Sunmaster XL 10K/15K

High power grid connected solar inverter
OVERVIEW SUNMASTER XL ENCLOSURE

Figure 1: Inside view of the Sunmaster XL, including the power modules

*Note: DIN rails and components for AC / DC distribution are not included with the standard delivery.*

Figure 1: Inside view of the Sunmaster XL, including the power modules
OVERVIEW POWER MODULE

Figure 2: Front view and bottom view of the power module

DIAGNOSTIC
- XL Power Module
- 3-Phase block
- PV insulation
- Solar high
- Temperature
- Grid quality
- Grid fault

ON
- 100%
- 75%
- 50%
- 25%

Serial no: V8220001A
Part no: 44020400
Type: Sunmaster XL
Designed by Mastervolt and manufactured in China
IP23

FRONT VIEW
- DIP switches
- Negative DC input (MultiContact)
- Positive DC input (MultiContact)
- AC output: L, N, PE
- MasterBus connectors (2x)
- RS485 connectors (2x) (QS-DataBus)
- User interface
- Indication LEDs
- Wire seal facility
- Identification label
- Cooling fans

BOTTOM VIEW
- DIP switches
- Negative DC input (MultiContact)
- XL5000 only

WARNING
Do not open. No serviceable parts inside. Always disconnect AC before releasing the solar input plugs.
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1 GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION
Congratulations for choosing the Mastervolt Sunmaster XL 10K/ XL 15K, further referred to as "Sunmaster XL". The Sunmaster XL is a grid connected solar inverter, used for the feed back into a three phase utility grid of power generated by photovoltaic modules. Depending on the application and in order to meet the local applicable regulations, the Sunmaster XL can be ordered in several models. See section 4.3 for an overview of the available models. The Sunmaster XL is not suitable for stand-alone use (i.e. use without public grid).

1.2 USE OF THIS MANUAL
Copyright © 2011 Mastervolt. All rights reserved. Reproduction, transfer, distribution or storage of part or all of the contents in this document in any form without the prior written permission of Mastervolt is prohibited. This manual serves as a guideline for the safe and effective installation of the Sunmaster XL:
- For the electrician this manual gives directions for the installation, operation and commissioning.
- For the end-user this manual gives directions for the operation, maintenance and possible correction of minor malfunctions of the Sunmaster XL.
- Every person who works with the apparatus should be familiar with the contents of this manual, and must carefully follow the instructions contained herein.
- Store the manual in a user accessible place.
This English manual has 32 pages.

1.3 VALIDITY OF THIS MANUAL
All the specifications, provisions and instructions contained in this manual apply solely to the Mastervolt-delivered standard versions of the Sunmaster XL (refer to section 4.3).

1.4 GUARANTEE SPECIFICATIONS
Mastervolt assures the product guarantee of the Sunmaster XL during five years after your purchase, on the condition that all instructions and warnings given in this manual are taken into account during installation and operation. Among other things, this means that installation is carried out by a qualified electrician, that installation and maintenance are executed according to the stated instructions and correct working sequence and that no changes or repairs may have been performed on the Sunmaster XL other than by Mastervolt. The warranty is limited to the costs of repair and/or replacement of the product by Mastervolt only. Costs for installation labour or shipping of the defective parts are not covered by this warranty. For making an appeal on warranty you can directly contact your supplier, stating your complaint, application, date of purchase and part number / serial number

1.5 LIABILITY
Mastervolt accepts no liability for:
- consequential damage due to use of the Sunmaster XL;
- possible errors in the manuals and the results thereof.
- loss of energy revenues due to possible defects

1.6 CHANGES TO THE SUNMASTER XL
Changes on the Sunmaster XL may be carried out only after the written permission of Mastervolt

