DAKAR COMBI
24/3000-100, 24/5000-100 & 48/5000-60 (230V)
12/1500-65 & 24/3000-100 (117V)
SINE WAVE INVERTER/CHARGER COMBINATION
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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 Dakar Combi. This manual is valid for the following models:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dakar Combi 24/3000-100 / 230V</td>
<td>31823000</td>
</tr>
<tr>
<td>Dakar Combi 24/5000-100 / 230V</td>
<td>31825000</td>
</tr>
<tr>
<td>Dakar Combi 48/5000-60 / 230V</td>
<td>31845000</td>
</tr>
<tr>
<td>Dakar Combi 12/1500-65 / 117V</td>
<td>31011500</td>
</tr>
<tr>
<td>Dakar Combi 24/3000-100 / 117V</td>
<td>31223020</td>
</tr>
</tbody>
</table>

It is therefore obligatory that every person who works on or with the Dakar Combi 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 Dakar Combi, 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 (chapter 2 of this manual).

Keep this manual at a secure place!
The English version has 36 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 Dakar Combi delivered by Mastervolt.

1.5 LIABILITY
Mastervolt can accept no liability for:
- consequential damage due to use of the Dakar Combi;
- 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 DAKAR COMBI
Changes to the Dakar Combi 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:

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 charger if the user does not (carefully) follow the procedures.

2.2 USE FOR INTENDED PURPOSE
1 The Dakar Combi is constructed as per the applicable safety-technical guidelines.
2 Use the Dakar Combi only:
   • for the charging of lead acid batteries and the supply of users attached to these batteries, in permanent systems;
   • connected to a dedicated double pole circuit breaker (MCB) or earth leakage;
   • with a fuse, protecting the wiring between Dakar Combi 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 Dakar Combi in locations where there is danger of gas or dust explosion or potentially flammable products!

3 Use of the Dakar Combi 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 chapter 2, Safety Guidelines and Measures.

2.4 MAINTENANCE & REPAIR
1 If the Dakar Combi is switched off during maintenance and/or repair activities, it should be secured against unexpected and unintentional switching on:
   • remove the fuse(s) from the AC supply or switch off the AC circuit breaker;
   • switch off the connection with the batteries or remove the DC fuse(s);
   • be sure that third parties cannot reverse the measures taken.
2 If maintenance and repairs are required, use only original spare parts.

2.5 GENERAL SAFETY AND INSTALLATION PRECAUTIONS
   • Before using the Dakar Combi, read all instructions and cautionary markings on the Dakar Combi, the batteries, and all appropriate sections of the manual. If you do not follow these instructions the unit could be damaged.
   • Do not expose the Dakar Combi to rain, snow, spray, moisture, excessive pollution and condensing circumstances. To reduce risk of fire hazard, do not cover or obstruct the ventilation openings. Do not install the Dakar Combi in a non-ventilated room, overheating may result.
   • The Dakar Combi is designed to be permanently connected to your AC and DC electrical systems. Mastervolt recommends that all wiring be done by a certified technician or electrician to ensure adherence to proper electrical wiring regulations.
   • The Dakar Combi must be provided with an equipment-grounding conductor to the AC-input ground terminal. Grounding and all other wiring must comply with local codes and ordinances.
   • Do not exceed the 250VAC on the AC-input of the Dakar Combi (therefore Mastervolt does not recommend a three phase generator). If you want to use a generator to feed AC-in then Mastervolt urges to use an over voltage protection relay.
   • Connecting an AC power supply to the AC output terminal, will severely damage the Dakar Combi and the warranty will be void.
   • Use always Personal Protective Equipment (PPE).
   • 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, Dakar Combi and the cabling. Fuses between the batteries and the Dakar Combi 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 Dakar Combi or system if it is still connected to a current source. Only allow changes in your electrical system to be carried out by qualified electricians.

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

• Do not touch the equipment when wet or if your hands are clammy.

• The Dakar Combi is heavy. Ensure adequate mounting security and always use suitable handling equipment for transportation.

2.6 WARNING REGARDING LIFE SUPPORT APPLICATIONS

The Dakar Combi 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 additional reliability testing of the Dakar Combi parts and/or to commit to undertake such testing as a part of the manufacturing process. In addition the manufacturer must agree to indemnify and not hold Mastervolt responsible for any claims arising from the use of the Dakar Combi 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 Dakar Combi should only be undertaken by authorised personnel!
3 TECHNOLOGY

3.1 INTRODUCTION
This users manual describes the Dakar Combi series from Mastervolt. This unit performs four distinct functions:
1. DC to AC power inverting;
2. Automatic transfer switching between inverter power and incoming AC power;
3. Three-stage automatic battery charging.
4. AC to DC power conversion

3.2 DESCRIPTION OF THE SEVERAL FUNCTIONS

3.2.1 The inverter
The inverter provides voltage and frequency regulated AC power from a deep-cycle battery bank. For protection reasons low and high battery cutout circuits and overload protection have been implemented. Considerable momentary surge power is available for starting electric motors. High efficiency ensures long battery life between recharges. A built in idle circuit reduces battery power consumption when the inverter is unloaded.

3.2.2 The transfer switch
The transfer switch allows the Dakar Combi to be connected to an external AC source. Some of the external AC power is used to operate the battery charger, the rest is switched through the unit to the output. The Power support feature constantly senses the AC amperage being used by the battery charger and the appliances connected to the output, and automatically reduces battery charger power consumption if usage exceeds the input circuit breaker rating. In case of no external AC power the load connected to the Dakar Combi will be supplied within its capacity by the inverter.

3.2.3 The battery charger
The built-in battery charger is electronically controlled. It is designed to rapidly and optimally recharge either wet or gel cell deep-cycle batteries. Battery charging is accomplished in three automatic stages: BULK, ABSORPTION and FLOAT. With an external AC source connected, the Dakar Combi charger also serves the functions of an AC to DC converter to supply DC loads which are connected to the battery. Simple, automatic operation is made possible by the microprocessor that is the brain of the inverter/charger combination. In most cases, the unit is left on and no attention or maintenance is required. See chapter 5 for additional information about battery charging.

3.3 THINGS YOU SHOULD KNOW
This is a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures. A transfer between inverter and charge modes of operation may temporarily take place when the product is subjected to electrostatic discharge.

