victron energy
BLUE POWER

Manual

EN

Battery Monitor

BMV 600

BMV 602

1. INTRODUCTION

Victron Energy has established an international reputation as a leading designer and manufacturer of energy systems. Our R&D department is the driving force behind this reputation. It is continually seeking new ways of incorporating the latest technology in our products. Each step forward results in value-added technical and economical features.

1.1 Victron Energy battery monitor basics

The Precision Battery Monitor is a device that monitors your battery status. It constantly measures the battery voltage and battery current. It uses this information to calculate the actual state of charge of your battery.

The BMV is also equipped with a potential free contact. This can be used to automatically start and stop a generator, or signal alarm conditions.

1.2 Why should I monitor my battery?

Batteries are used in a wide variety of applications, mostly to store energy for later use. But how do you know how much energy is stored in your battery? No one can tell by just looking at it.

Battery technology is often oversimplified, but some basic battery knowledge and good monitoring is essential if you want to enjoy maximum life from your expensive batteries. The lifetime of batteries depends on many factors. Battery life gets reduced by under-charging, over-charging, excessively deep discharges, discharges which go too fast, and a too high ambient temperature. By monitoring your battery with an advanced battery monitor like the BMV, important feedback is given to the user so that remedial measures can be taken when necessary. This way, by extending the battery life, the BMV will quickly pay for itself.

1.3 How does the BMV work?

The capacity of a battery is rated in Amp hours (Ah). For example, a battery that can deliver a current of 5 Amps for a period of 20 hours is rated at 100Ah (5 * 20 = 100). The BMV continuously measures the net current flow into or out of the battery. This way it can calculate the amount of energy removed from or added to the battery. But since battery age, discharge current and temperature all influence the battery's capacity; you cannot rely simply on an Amp hours reading. When the same 100Ah battery is discharged completely in two hours, it may only give you 56Ah (because of the higher rate of discharge).

As you can see the battery's capacity is almost halved. This phenomenon is called Peukert efficiency (see chapter 0). Also, when the temperature of the battery is low, its capacity is decreased even more. This is why simple Amp hour counters or Voltmeters give you far from an accurate state-of-charge indication.

The BMV can display both the Amp hours removed (not compensated) and the actual state-of-charge (compensated by Peukert efficiency and charge efficiency). Reading the state-of-charge is the best way to read your battery. This parameter is given in percentages, where 100.0% represents a fully charged battery and 0.0% a completely flat battery. You can compare this with a fuel-gauge in a car.

The BMV also makes an estimation of how long the battery can support the present load (time-to-go readout). This is actually the time left until the battery needs to be charged again. If the battery load is fluctuating heavily it is best not to rely on this reading too much since it is a momentary readout and must be used as a guideline only. We always encourage the use of the state-of-charge readout for accurate battery monitoring.

Besides the main function of the BMV, displaying the actual battery status, this monitor offers many other features. The readout of actual battery voltage and current, and the ability to store historic data are just a few of many features of the BMV. These features are more specifically explained in the corresponding chapters of this manual.

1.4 Special features of the BMV-602

1.4.1 Starter battery monitoring

In addition to the comprehensive monitoring of the main battery system, the BMV also provides basic monitoring of a second voltage input. This is useful for systems such as those with a separate starter battery. Unless otherwise indicated, all values and settings described in this manual refer to the main battery system.

1.4.2 PC-Link
The BMV features a serial communications interface for connecting to a PC, or other suitable equipment, to provide remote monitoring capabilities. For information on how to use the communications interface, contact your Victron dealer, or email sales@victronenergy.com.
Use of alternative shunts

The BMV is supplied with a 500A/50mV shunt. For most applications, this should be suitable; however the BMV can be configured to work with a wide range of different shunts. Shunts of up to 999A, and/or 100mV can be used.

2. SETTING UP THE BMV

2.1 Safety Precautions!

1. Working in the vicinity of a lead acid battery is dangerous. Batteries can generate explosive gases during operation. Never smoke or allow a spark or flame in the vicinity of a battery. Provide sufficient ventilation around the battery.

