



USERS MANUAL / GEBRUIKERSHANDLEIDING
BETRIEBSANLEITUNG / MANUEL UTILISATEURS

ALPHA ALTERNATOR

12/90, 12/130, 24/75, 24/95C, 24/110 & 24/150

HIGH OUTPUT ALTERNATORS WITH 3-STAGE REGULATOR



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

CONTENTS:

v 1.2. June 2007

1	GENERAL INFORMATION.....	4
1.1	Use of this manual.....	4
1.2	Guarantee specifications.....	4
1.3	Quality.....	4
1.4	Validity of this manual.....	4
1.5	Liability.....	4
1.6	Changes to the Alpha alternator / Alpha Pro regulator.....	4
2	SAFETY GUIDELINES AND MEASURES.....	5
2.1	Warnings and symbols.....	5
2.2	Use for intended purpose.....	5
2.3	Oganizational measures.....	5
2.4	Maintenance & repair.....	5
2.5	General safety and installation precautions.....	6
2.6	Warning regarding life support applications.....	6
2.7	Warning regarding the use of batteries.....	6
3	TECHNOLOGY.....	7
3.1	Alpha alternator.....	7
3.2	Alpha Pro regulator.....	7
3.2.1	Three step charging system.....	7
3.2.2	Temperature compensated charging.....	8
4	INSTALLATION.....	9
4.1	Unpacking.....	9
4.2	Important to know.....	9
4.3	Environment.....	9
4.4	Mounting of the alternator.....	10
4.4.1	General.....	10
4.4.2	Rotating direction.....	10
4.4.3	Mounting step-by-step.....	10
4.5	Electrical connections.....	11
4.5.1	Battery capacity.....	12
4.5.2	Installation drawings.....	12
4.5.3	Wiring instructions.....	12
4.5.4	Connection of a tachometer (optional).....	14
4.5.5	Connection of an alternator indication lamp (optional).....	14
4.5.6	Use of a battery isolator (optional).....	15

5	COMMISSIONING.....	16
5.1	Testing.....	16
5.1.1	Test prior to starting engine.....	16
5.1.2	In operation test.....	16
5.2	Adjustments.....	17
5.2.1	Voltage Settings.....	18
5.2.2	Absorption voltage adjustment.....	18
5.2.3	Float voltage adjustment.....	18
5.2.4	Absorption time adjustment.....	19
5.2.5	Temperature compensation.....	19
5.3	Operation.....	19
6	MAINTENANCE.....	20
6.1	Electrical connections.....	20
6.2	Cleaning of the alternator.....	20
6.3	Mounting of the alternator.....	20
6.4	Tension and condition of V-belts.....	20
7	TROUBLE SHOOTING.....	21
8	TECHNICAL DATA.....	23
8.1	Specifications Alpha alternators.....	23
8.2	Specifications Alpha Pro regulators.....	24

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
48012090	Alpha alternator 12/90, incl Alpha Pro 12V regulator (45511000)
48012130	Alpha alternator 12/130, incl Alpha Pro 12V regulator (45511000)
48024075	Alpha alternator 24/75, incl Alpha Pro 24V regulator (45511200)
48020950	Alpha alternator 24/95 Compact, incl Alpha Pro-B 24V regulator (45511600)
48024110	Alpha alternator 24/110, incl Alpha Pro 24V regulator (45511200)
48024150	Alpha alternator 24/150, incl Alpha Pro 24V regulator (45511200)
45511000	Alpha Pro 12V regulator
45511200	Alpha Pro 24V regulator
45511400	Alpha Pro 12V-B regulator
45511600	Alpha Pro 24V-B regulator

It is therefore obligatory that every person who works on or with the Alpha alternator / Alpha Pro regulator must be completely familiar with the contents of this manual, and that he/she carefully follows the instructions contained herein.

Installation of, and work on the Alpha alternator / Alpha Pro regulator, may be carried out only 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!

The English version has 24 pages.

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.



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 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.



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 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 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, use only 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.
- 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 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 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 can 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!