3.3.1 Intended use
The Dakar Combi is intended:
- as a DC to AC inverter/battery charger;
- for use in recreational vehicles;
- for use in professional vehicles;
- for use in recreational and professional marine vessels;
- for use in residential solar applications;
- to be permanently installed, not portable;
- to be used with a DC fuse as described in chapter 4 - Installation.
3.4 OPERATION

The only control on the Dakar Combi itself is the power switch (see fig 1, ref. 8). This switch controls ON/OFF and remote. Expect a three second delay when the power switch is turned ON before the unit is activated. If AC power is available on the AC input, the internal transfer switch will continue to be engaged and AC power will be available at the output of the unit. If AC power is removed, the unit will come on as an inverter. Inverter overload protection, built-in idle mode circuitry, transfer switching, power support and battery charger regulation will all function automatically.

3.4.1 Control & LED function during charging

The system state and battery state are made visible by means of seven bi-colour LED’s (1-7). When charging the frontpanel must be read as follows (see fig 2).

Depending on the state of the charging process one of the three LED’s (1, 2, 3) will be lit. At first the LED “bulk” (1) will go on, depending on the condition of the batteries. After some time the LED “absorption” (2) will be lit. The battery voltage will be approx. 14.25/28.5/57.0V at 20°C. After a factory set absorption time the charger will switch to “float” and the LED float (3) follows. This is the final stage in the charging process.

3.4.2 Control & LED function in inverter mode

When the Dakar Combi is in inverter mode, the front panel must be read as follows (see fig 3). When normal operation conditions are met, none of the three red alarm LED’s (1, 2, 3) will be lit. The temperature LED (1) will be lit indicating that there is an abnormal temperature rise in the inverter circuits. This can be caused by inadequate ventilation or the connected load exceeds the capabilities of the inverter. Low battery (2) will go on, when the battery voltage drops below the low battery cut out voltage. The LED overload (3) will be lit after a short circuit or heavy overload. Removing the short circuit or reducing the connected load resets the overload circuit.
3.4.3 Electronic protection
Fast acting electronic circuits protect the inverter against extreme overloads, low and high battery voltage and overheating of the inverter. The LED overload (3) will be lit when too much load is connected to the inverter. After ± 3s the inverter will switch off and the LED failure (7) will be lit together with the LED overload (3). The inverter stays switched off for ± 10s and then starts up again. If the inverter can not start up the load in 5 times it will switch off permanently. The connected load is too much for the inverter. Reduce the load, or reduce the number of consumers. The inverter has to be restarted manually by means of the on/off switch (8).

3.4.4 Built-in idle circuit
The built-in automatic energy saving feature reduces battery power consumption when no load is present. Response from idle is instant. In most cases the operation is not noticeable. Small loads such as clocks in VCR’s and microwaves will perform equally as well whether the inverter is idle or is on. The output voltage is the same as in normal operation condition e.g. 230V (or 117V). This is called 'high energy' state, which is also the default setting. To obtain even lower power consumption when a small load is present two options are available. The options can be selected by means of the jumpers S205 and S204. (See fig. 9) With S205 placed the inverter reduces, below the 300W connected load, the output voltage to 208V (or 104V). This is called 'economy' state. With S204 placed the inverter reduces the output voltage to 208V (or 104V) when the connected load is less than 80W. This is called 'low energy' state.

3.4.5 Power Support
The Dakar Combi can automatically reduce the battery charger output, and therefore the AC power consumption, if appliances are turned on that threaten to trip the incoming circuit breaker (i.e. shore power or genset fuse). This feature is set to protect a 20A/40A source by default. With the Dakar Power Centre Control the AC power consumption of the Dakar Combi can be reduced remotely. The Power Support level should be set to match the value of the circuit breaker, which protects the incoming AC power. For instance, in most campsites or marinas (with 230V AC systems), a 16A shore power circuit is available. When the Power Support level is set at 15A, the Dakar Combi never exceeds this current consumption, as long as the load connected to the AC-output is not more than 15A.
4 INSTALLATION

During installation and commissioning of the Dakar Combi, the Safety Guidelines & Measures are applicable at all times. See chapter 2 of this manual.

See chapter 6 for additional information about the design and set-up of an electrical system

4.1 UNPACKING

In addition to the Dakar Combi the delivery includes:

- a temperature sensor*;
- a remote control panel: Dakar Power Centre Control + communication cable
- this operating manual.

* The temperature sensor is attached on the right hand side inside the connection compartment of the Dakar Combi.

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

4.2 ENVIRONMENT

Install the Dakar Combi in a dry, well ventilated dust free room. Locate the Dakar Combi as close as possible to the DC distribution in order to keep the battery cables short. Do not locate the Dakar Combi in the same compartment as the batteries. The heat of the Dakar Combi is discharged by a ventilator with a variable speed.

At assembly of the Dakar Combi be sure that:

- the air flow is not obstructed;
- no water and/or dust can enter the cabinet.

4.3 WIRING

The way of wiring has influence on the EMC behaviour of the system of which the Dakar Combi is a component. This is caused by the fact that wires and cables are excellent reception and transmitter antennas of radio frequency electro magnetic interference. Most problems originate from mutual influencing of wires and cables.

Starting points for wiring with good EMC properties:

- lay the cables in metal cable trunking. The metal of the trunking offers a low resistance to interference currents, so that these currents run in the trunking.
- The DC cables are to be in contact with one another, as far as possible. The cables of different groups should not be twisted but run in parallel. If trunking is not possible, lay the cables parallel to a metal bar. If this is not possible, make a cable bunch in which the cables run in parallel.

4.4 MOUNTING OF THE CABINET

M8 bolts (or M6 bolts for the Dakar Combi 12/1500) can be used for the mounting of the cabinet. Proceed as follows for mounting the cabinet.

1. Screw the topmost bolts somewhat into the wall.
2. Hang the cabinet with its key holes over the two bolts and screw these bolts finger tight, so that some shifting is still possible.
3. Place the two lowermost bolts.
4. Fasten all bolts securely.

CAREFUL!

Careful! Dakar Combi must be placed vertically and text on front readable

WARNING

Never use the Dakar Combi at locations where there is gas or explosion danger!
Fig. 5: Dimensions Dakar Combi 24/3000-100 (117 and 230V), 24/5000-100 (230V) and 48/5000 (230V)

Fig. 4: Dimensions Dakar Combi 12/1500-65 (117V)
4.5 REMOVAL OF THE FRONT PANEL

**WARNING**
The front panel may never be removed while the Dakar Combi is still connected to a power source!

Steps:

1. Remove the four Phillips screws from the corners of the cabinet (See figure 4 or 5, ref A)
2. Slide the front panel straight forward.
3. All terminals are now accessible
4. If not placed already, fit the loose supplied cable glands to holes at the bottom of the cabinet.

4.6 CONNECTIONS OF AC & DC WIRING

**WARNING**
Let installation work be done by a licensed electrician. Before beginning with the connection of the wiring, make the AC distribution as well as the DC distribution voltage free. Move the On/Off/Remote-switch (see fig 1, ref. 8) to the “Off”-position.