2. Wear eye and clothing protection. Avoid touching eyes while working near batteries. Wash your hands when done.

3. If battery acid contacts skin or clothing, wash them immediately with soap and water. If acid enters an eye, immediately flood the eye with running cold water for at least 15 minutes and get medical attention immediately.

4. Be careful when using metal tools in the vicinity of batteries. Dropping a metal tool onto a battery might cause a short circuit and possibly an explosion.

5. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short circuit current high enough to melt objects such as rings, causing severe burns.

2.2 Installation

Before proceeding with this chapter, please make sure your BMV is fully installed in accordance with the installation guide.

If using a shunt other than the one supplied with the BMV, the following additional steps are required:

1. Unscrew the PCB from the supplied shunt.
2. Mount the PCB on the new shunt, ensuring that there is good electrical contact between the PCB and the shunt.
3. Set the correct values for the ShA, and ShV parameters (see chapter 0).
4. Connect the shunt to both the positive and negative of the battery as described in the installation guide, but do not connect anything to the load side of the shunt.
5. Issue the zero command (see chapter 0).
6. Disconnect the negative battery connection from the shunt.
7. Connect the load to the shunt.
8. Reconnect the battery negative to the shunt.

2.3 Background information

When your BMV is installed it is time to adjust the battery monitor to your battery system. But before discussing the functions in the setup menu, four important items must be explained first. It is important that as a user of the BMV you have some insight into these four items. The actual setup menu functions are explained in chapter 0 – Function overview.

2.3.1 Charge Efficiency Factor (CEF)

During battery charging, not all of the energy transferred into the battery is available when the battery is being discharged. The charge efficiency of a brand new battery is approximately 90%. This means that 10Ah must be transferred to the battery to get 9Ah actually stored in the battery. This efficiency figure is called the Charge-Efficiency-Factor (CEF) and will decrease with battery age. The BMV can automatically calculate the CEF of the battery.

2.3.2 Peukert's exponent

As mentioned in chapter 0, the Peukert efficiency describes how, when you discharge a battery faster than the 20hr rating, its Ah capacity decreases. The amount of battery capacity reduction is called the 'Peukert exponent' and can be adjusted from 1.00 to 1.50. The higher the Peukert exponent the faster the battery size shrinks with increasing discharge rate. An ideal (theoretical) battery has a Peukert Exponent of 1.00 and has a fixed capacity; regardless of the size of the discharge current. Of course such batteries do not exist, and a setting of 1.00 in the BMV is only implemented to bypass Peukert compensation. The default setting for the Peukert exponent is 1.25, and is an acceptable average value for most lead acid type of batteries. However for precise battery monitoring, entering the right Peukert exponent is essential. If the Peukert exponent is not provided with your battery, you can calculate it by using other specifications which should be provided with your battery.

The Peukert equation is stated below:

$Cp = I^n \cdot t$ where the Peukert exponent, n = $\dfrac{\log t_2 - \log t_1}{\log I_1 - \log I_2}$

The battery specifications needed for calculation of the Peukert exponent, are the rated battery capacity (usually the 20hr discharge rate[1]) and for example a 5hr discharge rate[2]. See below for an example of how to define the Peukert exponent using these two specifications.

5hr rating

$$C_{5hr} = 75Ah$$
$$t_1 = 5hr$$
$$I_1 = \frac{75Ah}{5hr} = 15A$$

20hr rating,

$$C_{20hr} = 100Ah \text{ (rated capacity)}$$
$$\mathrm{t}_2 = 20hr$$
$$I_2 = \frac{100Ah}{20hr} = 5A$$

Peukert exponent, $n = \dfrac{\log 20 - \log 5}{\log 15 - \log 5} = \underline{\mathbf{1.26}}$

[1] Please note that the rated battery capacity can also be defined as the 10hr or even 5hr discharge rate.
[2] The 5hr discharge rate in this example is just arbitrary. Make sure that besides the C20 rating (low discharge current) you choose a second rating with a substantially higher discharge current.