3 TECHNOLOGY

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 give high output with 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 Batteries and fuses (not included)

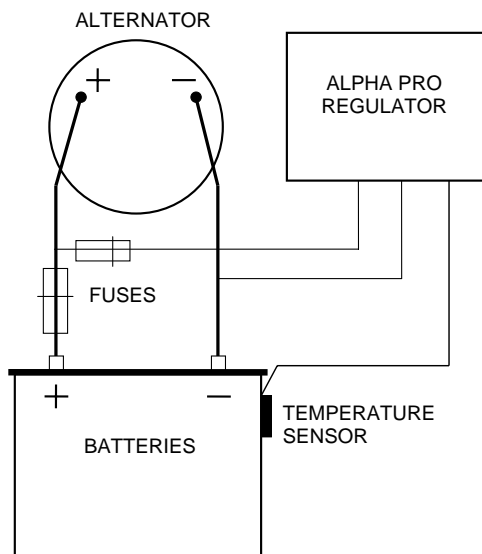


Fig.1: Basic principle of a charging system consisting of the Alpha Alternator together with the Alpha Pro regulator

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 REGULATOR

The Alpha Pro voltage regulator controls the alternator's output voltage. It is designed for optimal recharging of both wet, gel and AGM 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 regulator

3.2.1 Three step charging system

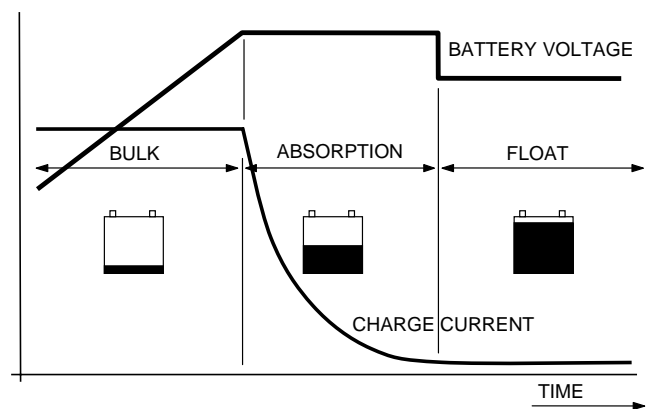


Figure 2: Three step charge system

See figure 2. The first step of the three step 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 capacity of the battery is rapidly charged. The current charges the batteries and the voltage will rise to the absorption voltage of 14.25V (12V models) or 28.5V (24V models) @ 25°C / 77°F. The duration of this phase depends on the ration of charging capacity versus 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 14.25V (12V models) / 28.5V (24V models) @ 25°C / 77°F, 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 some four hours, with gel and AGM around three.

Once the battery is 100% full, the Alpha Pro regulator automatically switches over to the float phase.

During the float phase (C) the Alpha Pro regulator switches to 13.25V (12V models) or 26.5V (24V models) @ 25°C / 77°F 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.

3.2.2 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.

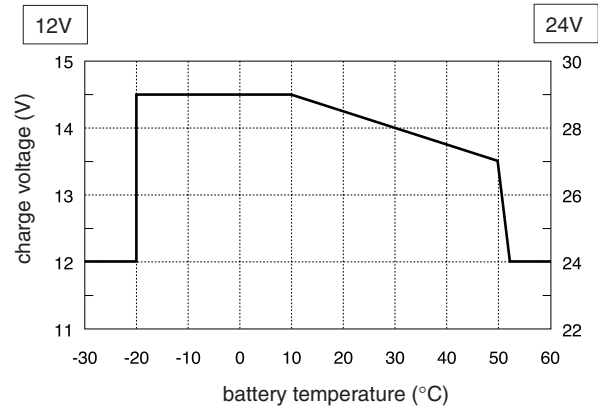


Figure 3: Temperature compensated charging

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

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 2 of this manual.

4.1 UNPACKING

In addition to the Alpha Pro alternator the delivery includes:

- The Alpha Pro regulator
- A cable harness
- A battery temperature sensor;
- 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.

Check from the identification labels whether the nominal DC voltage is equal for all applied components (e.g. a 24V alternator with a 24V Alpha Pro regulator and a 24V battery set).

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
24/95 Compact	10000 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 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: when the alternator becomes dirty either externally or internally restricting its ability to dissipate heat from its external surface or when fresh airflow through the alternator is restricted.
- **Dirt and dust.** The alternator operates less efficiently when buildup of dirt particles form 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

Except for the model 24/95 Compact, the Alpha alternator is equipped with a bidirectional fan. Therefore it may rotate in either a clockwise or counter clockwise direction.