**4.6.1 AC supply**

**CAREFUL!**
Check whether the voltage from the mains or generator is the same as the specified input voltage on the type number plate. Connect the Dakar Combi to a dedicated group of the AC distribution.

The maximum current passing the built-in transfer relay must be limited. Therefore the AC-input must be protected by a fuse, as specified below.

<table>
<thead>
<tr>
<th>Model Dakar Combi</th>
<th>Maximum rating of the AC input fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>All models</td>
<td>25A</td>
</tr>
</tbody>
</table>

Proceed as follows to connect the AC supply:

1. Check whether the relevant group of the AC distribution is voltage free and locked.
2. Use cable of 3x4 mm²
3. Lay the cable between the AC distribution and the Dakar Combi.
4. Feed the cable through the cable glands to the left terminal block and connect the wires (see fig. 6 and 7).

**WARNING**
Check once again if the 230V AC supply cable is connected to the AC input section. Connecting the 230V AC supply cable to the AC output terminals will severely damage the Dakar Combi and the warranty will be void.

4.6.2 AC load

Check whether the AC output voltage of the Dakar Combi is the same as the connected equipment.

1. Use cable of 3x4 mm²
2. Lay the cable between the AC load and the cable glands.
3. Run the cable to the right terminal block and connect the wires (see fig. 6 and 7).
Fig. 6: Overview connection compartment Dakar Combi models 24/5000-100 / 230V and 48/5000-60 / 230V:

1+2: Remote operation switch
13+14: Battery temperature sensor
Dakar Power Center Control Panel or CSCP

Jumpers
Inverter Ground connection wires
positive battery terminal
negative battery terminal

AC input
AC output

13+14: Battery temperature sensor
Dakar Power Center Control Panel or CSCP

Jumpers
Inverter Ground connection bar
positive battery terminal
negative battery terminal

AC input
AC output

* n/a for Dakar Combi 48/5000-60 / 230V

Fig. 7: Overview connection compartment Dakar Combi models 24/3000-100 / 230V, 12/1500-65 / 117V and 24/3000-100 / 117V:

1+2: Remote operation switch
13+14: Battery temperature sensor
Dakar Power Center Control Panel or CSCP

Jumpers
Inverter Ground connection wires
positive battery terminal
negative battery terminal

AC input
AC output

* n/a for Dakar Combi 48/5000-60 / 230V

Fig. 7: Overview connection compartment Dakar Combi models 24/3000-100 / 230V, 12/1500-65 / 117V and 24/3000-100 / 117V:

1+2: Remote operation switch
13+14: Battery temperature sensor
Dakar Power Center Control Panel or CSCP

Jumpers
Inverter Ground connection wires
positive battery terminal
negative battery terminal

AC input
AC output

* n/a for Dakar Combi 48/5000-60 / 230V
4.6.3 AC safety grounding

**WARNING**
The ground wire offers protection only if the cabinet of the Dakar Combi is connected to the safety ground. Connect the earth terminal (PE) to the hull or the chassis.

**CAREFUL!**
For safe installation it is necessary to:

- connect the neutral conductor (N) of the AC output to the earth (PE), only during inverter operation of the Dakar Combi;
- insert a Residual Current Device (earth leakage switch) of 30mA in AC output of the Dakar Combi.

Refer to local regulations on these issues!

For safety purposes, with all models the neutral conductor (N) of the AC output is automatically connected to the earth (PE) when the Dakar Combi is in inverter operation. When utility power is available on the AC input, and the Dakar Combi is in charger mode, this connection is automatically disconnected.

In some applications automatic connection between the neutral conductor (N) and earth (PE) is not required or acceptable.

**WARNING**
Disabling the automatic connection between the neutral conductor (N) and earth (PE) could contribute to a hazardous and potentially fatal situation!

To disable this automatic connection:

- Dakar Combi models 24/5000-100 / 230V and 48/5000-60 / 230V: see figure 6. Cut away the Inverter Ground connection wires
- All other models: see figure 7. Remove the Inverter Ground connection bar.

4.6.4 DC wiring

Keep in mind that high current will pass through the DC wiring. Keep the cable length as short as possible, this will keep the system efficiency as high as possible. The recommended minimum size of the battery cables is:

<table>
<thead>
<tr>
<th>Model Dakar Combi</th>
<th>DC Cable thickness:</th>
</tr>
</thead>
<tbody>
<tr>
<td>24/3000-100 / 230V</td>
<td>50mm² / AWG0</td>
</tr>
<tr>
<td>24/5000-100 / 230V</td>
<td>70mm² / AWG2/0</td>
</tr>
<tr>
<td>48/5000-60 / 230V</td>
<td>35mm² / AWG2</td>
</tr>
<tr>
<td>12/1500-65 / 117V</td>
<td>50mm² / AWG0</td>
</tr>
<tr>
<td>24/3000-100 / 117V</td>
<td>50mm² / AWG0</td>
</tr>
</tbody>
</table>

Use ring terminals on the ends of the wires. The terminals should be crimped with a proper crimping tool.

- Mark the positive cable red;
- Mark the negative cable black.

Lay the positive and negative cables next to each other to limit the electro magnetic field around the cables. The negative cable should be connected directly to the negative post of the battery bank or the ground side of a current shunt. Do not use the chassis frame as the negative conductor. Tighten securely. The positive battery cable must be fused and connected to the positive post of the battery bank, or through a selector switch to one or more battery banks.

For safety reasons a fuse is required to protect the battery and the cables. The fuse with the fuse-holder is available from your local Mastervolt distributor or Customer Service Representative.

<table>
<thead>
<tr>
<th>Model Dakar Combi</th>
<th>Recommended Combi fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>24/3000-100 / 230V</td>
<td>250A</td>
</tr>
<tr>
<td>24/5000-100 / 230V</td>
<td>355A</td>
</tr>
<tr>
<td>48/5000-60 / 230V</td>
<td>250A</td>
</tr>
<tr>
<td>12/1500-65 / 117V</td>
<td>250A</td>
</tr>
<tr>
<td>24/3000-100 / 117V</td>
<td>250A</td>
</tr>
</tbody>
</table>
CAREFUL!
The Dakar Combi is not DC reverse polarity protected. Be very careful to connect the negative and positive cables correctly, otherwise damage will result and the warranty will be void.

CAREFUL!
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 DC cables of the correct size.

