

# **MASTERVOLT**

## **APPENDIX**

# **ALPHA ALTERNATOR**

DIMENSIONS, INSTALLATION DRAWINGS AND CHARACTERISTICS



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## 1 DIMENSIONS

### 1.1 DIMENSIONS ALPHA ALTERNATOR MODEL 12/90

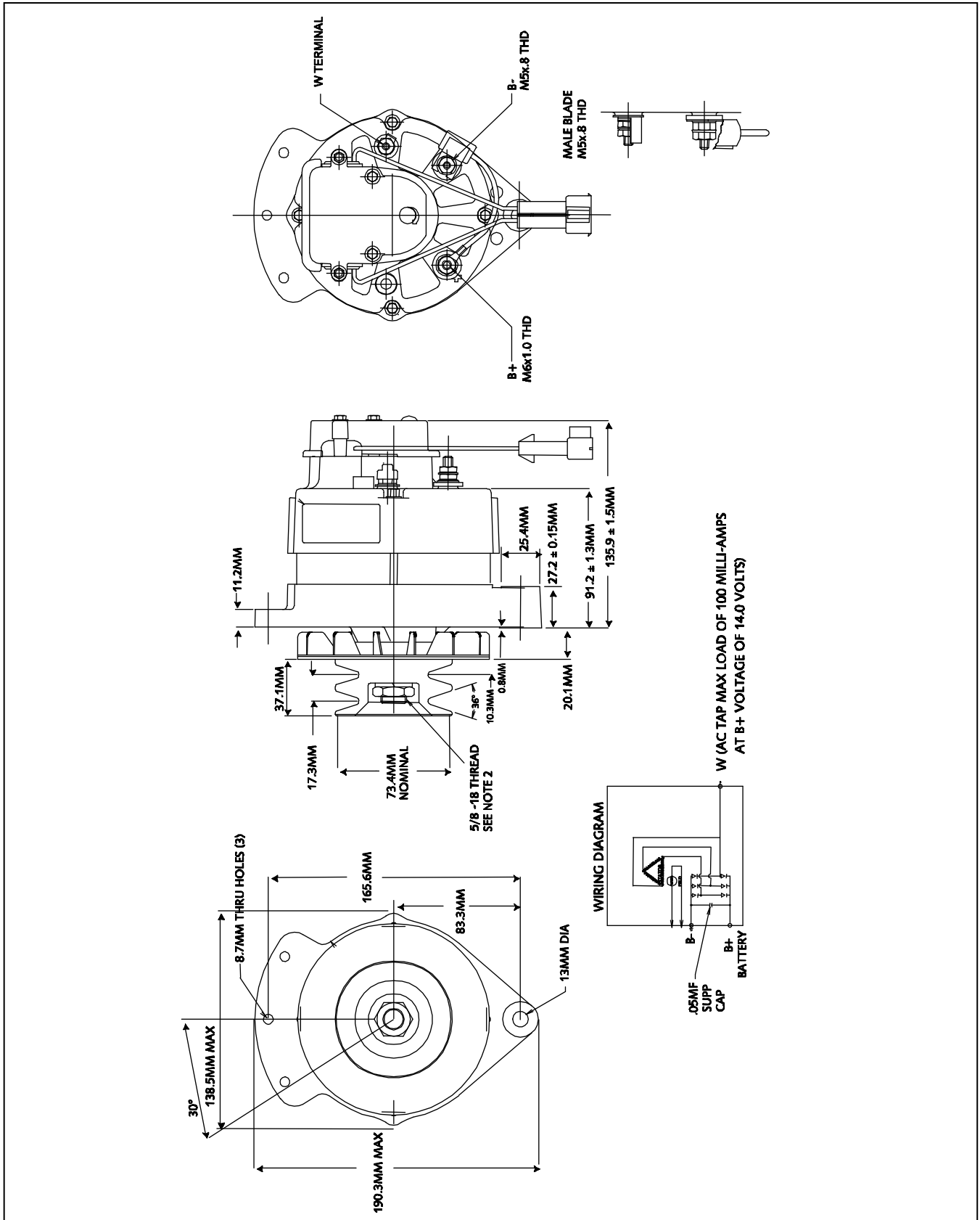


Figure A-1: Dimensions Alpha alternator model 12/90 (enclosure A)

## 1.2 DIMENSIONS ALPHA ALTERNATOR MODELS 12/130, 24/75 AND 24/110

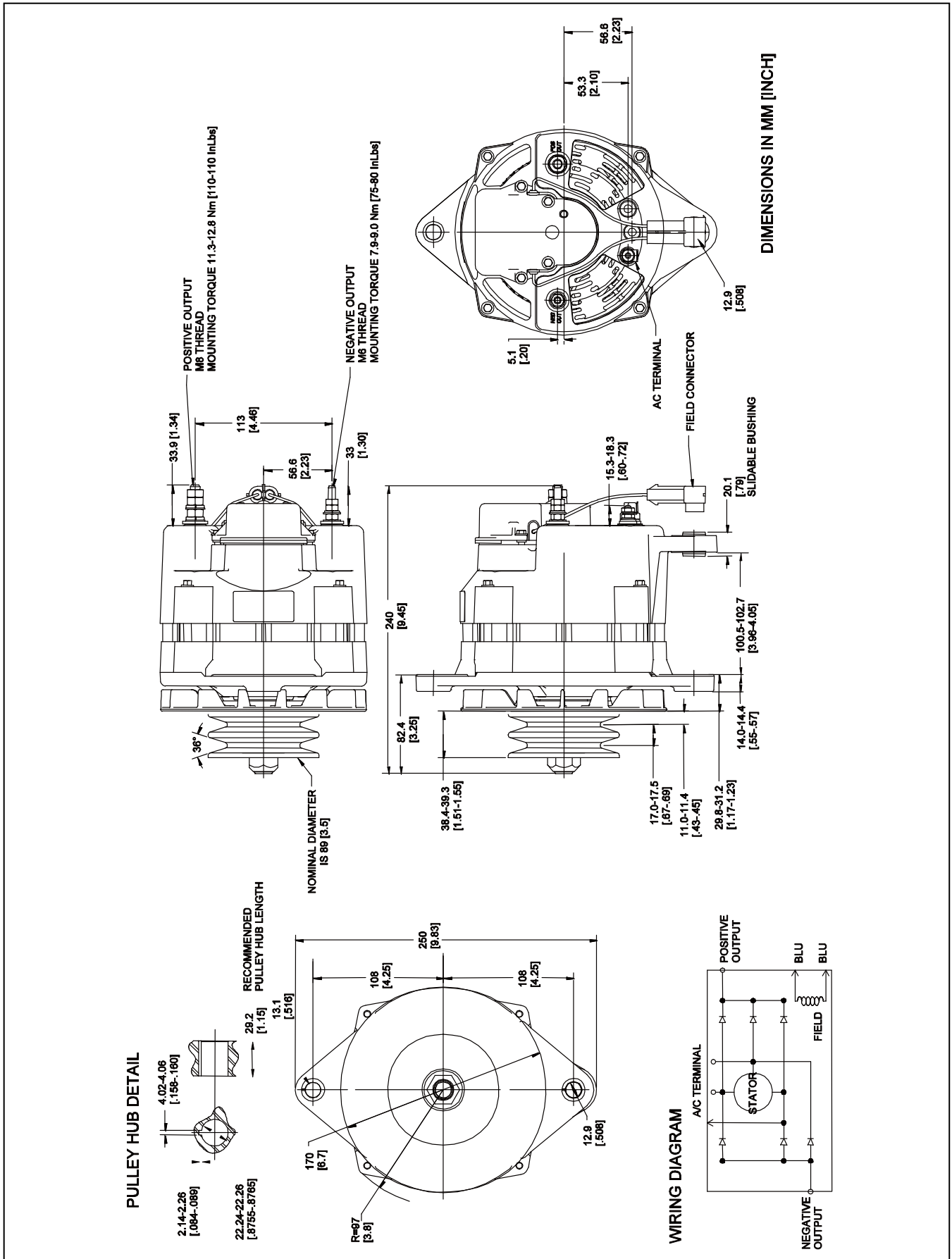


Figure A-2: Dimensions Alpha alternator models 12/130, 24/75, 24/110 and 24/150 (enclosure B)

## 1.3 DIMENSIONS ALPHA ALTERNATOR MODEL 24/150

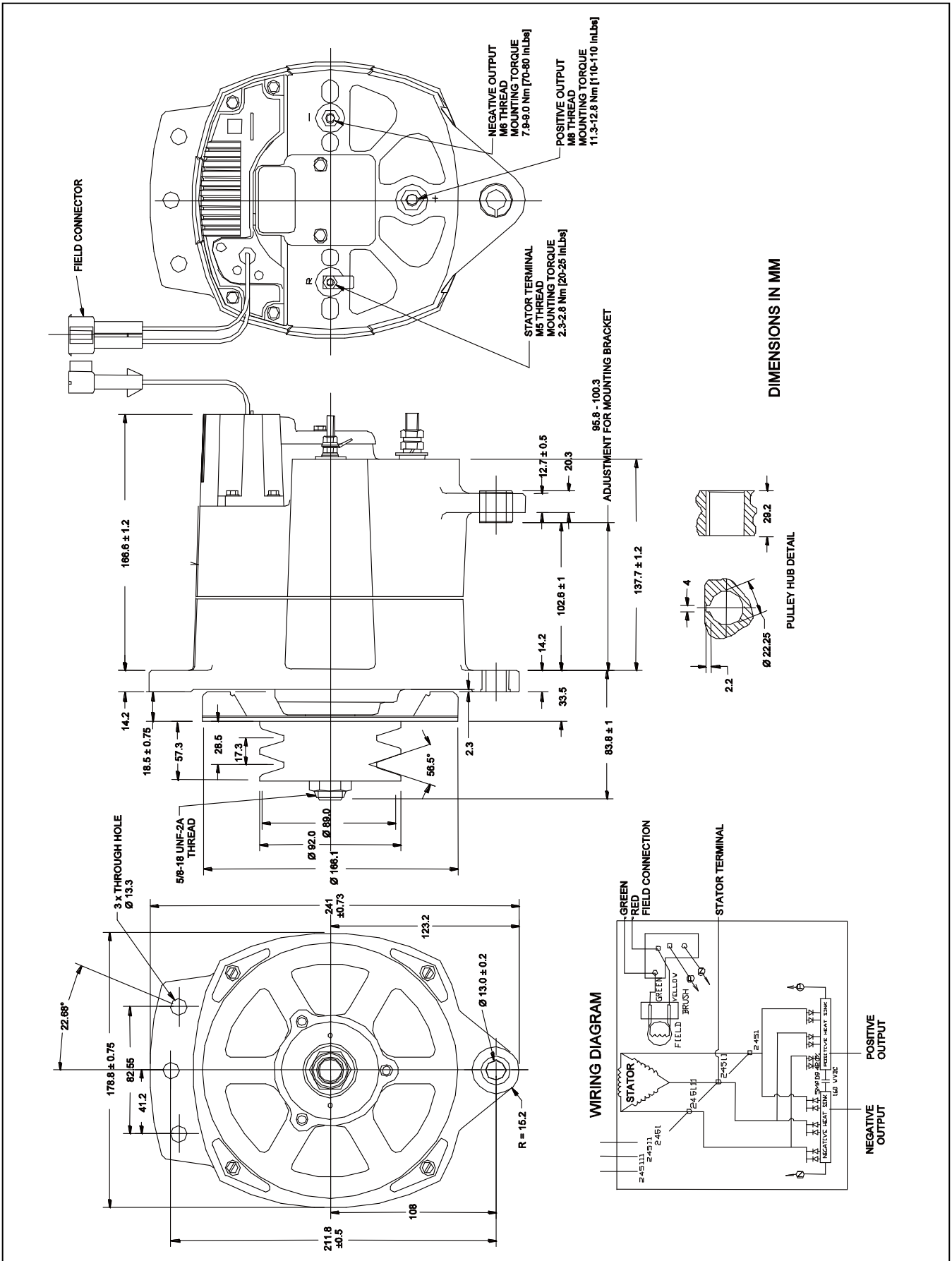


Figure A-3: Dimensions Alpha alternator model 24/150 (enclosure C)

