

# MASTERVOLT

USERS MANUAL / GEBRUIKERSHANDLEIDING  
BETRIEBSANLEITUNG / MANUEL UTILISATEURS

## ALPHA ALTERNATOR

12/90, 12/130, 24/75, 24/110 & 24/150

HIGH OUTPUT ALTERNATORS WITH ALPHA PRO II REGULATOR



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# THIS MANUAL HAS TO BE READ IN COMBINATION WITH THE “APPENDIX ALPHA ALTERNATOR”

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## 1 GENERAL INFORMATION

### 1.1 USE OF THIS MANUAL

This manual serves as a guideline for the safe and effective operation, maintenance and possible correction of minor malfunctions of the Alpha alternator and the Alpha Pro II regulator.

This manual is valid for the following models:

<b>Part number</b>	<b>Description</b>
48512090	Alpha alternator 12/90, incl 3-stage Alpha Pro II regulator MasterBus
48512130	Alpha alternator 12/130, incl 3-stage Alpha Pro II regulator MasterBus
48512131	Alpha alternator 12/130 MG + 3-stage Alpha Pro II regulator MasterBus
48524075	Alpha alternator 24/75, incl 3-stage Alpha Pro II regulator MasterBus
48524076	Alpha alternator 24/75 MG + 3-stage Alpha Pro II regulator MasterBus
48524110	Alpha alternator 24/110, incl 3-stage Alpha Pro II regulator MasterBus
48524150	Alpha alternator 24/150, incl 3-stage Alpha Pro II regulator MasterBus
45512000	Alpha Pro II regulator for Mastervolt and Bosch alternator

Every person who works on or with the Alpha alternator / Alpha Pro II regulator must be completely familiar with the contents of this manual and must follow its instructions. Installation of, and work on the Alpha alternator / Alpha Pro II regulator, must be carried out by qualified, authorised and trained personnel, consistent with the locally applicable standards and taking into consideration the safety guidelines and measures (section 2 of this manual). Keep this manual at a secure place!

### 1.2 GUARANTEE SPECIFICATIONS

Mastervolt guarantees that this unit has been built according to the legally applicable standards and

specifications. Should work take place, which is not in accordance with the guidelines, instructions and specifications contained in this users manual, then damage may occur and/or the unit may not fulfil its specifications. All of these matters may mean that the guarantee becomes invalid.

### 1.3 QUALITY

During their production and prior to their delivery, all of our units are exhaustively tested and inspected. The standard guarantee period is two years.

### 1.4 VALIDITY OF THIS MANUAL

All of the specifications, provisions and instructions contained in this manual apply solely to standard versions of the Alpha alternator / Alpha Pro II regulator delivered by Mastervolt.

### 1.5 LIABILITY

Mastervolt can accept no liability for:

- consequential damage due to use of the Alpha alternator / Alpha Pro II regulator;
- possible errors in the manuals and the results thereof.



#### **CAREFUL!**

Never remove the type number plate.

Important technical information required for service, maintenance & secondary delivery of parts can be derived from the type number plate.

### 1.6 CHANGES TO THE ALPHA ALTERNATOR / ALPHA PRO II REGULATOR

Changes to the Alpha alternator / Alpha Pro II regulator may be carried out only after obtaining the written permission of Mastervolt.

## 2 SAFETY GUIDELINES AND MEASURES

### 2.1 WARNINGS AND SYMBOLS

Safety instructions and warnings are marked in this manual by the following pictograms:



A procedure, circumstance, etc which deserves extra attention.



#### CAREFUL!

Special data, restrictions and rules with regard to preventing damage.



#### WARNING

A WARNING refers to possible injury to the user or significant material damage to the Alpha alternator / Alpha Pro II regulator if the user does not (carefully) follow the procedures.



#### WARNING

Moving machinery. This symbol indicates that a potential hazard exists caused by moving parts.

### 2.2 USE FOR INTENDED PURPOSE

- 1 The Alpha alternator / Alpha Pro II regulator is constructed as per the applicable safety-technical guidelines.
- 2 Use the Alpha alternator / Alpha Pro II regulator only:
  - for the charging of lead acid or li-ion batteries and the supply of loads connected to these batteries, in permanent systems;
  - with fuses, protecting the wiring between Alpha alternator / Alpha Pro II regulator output and battery;
  - in a technical correct condition;
  - in a closed, well-ventilated room, protected against rain, moist, dust and condensation;
  - observing the instructions in the users manual.



#### WARNING

Never use the Alpha alternator / Alpha Pro II regulator in locations where there is danger of gas or dust explosion or potentially flammable products!

- 3 Use of the Alpha alternator / Alpha Pro II regulator other than mentioned in point 2 is not considered to be consistent with the intended purpose. Mastervolt is not liable for any damage resulting from the above.

### 2.3 ORGANIZATIONAL MEASURES

The user must always:

- have access to the user's manual;
- be familiar with the contents of this manual. This applies in particular to section 2, Safety Guidelines and Measures.

### 2.4 MAINTENANCE & REPAIR

- 1 If the Alpha alternator, Alpha Pro II regulator and engine are switched off during maintenance and/or repair activities, they should be secured against unexpected and unintentional switching on:
  - remove the key from the engine ignition switch
  - switch off the connection with the batteries or remove the DC fuse(s);
  - be sure that third parties cannot reverse the measures taken.



#### WARNING

When service has to be carried out while the engine is running, be aware of moving parts like V-belts.

- 2 If maintenance and/or repairs are required, only use original spare parts.

## **2.5 GENERAL SAFETY AND INSTALLATION PRECAUTIONS**

- Before using the Alpha alternator / Alpha Pro II regulator, read all instructions and cautionary markings on the Alpha alternator / Alpha Pro II regulator, the batteries, and all appropriate sections of the manual. If you do not follow these instructions danger may occur or the unit could be damaged.
- The Alpha alternator / Alpha Pro II regulator is designed to be permanently connected to your DC electrical systems. Mastervolt recommends that all wiring be done by a certified technician or electrician to ensure adherence to proper electrical wiring regulations.
- Wrong use of the mode selector will lead to serious damage to batteries, the Alpha alternator, the Alpha Pro II regulator and the cabling.
- Wrong MasterBus settings will lead to serious damage to batteries, the Alpha alternator, the Alpha Pro II regulator and the cabling.
- Selection of a MasterShunt connected to a battery with a different nominal voltage will lead to serious damage to batteries, the Alpha alternator, the Alpha Pro II regulator and the cabling.
- Be aware of parts that can be hot: not only engine parts, but the alternator as well.
- In case of fire, you must use the fire extinguisher which is appropriate for electrical equipment.
- Short circuiting or reversing polarity will lead to serious damage to batteries, the Alpha alternator, the Alpha Pro II regulator and the cabling. Fuses between the batteries and the electrical installation can not prevent damage caused by reversed polarity and the warranty will be void.
- Secure the DC wiring with a fuse, according to the guidelines in this manual. Connection and protection must be done in accordance with local standards.
- Do not work on the Alpha alternator, Alpha Pro II regulator or parts of the electrical system if it is still connected to a current source. Only allow changes in your electrical system to be carried out by qualified electricians.

## **2.6 WARNING REGARDING LIFE SUPPORT APPLICATIONS**

Mastervolt products are not sold for applications in any medical equipment intended for use as a component of any life support system unless a specific written agreement pertaining to such intended use is executed between the manufacturer and Mastervolt. Such agreement will require the equipment manufacturer either to contract for additional reliability testing of the Mastervolt parts and/or to commit to undertake such testing as a part of the manufacturing process. In addition such manufacturer must agree to indemnify and hold Mastervolt non responsible from any claims arising out of the use of the Mastervolt parts in the life support equipment.

## **2.7 WARNING REGARDING THE USE OF BATTERIES.**

Excessive battery discharge and/or high charging voltages will cause serious damage to batteries. Do not exceed the recommended limits of discharge level of your batteries. Avoid short circuiting batteries, as this may result in explosion and fire hazard. Installation of the batteries and adjustments of the Alpha alternator / Alpha Pro II regulator should only be undertaken by authorised personnel!

## 3 HOW IT WORKS

This user's manual describes the installation and operation of the Alpha Alternator together with the Alpha Pro II regulator from Mastervolt. This charging system is designed to provide a high output power at low RPM, which is typical for marine applications. It consists of the following main components (See figure 1):

- 1 Alpha alternator (included)
- 2 Alpha Pro II charge regulator (included)
- 3 Battery fuses (10A fuse included)
- 4 Batteries (not included)
- 5 Temperature sensor (included)\*

\*The picture shows an installation without MasterShunt. If you have a MasterShunt installed, the Alpha Pro II temperature sensor is better mounted on the alternator.

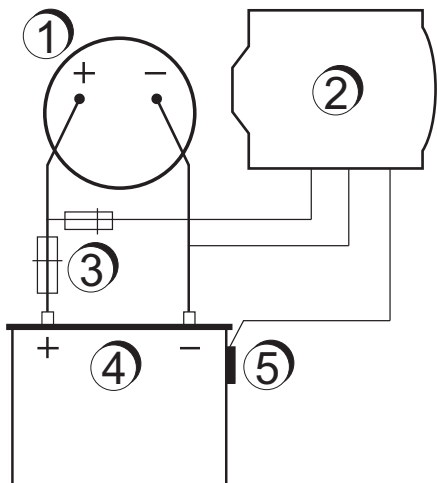


Fig.1: Basic charging system consisting of the Alpha Alternator and the Alpha Pro II regulator

### 3.1 ALPHA ALTERNATOR

Mastervolt Alpha alternators are specially designed to provide high power even at low RPM. A pulley ratio of 1:2 – 1:3 and an engine idle speed of around 700-800 rpm will generate substantial current for charging the battery sets and powering the connected equipment.