Proceed as follows to connect the DC cables:

1. Check whether the combi fuse is not placed yet.

2. Feed the cables through the cable glands of the cabinet. Then fix the ring terminals to the wire ends. Connect as follows:
   - The minus cable (black) on the negative terminal
   - The plus cable (red) on the plus terminal

3. Make both cables the right length and crimp terminals to the cable ends.
   - The minus cable (black) to the minus terminal of the DC distribution;
   - The plus cable (red) to the combi fuse.

4. Check the polarity of the above made connections.

**4.6.5 Battery temperature sensor (optional)**
Attach the temperature sensor to the battery. Connect the temperature sensor to terminals 13 and 14 by using 0.75mm2 wires (not included). See figure 6 and 7.

**4.6.6 Battery voltage sense wires (optional)**
To shorten the charge time, the voltage losses over the battery cables can be compensated by using the battery voltage sense function. Use wires of 0.75mm2, preferable black for the negative battery pole and red for the positive battery pole. Integrate 2Amps–T fuses in both sense wires.
First connect the wires to the terminals on the Dakar Combi and then connect the wires to the battery.

The terminals of the battery voltage sense wires are located on the connection board right next to the main DC connector. See fig. 6 and 7. Steps:
1. Connect the positive sensor wire to the plus terminal.
2. Connect the negative sensor wire to the minus terminal.

**4.6.7 Connection of a second battery (optional)**
The Dakar Combi is equipped with second charge output which can be used to give a maintenance charge to a small battery set like a starter battery (not available on Dakar Combi 48/5000-60 / 230V). Maximum output current: 3 Amps.
Output voltage: same as the main charger.

   - Use 2.5 to 4 mm² cable for connection.
   - Connect the negative of the second battery to the negative of the main battery.
   - Connect the positive of the second battery to the second output terminal of the Dakar Combi (see figure 6 and 7). Integrate a 10 Amps–T fuse in this wire.

**4.6.8 Dakar Power Centre Control**
To install the Dakar Power Centre Control, please refer to the user’s manual of the Dakar Power Centre Control.

Note: the Dakar Combi can also be operated without the Dakar Power Centre Control panel connected.
This schematic is to illustrate the general placement of the Dakar Combi in a circuit. It is not meant to provide detailed wiring instructions for any particular electrical installation.
4.7 SETTINGS
There are three jumpers for specific settings of the Dakar Combi. See figure 9. Adjust the DIP-switches prior to commissioning.

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Connection</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>S202</td>
<td>1-2</td>
<td>Output frequency = 50Hz</td>
</tr>
<tr>
<td></td>
<td>2-3</td>
<td>Output frequency = 60Hz</td>
</tr>
<tr>
<td>S204</td>
<td>None</td>
<td>Normal mode</td>
</tr>
<tr>
<td></td>
<td>1-2</td>
<td>Low energy state @ &lt;80W</td>
</tr>
<tr>
<td>S205</td>
<td>None</td>
<td>Normal mode</td>
</tr>
<tr>
<td></td>
<td>1-2</td>
<td>Economy state @ &lt;300W</td>
</tr>
</tbody>
</table>

See chapter 3.4.4 for explanation of the “low energy state” and “economy state”.

4.8 COMMISSIONING AFTER INSTALLATION

CAREFUL!
Check the polarity of all wiring before commissioning: plus connected to plus (red cables), minus connected to minus (black cables).

Follow the steps described below to switch on the Dakar Combi.

1. Tighten all cable glands to ensure the pull relief
2. Check all wiring and connections
3. Close the front cover plate of the connection compartment of the Dakar Combi. Beware that the cabling does not obstruct the cooling fans and air flow.
4. Place the DC-fuse(s) of the DC-distribution to connect the batteries to the Dakar Combi.

WARNING
When placing this fuse, a spark can occur, caused by the capacitors used in the Dakar Combi. This is particularly dangerous in places with insufficient ventilation, due to the gassing of the batteries an explosion can occur and avoid having flammable materials close by.

Now the Dakar Combi is ready for operation.

4.9 DECOMMISSIONING
If it is necessary to put the Dakar Combi out of operation, follow the instructions in order of succession as described below:

1. Move the On/Off/Remote-switch of the Dakar Combi to the “Off”-position (see figure 1, ref. 8).
2. Remove the DC-fuse(s) of the DC-distribution and/or disconnect the batteries.
3. Remove the AC-fuse(s) of the AC-input and/or disconnect the AC-mains.
4. Open the connection compartment of the Dakar Combi (see chapter 4.5)
5. Check with a suitable voltage meter whether the inputs and the outputs of the Dakar Combi are voltage free.
6. Disconnect all the wiring

Now the Dakar Combi can be demounted in a safe way.
5 BATTERY CHARGING

5.1 THE DAKAR COMBI BATTERY CHARGER
The Dakar Combi/Charger combination is designed to overcome the limitations of conventional chargers by utilizing three distinct stages, each designed for optimal recharging of both wet cell, gel cell and AGM deep cycle batteries. The benefits of the Dakar Combi/Charger versus the traditional taper charger are that it is: quicker, has more complete recharging and safe long term charging. Each time the battery charger is engaged, the three stages proceed automatically, resulting in an efficient, complete recharge and safe battery maintenance.

The battery charger stages are:

5.1.1 Main charge - “BULK”
The main charge starts after the Dakar Combi is switched on. During this phase the charger supplies the maximum current. The current charges the batteries and gradually the voltage rises to the absorption voltage of 14.25V (12V), 28.5V (24V), 57.0V (48V) models @ 20°C. When the absorption voltage is reached the absorption phase commences. The yellow lamp “bulk” on the front of the Dakar Combi is lit during bulk charging.

The bulk charging may take a few hours. The time depends on the capacity and charge of the batteries and how much current is supplied directly to the load. In general the electrical system is designed in such way that the batteries will be recharged for 80% after the bulk charge.

5.1.2 Post charge - “ABSORPTION”
Absorption charging starts when the voltage on the batteries has reached 14.25V / 28.5V / 57.0V @ 20°C. During the absorption phase the voltage is maintained. The charge current is decreasing slowly dependent on the absorption capacity of the batteries. The absorption phase lasts 4 hours and during this time the batteries are charged up to 100%. The yellow lamp “ABSORPTION” is lit during the absorption phase.

5.1.3 Trickle charge - “FLOAT”
The third phase, trickle charging, starts after the absorption phase. The Dakar Combi switches to 13.25V / 26.5V / 53.0V @ 20°C and stabilises this voltage. This voltage is high enough to maintain the batteries fully charged and low enough to prevent

![Graph showing three-stage charge characteristics](image-url)
wear out. This is the reason why the Dakar Combi can be continuously switched on.