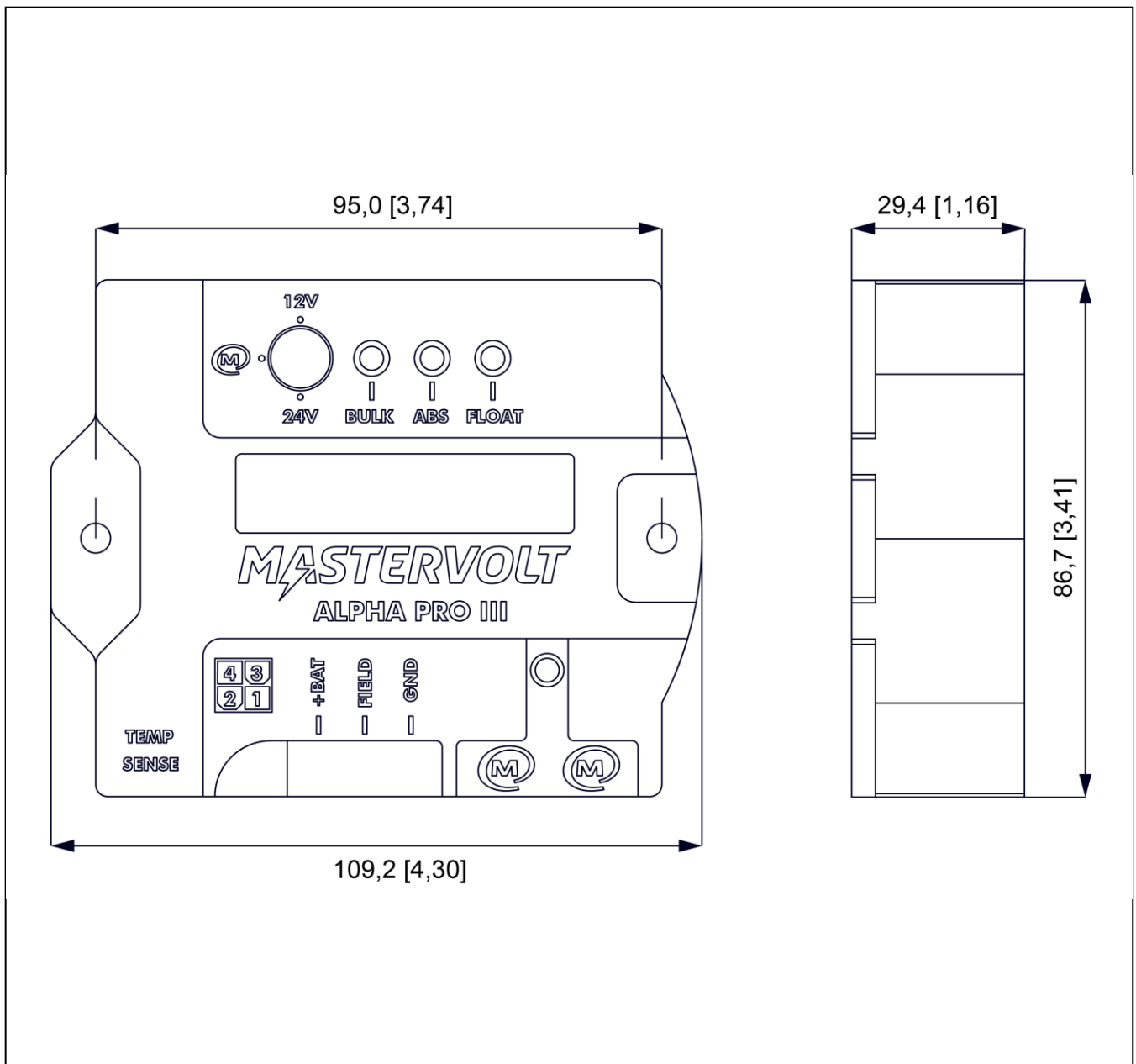
**1.4 DIMENSIONS ALPHA PRO III REGULATOR**

Figure A-5: Dimensions of the Alpha Pro III regulator (all models)

## 2 INSTALLATION DRAWINGS AND INSTRUCTIONS

### 2.1 ALPHA ALTERNATOR MODEL 12/90

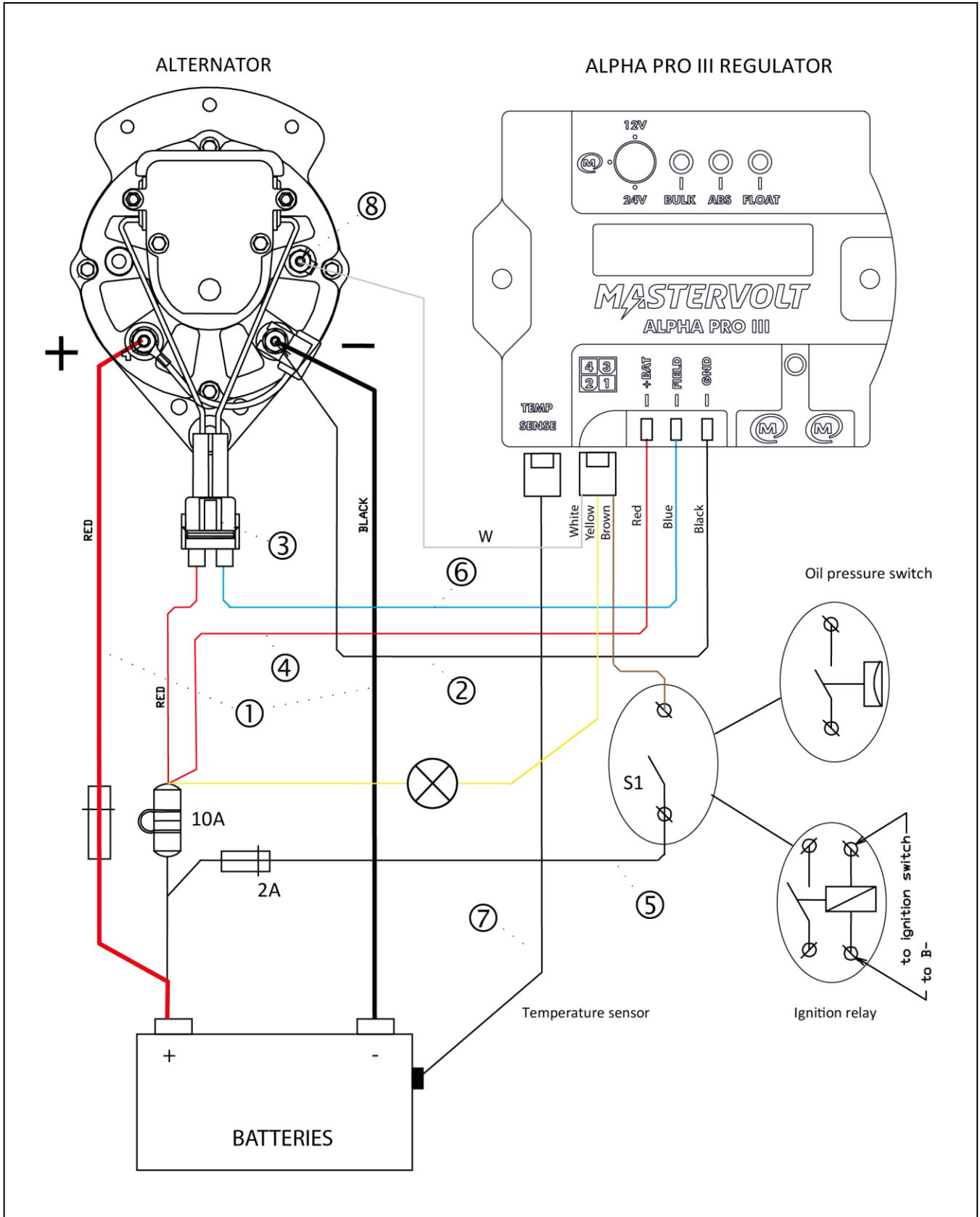


Figure A-6: Installation drawing Alpha alternator model 12/90

## 2.2 ALPHA ALTERNATOR MODELS 12/130, 24/75 AND 24/110

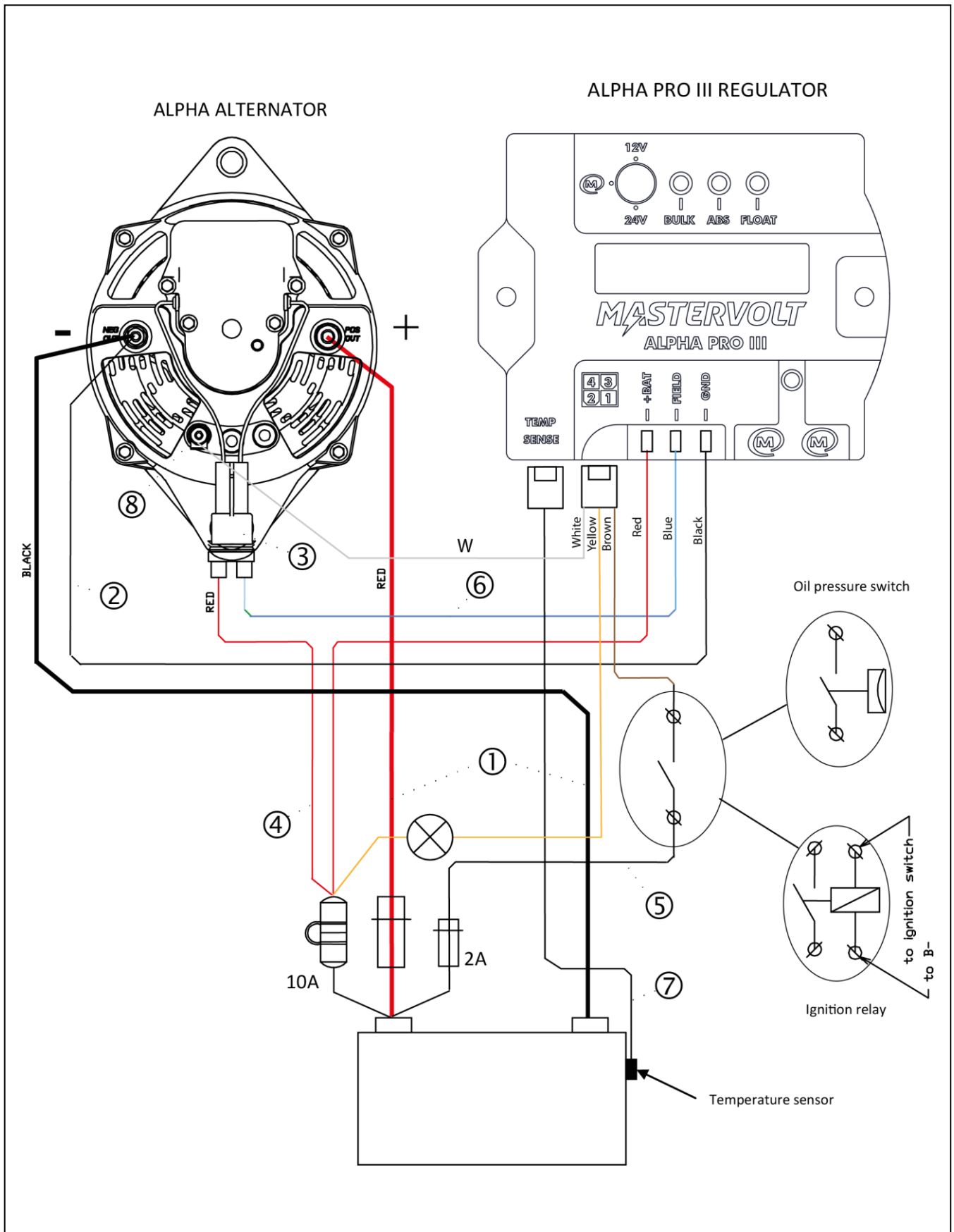


Figure A-7: Installation drawing Alpha alternator models 12/130, 24/75 and 24/110



