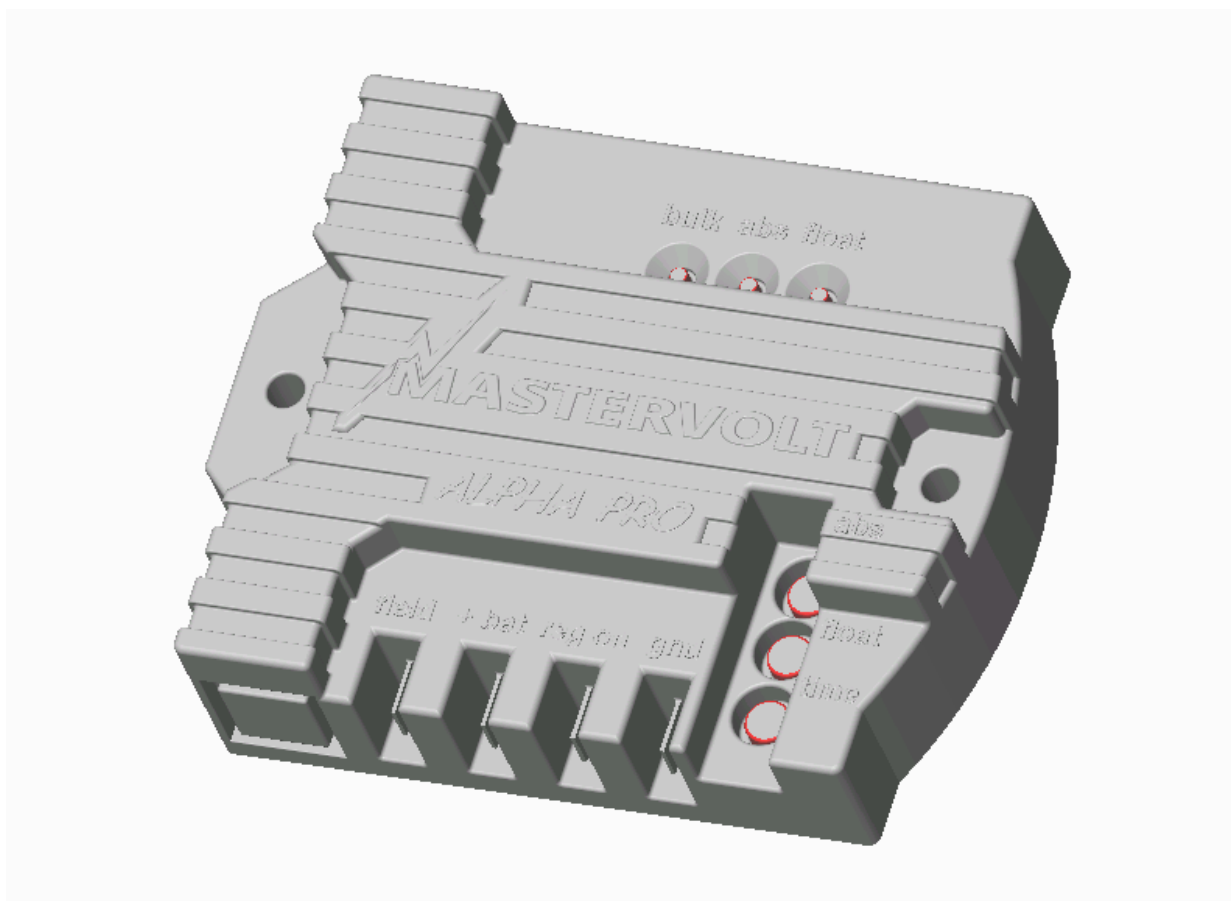




GEBRUIKERSHANDLEIDING / USERS MANUAL
BETRIEBSANLEITUNG / MODE D'EMPLOI

ALPHA PRO



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English / v3.1 / August 2003

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1 General information

1.1 Use of this manual

This manual serves as a guideline for the safe and effective operation, maintenance and possible correction of minor malfunctions of the Alpha pro. It is therefore essential that every person who works on or with the Alpha pro 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 pro, may be carried out only by qualified, authorized and trained personnel, consistent with locally applicable standards and taking into consideration the safety guidelines and measures (chapter 2 of this manual).