When no ratings are given at all, you can measure your battery using a 'constant load bank'. In this way a second rating can be obtained, together with the 20hr rating which represents the rated battery capacity in most cases. This second rating can be determined by discharging a fully charged battery with a constant current; until the battery reaches 1.75V per cell (which is 10.5 V for a 12 V battery or 21 V for a 24 V battery). A calculation example is shown below:

A 200 Ah battery is discharged with a constant current of 20 A and after 8.5 hours 1.75 V/cell is reached.

So,

$$t_1 = 8.5hr$$
$$I_1 = 20A$$

20hr rating,

$$C_{20hr} = 200Ah$$
$$t_2 = 20hr$$
$$I_2 = \frac{200Ah}{20hr} = 10A$$

$$\text{Peukert exponent}, n = \frac{\log 20 - \log 8.5}{\log 20 - \log 10} = \underline{\mathbf{1.23}}$$

A Peukert calculator is available at http://www.victronenergy.com.

2.3.3 Charged-parameters

Based on increasing charge voltage and decreasing charge current, a decision can be made whether the battery is fully charged or not. When the battery voltage is above a certain level during a predefined period while the charge current is below a certain level for the same period, the battery can be considered fully charged. These voltage and current levels, as well as the predefined period are called 'charged-parameters'. In general for a 12V lead acid battery, the voltage-charged-parameter is 13.2V and the current-charged-parameter is 4.0% of the total battery capacity (e.g. 8 A with a 200 Ah battery). A charged-parameter-time of 4 minutes is sufficient for most battery systems. Please note that these parameters are very important for correct operation of your BMV, and must be set appropriately in the corresponding menu items.

2.3.4 Synchronizing the BMV

For a reliable readout of the state of charge of your battery, the battery monitor has to be synchronized regularly with the battery and charger. This is accomplished by fully charging the battery. When the charger is operating in the 'float' stage, the charger considers the battery full. At this moment the BMV must also determine that the battery is full. Now the Amp hour count can be reset to zero and the state-of-charge reading can be set to 100.0%. By precisely adjusting the charged-parameters in the BMV, the battery monitor can automatically synchronize with the charger when the 'float' stage is reached. The range of the charged parameters is wide enough to adjust the BMV to most battery charging methods.

When the voltage supply to the BMV has been interrupted, the battery monitor must be resynchronized before it can operate correctly.

Please note that regularly (at least once per month) fully charging your battery not only keeps it in sync with the BMV, but also prevents substantial capacity loss of your battery which limits it's lifetime.

2.4 Using the menus

There are four buttons that control the BMV. The functions of the buttons vary depending on which mode the BMV is in. When power is applied, the BMV starts in normal mode.

Button	Function	
	Normal mode	Setup mode
Setup	Hold for 3 seconds to switch to setup mode	-When not editing, hold this button for 3 seconds to switch to normal mode. -When editing, press this button to confirm the change. When a parameter is confirmed, it will be checked for validity. If the value is valid it is stored. If the value is invalid, the display blinks 10 times and the nearest valid value is displayed but not stored. The value can be corrected if needed, and can then be stored by pressing this button again.
Select	Switch between the monitoring and historical menus.	-When not editing, press this button to begin editing the current parameter. -When editing, this button will advance the cursor to the next editable digit.
+	Move up one item.	-When not editing, this button moves up to the previous menu item. -When editing, this button will increment the value of the selected digit.
-	Move down one item.	-When not editing, this button moves down to the next menu item. -When editing, this button will decrement the value of the selected digit.

2.5 Function overview

The BMV factory settings are suitable for an average 12V/24V lead acid battery system of 200Ah. The BMV can automatically detect the nominal voltage of the battery system (see chapter 0), so in most cases the only setting which will need to be changed is the battery capacity (Cb). When using other types of batteries please ensure that all the relevant specifications are known before attempting to setup the BMV parameters.