The 24/95 Compact must be mounted in such way that it rotates clockwise, when looking to the side of the fan (see figure 4)

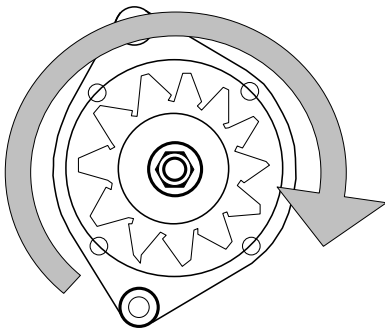


Figure 4: Rotating direction of the 24/95 Compact only (all other models are bidirectional)

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.

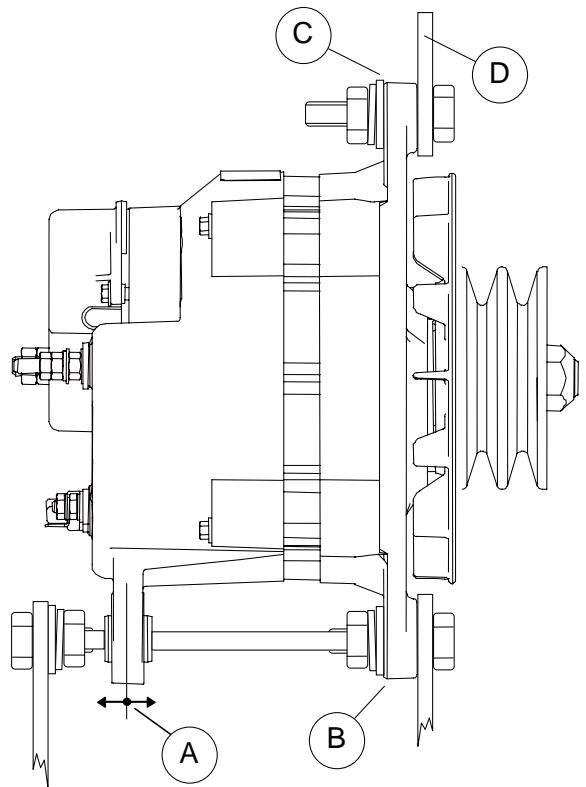


Figure 5

- 3 Align the alternator pulley with the engine drive pulley as shown in figure 6 and tighten the bracket mounting bolts, securing the mounting bracket to the engine.

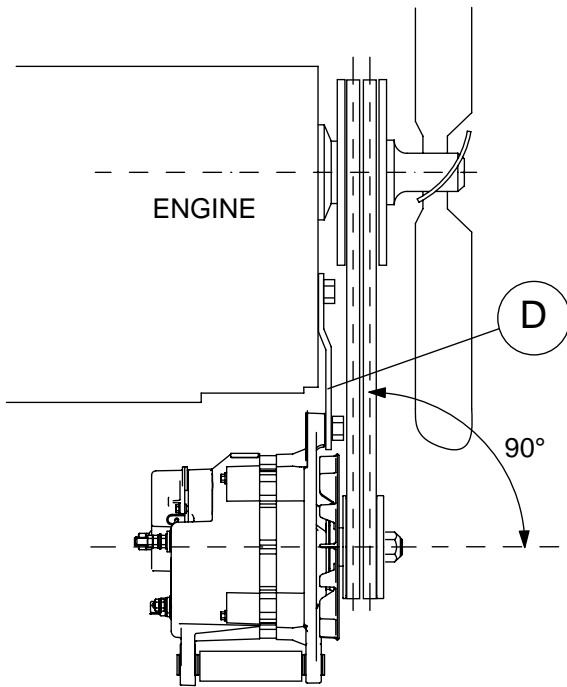


Figure 6

- 4 Loosely attach the alternator adjustment strap (figure 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 retighten 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 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 8) for recommended wire sizes

- Use the supplied cable harness 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.

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 as follows:

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
- For Alpha alternator model 24/95C: see APPENDIX figure A-9

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 8 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 harness between the [gnd] terminal of the Alpha Pro regulator and the B- terminal of the alternator
- 3 Insert the two pole connector of the cable harness 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 harness between the [+bat] terminal of the Alpha Pro 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 loom should not be connected to the B+ terminal of the alternator but to the positive (+) pole of the battery instead. See section 4.5.6.

- See reference ⑤. The brown cable of the cable harness must be connected to the [reg on] terminal of the Alpha Pro 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 2.5mm² 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.