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 may become invalid.

1.3 Quality

During their production and prior to their delivery, all of our units are exhaustively tested and inspected.

The 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 the Mastervolt-delivered standard versions of the Alpha-pro.

1.5 Liability

Mastervolt can accept no liability for:

- damage due to use of the Alpha-pro
- possible errors in the manual 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-pro

Changes on the Alpha-pro may be carried out only after 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-pro if the user does not (carefully) follow the procedures.

2.2 Use for intended purpose

1 The Alpha Pro is constructed as per the applicable safety-technical guidelines.

2 Use the Alpha Pro only:

- In a technically correct condition
- In a closed, well-ventilated room, protected against rain, moist, dust and non condensing conditions.
- Observing the instructions in the users manual.



Never use the Alpha-pro at locations where there is danger of gas- or dust explosion!

3 Use other than as mentioned under 2 is not considered to be consistent with the in-

tended purpose. Mastervolt is not liable for any damage resulting from the above.

2.3 Organizational Considerations

The user must always:

- Have access to the users manual.
- Be familiar with the contents of this manual. This applies particular to chapter 2, Safety Guidelines and Measures.

2.4 Maintenance & Repair

1 If the Alpha pro is switched off during maintenance and/or repair activities, it should be secured against unexpected and unintentional switching on:

- Switch off the connection with the batteries or remove the Alpha Pro fuse
- Be sure that third parties cannot reverse the measures taken.

2 If such are required, use only original spare parts.

2.5 Warning of special dangers

1 Secure the DC wiring with a fuse, according to the guidelines in this users manual.

2 Connection and protection must be done in accordance with local standards.

3 Do not work on the Alpha Pro or the system if it is still connected to a current source. Only allow changes in your electrical system to be carried out by qualified electricians.

4 Check the wiring at least once a year. Defects such as loose connections, burned cables etc. must be corrected immediately.

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.

3 Warnings

- Do not exceed the recommended limits of voltage for your battery unless you are attempting to perform a mild "equalizing charge". If you do this, observe the battery current and electrolyte. Return the setting for acceptance to the proper point when finished.
- Do use the proper size flat blade screwdriver or adjustment tool that fits the slots of the adjustment controls. Do not attempt to drive the settings past the indicated limits. You will damage the controls. The pots move through a 270° rotation.
- An alternator driven tachometer may reduce its reading or flicker when the 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. Turning on one or two 12 Volt lights will remedy the situation.

4 Technology

4.1 General information

The MASTERVOLT alternators are designed to give high output with low RPM of the engine. The alternator has a three-step charging cycle. First the current is limited by the alternator, then the output voltage is maintained on a high absorption (accept) voltage, then after some time the output voltage is switched over to a lower float voltage. The regulator settings of the alternator are adjustable.

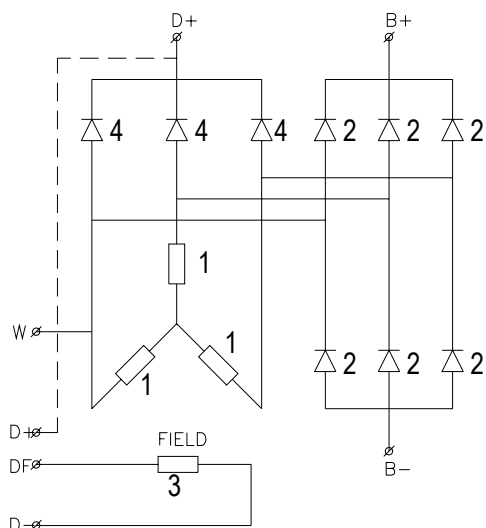
The diagram below shows the internal configuration of the alternator:

- 1 Main windings stator.
- 2 Power rectifiers.
- 3 Field windings rotor.
- 4 Power field rectifiers.