The current to the batteries is very low, enough to compensate the self discharge. At the same time the Dakar Combi can supply current directly to the consumers. The yellow lamp “FLOAT” on the front of the Dakar Combi is lit during the float phase. The Dakar Combi starts a new cycle if is switched off for more than 10 seconds or when the current reaches the maximum charge current for more than 10 seconds.

5.2 TEMPERATURE COMPENSATED CHARGING

The charge voltages of the Dakar Combi are adjusted in such way that with a battery temperature of 20°C optimum results are obtained. However, often the batteries are used in environments where the temperature is much lower or much higher than 20°C. The batteries also become warmer from charging. The charge voltages can be automatically adapted for deviating temperatures by installing the supplied battery temperature sensor. When the battery temperature is low, the charge voltage increases, in order to compensate the decreased chemical activity inside the battery. Full charge is still possible in an acceptable charge time. When the battery temperature is high, the charge voltage is decreased, to compensate the increased chemical activity inside the battery. Over charge and gassing are prevented this way. The charge voltage is limited to 14.5 V / 29.0V / 58.0V, to prevent an unacceptable high voltage on the consumers battery. Below 20°C and above 50°C the charger regulates the output voltage to 12.0V / 24.0V / 48.0V and the lamp “FAILURE” will be lit. See section 4.6.5 to connect the temperature sensor.

5.3 COMPENSATION OF THE DC CABLE LOSSES

The Dakar Combi can compensate the voltage drop occurring over the DC cables of the charger. For this purpose the Dakar Combi is provided with terminals for sensor wires. It is not necessary to use both sensor wires. See chapter 4.6.6 for the connection of the sensor wires.

5.4 BATTERY CHARGING WITH THE DAKAR POWER CENTRE CONTROL CONNECTED

When the Dakar Power Centre Control is connected to the Dakar Combi, the panel will overrule the internal regulation.

For example, the charge characteristic from the Dakar Power Centre Control differs from the Dakar Combi characteristic. See user’s manual of the Dakar Power Centre Control for more information.
6 APPLICATIONS

6.1 SYSTEM DESIGN
The performance of an electrical system is depending on choosing the right size of equipment. It is crucial for having a system which is built up in such a way that the best possible performance is guaranteed. To design the electrical system with all the components fit to each other it is a need to know what the Dakar Combi does and does not.

The Dakar Combi cannot be used for:
- Grid connection /feedback purpose.
- Generator support.
- Parallel function with any other AC source.
- 3 phase generator systems if more than one Dakar Combi will be used.
- Generators providing a quasi sine wave output voltage.

6.1.1 Combi / generator sizing
In general the generator manufacturers specify and measure the power rating of their generators using a resistive load. Resistive loads are for example heating elements. The resistive loads are ideal loads to use and achieve the highest possible power rating. The power ratings can be given in Watts (W) or in Volt-Amps (VA). These ratings are often expressed as kilowatts (kW) or kVA, where the k stands for 1000. Watts is a measure of real power, while VA is a measure of apparent power.

To calculate power in Watts we use the formula Power (W) = Volts x Amps x PF (PF is the power factor also mentioned as cos phi).

To calculate power in VA we use the formula Power (VA) = Volts x Amps.

In this formula we do not take into account the power factor and is therefore referred to apparent power. The power factor (cos phi) is a correction factor used to compensate for phase shifts between voltage and current when inductive or capacitive loads are involved.

Most appliances that are used in electrical systems are inductive, not resistive from nature. This finally results in major de-rating of the actual output power that you can expect from the generator in a real world system where non resistive appliances are used. The de-rating varies on the nature of the appliances used in the system.

The de-rating which is varying on the load, is linked to the power factor. Resistive loads have a power factor 1 (unity), this means there is no phase shift between volts and current. If the power factor is 1, Watts and VA are exactly the same value.

For example we take an 1100 W generator producing 230V to supply power to a resistive load of 5 Amps and an inductive load of 5 Amps with power factor 0.5:
- Power (Watts) = Volts x Amps x PF
  - Power (Watts) = 230 x 5 x 1 = 1150 Watt resistive load
  - Power (Watts) = 230 x 5 x 0.5 = 575 Watt inductive load

In most of the solar driven energy applications, resistive loads include water heaters (calorifiers), stoves, space heaters and standard light bulbs (not PL or TL). Inductive loads include all motors, transformers, air conditioners, microwave ovens, some of the battery chargers (some of the better brands have battery chargers with power factor 1), converters, electronic equipment and fluorescent lights.
Therefore, when sizing the generator or inverter for a particular application, it is necessary to take into account the nature of the loads and not just the total loads in Watts or VA.

The Dakar Combi has a power factor corrected battery charger function, this results in a nearly ideal load for the incoming grid or generator power.

Example
What size generator would I need to charge my batteries at 80 Amps max charge current of the 12 Volt battery charger/inverter.

- Required power during charge 80 Amps = (80Amps * 12 Volts) / (0.70 * 1) = approx. 1400 VA

In order to enable the full 80 Amps bulk charge rate, we recommend you to use at least 1600 Watt continuous generator power (7 Amps @ 230V). A slightly smaller generator may operate since the Dakar Combi will operate on lower input voltage as well (180-250V), however the generator may suffer damage due to overheating / overload.

You may choose for a smaller generator, the input power consumption of the Dakar Combi can be reduced with the Power Support Level feature. The power support level setting must match the generator continuous rated AC Amps. If the lower setting is less than 8 Amps it will reduce the bulk charge current which results in a longer charge time.

**CAREFUL!**
Mastervolt has identified that the Dakar Combi range is not always compatible with generators which provide a quasi sine wave output voltage.

The reason for this is that the generator waveform deviates substantially from a true sine wave and is deemed "bad AC wave form" by the Dakar Combi. Furthermore, the waveform produced by some generators changes shape for different loads. The Dakar Combi might accept the waveform at no (or light) load condition and reject it at higher load or vice versa.
6.2 OVERVIEW SYSTEM SETUP

6.2.1 System with AC mains power connection (backup power configuration)

Fig. 12: System with AC mains power connection (backup power configuration)
6.2.2 Autonomous power system with generator backup

The generator power can be connected directly to the Dakar Combi if the generator current is not exceeding the 25 Amps, which is the limitation for the double pole built-in transfer relay of the Dakar Combi. If the generator current is exceeding the 25 Amps you need to connect the high power loads which do not need to run on the inverter, directly to the generator or separate transfer (see figure 13). Exceeding the 25 Amps for the build in transfer relay will result in welded contacts of the relay which can cause damage to the Dakar Combi and electrical system. We advice to install a 25 Amps circuit breaker, in the generator and Combi AC input line.