1.7 IDENTIFICATION LABELS

<table>
<thead>
<tr>
<th>Type</th>
<th>XL10K</th>
<th>XL15K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article no.</td>
<td>13051000</td>
<td>130511000</td>
</tr>
<tr>
<td></td>
<td>13061500</td>
<td>130616000</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Inverter</td>
<td>Inverter</td>
</tr>
<tr>
<td>Input</td>
<td>100 - 550VDC 3 x 15A max.</td>
<td>100 - 600VDC 3 x 30A max.</td>
</tr>
<tr>
<td>Output</td>
<td>230Vac 50Hz 3x15A max. 10.000W nom.</td>
<td>230Vac 50Hz 3x22A max. 15.000W nom.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serial no.</th>
<th>TN28C0123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Module no.</td>
<td>#1</td>
</tr>
</tbody>
</table>

Figure 3

See figures 1, 2 and 3 for location of the identification labels. Important technical information required for service, maintenance & secondary delivery of parts can be derived from the identification labels (figure 2).

A small serial number sticker is provided with each power module. Stick these on the reserved locations of the Sunmaster XL label. See figure 3, #1, #2 and #3.

CAUTION!
Never remove the identification label(s).
2 SAFETY GUIDELINES AND WARNINGS

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 information, commands and prohibitions in order to prevent damage.

WARNING
A WARNING refers to possible injury to the user or installer or significant material damage to the Sunmaster XL if the installer / user does not (carefully) follow the stated procedures.

2.2 USE FOR INTENDED PURPOSE
The Sunmaster XL is constructed as per the applicable safety-technical guidelines. Use the Sunmaster XL only in installations that meet the following qualifications:

• in permanent installations;
• connected to a separate, grounded three phase AC group, to which no other electrical equipment is connected;
• the electrical installation must meet the applicable regulations and standards, must be carried out correctly and must be in a good condition.
• according to the technical specifications as stated in chapter 8.1.

WARNING
Never use the Sunmaster XL in situations where there is danger of gas or dust explosion or potentially flammable products!

Use of the Sunmaster XL other than as mentioned under § 2.2 and 4.4 is not considered to be consistent with the intended purpose. Mastervolt is not liable for any damage resulting from the above.

2.3 ORGANISATIONAL MEASURES
The installer / user must always:

• have access to this manual;
• be familiar with the contents of this manual. This applies particularly to Chapter 2, Safety Guidelines & Warning.

2.4 INSTALLATION, MAINTENANCE AND REPAIR
As lethal voltages exist, allow installation, maintenance and repair of the Sunmaster XL and changes in your electrical system to be carried out by qualified electricians only.

Connections and safety features must be executed according to the locally applicable regulations.

In case of decommissioning and/or demounting follow the instructions as stated in section 7.2.

If such are required, use only original spare parts.

2.5 WARNING OF SPECIAL DANGERS

• Not only AC-grid voltage, but DC voltages up to 600V may exist in the Sunmaster XL as well.
• The voltages present at the grid and solar side of the Sunmaster XL are not safe to touch and cannot be switched off at the solar side. Depending on local applicable regulations the use of an internal or external DC switch may be obligatory.
• Do not work on the Sunmaster XL and/or the electrical installation if it is still connected to the solar panels and/or AC-grid.
• Only allow changes in your electrical system to be carried out by qualified electricians.
• A Sunmaster XL with a known defective condition must be switched off immediately. To do so, first switch off the AC, then disconnect the solar wiring (refer to section 7.2).
3 HOW IT WORKS

The Sunmaster XL converts the energy from a PV array and feeds this energy back to the electric grid. The mechanical layout of the electrical components in the Sunmaster XL is of a modular concept and housed in an IP55 enclosure.

See figure 4. The Sunmaster XL consists of three identical power modules, indicated as “SOLAR 1”, “SOLAR 2” and “SOLAR 3”. These separate power modules have their own individual system control, monitoring and protection. Each power module can convert up to 3.5 or 5 kW, depending on the model. This means that the Sunmaster XL can convert up to 10 or 15kW. The DC voltage range of the power modules is 100-550V DC (XL3301) or 100-600V DC (XL5000).

The AC-outputs are connected in a 230 V AC three-phase star configuration. Islanding protection is provided according to national standards. If one of the phases of the AC-grid fails in operation, all power modules will switch off immediately. A communication cable must be used for communication between the power modules.

Extended diagnostics and remote monitoring may be ordered as an option.