4.2 Three-step charging

Three-step charging has two advantages. First, it allows deep-cycle (liquid and gelled) lead-acid batteries to be charged as fast, and as fully as possible. Second, it ensures long life by maintaining the batteries at a safe float voltage after they are charged. The alternator begins with a charge cycle that supplies the maximum available output of the alternator. When the batteries reach the upper voltage set-point (14.25/28.5 Volts) the absorption cycle begins. The batteries are held at this voltage. They accept less and less current as they become charged. After the batteries have been held at the boost voltage for two to three hours, they are normally fully charged and the float cycle begins. During the float cycle the batteries are maintained at a lower voltage (13.4/26.8 Volts) where there is no water consumption or over-charging. Full output current of the alternator is available for the DC consumers in the system.

ELECTRIC DIAGRAM ALTERNATOR



5 Installation

 For installation diagrams I refer to chapter 11.

5.1 The alternator

The alternator is isolated from ground. The plus terminal (B+) is connected to the plus of the battery. To protect the plus wire, a fuse should be used between battery plus and wire. The minus terminal (B-) is connected direct to the minus of the battery. If a shunt is used for measuring the DC-current in the minus of the battery, connect the wire to the “load” side (cold) side of the shunt and connect the other side of the shunt to the battery.

5.2 The regulator

The regulator is supplied with a cable harness for easy and fast installation. The color codes described are for the standard cable harness. Attach the cable tightly to the bracket where the regulator is mounted to create a pull relief. People could unintentional pull the regulator cable and disconnect the regulator partly or complete.

- The black wire is the ground (GND) connection and should be connected to the negative terminal (B-) of the alternator.
- The red wire is the +BAT connection. This wire is connected to the positive terminal of the DC distribution panel, or the B+ terminal of the alternator. If there is a diode splitter between B+ of the alternator and the plus of the battery, connect the red +BAT wire to the plus of the battery. Do not connect the +BAT wire to the B+ terminal of the alterna-

tor. Also the REG ON wire has to be mounted to this point.

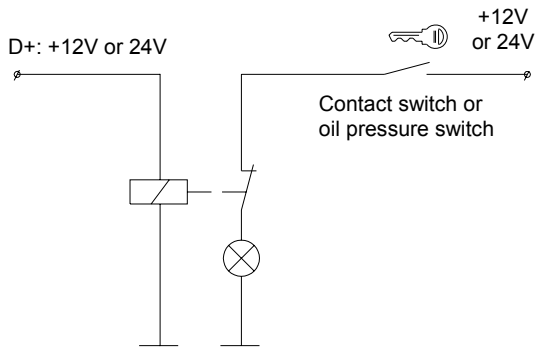
- The brown wire is the REG ON signal. It should be connected to an ignition switch, or normally open oil pressure switch, that switches the +BAT-signal when the engine is running. This line should not be shared with other loads. The reason is that on this point the battery voltage is measured. Use 2.5mm² wire for the installation. Also the brown REG ON wire should be fused with a 2A fuse at its source end.
- The blue wire is the FIELD connection. This wire must be connected directly to the min side of the field (D-) of the alternator. The D- must be isolated from ground. Check this before installation. If D- is connected to ground, this connection should be removed.
- If the tachometer connection in the installation is used, connect it to (W) on the alternator.

5.3 Temperature sensor

A temperature sensor is supplied with the Alpha pro regulator. This sensor gives a correction to the charge-voltage depending on the battery-temperature which will increase the battery-lifetime. This sensor has to be mounted on top of the battery.

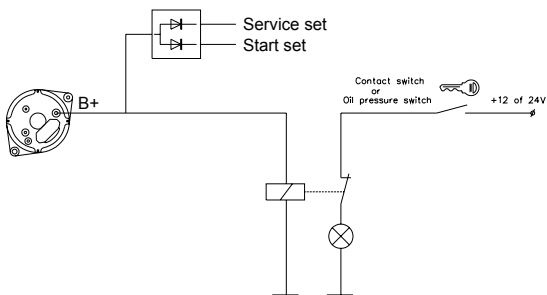
5.4 Alternator indication lamp

To check operation of the alternator often an indication lamp is used. The indication lamp will go off when the alternator charges.