The need to install an Earth leakage breaker or RCD (Residual Current Device) or also called GFCI (Ground fault Current Interrupt) is depending on the local requirements and regulations. Their purpose is to detect a difference in Line and Neutral power line current and trip a breaker if the current exceeds 30 mA.

Fig. 13: Autonomous power system with generator backup
6.2.3 A combined AC mains / generator / inverter system

See figure 14.
6.2.4 System with single phase mains and three phase generator

We have experienced that in some situations our Dakar Combi units are being used in combination with a 3 phase AC generator for powering the Dakar Combi with 230V AC on charger mode. We are aware that 3 phase AC generators are commonly used for power back up in hybride or stand alone PV systems.

Benefits of three phase AC generators are that they are easy to obtain and they are affordable. However, using Dakar Combi’s in such a system has resulted in practical problems and damage to these units. Therefore we made this Information Memorandum to explain the system and point out the possible problems. We also indicate possible solutions.

6.2.5 Using one Combi in a system with a three phase AC generator

See figure 15. In a system where a three phase generator is being used the AC input of the Combi must be connected to that line where the Voltage Regulator of the generator (VR) is connected. Should you have any doubt to which line the VR is connected we advise to consult your generator supplier.

The Dakar Combi must be connected to the phase where the genset voltage regulator is connected to. This needs to be done to protect the Dakar Combi for over voltage in the event of neutral shifting.

**Fig. 15: System with single phase mains and three phase generator**
6.2.6 Using three Combi’s in a system with a 3AC Generator

We do not recommend such a system, because; If the system consists of three Combi’s each connected to one AC 230V, on each line problems are to be expected with neutral shifting. Neutral shifting is the result of the correction of the output voltage when the generator is not equally loaded over the phases. As it is very hard to make sure that each Combi, is continuously loaded at the same rate at all times we strongly advice not to use this configuration as the chance that the Combi’s which are in the lines where the VR is not connected are likely to get damaged by over voltage.

The voltage regulation of three phase generators is in most of the cases done by measuring the voltage. In the event that the line in which the regulator is connected, has a higher load than the other line or two lines (when measured across two phases) the voltage in the loaded line(s) will decrease. The regulator will regulate (increase) the output voltage on this line. As result the other line or two lines which were less loaded, will increase in voltage. The voltage can reach more than 280 Volt. This will result in damaging the Power board of the Combi (The FETS will burn).

The input AC Voltage range of the Combi is between 180V and 250V and may therefore never be higher than 250 Volt.

To make sure a three phase system will work well it must be sure that all lines are equally loaded at all times. The load balance for each line must be equal. In practice this is very hard to do. We consider this system not suitable for this and therefore it is not recommended.
6.3 LIGHTNING
This section is intended to provide information on basic grounding techniques that will help to prevent damage to inverter/charger systems due to lightning.

It is not a guarantee against protection during lightning strike situations. If an electrical system has components grounded at different points in the earth, large voltage differences will exists between these points during a lightning strike. See figure 16. If these voltages appears between the AC and DC side of the inverter it will fail. The Combi units are designed to withstand a minimum of 3.5 kVolts between AC and ground, and 3.5 kVolts between DC and ground.
One ground connection point for all components in the system is preferred. See figure 17. To protect your system you need to make sure that all the components in the system which need to be grounded are grounded physically at the same location.

By doing this there is no change of Voltage differences (like in the above figure). If there is no voltage difference there is no possibility that there will be a current flow through the system.

Be sure that the generator is physically isolated from the ground. This assures the single point ground system is maintained.

Keep the components close together.

All the components from the system should physically be located as close as possible to each other. This reduces the potential that is developed between the ground site and the individual components of the system during a lightning strike. The single point grounding reduces the potential for lightning damage to electrical equipment dramatically.

If there is no change of achieving the single point grounding due to large distances between the components, we advise to consult a specialist on lightning protection systems.
## TROUBLE SHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>No inverter output voltage. The inverter does not work, or just for a few seconds.</td>
<td>Battery voltage may be too low. Low voltage cutout will come in at 10V (12V), 20V (24V) or 40V (48V).</td>
<td>Recharge battery bank for a period of 24 hrs.</td>
</tr>
<tr>
<td></td>
<td>Battery connection corroded.</td>
<td>Check for corrosion, and replace bad section(s).</td>
</tr>
<tr>
<td></td>
<td>Check if the inverter is overheated. In case of overheating LED temp + failure will be lit.</td>
<td>Remove connected load. Improve ventilation.</td>
</tr>
<tr>
<td></td>
<td>An overload or short circuit. LED overload + failure will be lit.</td>
<td>Remove excessive load. Remove short circuit condition.</td>
</tr>
<tr>
<td>The COMBI battery charger does not function.</td>
<td>AC input voltage not present.</td>
<td>Check installation. The green LED ‘AC in’ should be lit if mains is present. Check fuses or circuit breakers</td>
</tr>
<tr>
<td></td>
<td>Input voltage too low. The COMBI battery charger will not function below 160/80V.</td>
<td>Check the generator output voltage remove connected load, output voltage should come up.</td>
</tr>
<tr>
<td>The COMBI battery charger does not function, while mains voltage is present.</td>
<td>Mains frequency could be too high or too low. The frequency must be within 35-66 Hz.</td>
<td>Check the generator output frequency. Check generator RPM</td>
</tr>
</tbody>
</table>

If you cannot correct a problem with the aid of the malfunction table, contact your Mastervolt Service Centre or Mastervolt Amsterdam for an extended service list, tel: INT+ 31-20-3422100.
8 MAINTENANCE

For reliable and optimal function of the Dakar Combi the following is required:

- At least once a year check that all cable and wire connections are still firmly connected.
- Keep the Dakar Combi dry, clean and dust free, in order to secure a good heat discharge.
- Check fan operation, the fan has a life time of at least 10 years under normal conditions.

9 STORAGE & TRANSPORTATION

Dakar Combi products must be stored dry and dust free, preferably in the original packing. See packing guidelines.