## 2.3 ALPHA ALTERNATOR MODEL 24/150

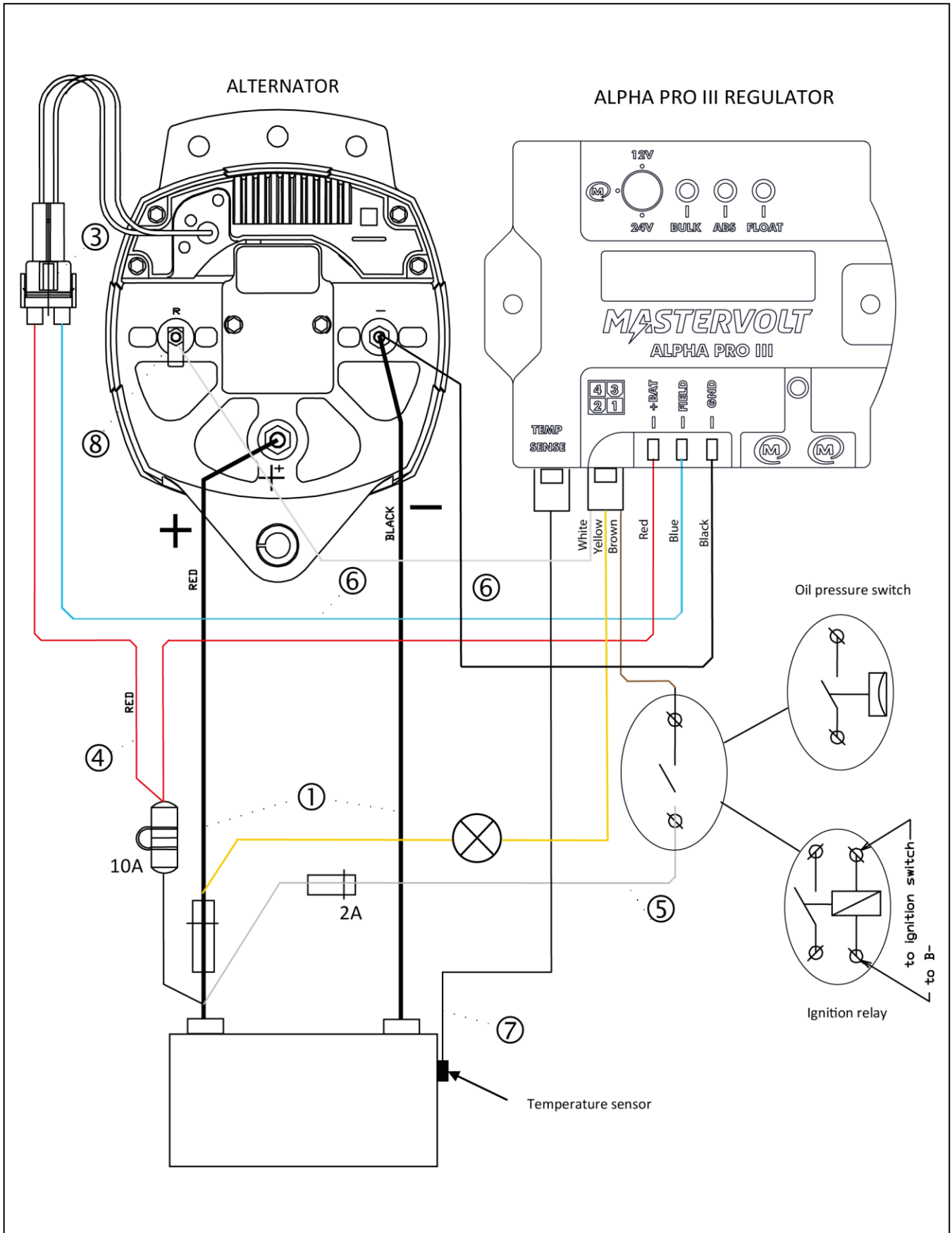


Figure A-8: Installation drawing Alpha alternator model 24/150



## 2.5 INSTRUCTION FOR MODIFICATION OF STANDARD BOSCH ALTERNATORS

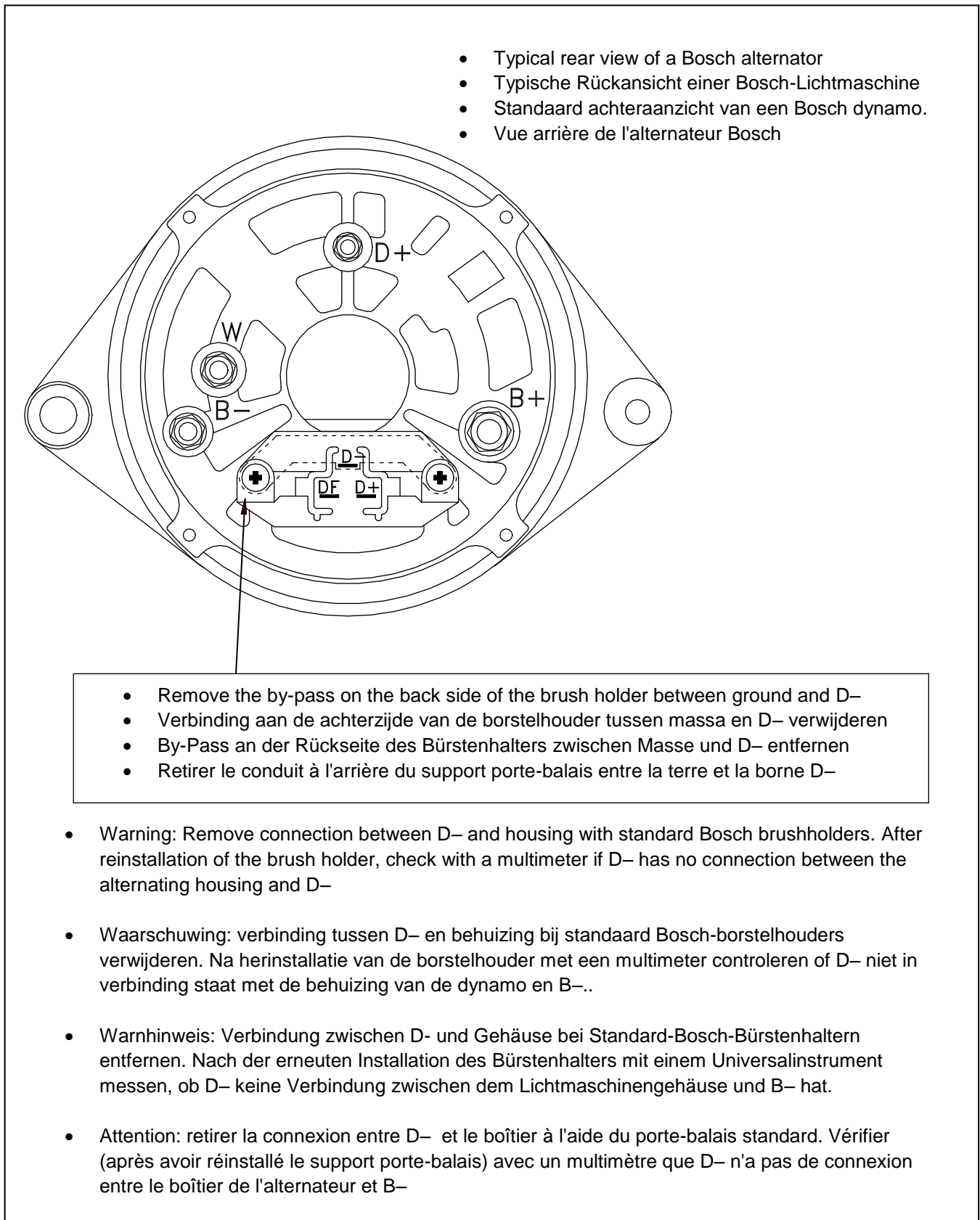


Figure A-10: Standard Bosch alternator (not applicable for Mastervolt alternators)

## 2.6 INSTALLATION EXAMPLES FOR ALPHA ALTERNATOR MODEL 12/90

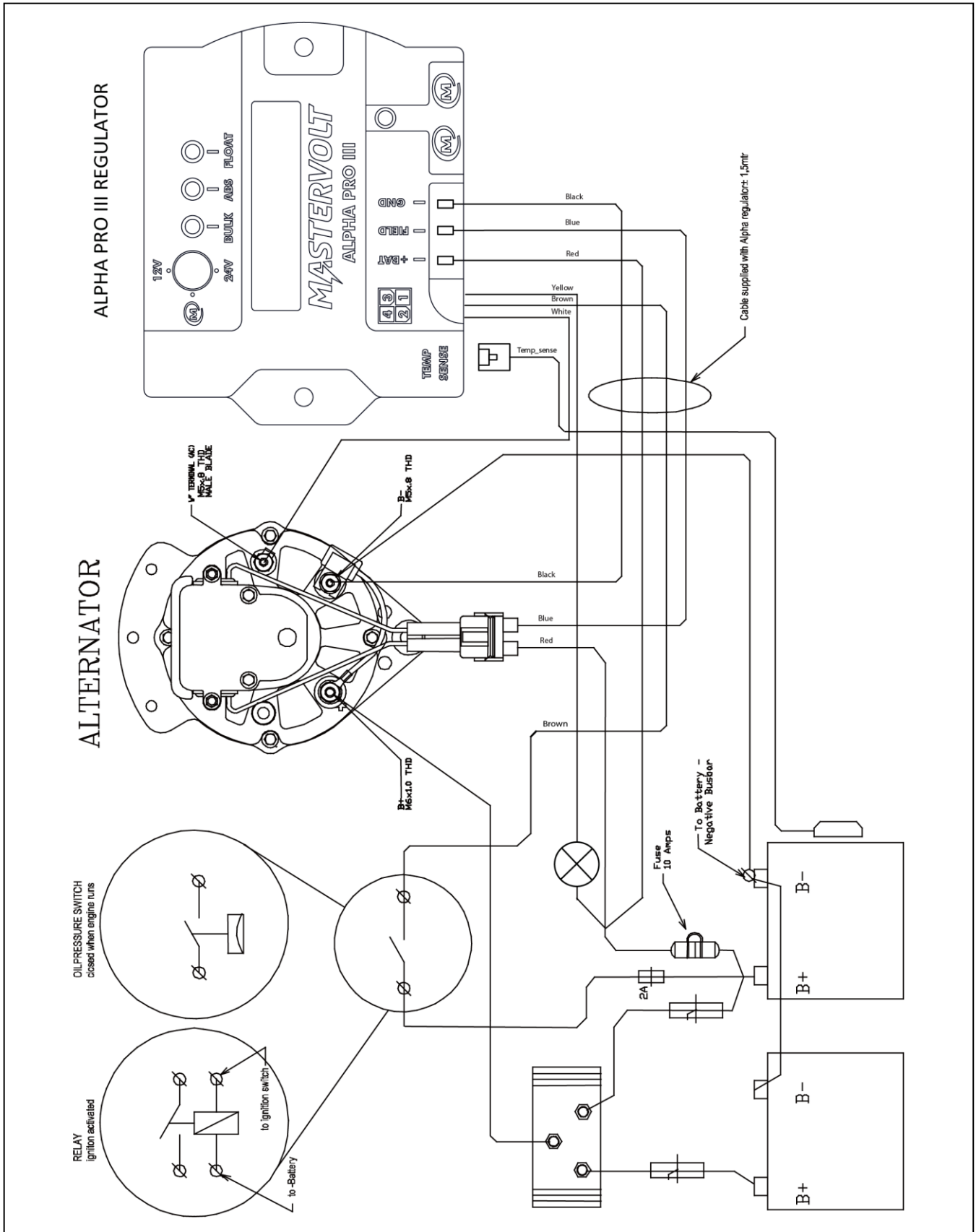


Figure A-11: This drawing shows the installation of the Alpha alternator 12/90 in combination with a battery isolator to charge two battery banks simultaneously