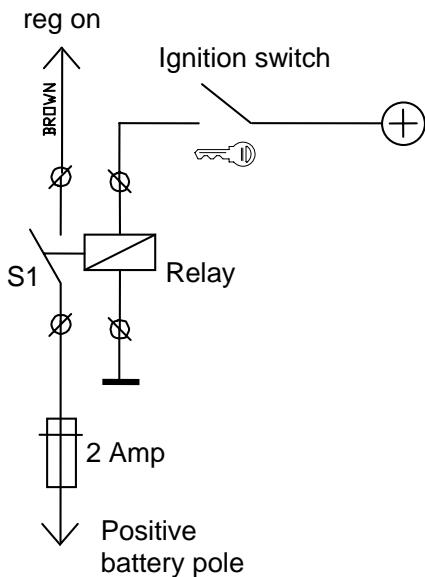


Figure 7: Connection of the ignition switch

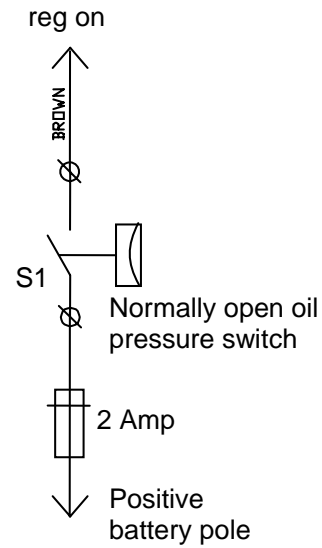


Figure 8: Connection of an independent (ungrounded) oil pressure switch with normally open contact

- See reference ⑥. The blue wire of the cable harness is the field connection of the alternator. Connect this wire to the [field] terminal of the Alpha Pro 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.

- See reference ⑦. Attach the temperature sensor to the battery and connect the RJ12 connector to the Alpha Pro 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 regulator switches from absorption mode to float mode. Switching on some loads during operation will solve this problem.

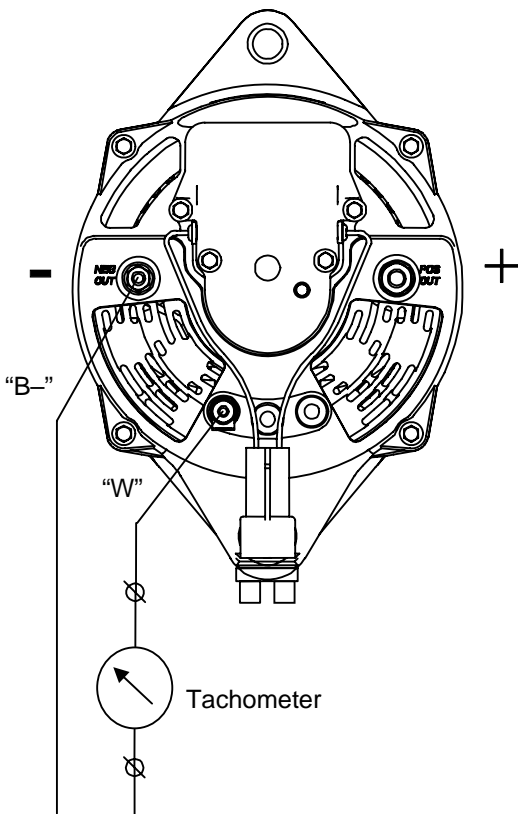


Figure 9: Connection of a tachometer (position of the terminals may differ; see APPENDIX figures A-6 till A-9)

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

- For Alpha alternator model 24/95C only: see figure 10

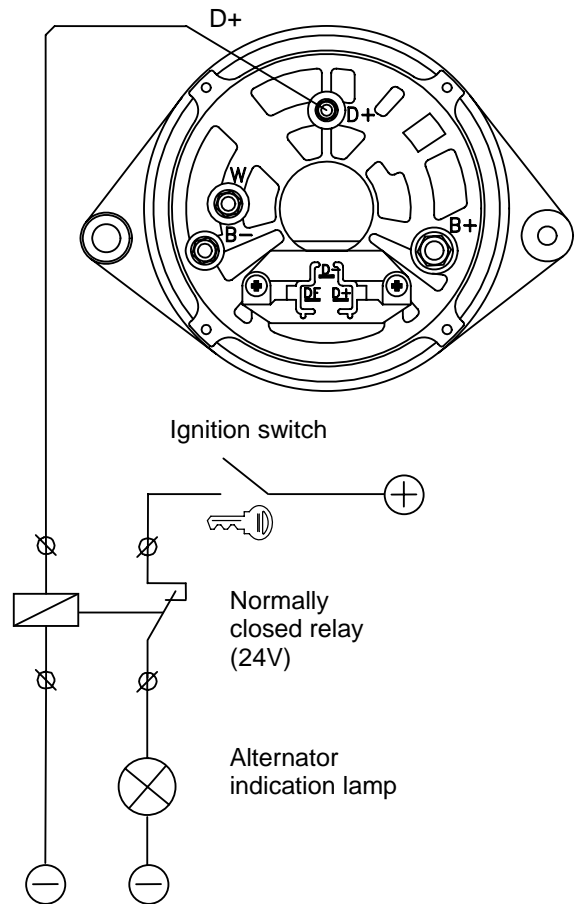


Figure 10: Connection of an alternator indication lamp (Alpha alternator model 24/95C only)