9.1 PACKING GUIDELINES FOR MASTERVOLT PRODUCTS

- Request before shipment a RMA (Return Material Authorization) number using the after sales format. Contact your local Mastervolt Service Centre for further details.
- Do not forget to mention: return address, phone number and person to be contacted.
- Ship equipment only, without operating manual and temperature sensor.
- Use only the original packing to prevent transport damage.
- Summarize the nature of the malfunction.
- If possible also send a installation diagram.
## 10 TECHNICAL DATA

### 10.1 230V MODELS

<table>
<thead>
<tr>
<th>Model Dakar Combi</th>
<th>24/3000-100 -230V</th>
<th>24/5000-100 -230V</th>
<th>48/5000-60 -230V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>31823000</td>
<td>31825000</td>
<td>31845000</td>
</tr>
</tbody>
</table>

**Electrical specifications**

| DC/AC inverter/combination | 230V, single phase | 230V, single phase | 230V, single phase |

<table>
<thead>
<tr>
<th>AC input voltage</th>
<th>230V</th>
<th>230V</th>
<th>230V</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC input voltage range (209V full output)</td>
<td>180-250V</td>
<td>180-250V</td>
<td>180-250V</td>
</tr>
</tbody>
</table>

**Mode function**

| stand alone | stand alone | stand alone |

| AC output rating |
|-----------------|-------------|-------------|
| p30 min.power rating @25°C, true sine wave | 3000 VA | 5000 VA | 5000 VA |
| Cont.Power rating @25°C, true sine wave | 2500 VA | 4000 VA | 4000 VA |
| Efficiency (peak/avg) | 91/89% | 91/89% | 91/89% |
| Output Voltage (RMS) | 230V | 230V | 230V |
| Output Voltage regulation | ± 5% | ± 5% | ± 5% |
| Total harmonic distortion (typ./max.) | 3% / 5% | 3% / 5% | 3% / 5% |
| Frequency (nom. ±0.04%), jumper selectable | 50-60 Hz. | 50-60 Hz. | 50-60 Hz. |
| Continuous output @ 25°C (Amps AC) | 10A | 17A | 17A |

**Surge capability**

- max load | 6000 VA | 10.000 VA | 10.000 VA |
- 100m sec power | 20A | 34A | 34A |
| Automatic transfer relay (double pole) | 25A | 25A | 25A |
| DC input voltage (nominal) | 24V | 24V | 48V |
| DC input voltage range | 20-32V | 20-32V | 40-69V |

**DC current at rated power**

<table>
<thead>
<tr>
<th>Short circuit current</th>
<th>protected</th>
<th>protected</th>
<th>protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-load consumption (typical at full output voltage)</td>
<td>33W</td>
<td>33W</td>
<td>33W</td>
</tr>
<tr>
<td>No-load consumption at economic mode</td>
<td>7.2W</td>
<td>7.2W</td>
<td>7.2W</td>
</tr>
<tr>
<td>Low battery protection (enabled, adjustable)</td>
<td>20V, 2.5 sec.</td>
<td>20V, 2.5 sec.</td>
<td>40V, 2.5 sec</td>
</tr>
<tr>
<td>Maximum charge rate (adjustable)</td>
<td>100A</td>
<td>100A</td>
<td>60A</td>
</tr>
</tbody>
</table>

**Mechanical specifications**

<table>
<thead>
<tr>
<th>Specified temperature range:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified (will meet specified tolerances)</td>
</tr>
<tr>
<td>Allowed (may not meet specified tolerances)</td>
</tr>
<tr>
<td>Non operating (storage) temperature</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enclosure type</th>
<th>D4</th>
<th>D4</th>
<th>D4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit weight</td>
<td>38 kg.</td>
<td>47 kg.</td>
<td>47 kg.</td>
</tr>
<tr>
<td>Inverter dimensions, hxwxd, in mm</td>
<td>530x363x250</td>
<td>530x363x250</td>
<td>530x363x250</td>
</tr>
<tr>
<td>Mounting</td>
<td>vertical wall mounting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 10.2 117V MODELS

<table>
<thead>
<tr>
<th>Model Dakar Combi</th>
<th>12/1500-65 -117V</th>
<th>24/3000-100 -117V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part number</td>
<td>31011500</td>
<td>31223020</td>
</tr>
<tr>
<td>Electrical specifications</td>
<td>DC/AC inverter/combination</td>
<td></td>
</tr>
<tr>
<td>AC input voltage</td>
<td>117V, single phase</td>
<td>117V, single phase</td>
</tr>
<tr>
<td>AC input voltage range (209V full output)</td>
<td>90-125V</td>
<td>90-125V</td>
</tr>
<tr>
<td>Mode function</td>
<td>stand alone</td>
<td>stand alone</td>
</tr>
</tbody>
</table>

#### AC output rating

| p30 min. power rating @25°C, true sine wave | 1500 VA | 3000 VA |
| Cont. Power rating @25°C, true sine wave   | 1200 VA | 2500 VA |
| Efficiency (peak/avg)                      | 93/90%  | 93/90%  |
| Output Voltage (RMS)                       | 117V    | 117V    |
| Output Voltage regulation                  | ± 5%    | ± 5%    |
| Total harmonic distortion (typ./max.)       | 3% / 5% | 3% / 5% |
| Frequency (nom. ±0.04%), jumper selectable  | 50-60 Hz. | 50-60 Hz. |
| Continous output @ 25°C (Amps AC)          | 10A     | 21A     |

#### Surge capability

- max load: 2800 VA, 6000 VA
- 100m sec power: 19A, 40A
- Automatic transfer relay (double pole): 25A, 25A

#### DC input voltage (nominal)

- 12V, 24V

#### Mechanical specifications

- Specified temperature range:
  - Specified (will meet specified tolerances): 0°C to 40°C (32°F to 104°F)
  - Allowed (may not meet specified tolerances): 40°C to 80°C, derating 5% / °C > 40°C
  - Non operating (storage) temperature: -20°C to 80°C
- Enclosure type: D1, D4
- Unit weight: 23 kg, 38 kg
- Inverter dimensions, hwxwxd, in mm: 407x295x220, 530x363x250
- Mounting: Vertical wall mounting
10.3 GENERAL

Connections:
- AC connections internal, screw terminal
- DC connections internal, M8 bolts

Features & Options
- Forced air cooling standard variable speed brushless processor controlled DC fans
- Three stage battery charging (IUoUo) standard three-stage (bulk, absorption, float), temperature compensation –30mV/cell/°C, automatic voltage sense
- Auto generator control system optional automatic generator control system for 2 and 3 wire start generators (12 hr.interval run, grid monitoring)
- Battery temperature sensor BTS - standard remote battery temperature sensor for increased battery performance
- Remote control optional remote control and status indicator (CSCP and remote control analogue by RS 485/RS232)

Common specifications
- Waveform sine wave, H.F. battery charger: power factor controlled
- Listings CE compliance for 230V models