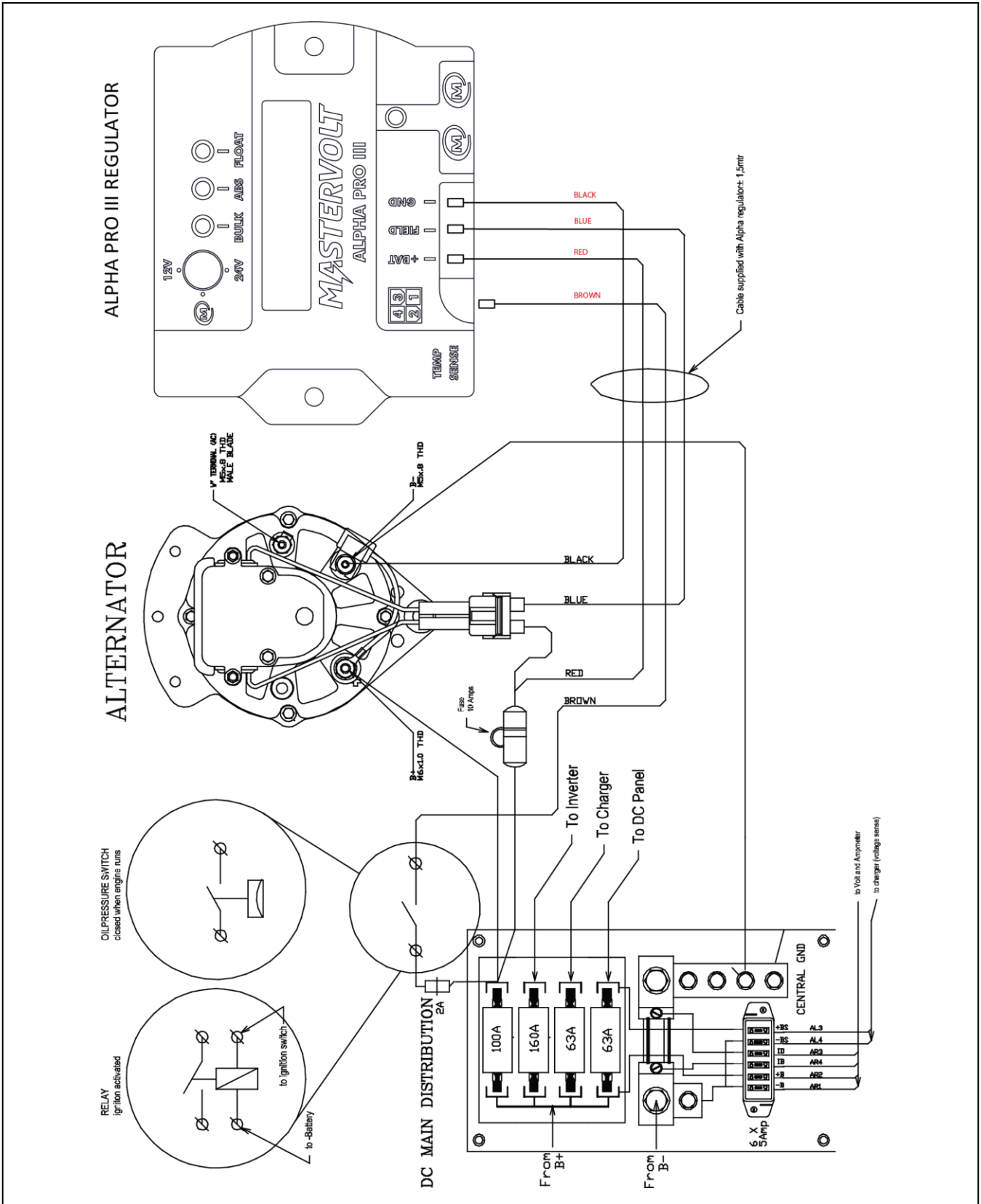


Figure A-12: Here the installation of the Alpha alternator 12/90 in combination with a Mastervolt DC distribution system is shown. The Mastervolt DC distribution systems are easy-to-install installation kits for central connection of the DC-sources (such as the alternator and the battery charger), the batteries and the DC loads (such as the inverter, the anchor winch or the bowthruster). These DC-distribution systems are standard pre-wired for connection of a battery monitor.

## 2.7 INSTALLATION EXAMPLES FOR ALPHA ALTERNATOR MODELS 12/130, 24/75 AND 24/110

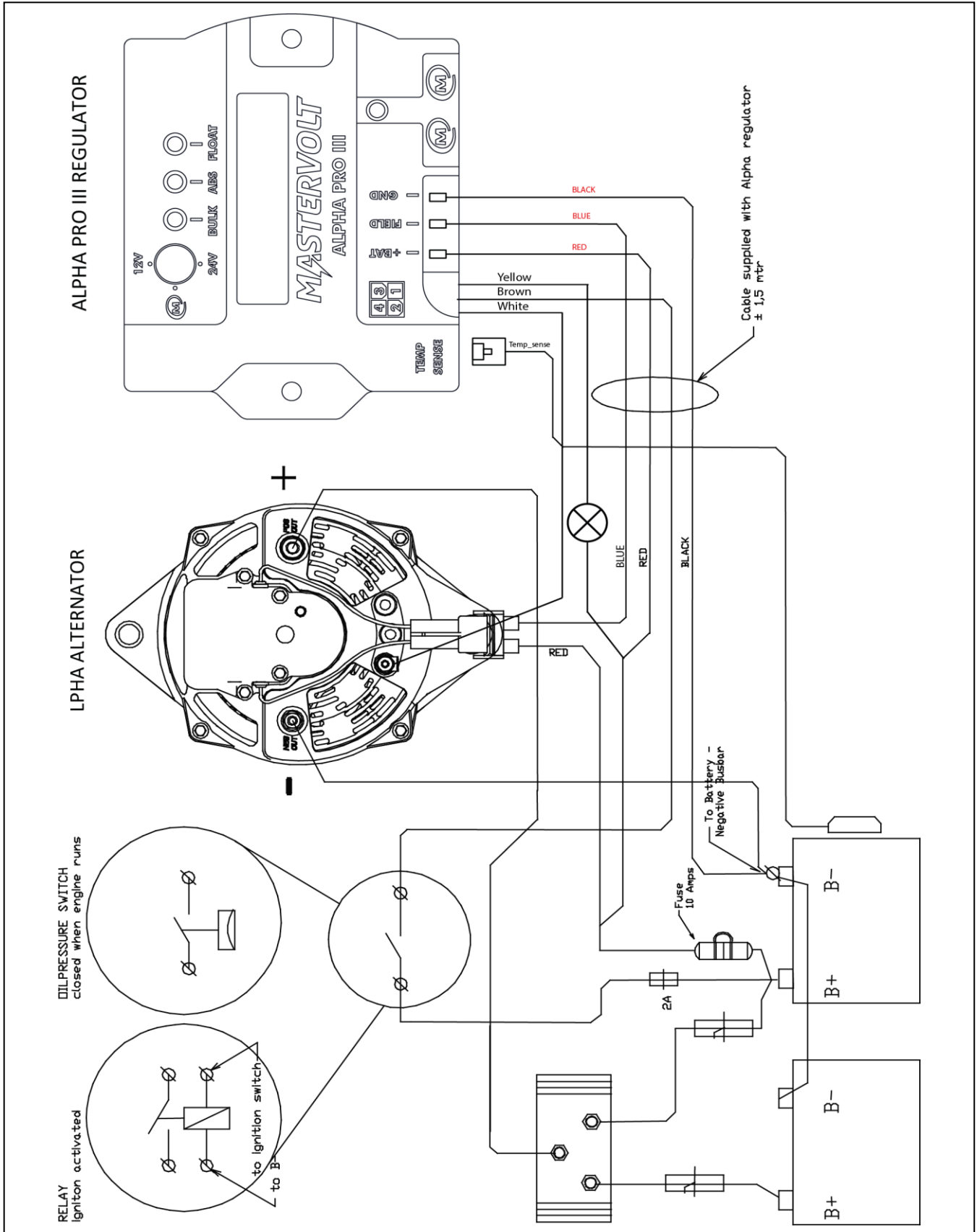
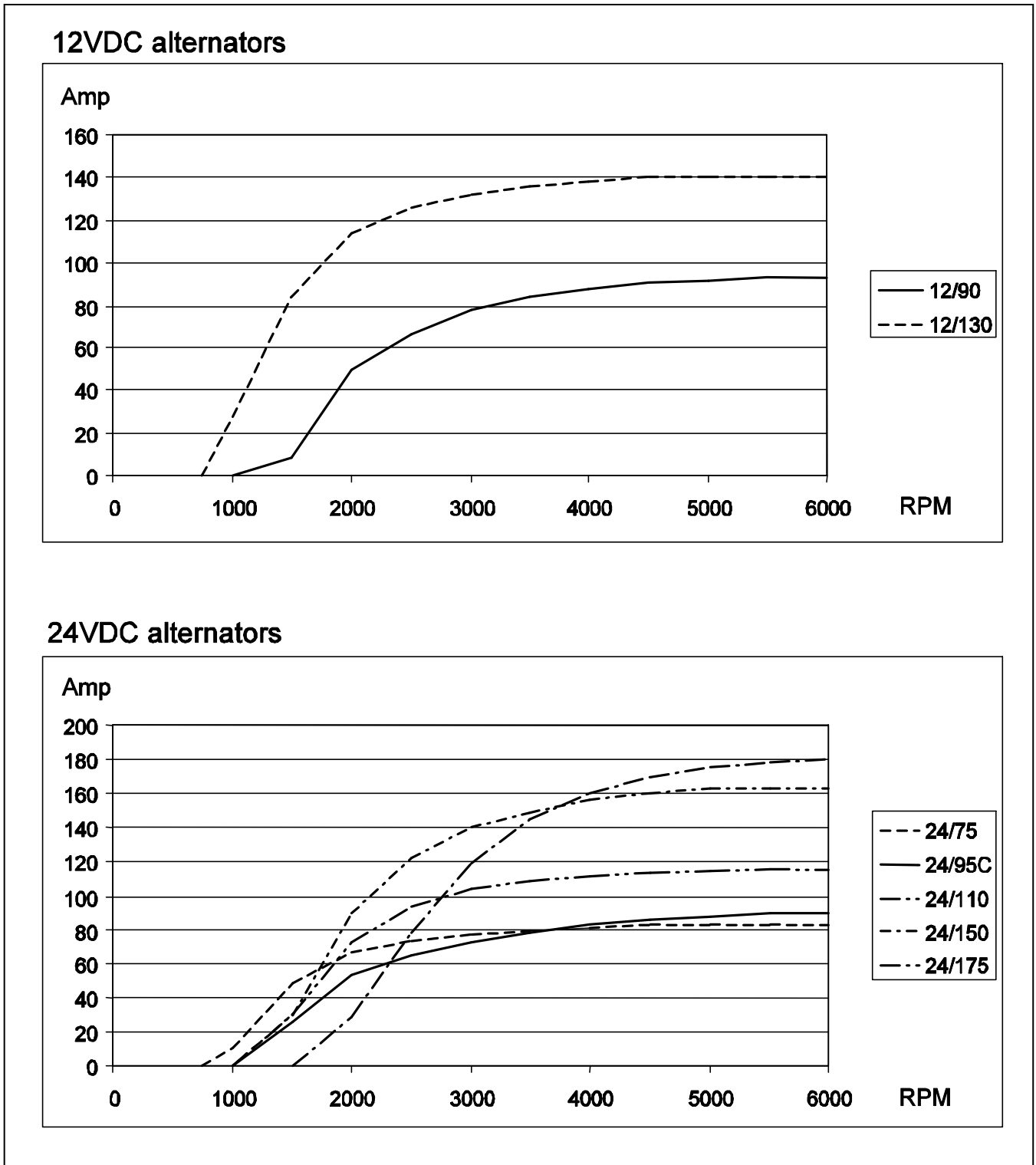


Figure A-13: This drawing shows the installation of the Alpha alternator models 12/130, 24/75 and 24/110 in combination with a battery isolator to charge two battery banks simultaneously.

## 3 CHARACTERISTICS

### 3.1 CHARGE CURRENT VERSUS RPM



Output power is measured in combination with Alpha Pro III regulator at nominal voltage (25°C)

Figure A-15: Characteristics for Mastervolt alternators: charge current versus RPM

## 4 ORDERING INFORMATION

### 4.1 ACCESSOIRES

Part number	Description
83007021	Battery isolator BI 702 for two battery banks. For alternators up to 70 Amps,
83007030	Battery isolator BI 703 for three battery banks. For alternators up to 70 Amps,
83012021	Battery isolator BI 1202 for two battery banks. For alternators up to 120 Amps,
83012031	Battery isolator BI 1203 for three battery banks. For alternators up to 120 Amps,
83116025	Battery Mate 1602-IG, low voltage drop battery isolator for two battery banks. For alternators up to 160 Amps
83116035	Battery Mate 1603-IG, low voltage drop battery isolator for three battery banks. For alternators up to 160 Amps
6384010000	Industrial DC fuse 100A DIN 00
6384012500	Industrial DC fuse 125A DIN 00
6384016000	Industrial DC fuse 160A DIN 00
6384510000	Industrial DC fuse 100A DIN 1
6384512500	Industrial DC fuse 125A DIN 1
6384516000	Industrial DC fuse 160A DIN 1
6384520000	Industrial DC fuse 200A DIN 1
6381001000	Fuse base DIN 0 (max. 160A)
6381002000	Fuse base DIN 1 (max. 250A)

Mastervolt can offer a wide range of products for your electrical installation, including battery chargers, AGM- and Gel batteries, DC-switches, battery monitoring panels and DC distribution kits.