Mastervolt alternators are resistant to the high temperature of the engine room, allowing the engine to serve as the energy source for onboard consumers and as a quick charger for the service and starter batteries.

### 3.2 ALPHA PRO II REGULATOR

The Alpha Pro II voltage regulator controls the alternator's output voltage. It is designed for optimal recharging of both wet, gel, AGM and li-ion batteries. Battery charging is accomplished in three automatic stages: BULK, ABSORPTION and FLOAT. Simple, automatic operation is made possible by the microprocessor that is the brain of the Alpha Pro II regulator.

#### 3.2.1 Three step charging system

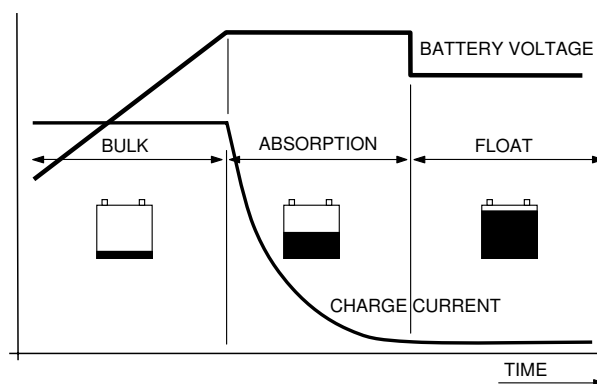


Figure 2: Three step plus charge system

See figure 2. The first step of the three step plus charge system is the BULK phase (A), in which the output current of the charging system is limited by the maximum output current of the alternator and the engine RPM. At this stage the major part of the battery capacity is rapidly charged. The current charges the batteries and the voltage will rise to the absorption voltage. Refer to the specifications for the charging voltages for different batteries.

The duration of this phase depends on the ratio of charging capacity to battery capacity and on the degree to which the batteries were discharged to begin with.

The bulk phase is followed by the absorption phase. (B). The absorption charge starts when the voltage on the batteries has reached the absorption voltage, and ends when the battery is fully charged. Battery voltage remains constant throughout this stage, and the charge current depends on the state of charge of the battery, the battery type, the ambient temperature, and so on. With a wet cell battery this stage lasts about four hours, with gel, AGM and li-ion batteries around three.



Once the battery is fully charged, the Alpha Pro II regulator automatically switches over to the float phase.

After Absorption phase (C) the Alpha Pro II regulator switches to Float voltage and stabilises this voltage to maintain the batteries in an optimum condition. Connected loads are powered directly by the charging system. If the load is higher than capacity of the charging system, the required additional power comes from the battery, which will be progressively discharged. The Alpha Pro II regulator will start a new cycle when the engine is started again.

### 3.2.2 Temperature compensated charging

A battery temperature sensor is not included in the delivery of the Alpha Pro II regulator. By installing this battery temperature sensor the charge voltages are automatically adapted for deviating temperatures.

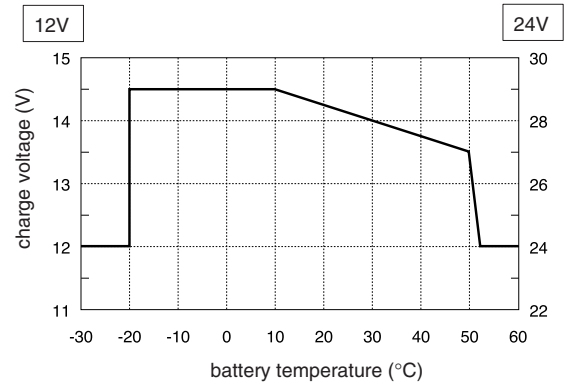


Figure 3: Temperature compensated charging

See figure 3. When the battery temperature is low, the charge voltage increases. On the other hand, when the battery temperature is high, the charge voltage is decreased. Over charge and gassing are prevented this way. This will extend the life of your batteries. Consult your battery manufacturer for recommended charging voltages.

### 3.2.3 MasterBus

The Alpha Pro II regulator features MasterBus, enabling communication with a MasterShunt for instance. This MasterShunt can be selected in the configuration menu after which it transmits battery state data to the Alpha Pro II. More MasterBus devices can be connected.



## 4 INSTALLATION

During installation and commissioning of the Alpha Alternator and Alpha Pro II regulator, the Safety Guidelines & Measures are applicable at all times. See section 2 of this manual.

### 4.1 UNPACKING

In addition to the Alpha Pro II alternator the delivery includes:

- The Alpha Pro II regulator
- A cable assembly for Mastervolt and Bosch alternators
- A Bosch adapter
- Battery temperature sensor
- MasterBus terminator
- This user's manual + appendix

After unpacking, check the contents for possible damage. Do not use the product if it is damaged. If in doubt, contact your supplier.

### 4.2 IMPORTANT TO KNOW

Mastervolt alternators offer a much higher output than alternators usually supplied with engines. As a result, a single V-belt is insufficient to transfer the power from the engine to the alternator. Therefore Mastervolt alternators are standard equipped with a pulley for two V-belts.

Before installing the pulley ratio between alternator and main engine need to be checked.

Alternator model	Maximum speed:
12/90, 12/130, 24/75, 24/110, 24/150	8000 RPM

Your engine supplier can help you choose an appropriate double pulley and advise on the bracket for the alternator.



Note that the alternator support has to be made suitable for handling the high forces as well



### CAREFUL!

Any changes to the alternator, including the alternator's wiring, pulley and/or mounting points, will make the guarantee void!

The (remaining) capacity of the engine should be large enough to drive the alternator. Take into consideration that the efficiency of a typical alternator (including transmission V-belt) is approximately 50%.

Example:

At full output power, the required engine power to drive Alpha Alternator model 24/75 is:

$$75 \text{ Amps} \times 28.5\text{V} / 50\% = 4.3\text{kW}$$

### 4.3 ENVIRONMENT

Keep the Alpha Pro II alternator away from:

- **Excessive heat.** The maximum alternator temperature should not exceed 105°C/220°F. An alternator can become damaged if it operates too long at excessive temperatures. Damaging heat levels are generated in two ways:
  1. when the alternator becomes dirty either externally or internally restricting its ability to dissipate heat from its external surface or
  2. when fresh airflow through the alternator is restricted.
- **Dirt and dust.** The alternator operates less efficiently when buildup of dirt particles forms around wire and cable connections. Dirty connections impair the flow of electrical current.
- **Vibration.** If the alternator is poorly or loosely mounted, the resulting vibration can damage internal components. A loosely mounted alternator will also diminish the performance of the belt drives.

**4.4 MOUNTING OF THE ALTERNATOR**

**4.4.1 General**

Consult your engine supplier for the availability of a mounting bracket and other necessary mounting hardware to mount the alternator on the engine. Mastervolt Alpha alternators require two A-type V-belts of equal length (measured pair) for transmission.

As every engine differs from the other, Mastervolt can not give any specific mounting instructions for any particular engine.

**4.4.2 Rotating direction**

The Alpha alternator is equipped with a bidirectional fan. Therefore it may rotate in either a clockwise or counter clockwise direction.

**4.4.3 Mounting step-by-step**

- 1 Determine the alternator mounting location.
- 2 Loosely attach the mounting bracket to the engine with the mounting engine bolts. Position the alternator mounting foot between the two ears (figure 5, references A and B) on the mounting bracket with the alternator mounting bolts. Note that the ear at the rear side of the alternator housing should be fixed in such way that it can freely move in the direction of the arrow (see figure 5, reference A). This is to avoid mechanical stress due to possible high temperatures of the alternator.

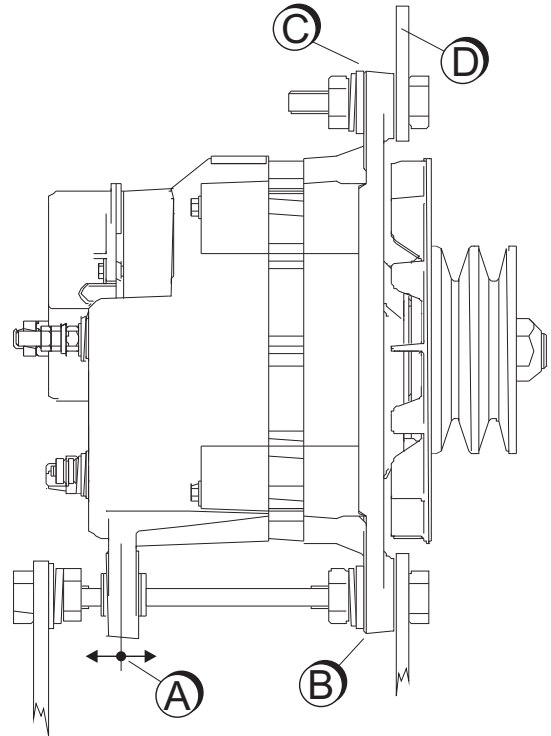


Figure 5

- 3 See figure 6. Align the alternator pulley (3) with the engine (1) drive pulley (2) and tighten the bracket mounting bolts, securing the mounting bracket (4) to the engine.