- For Alpha alternator models 12/90, 12/130, 24/75, 24/110 and 24/150: see figure 11

Mastervolt alternator models 12/90, 12/130, 24/75, 24/110 and 24/150 do not have a D+ connection. Therefore Mastervolt offers a solid state relay that can be used to simulate the charge lamp terminal (D+). See figure 11. See APPENDIX for ordering information.

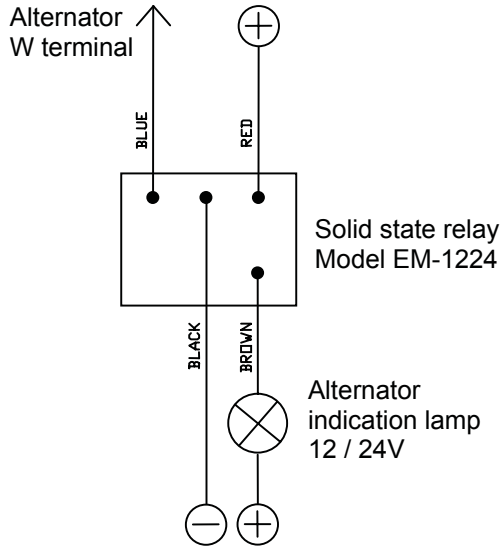


Figure 11: Connection the solid state relay model EM-1224

4.5.6 Use of a battery isolator (optional)

When two or more battery banks need to be charged simultaneously, use of 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 regulator, you can use a battery isolator that has no voltage sense connection

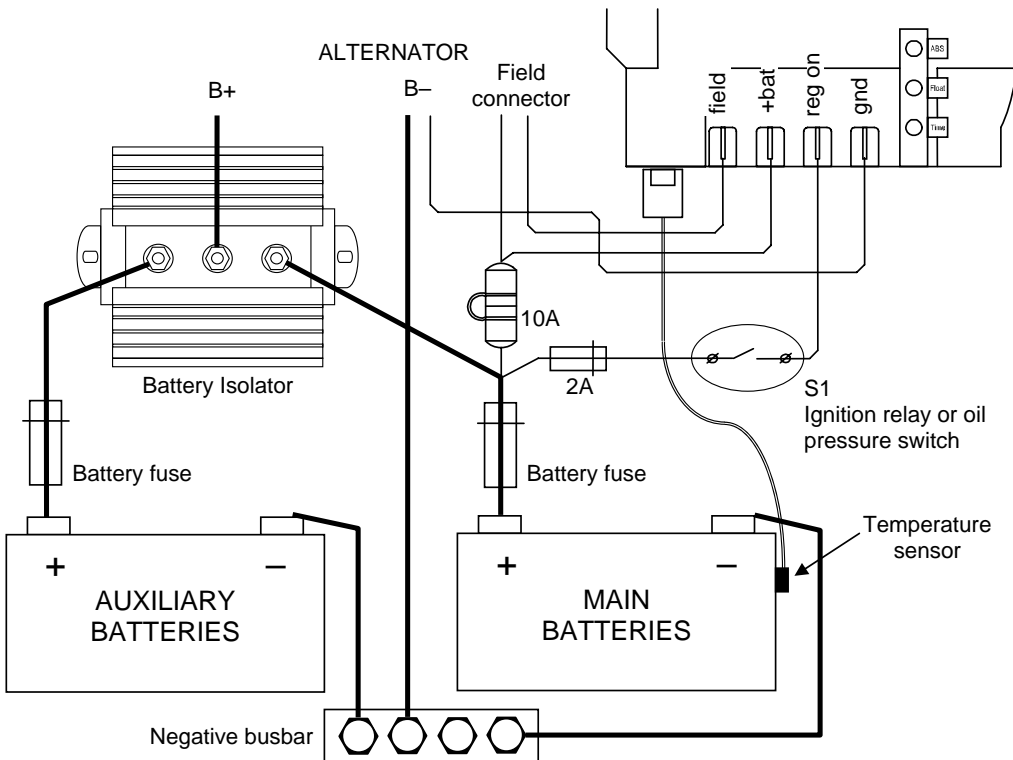


Figure 12: Use of a battery isolator

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 regulator involves two major parts:

- Testing
- Adjustments

5.1 TESTING

5.1.1 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 regulator.
- 2 Check whether all indication lights on the Alpha pro 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 13) Check whether the 3 green LED's start to blink. After approx. 10 seconds the green bulk led will illuminate.