### 4.2 SPARE PARTS

These parts are for after-sales applications only:

Part number	Description
45512000	Alpha Pro II regulator
45513000	Alpha Pro III regulator
41500400	Alternator temperature sensor cable (2m)
41500500	Battery temperature sensor
45510500	Bosch adapter cable
48400110	Brush holder for alternator models 12/90 12/130, 24/75 and 24/110
48400150	Brush holder for alternator model 24/150
48400010	Pulley for two belts, for alternators model 12/90
48400020	Pulley for two belts, for alternators models 12/130, 24/75and 24/110



# **MASTERVOLT**

USERS MANUAL

## **ALPHA ALTERNATOR**

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

HIGH OUTPUT ALTERNATORS WITH ALPHA PRO REGULATOR



# 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 regulator.

This manual is valid for the following models:

Part number	Description
45512000	Alpha Pro MB Regulator
45513000	Alpha Pro MB Regulator MKIII
48212090	MV Alternator 12/90 excl regulator
48212130	MV Alternator 12/130 excl regulator
48224075	MV Alternator 24/75 excl regulator
48224110	MV Alternator 24/110 excl regulator
48224150	MV Alternator 24/150 excl regulator
48312130	Alternator 12/130 Multigroove
48324075	Alternator 24/75 Multigroove
48512090	Alternator 12/90 + 3-Stage Regulator MB
48512130	Alternator 12/130 + 3-Stage Regulator MB
48512131	Alternator 12/130 MG+3-Stage Regulator MB
48524075	Alternator 24/75 + 3-Stage Regulator MB
48524076	Alternator 24/75 MG + 3-Stage Regulator MB
48524110	Alternator 24/110 + 3-Stage Regulator MB
48524150	Alternator 24/150 + 3-Stage Regulator MB
48612090	Alternator 12/90 + 3-Stage Regulator MKIII
48612130	Alternator 12/130 + 3-Stage Regulator MKIII
48612131	Alternator 12/130 MG + 3-Stage Regulator MKIII
48624075	Alternator 24/75 + 3-Stage Regulator MKIII
48624076	Alternator 24/75 Mg+3-Stage Regulator MKIII
48624110	Alternator 24/110 + 3-Stage Regulator MKIII
48624150	Alternator 24/150 + 3-Stage Regulator MK

Every person who works on or with the Alpha alternator / Alpha Pro 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 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!

Reproduction, transfer, distribution or storage of part or all of the contents in this document in any form without the prior written permission of Mastervolt is prohibited

## 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 regulator delivered by Mastervolt.

## 1.5 LIABILITY

Mastervolt can accept no liability for:

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



### CAUTION!

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 REGULATOR

Changes to the Alpha alternator / Alpha Pro 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.



#### **CAUTION!**

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 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 regulator is constructed as per the applicable safety-technical guidelines.
- 2 Use the Alpha alternator / Alpha Pro 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 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 regulator in locations where there is danger of gas or dust explosion or potentially flammable products!

- 3 Use of the Alpha alternator / Alpha Pro 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 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 regulator, read all instructions and cautionary markings on the Alpha alternator / Alpha Pro 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 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 regulator and the cabling.
- Wrong MasterBus settings will lead to serious damage to batteries, the Alpha alternator, the Alpha Pro 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 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 regulator and the cabling. Fuses between the batteries and the electrical installation cannot 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 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 regulator should only be undertaken by authorised personnel!

## 2.8 CORRECT DISPOSAL OF THIS PRODUCT (Waste Electrical & Electronic Equipment)



This product is designed and manufactured with high quality materials and components, which can be recycled and reused. When this crossed-out wheeled bin symbol is attached to a product, it means the product is covered by the European Directive 2012/19/EU.

Please be informed about the local separate collection system for electrical and electronic products.

Please act according to your local rules and do not dispose of your old products with your normal household waste. The correct disposal of your old product will help prevent potential negative consequences to the environment and human health.

## 3 HOW IT WORKS

This user's manual describes the installation and operation of the Alpha Alternator together with the Alpha Pro 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 charge regulator (included)
- 3 Battery fuses (10A fuse included)
- 4 Batteries (not included)
- 5 Battery temperature sensor (included)\*

\*The picture shows an installation without MasterShunt. If you have a MasterShunt installed in combination with the Alpha Pro, you must connect the temperature sensor directly to the MasterShunt.

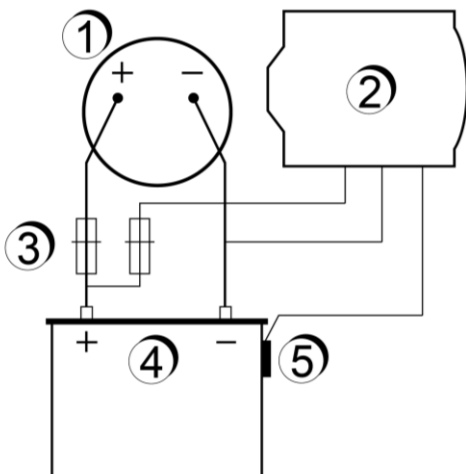


Figure 1: Basic charging system consisting of the Alpha Alternator and the Alpha Pro regulator

### 3.1 ALPHA ALTERNATOR

Mastervolt Alpha alternators are specially designed to provide high power even at low RPM. Pulley ratio should be chosen in such a way that the alternator runs at  $\pm 1500$  rpm idle and 3500 rpm at cruising speed.

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 REGULATOR

The Alpha Pro voltage regulator controls the alternator's output voltage. It is designed for optimal recharging of wet, gel, AGM and li-ion batteries. Battery charging is accomplished in three automatic stages: BULK, ABSORPTION and FLOAT.

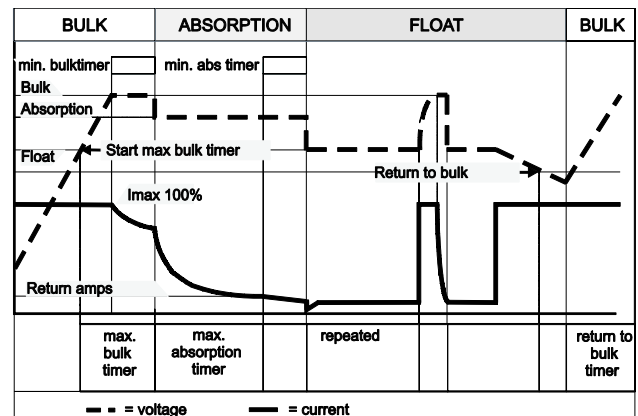


Figure 2: Three step plus charge system

See Figure 2. The first step of the three step plus charge system is the BULK phase, 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. 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 decreases during charging of the battery. 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, or the maximum absorption timer has passed, the Alpha Pro regulator automatically switches over to the float phase. During the float phase the Alpha Pro switches to float voltage, refer to specifications, 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 regulator will start a new cycle when the engine is started again or when the battery voltage drops below.

### 3.2.1 Temperature compensated charging

A battery temperature sensor is included in the delivery of the Alpha Pro regulator. By installing this battery temperature sensor the charge voltages are automatically adapted for deviating temperatures.

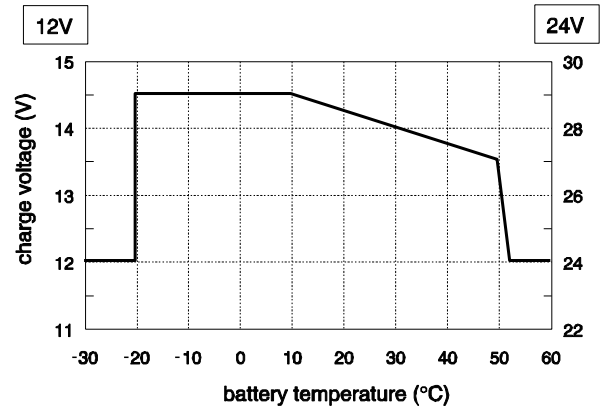


Figure 3: Temperature compensated charging



Temperature compensated charging does not prevent the batteries from overcharging situations.

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. This will extend the life of your batteries. Consult your battery manufacturer for recommended charging voltages.

## 4 INSTALLATION

During installation and commissioning of the Alpha Alternator and Alpha Pro regulator, the Safety Guidelines & Measures are applicable at all times. See section 0 of this manual.

### 4.1 UNPACKING

In addition to the Alpha Pro alternator the delivery includes:

- The Alpha Pro regulator
- Wiring loom for Mastervolt alternators
- 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 MASTERVOLT ALTERNATORS

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 needs 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



#### CAUTION!

Any changes to the alternator, including the alternator's wiring 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 ALTERNATORS FROM OTHER BRANDS

There are cases in which you are forced to use the Alpha Pro regulator in combination with an alternator of a brand other than Mastervolt. In that case, you may want to equip the alternator with a temperature sensor (41500400) that measures the housing temperature of the alternator. The MasterAdjust Temperature feature in MasterBus keeps track of the housing temperature and reduces and stops the charge of the alternator when necessary, see section 6.3.10.



Please read the Alpha Pro MB Appendix section 2.5 for an example of modification details.



#### CAUTION!

The Mastervolt high power output alternators do not need this alternator temperature sensor since they are designed to charge cyclic used batteries.



#### CAUTION!

The alternator must be suitable to handle its power continuously. Please refer to the alternator supplier for details regarding maximum allowed temperature and the best spot to place this sensor. Mastervolt does not accept any liability for consequential damage.

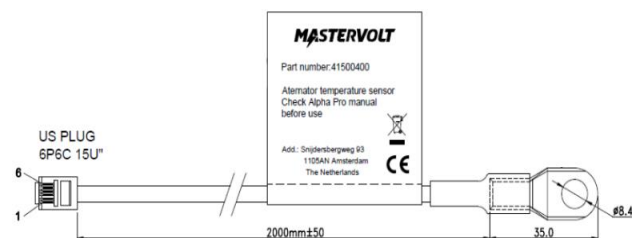


Figure 4: alternator with a temperature sensor

#### 4.3.1 How to attach the alternator temperature sensor?

The alternator temperature sensor is potted in a metal cable lug to make it more resistant for higher temperatures and also have a way to attach is to the alternator housing. The installer should find a way

where and how to attach the sensor to the alternator housing.



**CAUTION!**

Do not attach the cable lug to one of the alternator connection bolts. These bolts are often located in the airflow of the alternator and this will affect the measurement.

For configuration instructions see section 6.3.10.

**4.4 ENVIRONMENT**

Keep the Alpha Pro 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.

**4.5 MOUNTING OF THE ALTERNATOR**

**4.5.1 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.

The 24/110 and 12/130 alternators are also available with a multibelt pulley.

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

**4.5.2 Rotating direction**

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

**4.5.3 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.

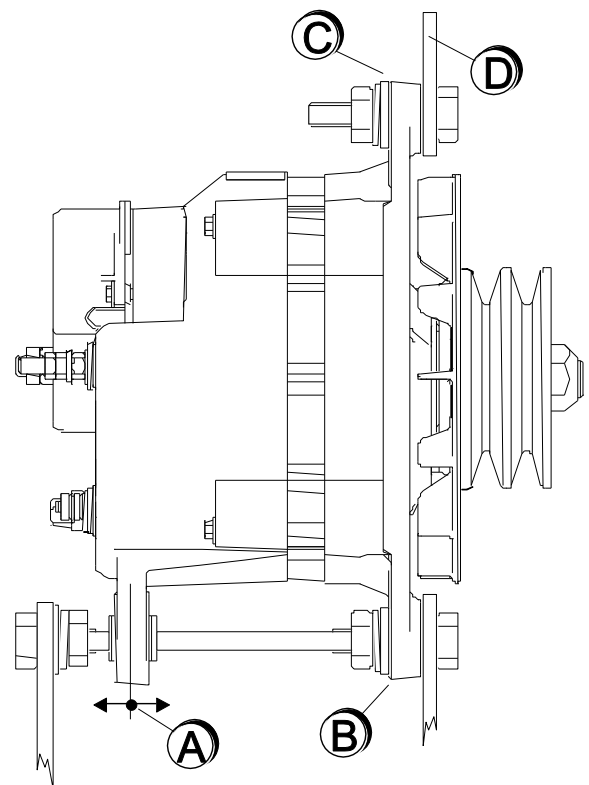


Figure 5

- 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.