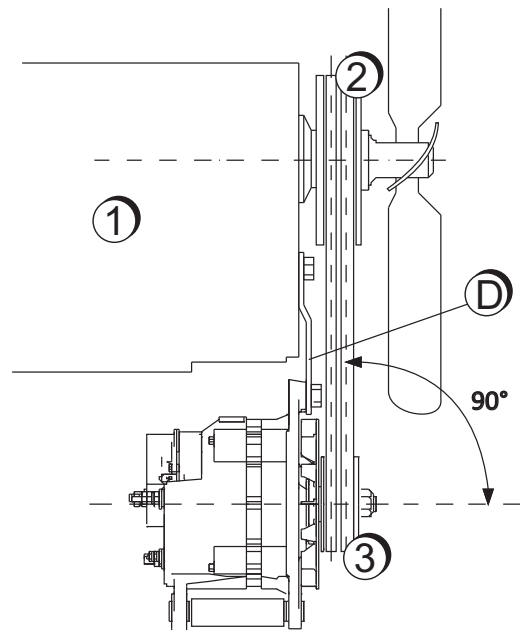


Figure 6: Alignment

- 4 Loosely attach the alternator adjustment strap (Figure 5 and 6: reference D) to the alternator adjustment ear (figure 5, reference C) with the bolt, lockwasher and flat washer.
- 5 Tighten the V-belt by applying pressure to the alternator front housing only and tighten the bolt to the adjustment ear (figure 5, reference C). Set belt tension per belt manufacturer's recommended specifications. If manufacturer's specifications are not readily available, set V-belt tension tight enough so that the V-belt on alternator fan pulley will not slip when attempting to rotate alternator by hand.



**CAREFUL!**

Alternator will be permanently damaged if pressure is applied to rear housing. Tighten the V-belt by pressing against front casing near alternator fan.

- 6 Tighten all remaining alternator mounting bolts and check all other bolts to secure the installation.

**4.5 ELECTRICAL CONNECTIONS**



**WARNING**

Let installation work be done by a licensed electrician. Before beginning with the connection of the wiring, make the DC distribution voltage free.



**CAUTION!**

Short circuiting or reversing polarity may lead to serious damage to the batteries, the alternator, the Alpha Pro II regulator, the cabling and/or the terminal connections. Fuses can not prevent damage caused by reversed polarity. The damage as a result of reverse polarity is not covered by the warranty.



**CAUTION!**

Too-thin cables and/or loose connections can cause dangerous overheating of the cables and/or terminals. Therefore tighten all connections well, in order to limit transition resistance as far as possible. Use cables of the correct size. See specifications (section 9) for recommended wire sizes.

- Use the supplied cable assembly for connection of the Alpha Pro II regulator
- DC Cables to connect the Battery to the alternator are not included in the delivery.
- The alternator wiring is electrically isolated from ground.

**4.5.1 Battery capacity**

Make sure that the alternator has the right capacity to charge the batteries and to supply the load that is connected to the batteries while charging. Failure to do so may result in extended charging times, increased alternator temperatures, and finally a reduced lifetime of your alternator and your batteries. The ratio between alternator capacity and battery capacity should be for a wet battery:

Type of vessel	Ratio between alternator capacity and battery capacity
Motor boat	20 – 40%
Sailing boat	30 – 50%

For example: on a sailing boat an alternator type 24/75 is suitable for charging a 24V battery bank of 150-250Ah (with no load connected).

Note that all above recommendations are given as example only. Choosing the correct alternator / battery capacity depends on many factors such as daily engine running hours, load connected to the batteries during charging, other charging equipment, etcetera. Therefore Mastervolt strongly advises to make an energy balance for the entire electrical installation.

**4.5.2 Installation drawings**



**NOTE!**

From the text below is often referred to a reference. These references are shown in the installation drawings of the loose supplied APPENDIX. Keep the APPENDIX on hand during installation

- For Alpha alternator model 12/90: see APPENDIX figure A-6
- For Alpha alternator models 12/130, 24/75 and 24/110: see APPENDIX figure A-7
- For Alpha alternator model 24/150: see APPENDIX figure A-8

**4.5.3 Wiring instructions**

- 1 See reference ①. Run the DC-cables between the battery set and the alternator. A DC-fuse must be integrated in the positive cable (see section 9 for specifications). Do not install the DC-fuse of the DC-distribution before the entire installation is completed. Connect the red cable between the B+ terminal of the alternator and the positive (+) pole of the battery. Connect the black cable between the B- terminal of the alternator and the negative (-) pole of the battery.
- 2 See reference ②. Connect the black wire of the cable assembly between the [gnd] terminal of the Alpha Pro II regulator and the B- terminal of the alternator.
- 3 Insert the two pole connector of the cable assembly into the field connector of the alternator See reference ③. Take adequate measures to assure a strain relief for this connector.
- 4 See reference ④. Connect the red wire of the cable assembly between the [+bat] terminal of the Alpha Pro II regulator and the positive (+) pole of the battery or the B+ terminal of the alternator.



**NOTE!**

If a battery isolator is used to charge more than one battery, the red wire of the cable assembly should not be connected to the B+ terminal of the alternator but to the positive (+) pole of the battery instead.

- 5 See reference ⑤. The brown cable of the cable assembly must be connected to the [reg on] terminal of the Alpha Pro II regulator. Connect the other wire end through a switch ("S1") with normally open contacts to the positive (+) pole of the battery as indicated. You can use the ignition switch (figure 7) or preferably an independent (ungrounded) oil pressure switch (figure 8). Use a 2.5mm<sup>2</sup> cable. This cable must also be secured by a 2 Amp fuse. As the [reg on] terminal is also used for voltage measurement, this cable should not be shared with other loads.



**CAUTION!**

If the engine is not running switch "S1" must be open, otherwise the field

windings of the alternator will be damaged due to overheating.



**NOTE!**

An additional toggle switch may be added *in series* with switch "S1" to shut down the alternator manually when increased propulsion is needed.

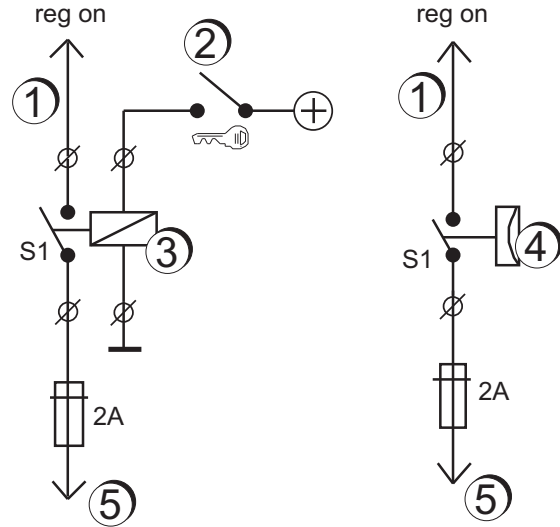


Figure 7: Connection of the ignition switch (left) and an independent (ungrounded) oil pressure switch with normally open contact (right)

1. Brown wire
2. Ignition switch
3. Relay
4. Normally open oil pressure switch
5. Positive battery pole
- 6 See reference ⑥. The blue wire of the cable assembly is the field connection of the alternator. Connect this wire to the [field] terminal of the Alpha Pro II regulator.



**NOTE**, only applicable for non-Mastervolt alternators: With most other brands there is an internal connection between the negative field terminal of the alternator (D-) and the alternator housing (GND). Be sure to remove this connection before installation. See APPENDIX section 2.5.

- 7 See reference ⑦. Attach the temperature sensor to the battery and connect the RJ12 connector to the Alpha Pro II regulator as indicated.

#### 4.5.4 Connection of a tachometer (optional)

If a tachometer is used, it should be connected between the W terminal of the alternator (see reference ⑧) and the B- terminal of the alternator (or the NEG pole of the battery). See figure 9.



**NOTE!**

With some alternators the W terminal is marked by an "R" instead of a "W"



**NOTE!**

The operation of the tachometer can not be guaranteed when the Alpha Pro II regulator switches from absorption mode to float mode. Switching on some loads during operation will solve this problem.

#### 4.5.5 Connection of an alternator indication lamp (optional)

To check the correct operation of the alternator often an indication lamp is used. This lamp will go off when the alternator is charging.

The Alpha Pro II regulator has this function integrated in MasterBus so at an alternator failure a MasterBus alarm is shown, refer to section 6.3.2.

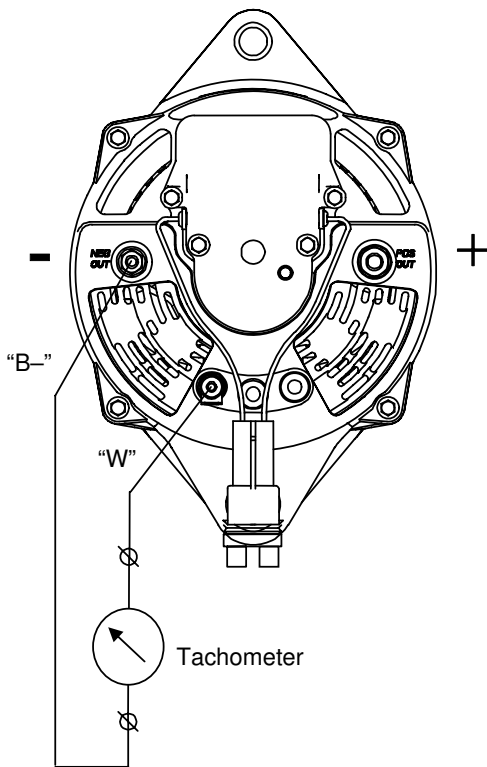


Figure 9: Connection of a tachometer (position of the terminals may differ; see APPENDIX figures A-6 till A-9)

The Alpha Pro II regulator has the same function integrated in its MasterBus functionality, so the number of revs can be shown on a MasterBus connected display too.