Mastervolt alternators do not have a D+ connection.

A diode splitter can be installed in the B+ line for a good function of the indication lamp. The relay is connected to the B+. See figure below.



6 Test prior to starting the engine

Before starting the engine you should make this simple test.

First all indication lights on the Alpha pro should be off. Energize the REG ON terminal by turning on the ignition switch or by putting a jumper across the oil pressure switch (if that is how the regulator is being turned on). The 3 green leds starts to blink. After approx. 10 seconds the green bulk led will illuminate.

Verify the alternator field is energized by touching the shaft of the alternator with a screwdriver. It should be strongly magnetic. If you cannot pass this test do not proceed.

Double check your wiring. Refer to the Trouble shooting section (chapter 10).

7 Operation & indicator light

To check operation you will need a digital voltmeter. If you have installed a *System Control Panel* or a battery monitor, such as a *Masterlink BTM1* or the *System Manager* or one of our other models, you can use this.

Otherwise you will need a hand held digital meter.

Be sure no other charging sources are on!
Be sure the battery is fully charged.

Start the engine.

When the green bulk led is illuminated the charge-cycle begins.

Measure the battery-voltage. The battery-voltage rises until the green absorption led begins to glow. The battery-voltage should stabilize between 14,15V and 14,25V for a 12V alternator or 28.30V and 28,50V for a 24V alter-

nator. If you want to change the settings read the Adjustments section thoroughly.

When the absorption voltage is reached, a timer begins which keeps the regulator in the absorption mode. The factory setting is 4 hours. At the end of that time the regulator will go to the float mode and the green float light will illuminate.

If a heavy load comes on, during the absorption or float mode, the regulator will not change back to bulk mode. 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.

8 Adjustments

8.1 Voltage Sense

Between the REG ON terminal and GND terminal the battery-voltage is measured.

Because the field current flows through the GND wire there will be a voltage drop on this cable. This will affect the charge voltage. To minimize this voltage drop a 4mm² black cable is used.

The positive voltage is measured on the REG ON terminal. This 2.5mm² brown cable should be switched by a (normally open) oil-pressure switch, a contact-relay or an other switch. This switch should NOT switch other loads. Also small loads can affect the voltage-measurement and thereby the charge-voltage. In all circumstances the voltage-drop may not be more than 0.01V.

8.2 Absorption Voltage Adjustment

Absorption and float voltage adjustments are best made 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. Also the temperature-sensor must be removed so there will not be a temperature-correction.

Measure the voltage on the battery-terminals when the regulator is in absorption mode. Increase the engine rpm slightly to verify that the voltage does not increase. If it does either wait for the battery to become more fully charged or find a high enough rpm where the voltage does not change with increasing rpm. Using a small screwdriver (one that fits) rotate the absorption potentiometer slightly clockwise to increase or counter clockwise to decrease the measured voltage until the desired value is set. With good wiring and good voltage sensing the resolution will be within 0.03 Volts.

The factory-settings are 14.25V for 12V battery and 28.50V for 24V batteries.

Do not adjust your battery voltage above 14.6/29.4 Volts or damage on sensitive equipment may occur and decrease the life time of your batteries.

8.3 Float Voltage Adjustment

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 in about 2 minutes. When the float led illuminates, adjust the float voltage.

The factory-settings are 13.25V for 12V battery and 26.50V batteries.

The alternator driven tachometer may reduce its reading or flicker as the transition is made from absorption to float. Turning on a light or two will solve this problem.

8.4 Time Adjustment

The regulator is set at the factory with a 4 hour absorption time. This is appropriate for most systems. Exceptions might be: extending the time to do some intentional overcharging to regain lost capacity. Or you might want to shorten the time if you stop and start the engine often each day. 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. The new setting will be activated when the unit is restarted.