Figure 4: principle operation of the Sunmaster XL
4 BEFORE YOU START

4.1 TRANSPORT, LIFTING AND STORAGE

Ensure adequate and secure mounting during transportation of the Sunmaster XL. Always use suitable handling equipment for transportation. On top of the enclosure are four hoist eyes which can be used for lifting and transportation (see figure 1). To avoid damage, use slings for lifting.

When lifting the Sunmaster XL avoid any risk of personal injuries, do not stand under the Sunmaster XL.

4.2 UNPACKING

The delivery of the Sunmaster XL consists of:
- 1 Sunmaster XL enclosure
- 3 XL power modules with AC wiring attached
- 6 multicontact DC cables
- 1 cable gland + 2 caps PG21
- 14 cable glands + 12 caps PG9
- 2 MasterBus communication cables
- 2 MasterBus terminating devices
- This user’s and installation manual.

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

As one electrical installation differs from the other, the Sunmaster XL is delivered without fuses, circuit breakers, terminal blocks, mains switches and DC-switches.

4.3 APPARATUS VERSION

The Sunmaster XL is equipped with an anti-islanding device that ensures the switch off in case of grid failure. European countries maintain different regulations with regard to anti-islanding devices and grid connection of distributed generation in general. The common islanding device switches off the inverter if the grid voltage or frequency is out of range. In some countries like Germany the ENS device (VDE-V-0126-1-1 compliant) which also measures the grid impedance, is compulsory.

Mastervolt provides both versions of the Sunmaster XL. These versions are available as several alternatives, suited to national regulations.

Check from the part number on the type number plate whether the Sunmaster XL is appropriate to be used for the intended application (refer to table 1).

CAUTION!
NEVER connect the Sunmaster XL to a utility grid other than specified (refer to table 1).

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
<th>Part number</th>
<th>Allowed to be used in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1311110000</td>
<td>Sunmaster XL 10 kW</td>
<td>131103300**/131103301*</td>
<td>- see section 4.8 -</td>
</tr>
<tr>
<td>1311110010</td>
<td>Sunmaster XL 10 kW – NLD</td>
<td>131103311</td>
<td>Netherlands</td>
</tr>
<tr>
<td>1311110020</td>
<td>Sunmaster XL 15 kW – BEL</td>
<td>131103321 max. 3333W AC</td>
<td>Belgium</td>
</tr>
<tr>
<td>1311110030</td>
<td>Sunmaster XL 10 kW – ENS</td>
<td>131103330/131103331</td>
<td>Germany, France, Austria</td>
</tr>
<tr>
<td>1311110040</td>
<td>Sunmaster XL 10 kW – KOR</td>
<td>131103340/131103341</td>
<td>South Korea</td>
</tr>
<tr>
<td>1311110050</td>
<td>Sunmaster XL 10 kW – ESP</td>
<td>131103350/131103351</td>
<td>Spain</td>
</tr>
<tr>
<td>1311110060</td>
<td>Sunmaster XL 15 kW – GBR</td>
<td>131103360/131103361</td>
<td>Great Britain</td>
</tr>
<tr>
<td>1311110070</td>
<td>Sunmaster XL 15 kW – ITA</td>
<td>131103370/131103371</td>
<td>Italy</td>
</tr>
<tr>
<td>1311110080</td>
<td>Sunmaster XL 15 kW – GRC</td>
<td>131103380/131103381</td>
<td>Greece</td>
</tr>
<tr>
<td>1311110000</td>
<td>Sunmaster XL 10 kW</td>
<td>131103400/131103401</td>
<td>Australia</td>
</tr>
<tr>
<td>1311110500</td>
<td>Sunmaster XL 15 kW</td>
<td>131105000**</td>
<td>- see section 4.8 -</td>
</tr>
<tr>
<td>1311110510</td>
<td>Sunmaster XL 15 kW – NLD</td>
<td>131105010</td>
<td>Netherlands</td>
</tr>
<tr>
<td>1311110530</td>
<td>Sunmaster XL 15 kW – ENS</td>
<td>131105030</td>
<td>Germany, France, Austria</td>
</tr>
<tr>
<td>1311110540</td>
<td>Sunmaster XL 15 kW – KOR</td>
<td>131105040</td>
<td>South Korea</td>
</tr>
<tr>
<td>1311110510</td>
<td>Sunmaster XL 15 kW – NLD</td>
<td>131105010</td>
<td>Netherlands</td>
</tr>
<tr>
<td>1311110550</td>
<td>Sunmaster XL 15 kW – ESP</td>
<td>131105050</td>
<td>Spain</td>
</tr>
<tr>
<td>1311110560</td>
<td>Sunmaster XL 15 kW – GBR</td>
<td>131105060</td>
<td>Great Britain</td>
</tr>
<tr>
<td>1311110570</td>
<td>Sunmaster XL 15 kW – ITA</td>
<td>131105070</td>
<td>Italy</td>
</tr>
<tr>
<td>1311110580</td>
<td>Sunmaster XL 15 kW – GRC</td>
<td>131105080</td>
<td>Greece</td>
</tr>
<tr>
<td>1311115xxx</td>
<td>Sunmaster XL 10 kW</td>
<td>131105100</td>
<td>Australia</td>
</tr>
</tbody>
</table>