**4.5.6 Use of a battery isolator (optional)**

When two or more battery banks need to be charged simultaneously, using a battery isolator is recommended. See figure 12 for installation details. See APPENDIX figures A-11, A-13 and A-14 for installation examples.



**CAUTION!**

If there is a battery isolator between the B+ terminal of the alternator and the positive (+) pole of the battery, both the red [+bat] wire and the brown [reg on] lines must be connected to the positive (+) pole of the battery. Do not connect these wires to the input of the battery isolator.



**NOTE!**

As battery voltage sensing is performed by the Alpha Pro II regulator, you can use a battery isolator that has no voltage sense connection.

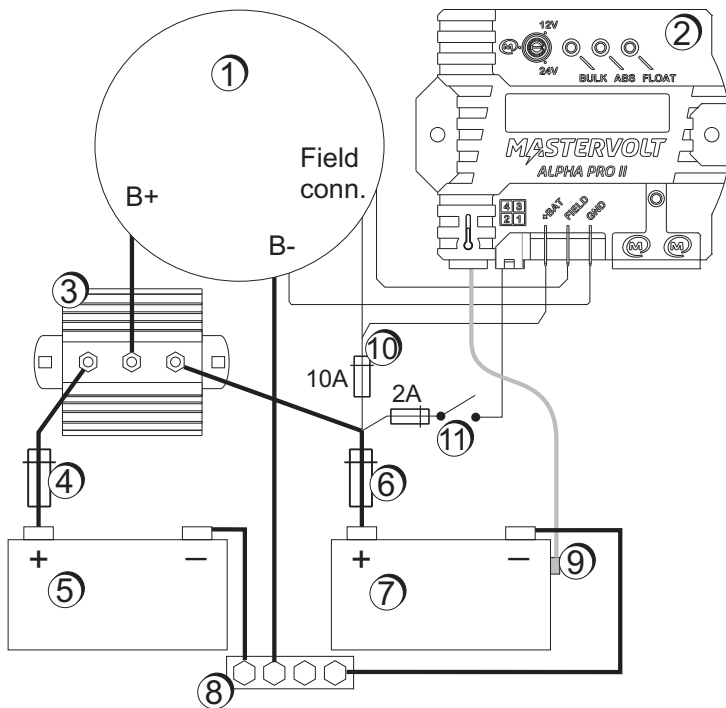


Figure 12: Installation of the Alpha Pro II

1. Alternator
2. Alpha Pro II regulator
3. Battery isolator
4. Auxiliary battery fuse
5. Auxiliary batteries
6. Main battery fuse
7. Main batteries
8. Minus bus bar
9. Battery sensor on main battery
10. 10A replaceable fuse between battery positive pole and alternator Field connector
11. Ignition relay or oil pressure switch, to be connected to Regulator On connection, number 1 in cable assembly

## 5 COMMISSIONING



### CAUTION!

Check all wiring before commissioning: positive connected to positive (red cables), negative connected to negative (black cables)

Commissioning of the Alpha alternator and the Alpha Pro II regulator involves two major parts:

- Selecting the charging mode
- Testing and adjusting

### 5.1 SELECTING THE CHARGING MODE

Both the Alpha alternator and the Alpha Pro II regulator are preset from the factory with settings that will work fine for most batteries.

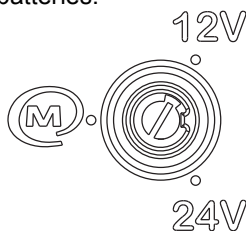


Figure 13: Three positions selector

The Alpha Pro II regulator has a three positions selector featuring standard settings for a 12V or 24V (lead acid) system and advanced settings via MasterBus. See figure 13. The default setting is MasterBus.

#### 5.1.1 Commissioning when selecting MasterBus

In case the MasterBus setting is selected by default the product's configuration will be unlocked resulting in an Alpha Pro II that *remains inactive* (shown by LEDs blinking twice alternately). Two parameters need to be selected via MasterBus before the configuration can be locked and the Alpha Pro II made operational (see Chapter 6 for more extensive explanation on using MasterBus).

1. Go to Configuration page
2. Go to group 'System' and select the 'Alternator type' present in your system

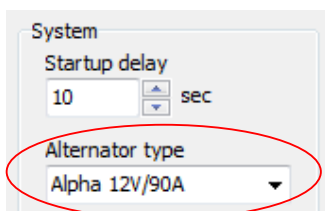


Figure 14: Selecting 'Alternator type' through MasterAdjust

3. Go to group 'Battery' and select the 'Battery type' present in your system

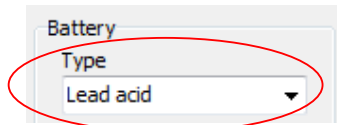


Figure 15: Selecting 'Battery type' through MasterAdjust

4. Go to group 'Alpha Pro setup' and select 'Lock setup'

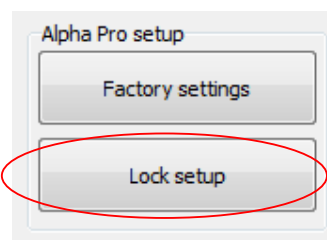


Figure 16: Selecting 'Lock setup' via MasterAdjust

After this has been done the Alpha Pro II is ready for testing.



### CAUTION!

Invalid settings can cause serious damage to your batteries. Adjustments of settings may be undertaken by authorised personnel only! Keep a record of setting changes in this manual.



### CAUTION!

Use a 0.4 x 2.5mm flat blade screwdriver to adjust the selector. Do not attempt to rotate the selector past the limit. You will damage the selector.

## 5.2 TESTING

### 5.2.1 Test prior to starting engine

Before starting the engine, follow all steps in order of succession as described below:

1. Place the DC-fuse(s) to connect the batteries to the wiring of the Alpha alternator and the Alpha Pro II regulator.
2. Check whether all indication lights on the Alpha Pro II regulator are off.



- 3 Energize the [reg on] terminal by either turning on the ignition switch (DO NOT START THE ENGINE) or by putting a jumper across switch S1 (see figure 14). Check whether the 3 yellow LED's start to blink. After approx. 10 seconds the yellow bulk led will illuminate.

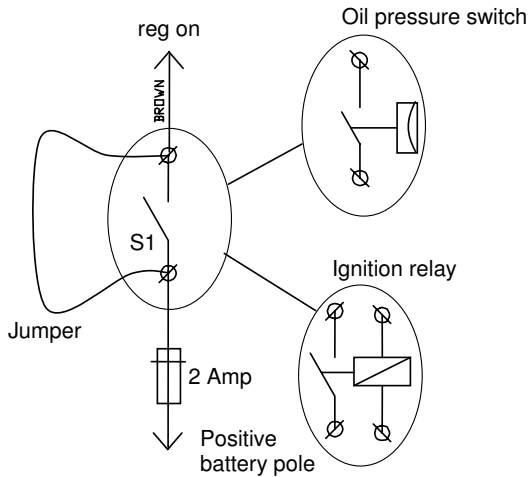


Figure 14: Jumper across switch S1

- 4 Check whether the alternator field is energized by touching the shaft of the alternator with a screwdriver. It should be strongly magnetic.
- 5 De-energize the [reg on] terminal by turning off the ignition switch or by removing the jumper across switch S1 again. All LED's should go off and the field should no longer be strongly magnetic.



**CAUTION!**

After performing this test, be sure to turn de-energize the [reg on] terminal, otherwise the field windings of the alternator will be damaged due to overheating

If you cannot pass the tests mentioned above, remove the DC-fuses and double check the wiring. Refer to the Trouble shooting section (section 8).

- 6 Check whether all bolts are securely mounted. Check both the aligning and tension of the V-belts.

**5.2.2 In operation test**

To check for proper operation you will need a hand held digital meter. If you have installed a battery monitor such as the *MasterShunt* or any other digital voltage measuring device, you can use this as well.



**WARNING**

When the engine is running, be aware of moving parts like V-belts.



**NOTE!**

See section 3.2.1 for explanation of the bulk, absorption and float mode.

- Be sure no loads or any other charging sources are on!
- Be sure the battery is (almost) fully charged

Follow all steps in order of succession as described below:

- 1 Measure and record the battery voltage at idle.
- 2 Start the engine. The three LEDs on the Alpha Pro II blink together to indicate the start up mode.
- 3 Check for abnormal noise or vibration.
- 4 The yellow [bulk] LED on the Alpha Pro II regulator (see figure 15) illuminates, indicating that the charge-cycle begins.
- 5 Measure and record the battery voltage. The battery voltage should be higher than measured before at step 1. The battery voltage rises until the yellow [abs] LED illuminates.
- 6 When the yellow [abs] LED illuminates, the absorption mode commences. Measure and record the voltage at which the battery stabilizes (@ 25°C / 77°F).
- 7 An absorption timer starts to keep the Alpha Pro II regulator in the absorption mode. The factory setting of this timer is 4 hours.



**NOTE!**

For testing you might want to reduce the absorption time temporarily.

- 8 When absorption time has elapsed, the green [float] LED will illuminate. This means that the float mode has started.

If you have passed the above mentioned tests, the charging system is ready for operation. Else check trouble shooting.