9 Recommended charging voltages

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

The charge-voltage must be influenced by the battery-temperature. Therefore a temperature-sensor has been supplied with the Alpha Pro regulator. Install this sensor on top of the battery and connect the jack-plug to the regulator. When the temperature-sensor is not connected the 25°C settings are taken.

Table 1:

Recommended charging voltages:

12 Volt systems		
Temperature °C	Float Voltage	Absorption voltage
45	12.65 V	13.65 V
40	12.80 V	13.80 V
35	12.95 V	13.95 V
30	13.10 V	14.10 V
25	13.25 V	14.25 V
20	13.40 V	14.40 V
15	13.55 V	14.55 V

24 Volt systems		
Temperature °C	Float Voltage	Absorption voltage
45	25.30 V	27.30 V
40	25.60 V	27.60 V
35	25.90 V	27.90 V
30	26.20 V	28.20 V
25	26.50 V	24.50 V
20	26.80 V	28.80 V
15	27.10 V	29.10 V

10 Trouble shooting

Malfunction 1:

Problem: There is no output power out of the alternator and the green led is on. The voltage on the field-terminal on the regulator is 0V.

Cause: There is a problem with the alternator, the wiring or the fuse (10A) is blown. This is the fuse in the red +BAT wire in the cable to the regulator.

Solution: Check the wiring from the regulator. Check the fuse in the red +BAT wire. If these are in good condition then there is a problem with the alternator.

Malfunction 2:

Problem: There is no output power out of the alternator and the green bulk led is on. There is some voltage on the D- connection of the alternator.

Cause: There is a problem with the regulator.

Solution: Contact the MASTERVOLT Service Centre.

Malfunction 3:

Problem: All leds are off and there is no voltage on the REG ON terminal.

Cause: There is a problem with the wiring, the (oil-pressure)switch or the fuse in the brown (REG ON)

Solution: Check the brown wire (REG ON) and the (oil-pressure)switch. Check the fuse (2A) in the brown wire to the switch or the battery.

If not please contact the MASTERVOLT Service Centre.

Malfunction 4:

Problem: Too high battery-voltage and the regulator stays in bulk.

Cause: The regulator drives the field of the alternator because the alternator measures a voltage lower than the absorption-voltage.

Solution: Check the connections if there is any corrosion. Check whether there is a voltage drop across the (oil-pressure) switch.

Adjust the absorption voltage.

Else contact the MASTERVOLT Service Centre.

Malfunction 5:

Problem: Too high battery-voltage and the regulator goes to absorption and float.

Cause: The regulator measures battery-voltage correctly. The regulator stops driving the field of the alternator but this has no influence on the battery-voltage.

Solution: Check that there is no other device charging the battery. Switch off all other chargers.

Check the voltage on the D- of the alternator. The voltage should be 12V or 24V depending on the type of the battery set. If the voltage on the D- of the alternator is 0V, check if the D-terminal is isolated from the housing.

Solution: If another device is charging the battery, this device is causing the problems.

Check that the blue wire does not have a short-circuit to the GND.

If the voltage on the D- is 0V, and D- is isolated from the housing, there is a problem with the regulator.

If the D- is not isolated from the housing, remove the connection between D- and the housing. A lot of the standard alternators has, on the inside, a connection between D- and the housing.

If you cannot solve a problem with the aid of the malfunction list, contact your Mastervolt Service Center or MASTERVOLT Amsterdam for an extended service list, phone: INT+ 31-20-3422100.