2.5.1 Setup parameter overview

Name	Description	Min.	Default	Max.	Reso-lution	Units
Cb	Battery capacity	20	200	9999	1	Ah
Vc	Charged voltage	0.0	13.2	90.0	0.1	V
It	Tail current	0.5	4.0	10.0	0.1	%
Tcd	Charged detection time	1	3	50	1	min.
CEF	Charge efficiency factor	50	90	99	1	%
PC	Peukert exponent	1.00	1.25	1.50	0.01	
Ith	Current threshold	0.00	0.01	2.00	0.01	A
Tdt	Time to go ∆tA	0	3	12	1	min.
DF	Discharge floor (SOC relay)	0.0	50.0	99.0	0.1	%
ClS	Clear SOC relay	0.0	90.0	99.0	0.1	%
RME	Relay minimum enable time	0	0	500	1	min.
RDD	Relay disable delay	0	0	500	1	min.
Al	Alarm low voltage (buzzer)	0.0	0.0	95.0	0.1	V
Alc	Clear low voltage alarm	0.0	0.0	95.0	0.1	V
Ah	Alarm high voltage (buzzer)	0.0	0.0	95.0	0.1	V
Ahc	Clear high voltage alarm	0.0	0.0	95.0	0.1	V
AS	Alarm low SOC (buzzer)	0.0	0.0	95.0	0.1	%
ASc	Clear low SOC alarm	0.0	0.0	95.0	0.1	%
Rl	Relay low voltage	0.0	0.0	95.0	0.1	V

Rlc	Clear relay low voltage	0.0	0.0	95.0	0.1	V
Rh	Relay high voltage	0.0	0.0	95.0	0.1	V
Rhc	Clear relay high voltage	0.0	0.0	95.0	0.1	V
BLI	Backlight intensity	0	5	9	1	
D V	The quantity with an ‘x’ can be selected in display mode. When they are all clear, the SOC is displayed.	No	Yes	Yes	N/A	
D VS*		No	Yes	Yes	N/A	
D I		No	Yes	Yes	N/A	
D CE		No	Yes	Yes	N/A	
D SOC		No	Yes	Yes	N/A	
D TTG		No	Yes	Yes	N/A	
ZERO	Zero current calibration	N/A	N/A	N/A	N/A	
SYNC	Manual synchronization	N/A	N/A	N/A	N/A	
R DEF	Reset default values	N/A	N/A	N/A	N/A	
Cl HIS	Clear history	N/A	N/A	N/A	N/A	
LOCK	Setup lock	No	No	Yes	N/A	
SW	Firmware version (cannot be altered)	N/A	N/A	N/A	N/A	

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Name	Description	Min.	Default	Max.	Resolution	Units
AlS	Alarm low starter battery voltage (buzzer)	0.0	0.0	95.0	0.1	V
AlcS	Clear alarm low starter battery voltage	0.0	0.0	95.0	0.1	V
AhS	Alarm high starter battery voltage (buzzer)	0.0	0.0	95.0	0.1	V
AhcS	Clear high starter battery voltage	0.0	0.0	95.0	0.1	V
RlS	Relay low starter battery voltage	0.0	0.0	95.0	0.1	V
RlcS	Clear relay low starter battery voltage	0.0	0.0	95.0	0.1	V
RhS	Relay high starter battery voltage	0.0	0.0	95.0	0.1	V
RhcS	Clear relay high starter battery voltage	0.0	0.0	95.0	0.1	V
ShA	Maximum rated shunt current	1	500	999	1	A
ShV	The shunt output voltage at the maximum rated current	0.001	0.05	0.1	0.001	V