11 ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6384525000</td>
<td>Industrial DC fuse 250A DIN 1</td>
</tr>
<tr>
<td>6384635500</td>
<td>Industrial DC fuse 355A DIN 2</td>
</tr>
<tr>
<td>6381002000</td>
<td>Fuse base DIN 1 (max. 250A)</td>
</tr>
<tr>
<td>6381003000</td>
<td>Fuse base DIN 2 (max. 400A)</td>
</tr>
<tr>
<td>6387001600</td>
<td>Double pole automatic circuit breaker DPN 16A-B, 1P+N</td>
</tr>
<tr>
<td>6387002500</td>
<td>Double pole automatic circuit breaker DPN 25A-B, 1P+N</td>
</tr>
<tr>
<td>6502001030*</td>
<td>Modular communication cable, cross wired, 6 pole, 6 meter</td>
</tr>
<tr>
<td>6502100100</td>
<td>Modular communication cable, cross wired, 6 pole, 10 meter</td>
</tr>
<tr>
<td>6502100150</td>
<td>Modular communication cable, cross wired, 6 pole, 15 meter</td>
</tr>
<tr>
<td>41500300*</td>
<td>Battery temperature sensor</td>
</tr>
<tr>
<td>55002045*</td>
<td>Dakar power centre control (remote control panel)</td>
</tr>
<tr>
<td>70403060</td>
<td>C-3-RC Remote Combi, Mastervision compatible remote control panel for Dakar Combi. Features: On/Off, status read out, Power Support</td>
</tr>
<tr>
<td>70403080</td>
<td>Masterlink Combi System Control Panel (CSCP), remote control panel for Dakar Combi. Features: On/Off, status read out, Power Support, extended battery monitoring functions</td>
</tr>
<tr>
<td>70400120</td>
<td>DC System Manager / Combi, Mastervision compatible remote control panel for Dakar Combi. Features: On/Off, status read out, Power Support, extended battery monitoring functions</td>
</tr>
</tbody>
</table>

* These parts are standard included with the delivery of the Dakar Combi

Mastervolt can offer a wide range of products for your electrical installation, including automatic AC transfer switches, remote control panels and DC distribution kits
See our website www.mastervolt.com for an extensive overview of all our products
12 DEFINITIONS

Alternating current (AC):
Also referred to as shore power, utility power, inverter output power, generator power or household current.

Ampere (Amp, A):
The unit of measure of electron flow rate of current through a circuit.

Ampere-hour (Amp-hr, Ah):
A unit of measure for a battery’s electrical storage capacity, obtained by multiplying the current in amperes by the time in hours of discharge. Example: a battery which delivers 5 amperes for 20 hours delivers 5 amperes times 20 hours, or 100 Amp-hours of capacity.

Ah capacity:
The ability of a fully charged battery to deliver a specified quantity of electricity (Amp-hour) at a given rate (Amps) over a definite period of time (hours).

Circuit:
An electric circuit is the path of an electric current. A closed circuit has a complete path. An open circuit has a broken or disconnected path.

Circuit (series):
A circuit which has only one path for the current to flow. Batteries arranged in series are connected with the negative of the first to the positive of the second, negative of the second to the positive of the third, etc. If two 12V batteries of 50 ampere-hours capacity are connected in series, the circuit voltage is equal to the sum of the two battery voltages, or 24 volts, and the ampere-hour capacity of the combination is 50 ampere hours.

Circuit (parallel):
A circuit which provides more than one path for current flow. A parallel arrangement of batteries (of like voltage and capacity) would have all positive terminals connected to a conductor and all negative terminals connected to another conductor. If two 12V batteries of 50 ampere-hour capacity each are connected in parallel, the circuit voltage is 12 volts and the ampere-hour capacity of the combinations is 100 ampere-hours.

Current:
The rate of flow of electricity or the movement rate of electronics along a conductor. It is comparable to the flow of a stream of water. The unit of measure for current is the ampere.

Current (alternating) (AC):
A current that varies periodically in magnitude and direction. A battery does not deliver alternating current. Also referred to as shore power, utility power, inverter power, generator power, etc.

Cycle:
In a battery, one discharge plus one recharge equals one cycle.

Direct current (DC):
Current that flows continuously in one direction such as that from batteries, photovoltaics, alternators, chargers and DC generators.

Discharging (discharge):
When a battery is delivering current it is said to be discharging.

Gel cell battery:
A type of battery that uses a gelled electrolyte solution. These batteries are sealed and are virtually maintenance free. Not all sealed batteries are the gel cell type.

Ground:
The reference potential of a circuit. In automotive use, the result of attaching one battery cable to the body or frame which is used as a path of completing a circuit in lieu of a direct wire from a component. This method is not suitable for connecting the negative cable of the inverter to ground, instead route the cable directly to negative terminal of the battery.

Led (light emitting diode):
Indicator light.

mm2:
A standard used to measure the size of wire.
**Negative:**
Designating or pertaining to electrical potential. The negative terminal is the point from which electrons flow during discharge.

**Ohm:**
A unit for measuring electrical resistance.

**Ohm’s law:**
Expresses the relationship between volt (V), amperes (A) in an electrical circuit with resistance (R). It can be expressed as follows: \( V = AR \). If any two of the three values are known, the third value can be calculated by using the above formula.

**Positive:**
Designating or pertaining to electrical potential; opposite of negative. The positive battery terminal is the point where electrons return to the battery during discharge.

**Power Support:**
The ability of the charger to reduce its output when the AC power being consumed by the charger and external AC loads connected to the output of the inverter are in excess of the input breaker rating.

**RCCB or RCD:**
Residual Current Circuit Breaker or Residual Current Device (earth leakage).

**Volt:**
The unit of measure for electric potential.

**Volt Amps (VA):**
See Watt.

**Watt:**
The unit for measuring electrical power, i.e. the rate of doing work, in moving electrons by or against an electric potential.

**Watt-Hour (Watt-Hr, WH):**
The unit for measuring electrical energy which equals Watts x Hours.

**Wet cell battery:**
A type of battery that uses liquid as an electrolyte. This type of battery requires periodic maintenance such as cleaning the connections and checking the electrolyte level.
13 EC DECLARATION OF CONFIRMITY

Manufacturer Mastervolt
Address Snijdersbergweg 93
1105 AN Amsterdam
The Netherlands

Herewith declares that:

Product:

31823000 Dakar Combi 24/3000-100 / 230V
31825000 Dakar Combi 24/5000-100 / 230V
31845000 Dakar Combi 48/5000-60 / 230V
31011500 Dakar Combi 12/1500-65 / 117V
31223020 Dakar Combi 24/3000-100 / 117V

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

The following harmonized standards have been applied:
Radio interference EN 55022, class B
Electrostatic discharge IEC 801-2:1984, 8kV AC, performance B
Electromagnetic field IEC 801-3:1984, 3V/m, performance A
Fast transients IEC 801-4:1988, AC supply 1kV, other ports 0,5kV, perf. B
Low voltage directive EN 60950

Amsterdam,

R.J. ter Heide,
General Manager MASTERVOLT

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