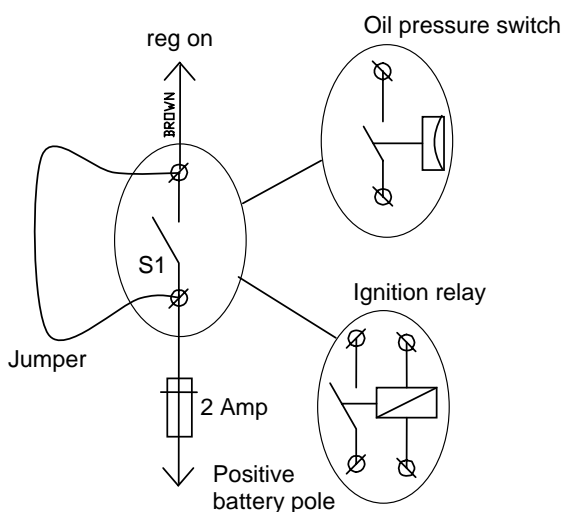


Figure 13: Jumper across switch S1

- 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 above mentioned tests, remove the DC-fuses and double check the wiring. Refer to the Trouble shooting section (section 7).

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

5.1.2 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 a the *Masterlink BTM* 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.
- 3 Check for abnormal noise or vibration.
- 4 The green [bulk] LED on the Alpha Pro regulator (see figure 15) will illuminate, 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 green [abs] LED illuminates.
- 6 When the green [abs] LED illuminates the absorption mode commences. Measure and record the battery voltage (@ 25°C / 77°F). It should stabilize at $14.25 \pm 0.05V$ for a 12V alternator or $28.50 \pm 0.10V$ for a 24V alternator (see sections 5.2 and 5.2.2 for adjustment of this voltage)
- 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; see sections 5.2 and 5.2.4 for adjustment of this timer.

- 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 section 6.4 for trouble shooting

5.2 ADJUSTMENTS

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



Figure 14: Adjustment of the potentiometers

The Alpha Pro regulator has three potentiometers (see figure 15) to adjust the charging system according to the demands of the electrical installation



CAUTION!

Invalid settings of the potentiometers 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 potentiometers. Do not attempt to drive the settings past the indicated limits. You will damage the potentiometers.

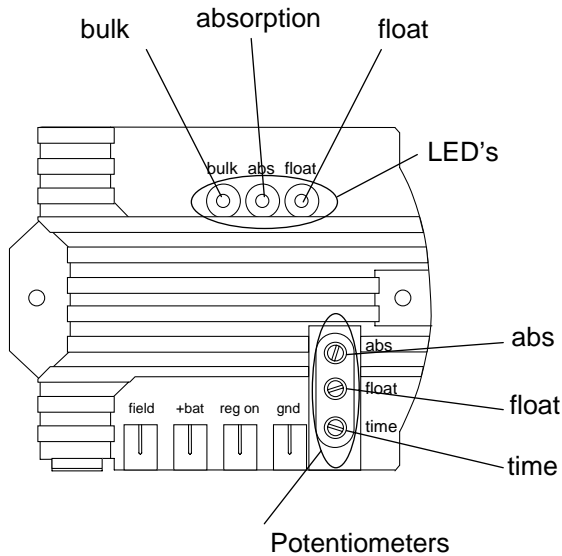


Figure 15: Front view of the Alpha Pro regulator

5.2.1 Voltage Settings

The Alpha Pro regulator uses the [reg on] terminal 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 4mm² black cable is used. Under all circumstances the voltage-drop may not exceed 0.01 Volts.

Absorption and float voltage adjustments are only possible with a fully charged battery. If the batteries are fully charged, the field current will be low and this will minimize the voltage-drop over the GND cable.

The temperature-sensor must be removed so that there will not be a temperature correction.