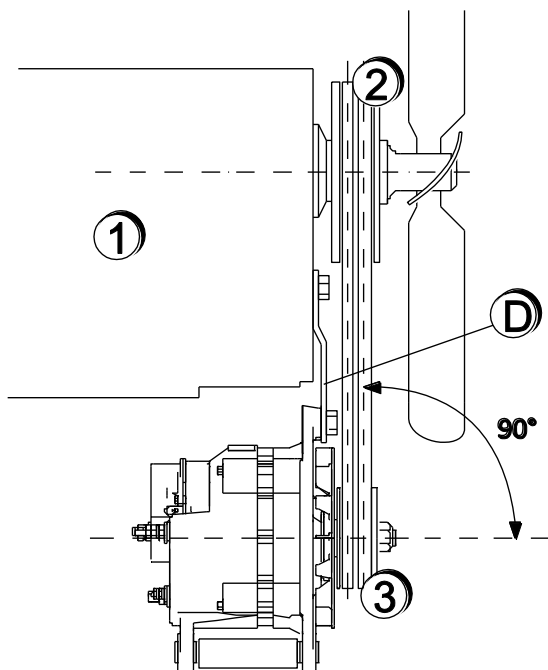


Figure 6: Alignment

- 4 Loosely attach the alternator adjustment strap (Figure 5 and 6: reference 2) to the alternator adjustment ear (Figure 5, reference 3) with the bolt, lock washer 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 3). Set the 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.



**CAUTION!**

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.

## 4.6 WIRING INSTRUCTIONS

### 4.6.1 General



**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 regulator, the cabling and/or the terminal connections. Fuses cannot 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 (Chapter 9) for recommended wire sizes.

- Use the supplied cable assembly for connection of the Alpha Pro regulator
- DC Cables to connect the Battery to the alternator are not included in the delivery.
- The alternator wiring is electrically isolated from ground.
- Install according to the installation drawing
  - 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
- A DC-fuse must be integrated in the positive cable between the battery and the alternator (see section 9 for specifications). Do not install the DC-fuse of the DC-distribution before the entire installation is completed.
- The two pole connector of the cable assembly goes into the field connector of the alternator. Take adequate measures to assure a strain relief for this connector.



**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.



**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.

**4.6.2 Reg on**

The “regon” wire should be interrupted with a relay or an ungrounded oil pressure switch. If you use a relay this relay can be powered from the ignition switch.

The “reg on” wire should run to the positive of the battery being charged as this is also the voltage measurement for the regulator. See Figure 7.



**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.

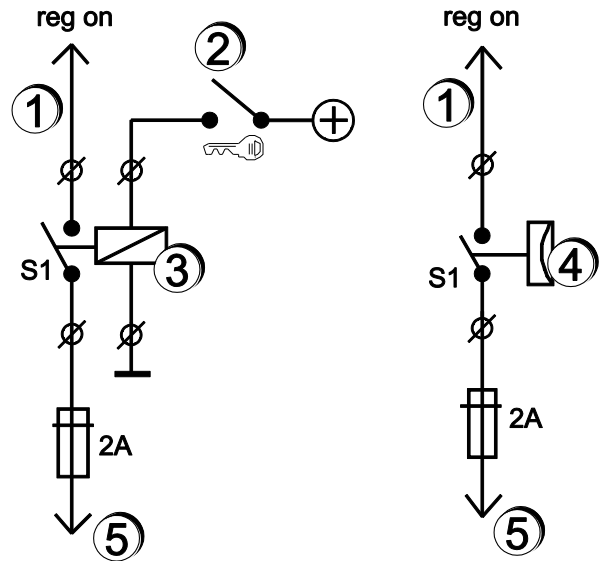


Figure 7: Connection of the ignition switch (left) and an independent (ungrounded) oil pressure switch with normally open contact (right)

- 1 Brown wire
- 2 Ignition switch
- 3 Relay
- 4 Normally open oil pressure switch
- 5 Positive battery pole

### 4.6.3 Connection of a tachometer (optional)

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

The white wire from the cable loom has to be connected to the Alpha Pro regulator.

See Figure 8.



**NOTE!**

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

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

### 4.6.4 Connection of a D+ 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 D+ control is also used for alarm indications:

- I field too high: 3 short blinks every 2 seconds.
- U battery too high: 2 short blinks every 2 seconds.
- I field too low: 1 short blink every 2 seconds.

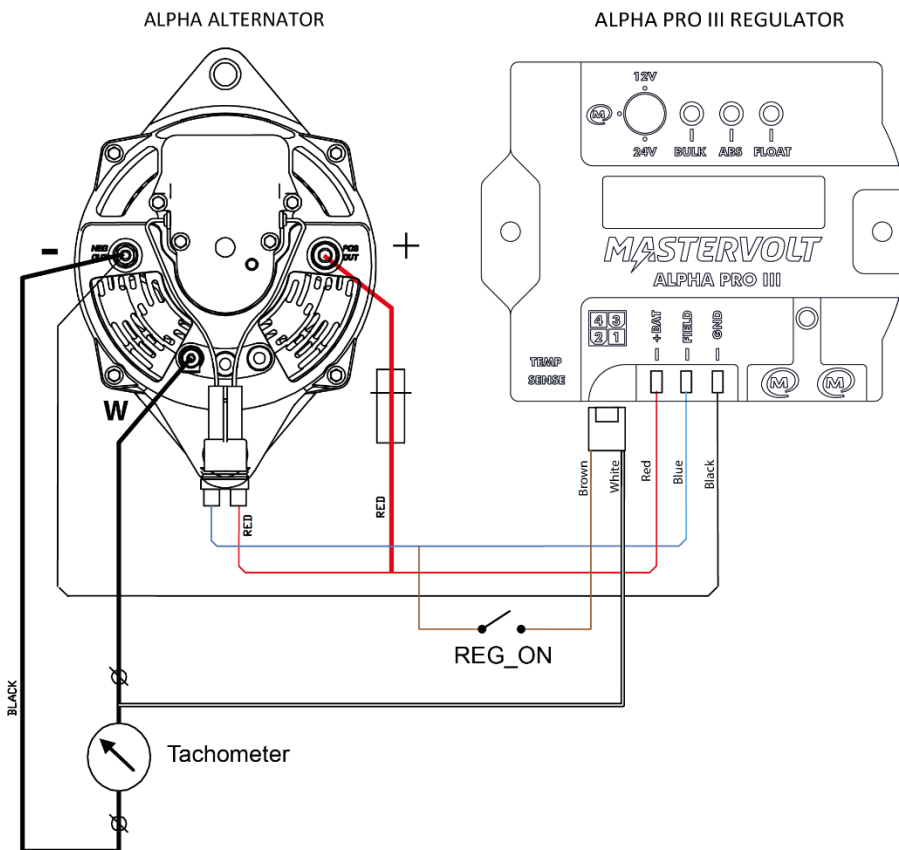


Figure 8: Connection of a tachometer (position of the terminals may differ; see APPENDIX Figures A-6 till A-9)

**4.6.5 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 9 for installation details. See APPENDIX Figures A-11 and A-13 for installation examples.



**CAUTION!**

If there is a standard 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 regulator, you can use a battery isolator that has no voltage sense connection.

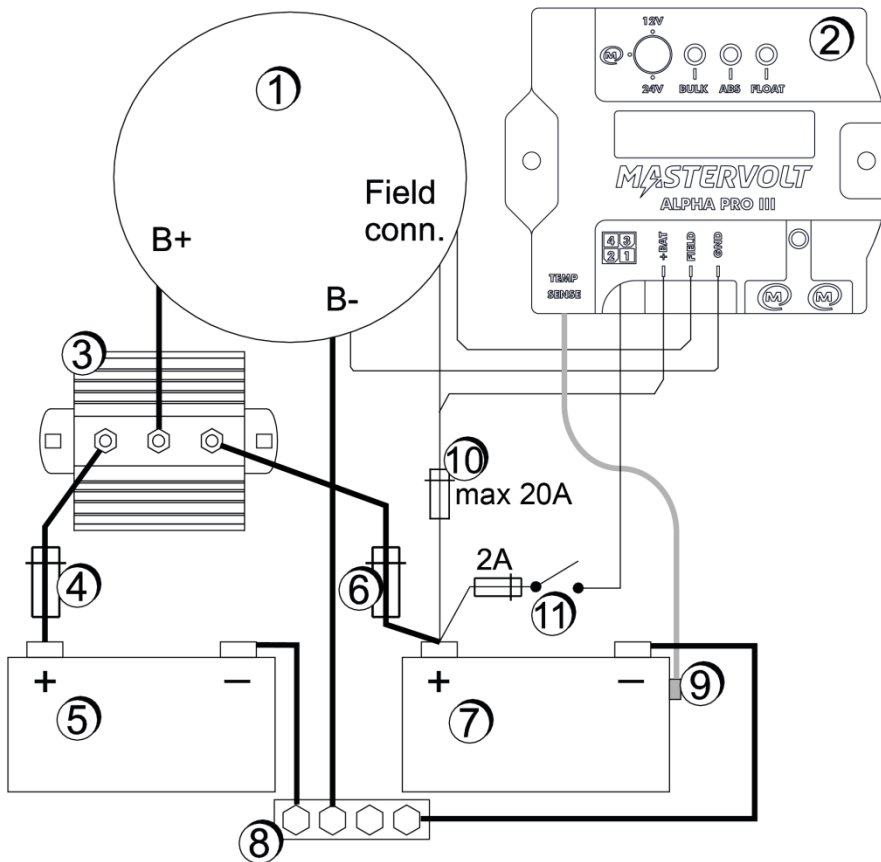


Figure 9: Installation of the Alpha Pro

1. Alternator
2. Alpha Pro 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. Max. 20A replaceable fuse between battery positive pole and alternator Field connector. Use 10 A fuse for Mastervolt alternators.
11. Ignition relay or oil pressure switch, to be connected to Regulator On connection.

## 5 COMMISSIONING



### CAUTION!

Fuses between the batteries and the Alpha Pro regulator cannot prevent damage caused by reversed polarity. The damage as a result of reverse polarity is not covered by the warranty.

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

- Selecting the charging mode
- Testing and adjusting

### 5.1 SELECTING THE CHARGING MODE

The Alpha Pro regulator has a three positions selector featuring standard settings for a 12V or 24V (lead acid) system and advanced settings via MasterBus. See Figure 10. **The default setting is MasterBus.**

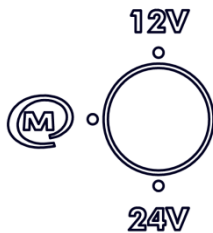


Figure 10: Three positions selector switch

#### 5.1.1 Commissioning when selecting MasterBus



### 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.

In case the MasterBus setting is selected, by default the product's configuration will be unlocked resulting in an Alpha Pro 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 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

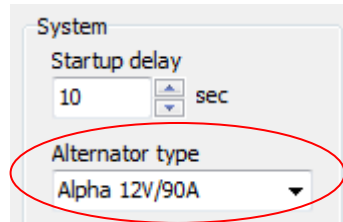


Figure 11: Selecting 'Alternator type' through MasterAdjust

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

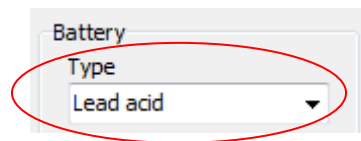


Figure 12: Selecting 'Battery type' through MasterAdjust

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

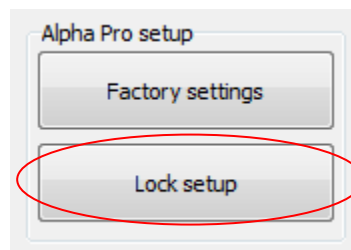


Figure 13: Selecting 'Lock setup' via MasterAdjust

Now the Alpha Pro is ready for testing.