11 Drawings

11.1 Diagram regulator with single battery.

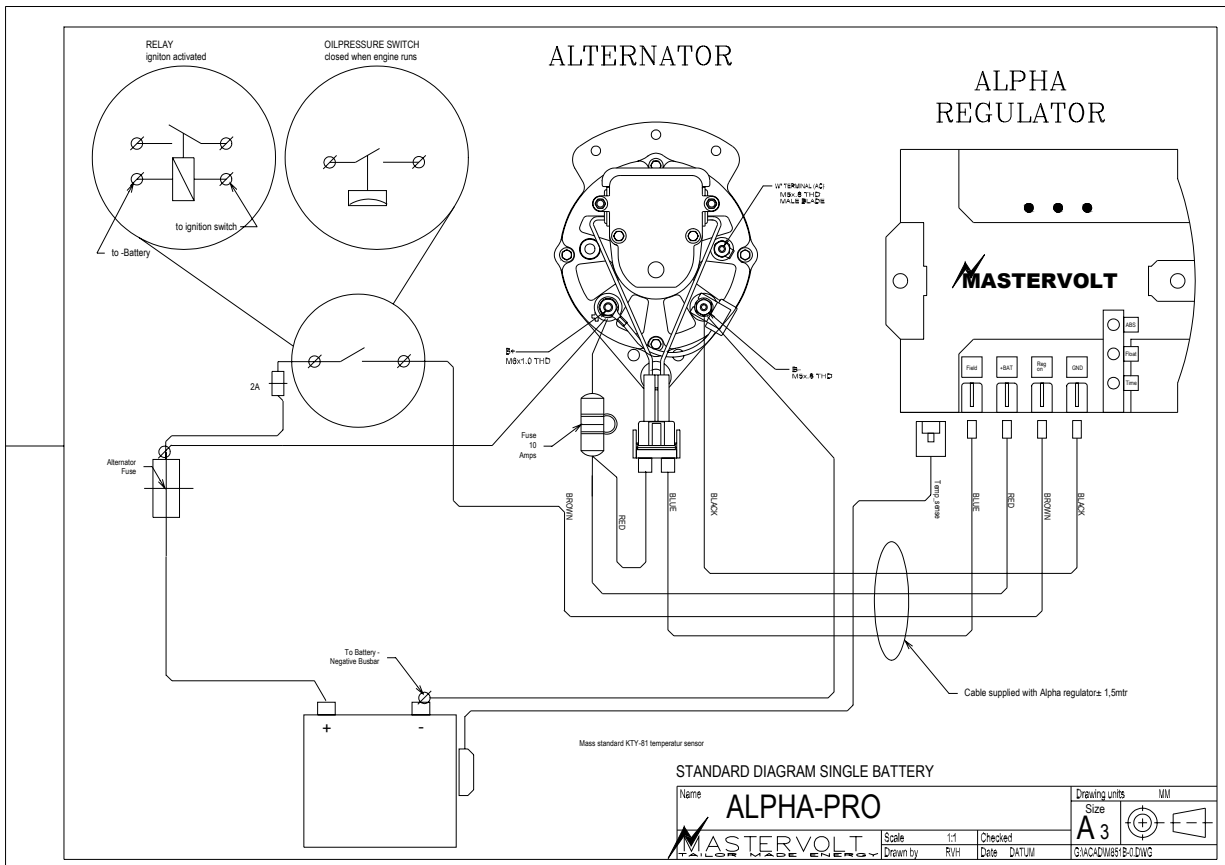


Figure 1

11.2 Diagram regulator with diode splitter.

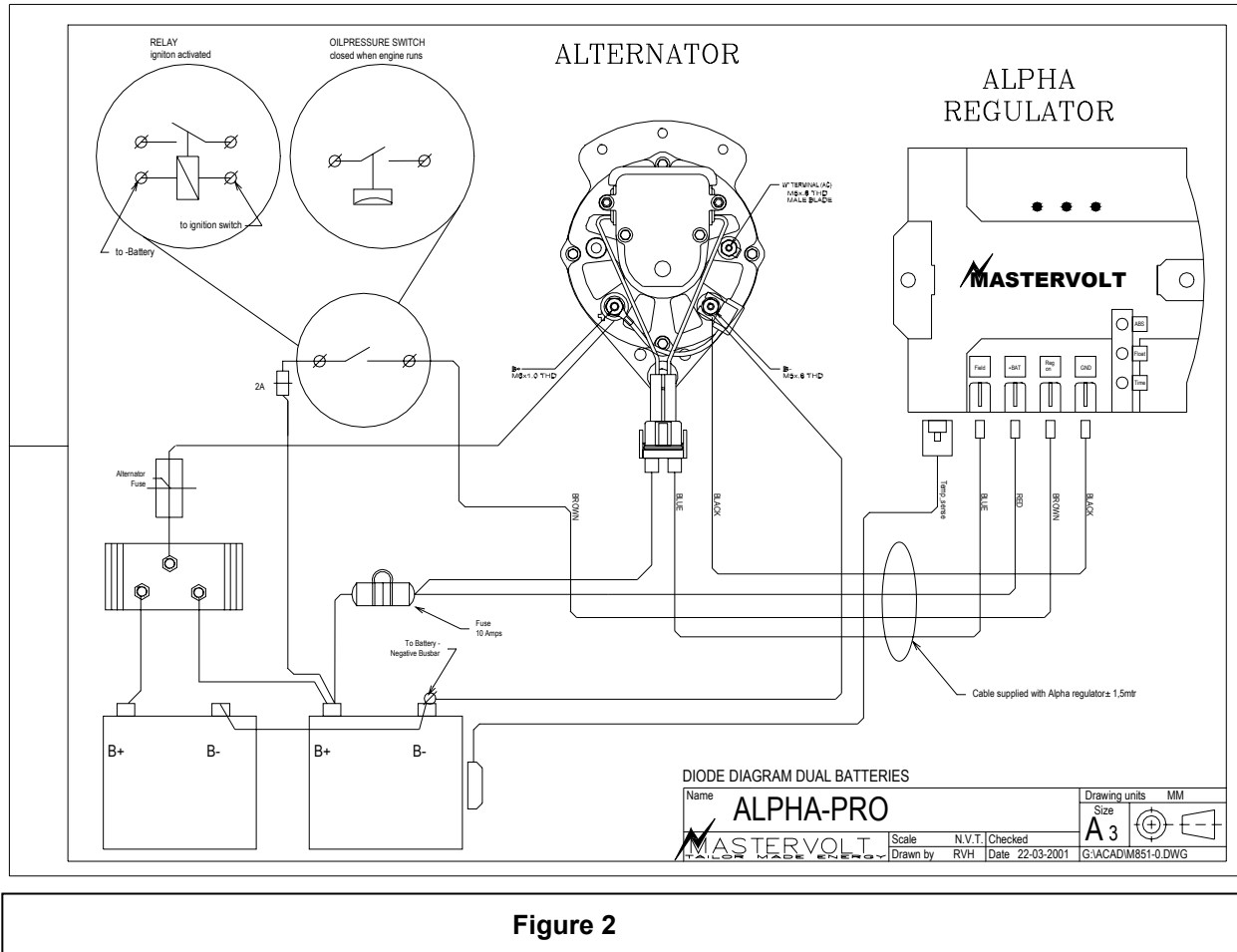


Figure 2

11.3 Diagram regulator with DC distribution.

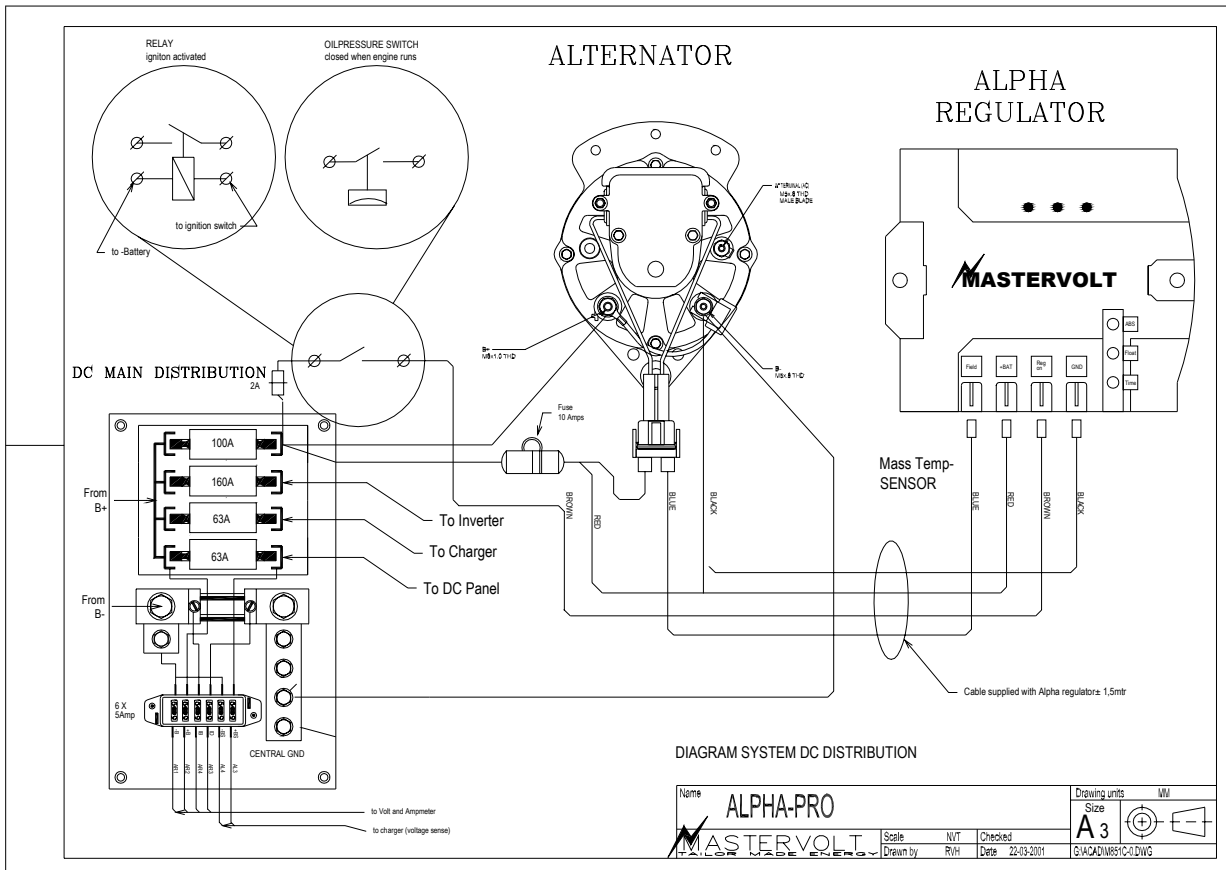


Figure 3

11.4 Drawing Bosch alternator

Typical rear view Bosch alternator

Remove the by-pass on the back side of the brushholder between ground and D-

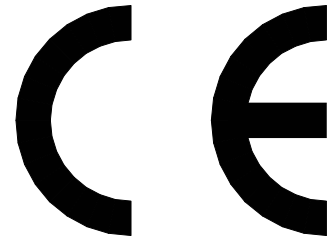
Warning: Remove connection between D- and housing with standard Bosch brushholders.

Check (after reinstalling brushholder) with a multimeter if D- has no connection between the alternator housing and B- .!!

Name Bosch alternator		Drawing units mm	
		Size A4	
	Scale 1:1	Checked	
	Drawn by R.v.H.	Date 18-04-2001	G:\acad\M863-0.dwg

12 CE declaration of conformity

Dealer : Mastervolt
Address : Snijdersbergweg 93
1105 AN Amsterdam
The Netherlands



Herewith declares that:

Product	: Alpha Pro 12V MV	04-55-11000
	Alpha Pro 24V MV	04-55-11200
	Alpha Pro 12V Bosch	04-55-11400
	Alpha Pro 24V Bosch	04-55-11600

Is in conformity with the provision of the EEC directive EMC 89/336/EEG and amendments 92/31/EEG and 93/68/EEG.

The following harmonised standards have been applied:

Emission	: EN 50081-1: 1994
Immunity	: EN 50082-2: 1994
Safety	: EN 60950: 1992

Amsterdam,

A handwritten signature in black ink, appearing to be 'F.J. ter Heide', written over a faint, stylized graphic element.

Dr F.J. ter Heide,
General Manager MASTERVOLT