Depending on your settings the regulator can switch to Float before a 100% SOC has been reached, refer to section 6.3.4

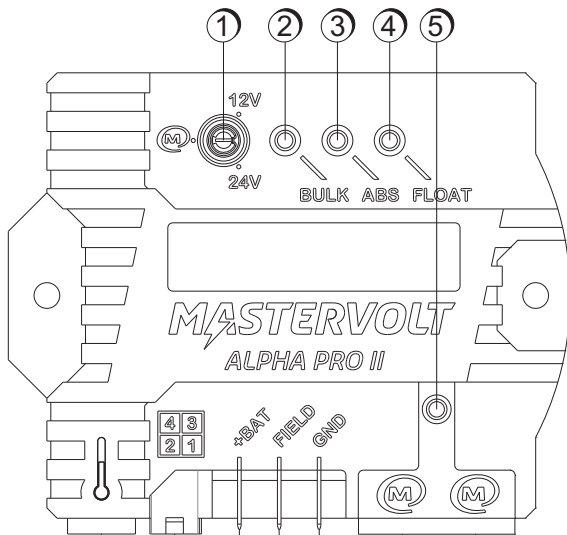


Figure 15: Overview of the Alpha Pro II regulator

1. Settings selector 12/24V, MasterBus
2. Yellow LED to indicate Bulk phase
3. Yellow LED to indicate Absorption phase
4. Yellow LED to indicate Float phase
5. Green LED to indicate MasterBus traffic

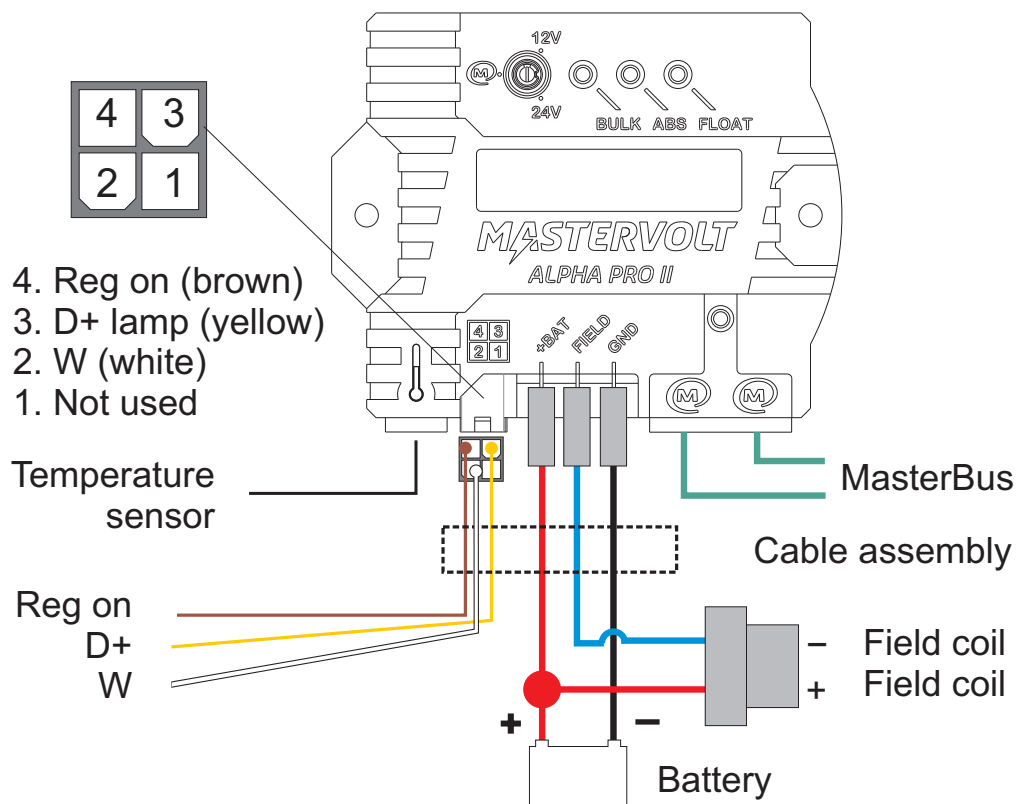


Figure 16: Connections of the Alpha Pro II regulator

### 5.2.3 Voltage Settings

The Alpha Pro II regulator uses the [reg on] terminal (figure 16, connection 4) and the [gnd] terminal for measurement of the battery voltage.

As the field current flows through the [gnd] terminal as well, a voltage drop may occur on the black cable which is connected to the [gnd] terminal. This will affect the charge voltage. To minimize this voltage drop, a 4mm<sup>2</sup> black cable is used. Under all circumstances the voltage-drop may not exceed 0.01 Volts.

### 5.2.4 Absorption voltage adjustment

The factory-settings for the absorption voltage are 14.25V for 12V battery and 28.50V for 24V batteries (@ 25°C / 77°F). These settings can be changed with the mode selector in MasterBus position and the configuration unlocked. Refer to section 6.3.4.

Do not adjust the charge voltage above the recommended limits of the battery manufacturer. Also note that too high voltages may damage sensitive equipment that is connected to the batteries.

### 5.2.5 Float voltage adjustment

The factory-settings for the float voltage are 13.25V for 12V battery and 26.50V for 24V batteries.

These settings can be changed with the mode selector in MasterBus position and the configuration unlocked. Refer to section 6.3.4.

If the float voltage is set near 13.0V you may have to switch on some DC loads to get the alternator to turn on because it takes some time +for the voltage to settle from the higher absorption voltage.

### 5.2.6 Absorption time adjustment

Factory setting of the absorption timer: 4 hours. This is appropriate for most systems. Exceptions might be:

- Extension of the absorption time to do some intentional overcharging to regain lost capacity.
- Shorten the time if you stop and start the engine often each day.
- Temporary time reduction for testing purposes

Changing absorption time is possible with the mode selector in MasterBus (9 o'clock) position and the configuration unlocked. Refer to section 6.3.4.

Adjustable range: 0 minutes up to 10 hours.

**NOTE!**

The new setting will only be activated after the Alpha Pro II was powered up again.

### 5.2.7 Temperature compensation

The battery temperature sensor included, compensates the charge voltage for deviating battery temperatures. See section 3.2.2 for details. When the temperature-sensor is not connected, the 25°C settings are taken.

High temperatures are destructive to batteries. If your batteries are regularly subjected to temperatures above 30°C / 100°F, you should relocate them or supply forced fresh air ventilation.

## 5.3 OPERATION

After starting the engine the Alpha alternator and the Alpha Pro II regulator will switch on automatically. The regulator will wait for the engine to rev up before it starts charging the battery. Refer to section 5.2.2 Start Up mode. There is no need for adjustment or operation. If the engine is stopped the Alpha alternator and the Alpha Pro II regulator will switch off again. When switched off, all LED's of the Alpha Pro II regulator are off. An exception is when the Alpha Pro II is set to power the MasterBus network. It will then stay switched on, even after switching off the engine.

**CAUTION!**

Never disconnect any wiring during operation of engine.

**NOTE!**

If a heavy load is switched on during the absorption or float mode the alternator will compensate this by increasing its output power, given the engine number of revs is sufficiently high. Note that the regulator will not change back to bulk mode to start a new charging cycle. A new charging cycle will only commence when the engine is started again.

See section 3.2.1 for explanation of the three step PLUS charging cycle.

Although the Alpha alternator is almost maintenance-free, still moving parts are involved that need regular service and maintenance. This should be done according to the directions in section 1.

## 6 MASTERBUS

### 6.1 WHAT IS MASTERBUS?



All devices that are suitable for MasterBus are marked by the MasterBus symbol.

MasterBus is a fully decentralized data network for communication between the different Mastervolt system devices. It is CAN-bus based which has proven itself as a reliable bus-system in automotive applications. MasterBus is used as power management system for all connected devices, such as the inverter, battery charger, generator and many more. This enables communication between the connected devices, for instance to start the generator when the batteries are low.

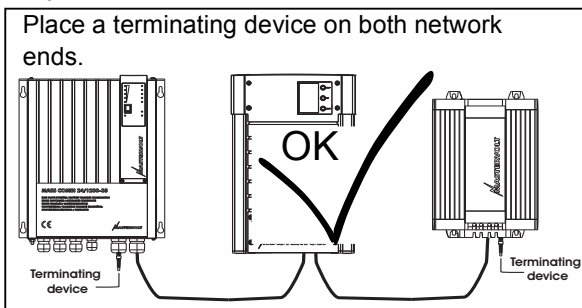
MasterBus reduces complexity of electrical systems by using UTP patch cables. All system components are simply chained together. Therefore each device is equipped with two MasterBus data ports. As only a few MasterBus cables are needed, installation and material costs are reduced importantly. New devices can be added to the existing network easily. Consequently the MasterBus network is highly flexible for extended system configuration. Mastervolt also offers several interfaces like the Modbus interface, making even non-MasterBus devices suitable to operate in the MasterBus network. For central monitoring and control of the connected devices Mastervolt offers four different panels, from the small Mastervision compatible 120 x 65 mm LCD screen up to the full colour MasterView System panel. All monitoring panels can be used for monitoring, control and configuration of all connected MasterBus equipment.



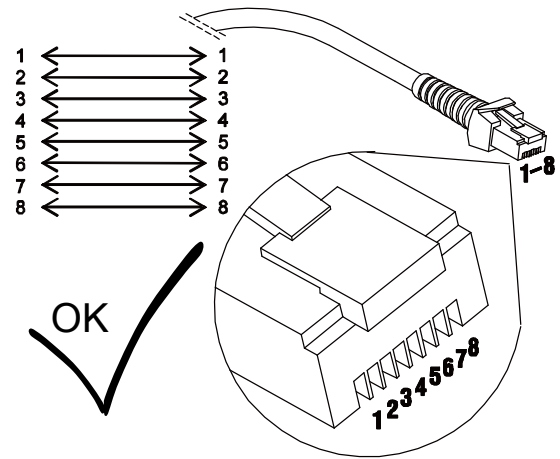
**CAUTION:** Never connect a non-MasterBus device to the MasterBus network directly! This will void warranty of all MasterBus devices connected.