### 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 Check whether all indication lights on the Alpha Pro regulator are off.
- 2 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.

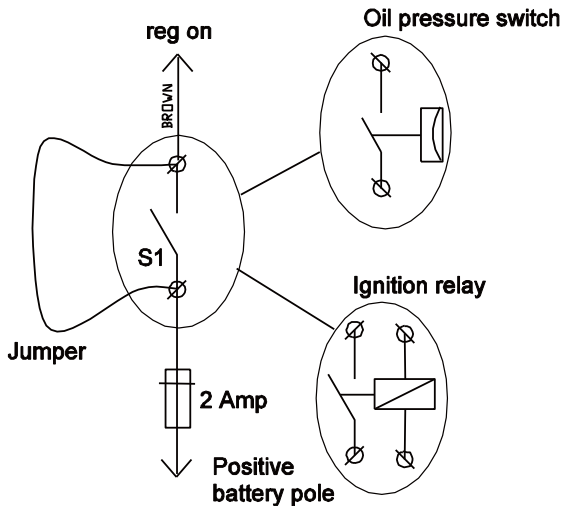


Figure 14: Jumper across switch S1

- 3 Check whether the alternator field is energized by touching the shaft of the alternator with a screwdriver. It should be strongly magnetic.
- 4 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!

If you fail to de-energize the [reg on] terminal, 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).

- 5 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 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 blink together to indicate the start up mode.
- 3 Check for abnormal noise or vibration.
- 4 The yellow [bulk] LED on the Alpha Pro regulator (see Figure 15) illuminates, indicating that the charge-cycle begins. Rev up the engine so the alternator rotates at 3000rpm
- 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). Disconnect the temperature sensor to measure the voltage at 25°C
- 7 An absorption timer starts to keep the Alpha Pro regulator in the absorption mode. The factory setting of this timer is 4 hours.

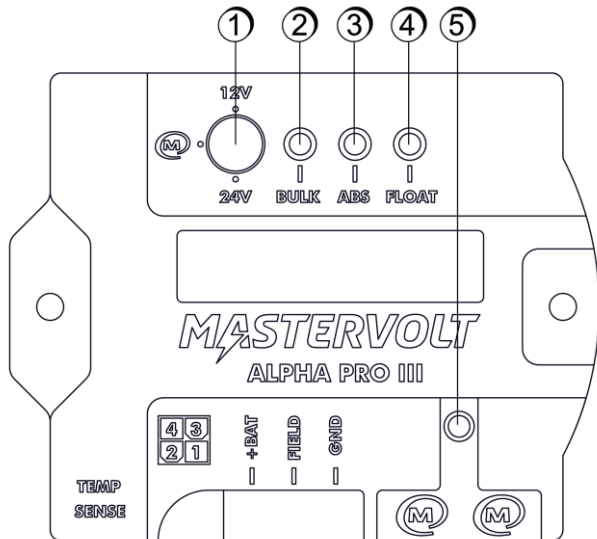


#### NOTE!

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

- 8 When absorption time has elapsed, the yellow [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.



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

Figure 15: Overview of the Alpha Pro regulator

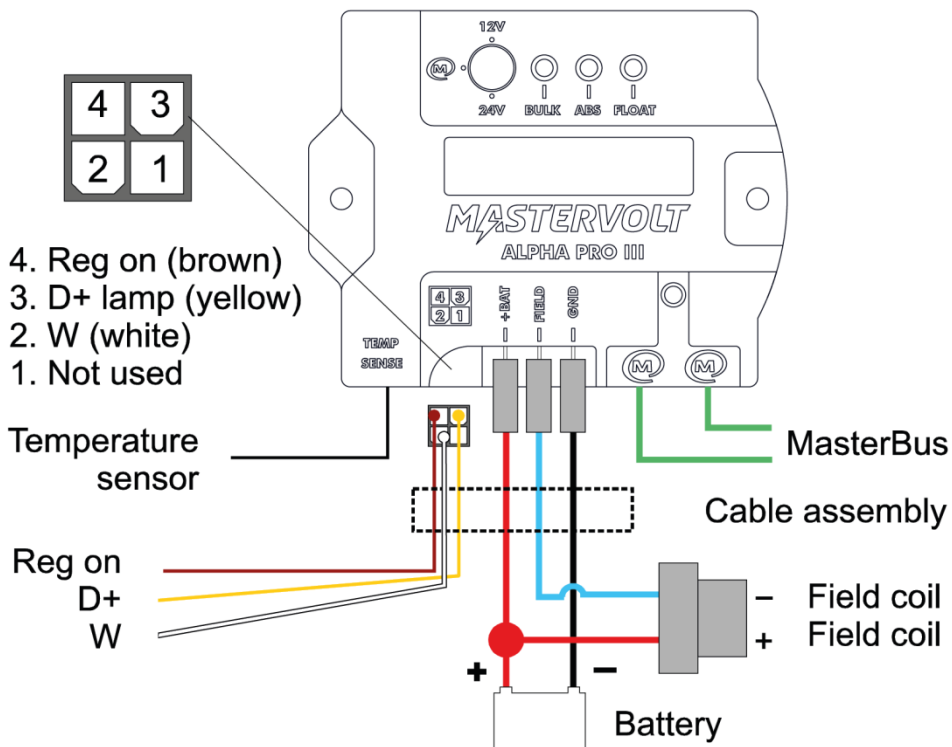


Figure 16: Connections of the Alpha Pro regulator

### 5.2.3 Voltage sensing

The Alpha Pro regulator uses the [reg on] terminal (Figure 16, connection 4) and the [gnd] terminal for measurement of the battery voltage. If installed correctly, the voltage-drop will never exceed 0.01 Volts. See Chapter 9 for correct wire sizes.

### 5.2.4 Temperature compensation

The battery temperature sensor included, compensates the charge voltage for deviating battery temperatures. See section 3.2.1 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 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 regulator will switch off again. When switched off, all LED's of the Alpha Pro regulator are off. An exception is when the Alpha Pro 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.



## 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. 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.

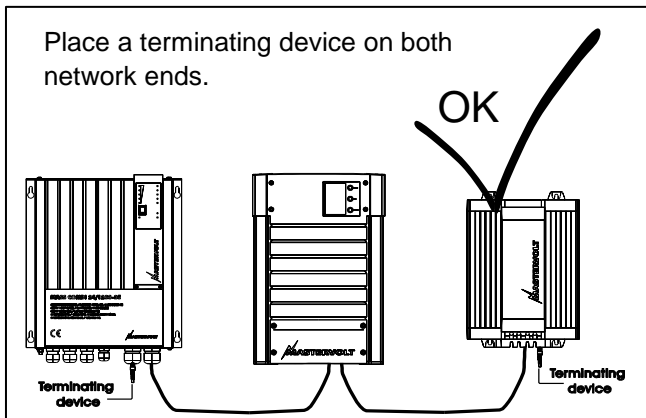
MasterBus reduces complexity of electrical systems by using UTP patch cables. All system components are simply chained together. Therefore each device is equipped with two MasterBus data ports. New devices can be added to the existing network easily. Consequently the MasterBus network is highly flexible for extended system configuration. All monitoring panels can be used for monitoring, control and configuration of all connected MasterBus equipment.



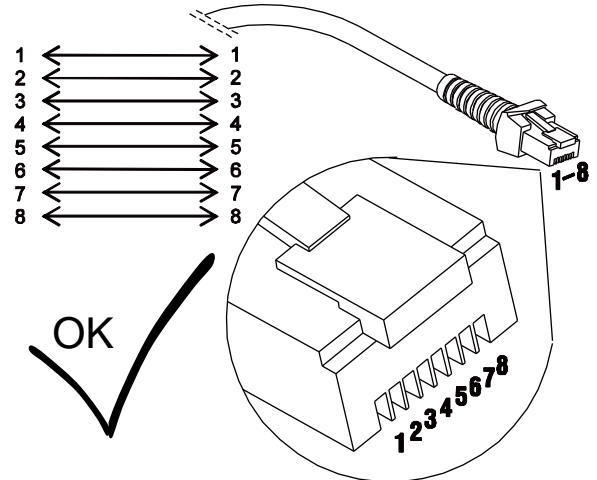
**CAUTION:** Never connect a non-MasterBus device to the MasterBus network directly! This can damage the Masterbus and the connected devices

### 6.2 HOW TO SET UP A MASTERBUS NETWORK

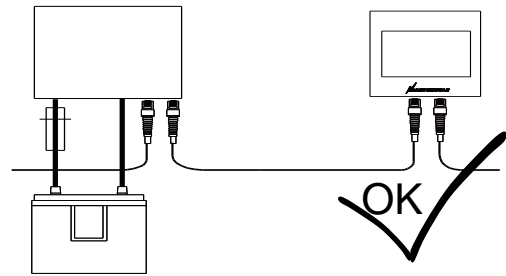
Every MasterBus device is equipped with two data ports (RJ-45). When two or more devices are connected via these ports, a local data network called the MasterBus is formed. Keep the following rules in mind:



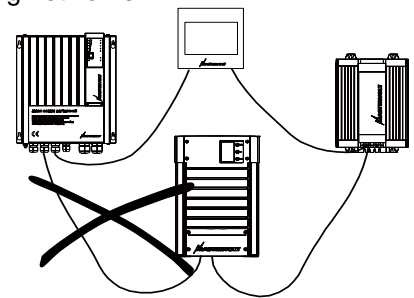
Connections between the devices are made by standard straight UTP patch cables.



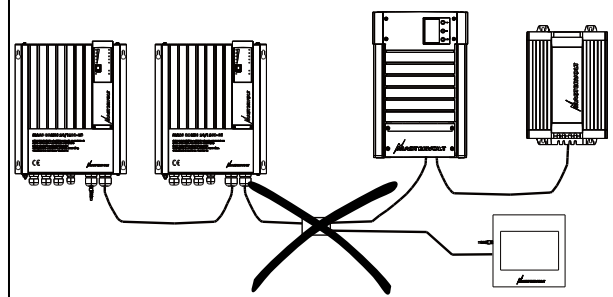
At least one device in the network must be MasterBus powering (see specifications). As all powering devices are galvanically isolated, multiple powering devices are allowed.



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 can be made via the MasterBus network by means of a MasterBus-USB interface connected to a PC with Masteradjust.



#### CAUTION!

Invalid settings of the Alpha Pro 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: Standby/ Charging/ Alarm
Charger state	Shows the state of the regulator: Off/ Bulk/ Absorption/ Float
<i>Battery</i>	
Battery voltage	Battery voltage measured by the Alpha Pro [V]
Battery temp.	Battery temperature measured by the by the Alpha Pro [°C].
<i>Alternator</i>	
Alternator shaft	Number of revolutions alternator [rpm]
Engine shaft	Number of revolutions engine [rpm] (only if a pulley ratio is filled in configuration)
Sense voltage	Battery voltage measured by the Alpha Pro [V] (on the reg on wire)
Field current	Current through the alternator field coil [A]
Alternator volt.	Voltage measured between +Bat and GND [V]
Alternator temp.	Alternator temperature (with installed sensor on the alternator). Refer to section 6.3.4 for settings
<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
Temp.sense 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. This is only applicable for the Alpha Pro II. 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
Battery low	Battery low voltage warning, generated by the Alpha Pro
High field current	Field current too high, Alpha Pro 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	Voltage drop is higher than 2,5 V. The cable between alternator and battery is too thin.
Shunt mismatch	Different voltage settings of MasterShunt and Alpha Pro

### 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. Set the mode selector in MasterBus position and unlock the configuration.

To change the Alpha Pro 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 again.