Use a hand-held digital meter to measure the voltage on the battery-terminals. To avoid wrong measurements, do not measure on the alternator output, neither on the terminals of the regulator

5.2.2 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). When the green absorption LED is on, increase the engine rpm slightly to verify that the charge voltage does not increase. If it does either wait for the battery to become fully charged or find a high enough rpm where the voltage does not change with increasing rpm. Rotate the [abs] potentiometer slightly clockwise to increase or counter clockwise to decrease the absorption voltage until the desired value is set. With good wiring and good voltage sensing the resolution will be within 0.03 Volts.

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.

5.2.3 Float voltage adjustment

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

To change the float-voltage, you can minimize the absorption time by turning the [time] potentiometer fully counter clockwise so that the regulator switches over to float mode in about 2 minutes. When the float LED illuminates, you should wait for approximately 10 minutes because it takes some time before the battery voltage has dropped. Then you can adjust the float voltage by rotating the [float] potentiometer

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.

Be sure to return the [time] potentiometer to its initial setting when finished.

5.2.4 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

From the factory, the slot from the potentiometer will be close to the 10 o'clock position. If you require a different time, you may interpolate the scale and make a new setting.

Adjustable range: 2 minutes up to 4.5 hours



NOTE!

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

5.2.5 Temperature compensation

The Alpha Pro regulator is standard delivered with a battery temperature sensor to compensate 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 regulator will switch on automatically. 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



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. 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 charging cycle

Although the Alpha alternator is almost maintenance-free, still moving parts are involved that need regular service and maintenance. This should be carried according to the directions in section 6.

6 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 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 regulator.

6.1 ELECTRICAL CONNECTIONS

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

6.2 CLEANING OF THE ALTERNATOR

The interval for cleaning of the alternator strongly depends on environmental conditions, but should be at least every six months.

Insure 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 and not regreasable.

6.3 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. Poorly or loosely mountings may lead to damaging vibration as well as diminished belt drive performance

6.4 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 in the first few hours of operation. After a new V-belt is 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.

7 TROUBLE SHOOTING

In case of any fault, we recommend consulting the Maintenance section first (see section 6). If you cannot solve a problem with the aid of the table below, contact your local Mastervolt Service Centre. See www.mastervolt.com.

PROBLEM	POSSIBLE CAUSE	SOLUTION
No voltages at all. All LED's of the Alpha Pro regulator are off.	• Battery fuse blown.	Investigate the cause of this malfunction. Then replace the fuse.
	• Battery connections are corroded or bad.	Clean and tighten the connections. If the cables are burned, replace them.
	• Black [gnd] wire is loose	Check black [gnd] wire (reference 2 on the installation drawings).
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	• Engine is not running	Start the engine
	• 2 Amps fuse in brown wire is blown	Check the 2 Amps fuse and replace if necessary.
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	• Problem with the oil pressure switch or ignition relay (S1) or brown [reg on] wire is loose	Check voltage on [reg on] terminal of the Alpha Pro regulator. Check brown [reg on] wire. Check the oil pressure contact or ignition relay for correct operation
	• 10 Amps fuse in the red wire blown	Check the 10 Amps fuse and replace if necessary.
	• Two pole field connector of the cable harness is loose (red and blue wire)	Check field connector on the alternator (reference 3 on the installation drawings).
	• Problem in the wiring	Check red and blue wires to the field connector
	• Blue [field] wire is loose	Check blue wire (reference 6 on the installation drawings)
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	• Field windings of the alternator are defective.	Check resistance of field windings. Replace alternator
	• Black [gnd] wire is loose	Check black [gnd] wire (reference 2 on the installation drawings).
Tachometer indication is too low or fluctuates	• Alpha Pro regulator defective	Replace Alpha Pro regulator
	• 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 or if the float voltage is set quite low.	Nothing, this is a normal situation. To avoid this, you may switch on some loads
Regulator stays in bulk mode all the time (Bulk LED stays on)	• Engine speed is too low	Increase engine speed
	• Wrong calibration of the tachometer	Adjust tachometer according to pulley ration
Regulator stays in bulk mode all the time (Bulk LED stays on)	• Alternator is overloaded.	Switch off a load; (part off) consumers.
	• Defective batteries, short-circuit between cells	Check batteries and replace if necessary