### 6.2 HOW TO SET UP A MASTERBUS NETWORK

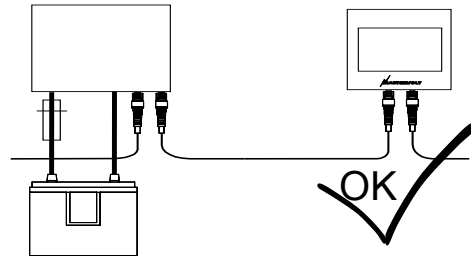
Every MasterBus device is equipped with two data ports. When two or more devices are connected via these ports, a local data network called the MasterBus is formed. Keep the following rules in mind:



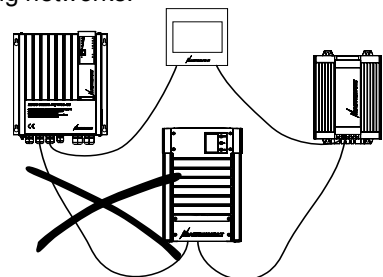
Connections between the devices are made by standard straight UTP patch cables.



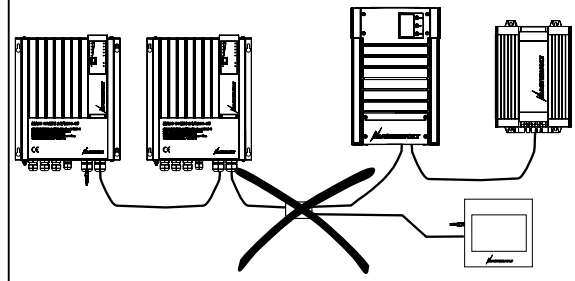
At least one device in the network must be MasterBus powering (see specifications). As all powering devices are galvanically isolated, multiple powering devices are allowed.



Do not make ring networks.



Do not make T-connections in the network.



**6.3 MASTERBUS FUNCTIONS**

Adjustment of the settings of the Alpha Pro II can be made via the MasterBus network (by means of a remote control panel or a MasterBus - USB interface connected to a PC with MasterView System software).



**CAUTION!**  
Invalid settings of the Alpha Pro II can cause serious damage to your batteries and/or the connected load! Adjustments of settings may be undertaken by authorised personnel only.

**6.3.1 Monitoring**

Value	Meaning
<i>General</i>	
Device state	Shows the state of the Alpha Pro II: Standby/ Charging/ Alarm
Charger state	Shows the state of the internal charger: Off/ Bulk/ Absorption/ Float
<i>Battery</i>	
Battery voltage	Battery voltage measured by the MasterShunt or, if no Mastershunt has been selected, the battery voltage is measured by the Alpha Pro II [V]
Battery temp.	Battery temperature measured by the MasterShunt or, if no Mastershunt has been selected, the battery temperature is measured by the Alpha Pro II [°C]
<i>Alternator</i>	
Alternator shaft	Number of revolutions alternator [rpm]
Engine shaft	Number of revolutions engine [rpm]
Sense voltage	Battery voltage measured by the Alpha Pro II [V]
Field current	Current through the alternator field coil [A]
Alternator volt.	Voltage measured between +Bat and GND [V]
Alternator temp.	Alternator temperature, mount the sensor on the alternator. Also refer to section 6.3.4
<i>Shunt</i>	
Status	Not selected/ Connected/ Connection lost
State of charge	Battery state of charge calculated by the shunt [%]
Battery voltage	Battery voltage [V] measured by the MasterShunt
Battery current	Battery current [A] measured by the MasterShunt
Battery temp.	Battery temperature measured by the MasterShunt temperature sensor [°C]

**6.3.2 Alarms**

Value	Meaning
TS error	Temperature Compensation error
Bat. Temp. high	The battery temperature sensor measures a high temperature
Dev. Temp. high	Alpha Pro device temperature too high
+D overload	Overload of the lamp connection (current too high)
Invalid system	Selector on a blank spot. The selector has two blank spots to separate 12V, MasterBus, 24V. The yellow LEDs are blinking twice alternately.
Battery high	Battery high voltage warning, generated by the Alpha Pro II
Battery low	Battery low voltage warning, generated by the Alpha Pro II
High field current	Field current too high, Alpha Pro II stops regulating and retries after 5 seconds repeatedly
Low field current	Field current too low, there is a disconnection in the field wiring
Cable losses	Cable between alternator and battery is too thin, causing voltage drop
Shunt mismatch	Different voltage settings of MasterShunt and Alpha Pro II

**6.3.3 History**

Value	Meaning	Factory setting	Adjustable range
Completed cycles	Total number of completed charging cycles	0	0-200000 x
Restarted cycles	Total number of aborted charging cycles	0	0-200000 x
Total charge time	Total regulator charge time since commissioning	0 min	0-2000000 min
# Temp. alarms	Total number of temperature alarms	0	0-65535
# High DC alarms	Total number of high DC voltage alarms	0	0-65535
# Low DC alarms	Total number of low DC voltage alarms	0	0-65535

## 6.3.4 Configuration

Below parameters can be changed via the MasterBus network by means of a MasterView panel or by means of an interface connected to a PC with MasterView System software.

Value	Meaning	Default	Adjustable. range
<i>General</i>			
Language	Language displayed on a MasterBus monitoring device	English	See specifications
Name	Name of this device. This name will be recognized by all devices connected to the MasterBus.	APR Alpha Pro MB	0-12 chars
MasterBus power	Option to let the Alpha Pro power MasterBus	Off	Off, On
<i>System</i>			
Startup delay	Delay in seconds to allow the engine revving up before the alternator starts loading it.	10	0-60
Alternator type*	Select the alternator type to connect this charging regulator to.	Alpha 12V/90A	See specifications
Battery voltage	Nominal battery voltage	12V	12V, 24V
Temp. sensor	Location of the Alpha Pro temperature sensor.	Battery	Battery, Alternator
<i>Alternator</i>			
Pole pairs	Number of alternator pole pairs*	6	1-16, alternator dependent
Pulley ratio	Motor pulley diameter relative to the alternator pulley diameter.	1.000	0.000-4.000
Keep alive DC	The field current is not to drop below this percentage of maximum to keep the rpm meter functioning well.	6 %	6-25%, only after Installer login
RPM event at Small engine	Number of revs at which an event takes place Option to minimize torque load by decreasing charging current. This prevents a small engine from stalling.	1000 rpm Not checked	200 - 10000 rpm
I <sub>max</sub> = 20% below	Field current turns to 20 % below X rpm.	1000	0-20000
I <sub>max</sub> =100% above	Field current turns to 100 % above Y rpm.	2000	0-20000
<i>Battery</i>			
Type	Battery type selection	Wet cell	See specifications
Temp. compensate	Voltage change at temperature rise	-0.030V/°C	-1.000 - +1.000
<i>Bulk</i>			
Voltage	Bulk voltage	14.25/28.50/57.00V	0.00-16.00/16.00-32.00/32.00-64.00V
Minimum time	Minimum bulk voltage timer	4 min	0-600 min
Start time at	Voltage at which to start the minimum bulk voltage timer	13.80/27.60/55.2V	0.00-16.00/16.00-32.00/32.00-64.00V
Maximum time	Maximum bulk voltage timer	360 min	0-600 min
Return voltage	Return to bulk voltage	12.80/25.60/51.2V	0.00-16.00/16.00-32.00/32.00-64.00V
Return time	Adjustable Return to Bulk time after the Return to Bulk voltage has been reached.	30 sec	0-255 sec
<i>Absorption</i>			
Voltage	Absorption voltage	14.25/28.50V	0-15.50/0-31.00V*
Maximum time	Maximum absorption timer	4 h	0-24 h*
<i>Float</i>			
Voltage	Float voltage	13.25/26.50V	0-15.50/0-31.00V*
<i>Alarm levels</i>			
High alarm on	Alarm DC High on	16.00/32.00V	0-16.00V0-32.00V*
High alarm off	Alarm DC High off	15.00/30.00V	0-16.00V0-32.00V*
Low alarm on	Alarm DC low on	10.00/20.00V	0-16.00/0-32.00V*
Low alarm off	Alarm DC low off	11.00/22.00V	0-16.00/0-32.00V*
Alarm delay	Alarm delay time	30 sec	0-240 sec*

Value	Meaning	Default	Adjustable. range
<i>Shunt</i>			
Shunt device	Selection of the shunt to measure the battery voltage		
<i>Alpha Pro II setup</i>			
Factory settings	Option to reset to factory settings		
Lock setup	Option to lock the configuration settings. With the configuration locked, only the language and the device name can be changed.		
Unlock setup	Option to unlock the configuration settings (only appears after Lock setup)		

\* only with Alternator type and Battery voltage configured as “user defined”

Value	Meaning	Default	Adjustable. range
<i>Events</i>			
Event x source	Event by the Alpha Pro II that should result in an action another device on the MasterBus network. Nine events are available: x can be 1-9.	Disabled	See Event source list
Event x target	Select a connected MasterBus device that should take action due to an Alpha Pro II event.	Select...	Selectable targets are system dependent.
Event x command	Action to be taken by the target device.	Select...	See command list in manual of the selected device.
Event x data	Data is linked to the command. See also figure 16.	Off	Off, On, Copy, Copy Invert, Toggle.
Event x+1	The next event appears after enabling Event x.	Disabled	See Event x.