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 and keeps it visible on Masterbus when engine is off	Off	Off, On
<i>System</i>		<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	Number of revs at which an event takes place	1000 rpm	200 - 10000 rpm
Small engine	Option to minimize torque load by decreasing charging current. This prevents a small engine from stalling.	Not checked	
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

Value	Meaning	Default	Adjustable. range
<i>Battery</i>			
Type	Battery type selection	Wet cell	See specifications
Temp. compensate	Voltage change at temperature rise/decrease	-0.030V/°C	-1.000 - +1.000
<i>Bulk</i>			
Voltage	Bulk voltage	14.25/28.50	0.00-16.00/16.00-32.00
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	0.00-16.00/16.00-32.00
Maximum time	Maximum bulk voltage timer	360 min	0-600 min
Return voltage	Return to bulk voltage	12.80/25.60	0.00-16.00/16.00-32.00
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 Do not adjust the charge voltage above the recommended limits of the battery manufacturer.	14.25/28.50V	0-15.50/0-31.00V
Maximum time	Maximum absorption timer Examples of cases when to adjust the default 4 h: <ul style="list-style-type: none"> <li>• Extension of the absorption time to do some intentional overcharging to regain lost capacity.</li> <li>• Shorten the time if you stop and start the engine often each day.</li> <li>• Temporary time reduction for testing purposes</li> </ul>	4 h	0-10 h
<i>Float</i>			
Voltage	Float voltage 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.	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
<i>Shunt</i>			
Shunt device	Selection of the shunt to measure the battery voltage, see Section 6.3.11.		
<i>Alpha Pro setup</i>			
Factory settings	Option to reset to factory settings		
Lock setup	Button to lock configuration settings. With the configuration locked, only the language and device name can be changed.		
Unlock setup	Option to unlock the configuration settings (only appears after Lock setup)		

### 6.3.5 Events

Value	Meaning	Default	Adjustable. range
<i>Events</i>			
Event x source	Event by the Alpha Pro that should result in an action on 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 event.	Select...	Selectable targets are system dependent.
Event x command	Action to be taken by the target device.	Select...	See Event target 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.

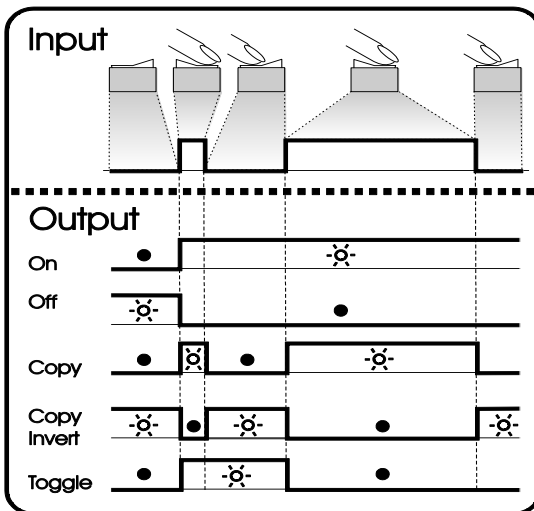


Figure 17: Event data

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.

### 6.3.6 Alpha Pro event source list (Alpha Pro 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

### 6.3.7 Alpha Pro event target list (Alpha Pro 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

### 6.3.8 Keep alive function

This is to keep a connected RPM meter functional if the field current drops. This will only function if the White wire is connected to the W or R point of the alternator

### 6.3.9 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%.

### 6.3.10 MasterAdjust Temperature configuration

MasterBus offers an extra feature of measuring the housing temperature of a third party alternator to reduce and stop the charge of the alternator on certain temperature level between 0 and 140 degrees Celsius.

There are two selection options in the Alpha pro settings; “battery” and “Alternator”. There is only a single temperature input on the Alpha Pro MB regulator. The Alpha Pro MB regulator comes standard with a potted battery temperature sensor (Product code: 41500500).

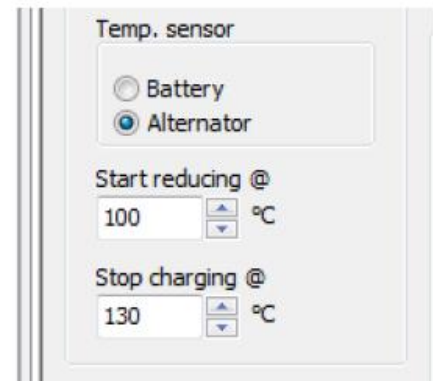
When charging batteries that need temperature compensated charge (Like lead acid) this battery sensor has the first priority at all times, this to charge the batteries in a save and efficient way!

If both the alternator and the batteries need to be measured a MasterShunt (Product code: 77020100) could be added to the system. The MasterShunt temperature sensor input can be used to measure the batteries and this data can be used by the Alpha Pro MB regulator by coupling the MasterShunt to the Alpha pro MB regulator via the MasterAdjust configuration, see Section 6.3.4.

By selecting the “Battery” circle, the Alpha pro expect the battery temperature sensor to be connected to its temperature input. This measured battery temperature data will now be used to compensate the voltage output of the alternator.

By selecting the “Alternator” circle the user can fill in two temperature levels. At the first temperature level the alternator will start reducing its output power and at the second temperature level the alternator will stop charging. Reducing will happen as a linear line between the two temperature levels.

Please consult the alternator manufacturer to discuss the right temperature values to reduce and stop the charge considering a  $\Delta T$  between the temperatures given by the manufacturer and the spot where the sensor will be installed.



#### **CAUTION!**

Please note that this solution will not protect the alternator against damage due to overheating. Mastervolt cannot be held responsible for any damage to the third party alternator!

The only accurate measurement is on the internal windings and this can in no way be covered by this sensor. Therefore this measurement is only an indication!

### 6.3.11 MasterShunt connected to Alpha Pro III

You can select a MasterShunt or a MLI Ultra battery in the MasterAdjust configuration menu. When this selection is active the Alpha Pro III receives important data from the battery via MasterBus. This will improve the charging system and protects the battery by means of the following the data:

- **Battery full determination**  
The MasterShunt or MLI Ultra battery measures the actual current that goes into the battery. When only a small percentage of current is measured, the Alpha Pro III considers the battery to be full and switches to maintenance charging (float).
- **Starting in Float.**  
Thanks to the above-mentioned mechanism the Alpha Pro III will start directly with maintenance charging
- **Use of the temperature sensor**  
The MasterShunt is installed closer to the battery than the alternator self. The battery temperature sensor can now be connected to the MasterShunt. The MasterShunt will pass the measured battery temperature on to the Alpha Pro III. This value is being used to compensate the charge voltage as described in Section 3.2.1.
- **Compensation for the voltage losses**  
The Alpha Pro III now uses the voltage of the MasterShunt or the MLI Ultra battery to determine the voltage loss between the battery and the alternator. The Alpha Pro III will compensate for these losses by rising the charge voltage evenly.



The Alpha Pro III uses both the shunt data and its own data (via Reg on) for determination of voltage losses. Therefore, Mastervolt advises to mount the reg on wire (brown) as close to the battery as possible on the load side of the fuse.

With a MasterShunt connected, the following is different in the use of the Alpha Pro regulator:

- 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.
- 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.
- The MasterShunt may have a battery voltage setting that differs from the Alpha Pro 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!

## 7 MAINTENANCE

During maintenance of the Alpha Alternator, Alpha Pro regulator and/or the engine, the Safety Guidelines & Measures are applicable at all times. See section 0 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 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 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 7). If you cannot solve a problem with the aid of the table below, contact your local Mastervolt Service Centre.

ISSUE	POSSIBLE CAUSE	SOLUTION
The three LED's of the Alpha Pro are blinking together.	<ul style="list-style-type: none"> <li>This is the start up mode of the Alpha Pro. After this the Alpha Pro starts regulating.</li> </ul>	This is a normal situation. Wait until the LED's stop blinking.
The three LED's of the Alpha Pro are blinking twice alternately.	<ul style="list-style-type: none"> <li>The Alpha Pro MasterBus configuration was unlocked, it has stopped regulating. Or unit has not been setup.</li> </ul>	Adjust the settings if needed and lock the configuration. The Alpha Pro enters the start up mode after this.
No voltages at all. All LED's of the Alpha Pro 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.
	<ul style="list-style-type: none"> <li>Reg on wire does not get voltage</li> </ul>	See next issue and solutions
No output power, all LED's of the Alpha Pro 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 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 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 in the Appendix document).
	<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 in the Appendix document).
	<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 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 in the Appendix document).
	<ul style="list-style-type: none"> <li>Alpha Pro regulator defective.</li> </ul>	Replace Alpha Pro 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 regulator makes a transition from absorption to float if the battery is fully charged with no loads</li> </ul>	Connect the W to the Alpha Pro regulator. See Figure 9.
	<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.

ISSUE	POSSIBLE CAUSE	SOLUTION
Regulator stays in bulk mode all the time (Bulk LED stays on).	<ul style="list-style-type: none"> <li>• Alternator is overloaded.</li> <li>• Defective batteries, short-circuit between cells.</li> </ul>	<p>Switch off a load; (part off) consumers.</p> <p>Check batteries and replace if necessary.</p>
	<ul style="list-style-type: none"> <li>• Defective alternator</li> </ul>	Check alternator and replace if necessary.
Alpha Pro regulator does not return to bulk mode when a high load is switched on	<ul style="list-style-type: none"> <li>• Capacity of the Alternator 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.
	<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>	It will go back to Bulk when the voltage drops below xx.xV 12,8V/25,6V
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> <li>• Regulator is still on (bulk/abs/flo led is on)</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>• Reg on is connected to the wrong battery</li> </ul>	Connect the reg on wire to the battery being charged
	<ul style="list-style-type: none"> <li>• With non-Mastervolt alternators: field terminal connected to the field connection of the regulator [D-] is not isolated from ground.</li> </ul>	Check if field is isolated 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 MasterBus settings
Alpha Pro 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.

## 9 TECHNICAL DATA

### 9.1 SPECIFICATIONS ALPHA ALTERNATOR

Model:	12/90	12/130
Part number:	48212090	48212130
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
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

Model:	24/75	24/110	24/150
Part number:	48224075	48224110	48224150
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
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 REGULATOR**

Models:	Alpha Pro II (part number 45512000) Alpha Pro III (part number 45513000)
Suitable for alternator type:	Alpha 12/90, 12/130, 24/75, 24/110, 24/150 and any other alternators with negative excitation (Bosch alternators via a separate cable adapter)
Nominal operation voltage:	12V /24V selectable, Li-ion voltages selectable via MasterBus only, with
Bulk / absorption voltage 12V [Li-ion]*:	14.25V [ 14.25V ]
Float voltage 12V [Li-ion]*:	13.25V [ 13.5V ]
Bulk / absorption voltage 24V [Li-ion]*:	28.50V [ 28.5V ]
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@12V -60mV@24V
Absorption time	4 hours, adjustable range: 0 min up to 24 hours
Cable assembly	1.5 mtr oil resistant connection cable
Temperature sensor	Included
Dimensions (hxxwd)	See figure 18
Weight:	0.4 kg / 0.9 lbs

\* Voltage at 25°C

\*\*See APPENDIX for outline drawings

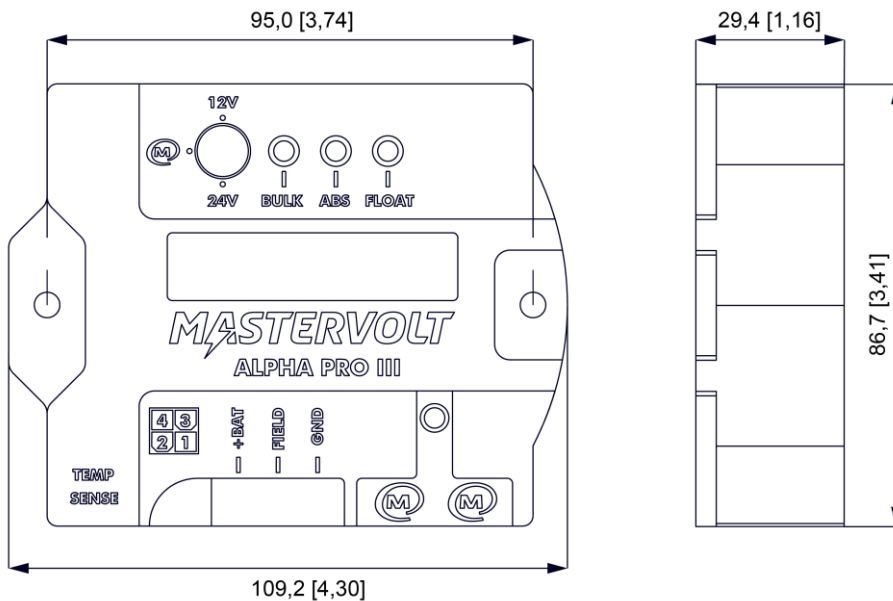


Figure 18: Dimension drawings of the Alpha Pro regulator in mm [inch]