2.5.2 Setup parameter detail

Cb: **Battery capacity Ah.** The battery capacity for a 20h discharge rate at 20℃.
Vc: **Charged voltage.** The battery voltage must be above this voltage level to consider the battery as fully charged. Make sure the voltage-charged-parameter is always slightly below the voltage at which the charger finishes charging the battery (usually 0.1V or 0.2V below the 'float' stage voltage of the charger).
It: **Tail current.** When the charge current value is below this percentage of the battery capacity (Cb), the battery can be considered as fully charged. Make sure this is always greater than the minimum current at which the charger maintains the battery, or stops charging.
Tcd: **Charged detection time.** This is the time the charged-parameters (It and Vc) must be met, in order for the battery to be considered fully charged.
CEF: **Charge Efficiency Factor.** When a battery is being charged, energy is lost. The Charge Efficiency Factor compensates for the lost energy, where 100% is no loss.
PC: **Peukert exponent** (see chapter 0). When unknown it is recommended to keep this value at 1.25. A value of 1.00 disables the Peukert compensation. Contact your battery manufacturer for the correct Peukert exponent for your battery.
Ith: **Current threshold.** When the current measured falls below this value it will be considered as zero Amps. With this function it is possible to cancel out very small currents that can negatively affect long term state-of-charge readout in noisy environments. For example if an actual long term current is +0.05A and due to injected noise or small offsets the battery monitor measures –0.05A, in the long term the BMV can incorrectly indicate that the battery needs recharging. When in this case Ith is set to 0.1, the BMV calculates with 0.0A so that errors are eliminated. A value of 0.0 disables this function.
Tdt: **Average time-to-go.** Specifies the time window (in minutes) that the moving averaging filter works with. Selecting the right time depends on your installation. A value of 0 disables the filter and gives you instantaneous (real-time) readout; however the displayed values may fluctuate heavily. Selecting the highest time (12 minutes) ensures that long term load fluctuations are included in the time-to-go calculations.
DF: **Discharge floor.** When the state-of-charge percentage has fallen below this value, the alarm relay will be activated. The time-to-go calculation is also linked to this value. It is recommended to keep this value at around 50.0%.

ClS: **Clear SOC relay.** When the state-of-charge percentage has risen above this value, the alarm relay will be de-activated. This value needs to be greater than or equal to DF.

RME: **Relay minimum enable time.** Specifies the minimum amount of time that the alarm relay should be enabled once an alarm condition has occurred.

RDD: **Relay disable delay.** Specifies how long you have to wait before disabling the relay; after the alarm condition has cleared.

Al: **Alarm low voltage (buzzer).** When the battery voltage falls below this value for more than 10 seconds a bell icon appears on the display, the backlight flashes, and the buzzer will sound. The buzzer and backlight-flashing can be turned off by pressing any key; the bell-icon will remain on the display.

Alc: **Clear low voltage alarm.** When the battery voltage rises above this value, the alarm is turned off. This value needs to be greater than or equal to Al.

Ah: **Alarm high voltage (buzzer).** When the battery voltage rises above this value for more than 10 seconds a bell icon appears on the display, the backlight flashes, and the buzzer will sound. The buzzer and backlight-flashing can be turned off by pressing any key; the bell-icon will remain on the display.

Ahc: **Clear high voltage alarm.** When the battery voltage falls below this value, the alarm is turned off. This value needs to be less than or equal to Ah.

AS: **Alarm low SOC (buzzer).** When the state-of-charge falls below this value for more than 10 seconds a bell icon appears on the display, the backlight flashes, and the buzzer will sound. The buzzer and backlight-flashing can be turned off by pressing any key; the bell-icon will remain on the display.

ASc: **Clear low SOC alarm.** When the state-of-charge rises above this value, the alarm is turned off. This value needs to be greater than or equal to AS.

Rl: **Relay low voltage.** When the battery voltage falls below this value for more than 10 seconds the alarm relay will be activated.

Rlc: **Clear relay low voltage.** When the battery voltage rises above this value, the alarm relay will be de-activated. This value needs to be greater than or equal to Rl.

Rh: **Relay high voltage.** When the battery voltage rises above this value for more than 10 seconds the alarm relay will be activated.