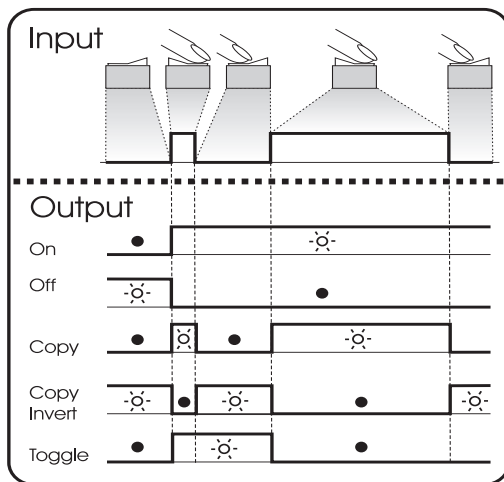


Figure 17: Event data

Figure 17 shows the meaning of the event data. **Input** is a pulse followed by a longer signal (1/0). **On** changes the status to On at the first signal. **Off** changes the status to Off at the first signal. **Copy** lets the status follow the input. **Copy Invert** lets the status follow the opposite of the input. **Toggle** changes the status at the first signal and back at the second signal. It is often used in combination with a pulse switch.

### 6.3.5 Alpha Pro II event source list (Alpha Pro II as event source)

Device state	A change in device state
Bulk	The charging process switches to Bulk phase
Absorption	The charging process switches to Absorption phase
Float	The charging process switches to Float phase
RPM event	The alternator number of revs reaches a certain level

### 6.3.6 Alpha Pro II event target list (Alpha Pro II as event target)

Bulk	The charging process switches to Bulk phase
Absorption	The charging process switches to Absorption phase
Float	The charging process switches to Float phase



### 6.3.7 Keep alive function

The Keep alive function is meant to keep the field current at least at a value that is detectable by the rpm meter. So if the number of revolutions decreases, the field current does not drop below this level.

### 6.3.8 Small engine function

If you have a small engine, this option limits the charge current in a selected number of revs interval. This enables a smaller engine to rev up so it will not stall as a result of the high torque required to provide the charge current. At the lower limit of this interval the charge current is 20%, at the higher limit it is 100%.

### 6.3.9 Unlocking configuration

To change the Alpha Pro II MasterBus configuration, it must be unlocked. With the configuration unlocked, the regulator has stopped regulating and its LEDs start blinking twice alternately. After you finished configuration, you need to lock it before the regulator restarts regulating.

### 6.3.10 MasterShunt connected

With a MasterShunt connected, many things are different using the Alpha Pro II regulator.

1. There are two options to place a temperature sensor. The MasterShunt temperature sensor is preferably placed onto the battery, the Alpha Pro sensor onto the alternator.
2. In the Alpha Pro II configuration, the MasterShunt must be selected
3. Absorption Return Amp is added in the configuration. This is the charge current at which the regulator starts the minimum absorption timer. This value is calculated from the MasterShunt Amp=Full percentage, multiplied by its entered Battery capacity.
4. The MasterShunt may have a battery voltage setting that differs from the Alpha Pro II voltage setting. In this case a MasterShunt Mismatch alarm is shown on MasterBus.



#### CAUTION:

If the Battery voltage was set User defined, there will be no MasterShunt Mismatch alarm when the MasterShunt has different voltage settings!

### 6.3.11 Start Float SOC

Percentage of the maximum State of Charge to enter Float stage. This setting can be used to save the batteries at higher SOC's as they are not constantly subject to the higher Absorption voltage. Further, during a long trip the engine can be reserved for propulsion rather than charging the batteries immediately.

## 7 MAINTENANCE

During maintenance of the Alpha Alternator, Alpha Pro II regulator and/or the engine, the Safety Guidelines & Measures are applicable at all times. See section 2 of this manual.

See below for preventive maintenance procedures that will contribute to many years of trouble free operation of the Alpha alternator and the Alpha Pro II regulator.

### 7.1 ELECTRICAL CONNECTIONS

Check the wiring at least every six months. Defects such as loose connections, corroded connections, burned cables etc. must be corrected immediately.

### 7.2 CLEANING OF THE ALTERNATOR

The cleaning interval of the alternator, strongly depends on environmental conditions but should be maximum six months.

Ensure that all alternator surfaces are clean to the point that they do not have a buildup of dirt, grease or dust. Air flow passages must also be clear so that air can easily pass through the unit.

The alternator's bearings are greased for life, they cannot be re greased.

### 7.3 MOUNTING OF THE ALTERNATOR

Check the mounting of the alternator after the first 50 running hours. Then every 150 running hours or at least every year, whatever comes first.

Make sure that the alternator is securely mounted to its applicable brackets. The brackets, in turn, need to be bolted securely to the engine. Poor or loose mountings may lead to damaging vibration as well as reduced belt drive performance.

### 7.4 TENSION AND CONDITION OF V-BELTS.

Loose belts will slip on the pulley, fail to turn the alternator's rotor and finally overheat the alternator. The tension of new V-belts must be checked after the first 50 running hours. Then every 150 running hours or at least every year, whatever comes first.

Before adjusting the V-belt tension, inspect it for glazing, cracks, or dryness. A worn or damaged V-belt should be replaced.

If the V-belt is in satisfactory condition, check belt tension with cricket belt tension gauge. Refer to manufacturer's specifications for proper belt tension. If necessary use proper tensioning gauge for your application. Then adjust the tension accordingly.

If you replace a worn or damaged V-belt, the new belt should be checked for proper tension as well. A new belt loses 60% of its tension during the first few hours of operation. If a new V-belt has been installed, run the engine with full load connected to the alternator for approximately 15 minutes. Then check the belt tension again and adjust it if necessary.

## 8 TROUBLE SHOOTING

In case of any issue, we recommend consulting the Maintenance section first (see section 1). If you cannot solve a problem with the aid of the table below, contact your local Mastervolt Service Centre. See [www.mastervolt.com](http://www.mastervolt.com).

ISSUE	POSSIBLE CAUSE	SOLUTION
The three LED's of the Alpha Pro II are blinking together.	<ul style="list-style-type: none"> <li>This is the start up mode of the Alpha Pro II. After this the Alpha Pro II starts regulating.</li> </ul>	This is a normal situation. Wait until the LED's stop blinking.
The three LED's of the Alpha Pro II are blinking alternately.	<ul style="list-style-type: none"> <li>The Alpha Pro II selector is on a blank spot. The MasterBus alarm <i>Invalid System</i> is shown.</li> </ul>	Check the selector and correct its position.
The three LED's of the Alpha Pro II are blinking twice alternately.	<ul style="list-style-type: none"> <li>The Alpha Pro II MasterBus configuration was unlocked, it has stopped regulating.</li> </ul>	Adjust the settings and relock the configuration. The Alpha Pro II enters the start up mode after this.
Your oil pressure light (if installed) is blinking twice each time.	<ul style="list-style-type: none"> <li>The selector is in the 12V position, while your alternator and battery are 24V. The Alpha Pro II is not regulating.</li> </ul>	Check the selector and correct its position.
No voltages at all. All LED's of the Alpha Pro II regulator are off.	<ul style="list-style-type: none"> <li>Battery fuse has blown.</li> </ul>	Investigate the cause of this malfunction. Then replace the fuse.
	<ul style="list-style-type: none"> <li>Battery connections are corroded or bad.</li> </ul>	Clean and tighten the connections. If the cables are burned, replace them.
	<ul style="list-style-type: none"> <li>Black [gnd] wire is loose.</li> </ul>	Check black [gnd] wire.
No output power, all LED's of the Alpha Pro II regulator are off. Voltage on the [+bat] terminal is 12/24V Voltage on the [reg-on] terminal of the regulator is 0V.	<ul style="list-style-type: none"> <li>Engine is not running.</li> </ul>	Start the engine.
	<ul style="list-style-type: none"> <li>2 Amps fuse in brown wire is blown.</li> </ul>	Check the 2 Amps fuse and replace if necessary.
	<ul style="list-style-type: none"> <li>Problem with the oil pressure switch or ignition relay (S1) or brown [reg on] wire is loose.</li> </ul>	Check voltage on [reg on] terminal of the Alpha Pro II regulator. Check brown [reg on] wire. Check the oil pressure contact or ignition relay for correct operation.
No output power, one of the LED's of the Alpha Pro II regulator is on. Voltage on the [field] terminal of the regulator is 0V.	<ul style="list-style-type: none"> <li>10 Amps fuse in the red wire blown.</li> </ul>	Check the 10 Amps fuse and replace if necessary.
	<ul style="list-style-type: none"> <li>Two pole field connector of the cable assembly is loose (red and blue wire).</li> </ul>	Check field connector on the alternator (reference 3 on the installation drawings).
	<ul style="list-style-type: none"> <li>Problem in the wiring.</li> </ul>	Check red and blue wires to the field connector.
	<ul style="list-style-type: none"> <li>Blue [field] wire is loose.</li> </ul>	Check blue wire (reference 6 on the installation drawings).
	<ul style="list-style-type: none"> <li>Field windings of the alternator are defective.</li> </ul>	Check resistance of field windings. Replace alternator.
No output power, All LED's of the Alpha Pro II regulator are off. Voltage on the [reg on] and the [+bat] terminal of the regulator are both 12/24V.	<ul style="list-style-type: none"> <li>Black [gnd] wire is loose.</li> </ul>	Check black [gnd] wire (reference 2 on the installation drawings).
	<ul style="list-style-type: none"> <li>Alpha Pro II regulator defective.</li> </ul>	Replace Alpha Pro II regulator.
Tachometer indication is too low or fluctuates.	<ul style="list-style-type: none"> <li>An alternator driven tachometer may reduce its reading or fluctuate when the Alpha Pro II regulator makes a transition from absorption to float if the battery is fully charged with no loads or if the float voltage is set quite low.</li> </ul>	Nothing, this is a normal situation. To avoid this, you may switch on some loads.
	<ul style="list-style-type: none"> <li>Engine speed is too low.</li> </ul>	Increase engine speed.
	<ul style="list-style-type: none"> <li>Wrong calibration of the tachometer.</li> </ul>	Adjust tachometer according to pulley ratio.