PROBLEM	POSSIBLE CAUSE	SOLUTION
	<ul style="list-style-type: none"> Capacity of the charging system is too low 	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"> Defective Alpha Pro regulator 	Replace Alpha Pro regulator
Alpha Pro regulator does not return to bulk mode when a high load is switched on	<ul style="list-style-type: none"> 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 	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"> Rotor field windings are still excited while engine is not running 	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"> The regulator measures a too low battery voltage and tries to compensate it. 	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"> Wrong setting of the charge voltage 	Adjust the charge voltage (see section 5.2)
	<ul style="list-style-type: none"> Battery temperature sensor not connected or not attached to the batteries 	Check the battery temperature sensor
	<ul style="list-style-type: none"> With non-Mastervolt alternators: terminal [D-] is not isolated from ground 	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"> Wrong setting of the absorption timer. 	Adjust the absorption timer (see section 5.2.4)
Alpha Pro regulator is in float mode, but battery voltage is still at absorption or bulk level	<ul style="list-style-type: none"> Any other device is charging the batteries 	Switch off all other charging devices and check battery voltage again.

8 TECHNICAL DATA

8.1 SPECIFICATIONS ALPHA ALTERNATORS

12V models

Model:	12/90	12/130
Part number:	48012090	48012130
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 ²	AWG0 - 50mm ²
3 m up to 5 m	AWG0 - 50mm ²	AWG2/0 - 70mm ²
Nominal voltage	12V	12V
Charge regulator:	Alpha Pro 12V	Alpha Pro 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	24/95 Compact
Part number:	48024075	48024110	48024150	46020950
Type enclosure (see APPENDIX):	B	B	C	D
Charge current:	75A	110A	150A	95A
Recommended DC fuse	100A	160A	200A	125A
Recommended DC wire size				
up to 3 m	AWG3 - 25mm ²	AWG2 - 35mm ²	AWG0 - 50mm ²	AWG3 - 25 mm ²
3 m up to 5 m	AWG2 - 35mm ²	AWG0 - 50mm ²	AWG2/0-70mm ²	AWG2 - 35 mm ²
Nominal voltage	24V	24V	24V	24V
Charge regulator:	Alpha Pro 24V	Alpha Pro 24V	Alpha Pro 24V	Alpha Pro-B 24V
Pulley diameter:	Ø 88 mm	Ø 88 mm	Ø 92 mm	Ø 76.4 mm
Belt tread:	2x	2x	2x	2x
Isolated from ground:	Yes	Yes	Yes	Yes
Rotating directions:	2	2	2	1 (clockwise)
Maximum speed:	8000 rpm	8000 rpm	8000 rpm	10000 rpm
Pulley:	Double	Double	Double	Double
Required transmission belt	A-type	A-type	A-type	A-type
Weight:	10.1kg / 22.3 lbs	10.1kg / 22.3 lbs	13.1kg / 28.9 lbs	7.9kg / 17.4 lbs
Number of mounting positions:	1	1	3	1

See APPENDIX for dimensions

8.2 SPECIFICATIONS ALPHA PRO REGULATORS

24V models

Model:	Alpha Pro 12V	Alpha Pro 24V	Alpha Pro B 12V	Alpha Pro B 24V
Part number:	45511000	45511200	45511400	45511600
Suitable for alternator type:	Mastervolt Alpha models 12/90 and 12/130.	Mastervolt Alpha models 24/75, 24/110 and 24/150.	Bosch 12V models	Mastervolt Alpha models model 24/95. Bosch 24V models
Nominal operation voltage:	12V	24V	12V	24V
Charge voltage – bulk / absorption*:	14.25V	28.5V	14.25V	28.5V
Charge voltage – float*:	13.25V	26.5V	13.25V	26.5V
Adjustable range – absorption:	13–15V	27–31V	13–15V	27–31V
Adjustable range – float:	13–13.9V	26–27.8V	13–13.9V	26–27.8V
Battery temperature compensation:	– 30mV/°C	– 60mV/°C	– 30mV/°C	– 60mV/°C
Absorption time	4 hours, adjustable range: 2 min up to 4.5 hours			
Cable harness included	Yes, 1.5 mtr oil resistant marine connection cable delivered as standard			
Temperature sensor included	Yes, including 6m/20ft cable			
Dimensions (hxwxd) in mm**	90x95x30	90x95x30	90x95x30	90x95x30
Dimensions (hxwxd) in inch**	3.5x3.7x1.2	3.5x3.7x1.2	3.5x3.7x1.2	3.5x3.7x1.2
Weight:	0.4 kg / 0.9 lbs	0.4 kg / 0.9 lbs	0.4 kg / 0.9 lbs	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



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