Rhc: **Clear relay high voltage.** When the battery voltage falls below this value, the alarm relay will be de-activated. This value needs to be less than or equal to Rh.

BLI: **Intensity backlight.** The intensity of the backlight, ranging from 0 (always off) to 9 (maximum intensity).
D V: **Battery voltage display.** Determines if the battery voltage is available in the monitoring menu.
D I: **Current display.** Determines if the current is available in the monitoring menu.
D CE: **Consumed energy display.** Determines if the consumed energy is available in the monitoring menu.
D SOC: **State-of-charge display.** Determines if the state of charge is available in the monitoring menu.
D TTG: **Time-to-go display.** Determines if the time to go is available in the monitoring menu.
ZERO: **Zero current calibration.** If the BMV reads a non-zero current even when there is no load and the battery is not charging, this option can be used to calibrate the zero reading. Ensure that there really is no current flowing into or out of the battery, then hold the select button for 5 seconds.
SYNC: **Manual synchronization.** This option can be used to manually synchronize the BMV. When the battery is fully charged, hold the select button for 5 seconds. Note: If the BMV fails to automatically synchronize, check the wiring, and ensure that Cb, Vc, It, and Tcd are set correctly.
R DEF: **Reset to factory defaults.** Reset all settings to the factory defaults by holding the select button for 5 seconds.
Cl HIS: **Clear historic data.** Clear all historical data by holding the select button for 5 seconds.
Lock: **Setup lock.** When on, all settings (except this one) are locked and cannot be altered.
SW: **Firmware version** (cannot be altered).

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AlS: Alarm low starter battery voltage (buzzer). When the starter battery voltage falls below this value for more than 10 seconds a bell icon appears on the display, the backlight flashes, and the buzzer will sound. The buzzer and backlight-flashing can be turned off by pressing any key; the bell-icon will remain on the display.
AlcS: Clear low starter battery voltage alarm. When the starter battery voltage rises above this value, the alarm is turned off. This value needs to be greater than or equal to AlS.
AhS: Alarm high starter battery voltage (buzzer). When the starter battery voltage rises above this value for more than 10 seconds a bell icon appears on the display, the backlight flashes, and the buzzer will sound. The buzzer and backlight-flashing can be turned off by pressing any key; the bell-icon will remain on the display.
AhcS: Clear high starter battery voltage alarm. When the starter battery voltage falls below this value, the alarm is turned off. This value needs to be less than or equal to AhS.
RlS: Relay low starter battery voltage. When the starter battery voltage falls below this value for more than 10 seconds the alarm relay will be activated.
RlcS: Clear relay low starter battery voltage. When the starter battery voltage rises above this value, the alarm relay will be de-activated. This value needs to be greater than or equal to RlS.
RhS: Relay high starter battery voltage. When the starter battery voltage rises above this value for more than 10 seconds the alarm relay will be activated.
RhcS: Clear relay high starter battery voltage. When the starter battery voltage falls below this value, the alarm relay will be de-activated. This value needs to be less than or equal to RhS.
D VS: Starter battery voltage display. Determines if the starter battery voltage is available in the monitoring menu.
ShA: Maximum rated shunt current. If using a shunt other than the one supplied with the BMV, set this to the rated current of the shunt.
ShV: The shunt output voltage at the maximum rated current. If using a shunt other than the one supplied with the BMV, set this to the rated voltage of the shunt.

3. GENERAL OPERATION

3.1 Monitoring menu

In normal operating mode the BMV can display the values of selected important parameters of your DC system. Use the + and - selection keys to select the desired parameter.