<b>ISSUE</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
Regulator stays in bulk mode all the time (Bulk LED stays on).	<ul style="list-style-type: none"> <li>• Alternator is overloaded.</li> </ul>	Switch off a load; (part off) consumers.
	<ul style="list-style-type: none"> <li>• Defective batteries, short-circuit between cells.</li> </ul>	Check batteries and replace if necessary.
	<ul style="list-style-type: none"> <li>• Defective alternator</li> </ul>	Check alternator and replace if necessary.
	<ul style="list-style-type: none"> <li>• Capacity of the charging system is too low.</li> </ul>	Use an alternator with more capacity or increase charging capacity by using an additional charger. Consult your Mastervolt representative for advice.
Alpha Pro II regulator does not return to bulk mode when a high load is switched on	<ul style="list-style-type: none"> <li>• Defective Alpha Pro II regulator.</li> </ul>	Replace Alpha Pro II regulator.
	<ul style="list-style-type: none"> <li>• Once the regulator is in absorption mode a timer is started and after this time the regulator switches to float and will stay in this mode.</li> </ul>	Nothing; this is a normal situation. If necessary: switch off engine and start again. See also section 5.3.
Alternator is getting hot while engine is not running	<ul style="list-style-type: none"> <li>• Rotor field windings are still excited while engine is not running.</li> </ul>	Switch off DC immediately to avoid field windings of the alternator being damaged due to overheating. Check the oil pressure contact or ignition relay for correct operation. This switch (S1) must be open when the engine is not running. Check wiring between battery and [reg on] terminal.
Output voltage too high	<ul style="list-style-type: none"> <li>• The regulator measures a too low battery voltage and tries to compensate it.</li> </ul>	Check wiring between battery and [reg on] terminal for corrosion. Check for voltage drop across the oil pressure switch (S1) (if applied). The line between battery and [reg on] should not be used by other loads.
	<ul style="list-style-type: none"> <li>• Wrong setting of the charge voltage.</li> </ul>	Adjust the charge voltage.
	<ul style="list-style-type: none"> <li>• Battery temperature sensor not connected or not attached to the batteries.</li> </ul>	Check the battery temperature sensor.
	<ul style="list-style-type: none"> <li>• With non-Mastervolt alternators: terminal [D–] is not isolated from ground.</li> </ul>	Check voltage on terminal [D–] It should measure nominal battery voltage. If this voltage is 0V, check whether the terminal [D–] is isolated from ground.
Charge voltage stays in absorption mode too long / too short	<ul style="list-style-type: none"> <li>• Wrong setting of the absorption timer.</li> </ul>	Adjust the absorption timer (see section 5.2.6).
Alpha Pro II regulator is in float mode, but battery voltage is still at absorption or bulk level	<ul style="list-style-type: none"> <li>• Any other device is charging the batteries.</li> </ul>	Switch off all other charging devices and check battery voltage again.
No display function	<ul style="list-style-type: none"> <li>• Display has switched off</li> </ul>	Switch on display.
	<ul style="list-style-type: none"> <li>• Error in the network wiring</li> </ul>	Check wiring for errors.
MasterView display shows no Alpha Pro II	<ul style="list-style-type: none"> <li>• No terminating device placed at the ends of the network</li> </ul>	MasterBus needs a terminating device on both ends of the network. Check if available (See section 4.2).

## 9 TECHNICAL DATA

### 9.1 SPECIFICATIONS ALPHA ALTERNATOR

<b>Model:</b>	<b>12/90</b>	<b>12/130</b>
Part number:	48512090	48512130
Type enclosure (see APPENDIX):	A	B
Charge current:	90A	130A
Recommended DC fuse	125A	160A
Recommended DC wire size		
up to 3 m	AWG2 - 35mm <sup>2</sup>	AWG0 - 50mm <sup>2</sup>
3 m up to 5 m	AWG0 - 50mm <sup>2</sup>	AWG2/0 - 70mm <sup>2</sup>
Nominal voltage	12V	12V
Charge regulator:	Alpha Pro II 12V	Alpha Pro II 12V
Pulley diameter:	Ø 73 mm	Ø 88 mm
Belt tread:	2x	2x
Isolated from ground:	Yes	Yes
Rotating directions:	2	2
Maximum speed:	8000 rpm	8000 rpm
Pulley:	Double	Double
Required transmission belt	A-type	A-type
Weight:	5.5 kg/ 12.1 lbs	10.1kg / 22.3 lbs
Number of mounting positions:	3	1

#### 24V models

<b>Model:</b>	<b>24/75</b>	<b>24/110</b>	<b>24/150</b>
Part number:	48524075	48524110	48524150
Type enclosure (see APPENDIX):	B	B	C
Charge current:	75A	110A	150A
Recommended DC fuse	100A	160A	200A
Recommended DC wire size			
up to 3 m	AWG3 - 25mm <sup>2</sup>	AWG2 - 35mm <sup>2</sup>	AWG0 - 50mm <sup>2</sup>
3 m up to 5 m	AWG2 - 35mm <sup>2</sup>	AWG0 - 50mm <sup>2</sup>	AWG2/0-70mm <sup>2</sup>
Nominal voltage	24V	24V	24V
Charge regulator:	Alpha Pro II 24V	Alpha Pro II 24V	Alpha Pro II 24V
Pulley diameter:	Ø 88 mm	Ø 88 mm	Ø 92 mm
Belt tread:	2x	2x	2x
Isolated from ground:	Yes	Yes	Yes
Rotating directions:	2	2	2
Maximum speed:	8000 rpm	8000 rpm	8000 rpm
Pulley:	Double	Double	Double
Required transmission belt	A-type	A-type	A-type
Weight:	10.1kg / 22.3 lbs	10.1kg / 22.3 lbs	13.1kg / 28.9 lbs
Number of mounting positions:	1	1	3

See APPENDIX for dimensions

**9.2 SPECIFICATIONS ALPHA PRO II REGULATOR**

Model:	Alpha Pro II
Part number:	45512000
Suitable for alternator type:	Alpha 12/90, 12/130, 24/75, 24/110, 24/150, Bosch alternators via a cable adapter (included)
Nominal operation voltage:	12V /24V selectable, Li-ion voltages selectable via MasterBus only, with
Bulk / absorption voltage 12V [Li-ion]*:	14.25V [ 14.6V ]
Float voltage 12V [Li-ion]*:	13.25V [ 13.5V ]
Bulk / absorption voltage 24V [Li-ion]*:	28.50V [ 29.2V ]
Float voltage 24V [Li-ion]*:	26.50V [ 27.0V ]
Adjustable range – absorption [Li-ion]*:	13–15V [26-30V ]
Adjustable range – float [Li-ion]*:	13–13.9V [26-27.8V ]
Battery temperature compensation:	– 30mV/°C
Absorption time	4 hours, adjustable range: 0 min up to 24 hours
Cable assembly	1.5 mtr oil resistant connection cable + Bosch connector included
Temperature sensor	Included
Dimensions (hxwx d)	See figure 18
Weight:	0.4 kg / 0.9 lbs

\* Voltage at 25°C (with connected temperature sensor 14.4/28.8V at 20°C)

\*\*See APPENDIX for outline drawings

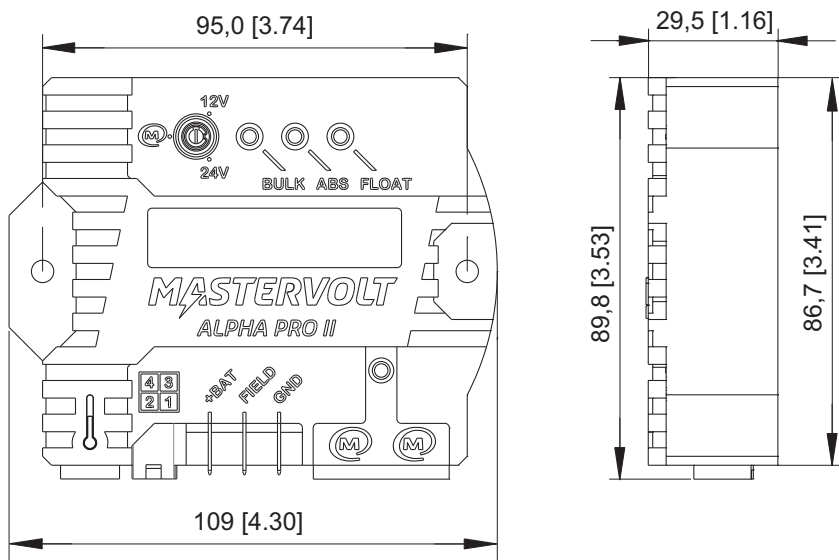


Figure 18: Dimension drawings of the Alpha Pro II regulator in mm [inch]

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