapted automatically by the BCM while operation of a sliding averaging over the 4 last cycles.

## Peukert exponent

standard batteries are appropriate for 20 hours discharge. That means it for example that a 100 amhours battery can produce 20 hours long 5 ampere, before the battery is empty. If the discharge current is higher, for example 10 amps, then the battery is not able to supply the full 100 ampere-hours. In this case the battery voltage sinks under the lower limit of 10,8 V for 12V batteries, before the battery supplied its nominal capacity. This can be seized mathematically with the Peukert equation. With the remaining time function this equation is used, in order to adapt the remainder time with high unloading rates. Under normal conditions the Peukert exponent does not need to be changed.

## Number of cycles

A cycle is counted, if the battery was discharged below the adjustable capacity border (alarm %) and afterwards charged again on at least 85% its capacity. With the number of cycles you are able to estimate the life span of your battery. Standard starting batteries possess one life span of 30-50 cycles, while however in the case of cycle batteries with one life span from up to 300 cycles to is to be counted, if a modern battery charger is used. These values can be attained only with normal care and worsen rapidly during false treatment.

## Number of deep discharge

If the the main battery will be discharged for 4 min under 10,0 V for a 12V battery, then this is rated as an deep discharge. Deep discharge should be absolutely avoided, since they damage the battery and a premature loss of capacity and loss is to be expected. If an deep discharge should occur nevertheless, then the battery must be charged immediately again, in order to avoid a further damage.

If a new main battery set is used, then the number of cycles and the number of deep-dischargings must be set to zero. In the Setup menue the set "deep discharge" must be called and the plus button must be pressed for 10 seconds in the menu. Subsequently, the two values are set to zero.

## Language (International version)

While pressing of the keys +/- the language of the Setup menus can be set.  
0 = German, 1 = English, 2 = Danish, 3 = Spanish.

## Button II/III: Display of battery voltage 2/3

Is an additional (starter -) battery connected, their voltage will be displayed. Are two additional (starters -) groups of batteries attached, then one of the two voltages is shown automatically on the display. By pressing the button it can be switched between the two tensions, since in each case one can be indicated.