Label	Description	Units
V	**Battery voltage:** this readout is useful to make a rough estimation of the battery's state-of-charge. A 12 V battery is considered empty when it cannot maintain a voltage of 10.5 V under load conditions. Excessive voltage drops for a charged battery when under heavy load can also indicate that the battery capacity is insufficient.	V
VS*	**Starter battery voltage:** this readout is useful to make a rough estimation of the starter battery's state-of-charge.	V
I	**Current:** this represents the actual current flowing in to or out of the battery. A discharge current is indicated as a negative value (current flowing out of the battery). If for example a DC to AC inverter draws 5 A from the battery, it will be displayed as –5.0 A.	A
CE	**Consumed Energy:** this displays the amount of Ah consumed from the battery. A fully charged battery sets this readout to 0.0 Ah (synchronized system). If a current of 12 A is drawn from the battery for a period of 3hours, this readout will show –36.0 Ah.	Ah
SOC	**State-of-charge:** this is the best way to monitor the actual state of the battery. This readout represents the current amount of energy left in the battery. A fully charged battery will be indicated by a value of 100.0%. A fully discharged battery will be indicated by a value of 0.0%.	%
TTG	**Time-to-go:** this is an estimation of how long the battery can support the present load; until it needs recharging.	h

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3.2 Historical menu

The BMV tracks multiple statistics regarding the state of the battery which can be used to assess usage patterns and battery health. The historical data can be viewed by pressing the select button when viewing the monitoring menu.

Label	Description	Units
H1	The depth of the deepest discharge.	Ah
H2	The depth of the last discharge.	Ah
H3	The depth of the average discharge.	Ah
H4	The number of charge cycles.	
H5	The number of full discharges.	
H6	The cumulative number of Amp hours drawn from the battery.	Ah
H7	The minimum battery voltage.	V
H8	The maximum battery voltage.	V
H9	The number of days since the last full charge.	
H10	The number of times the BMV has automatically synchronized.	
H11	The number of low voltage alarms.	
H12	The number of high voltage alarms.	
H13*	The number of low starter battery voltage alarms.	
H14*	The number of high starter battery voltage alarms.	
H15*	The minimum starter battery voltage.	V
H16*	The maximum starter battery voltage.	V

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3.3 Nominal voltage detection

Although the BMV factory settings are chosen for a 12V battery system, the BMV is able to automatically determine the nominal voltage. The BMV is also able to adjust the charged voltage parameter without user intervention.

During charging, the BMV measures the current battery voltage, and uses this to estimate the nominal voltage. The following table shows how the nominal voltage is determined, and how the charged voltage parameter is adjusted as a result.

Measured voltage (V)	Assumed nominal voltage (V)	Adjusted charged voltage (V)
≤ 15	12	13.2
15 - 30	24	26.4
30 - 45	36	39.6
45 - 60	48	52.8
60 - 90	72	79.2

Notes:

- The nominal voltage will only increase.
- After one hour of charging the BMV will stop estimating and use the current nominal voltage.
- If the voltage charged parameter is altered by the user, the BMV will stop estimating.

4. TECHNICAL DATA

Supply voltage range	9.5 ... 95VDC
Supply current (no alarm condition)	
@Vin=24VDC without back lighting	3 mA
@Vin=12VDC without back lighting	4 mA
Input voltage range auxiliary battery	9.5 ... 95VDC
Input current range (with supplied shunt)	-500 ... +500A
Battery capacity range	20 ... 9999Ah
Operating temperature range	0 ... 50℃
Readout resolution:	
Voltage (0 ... 135V)	voltage dependent
Current (0 ... 10A)	±0.1A
Current (10 ... 500A)	±1A
Amp hours (0 ... 200Ah)	±0.1Ah
Amp hours (200 ... 2000Ah)	±1Ah
State-of-charge (0 ... 100%)	±0.1%
Time-to-go (0 ... 100hrs)	±1minute
Time-to-go (100 ... 240hrs)	±1hr
Voltage measurement accuracy	±0.3%
Current measurement accuracy	±0.5%
Potential free alarm contact	
Mode	Normally open
Rating	60V/1A max.
Dimensions:	
Front panel	69 x 69mm
Body diameter	52mm
Overall depth	31mm
Net weight:	
BMV	70g
Shunt	315g
Material	
Body	ABS
Sticker	Polyester

Victron Energy **Blue Power**

Distributor:

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