* These models must be configured at first installation. See Appendix for configuration instructions.

Table 1
4.4 INSTALLATION ENVIRONMENT

Obey the following stipulations during installation:

• The Sunmaster XL is designed for both indoor and outdoor use, according to safety class IP55.

• The Sunmaster XL must be mounted in vicinity of the solar panels.

• Do not install the Sunmaster XL in dusty environments

• Ambient temperature: -20 ... 60°C; (power derating above 45°C).

• Keep at least 50 cm space at the front side and back side of the Sunmaster XL and 30 cm between the XL enclosures, see figure 5.

• If the Sunmaster XL is installed in the immediate vicinity of living areas, take into account that the Sunmaster XL can produce a certain noise level when operating (refer to section 6.3).

• The Sunmaster XL must be mounted vertically on a solid floor.

• The wiring is connected inside the enclosure. Always feed the wiring through the cable glands of the enclosure, and then connect the wiring to the terminals. Close unused holes with the caps supplied.

4.5 OPENING AND CLOSING THE ENCLOSURE

CAUTION!

Make sure that you do not disconnect nor damage the green/yellow ground connection cable which is attached to the inner side of the front plate.

For opening of the enclosure execute the steps below:

• Loosen the two hexagonal bolts at the lower side of the front plate (see figure 6).

• Lift the front plate from the enclosure (see figure 7).

• Disconnect the earth cable that is fixed to the front plate.
4.6  PLACING THE POWER MODULES

- Remove the support bar (figure 8) by unscrewing the two bolts.
- Place the power modules into the enclosure, facing the wiring and the connectors downwards. Hold the top front edge between the tongues of the top support bar and turn the power module into position (see figure 9). Avoid damaging the MultiContact connectors of the power modules!
- Fix the support bar (figure 8) by fastening the two bolts again. Make sure that all power modules are securely fixed in place by the support bar.

4.7  GROUNDING AND SURGE PROTECTION

4.7.1  General

The enclosure of the Sunmaster XL must be connected to protective earth (PE) by means of an equipment-grounding conductor. For this purpose a grounding terminal is situated at the lower right corner inside of the enclosure (see figure 10). The power modules PE cable must be grounded according to figure 12, section 4.8.3. Grounding of the solar array is not obligatory thanks to the galvanic isolation between the DC-input and the AC output of the Sunmaster XL. However, if you want to make a connection between the solar array structure and the ground, you need to lead the grounding cable together with the DC-cables to the Sunmaster XL and then to the AC distribution. Connect the grounding cable going from the PV-modules to the AC-distribution and the grounding terminal of the Sunmaster XL.

4.7.2  Optional DC grounding

Grounding of the positive or negative DC wiring is possible. The insulation protection function should be disabled. Refer to the Mastervolt M 2397 “Array grounding technical bulletin” for background information and instructions.

4.7.3  Lightning protection

Due to large distances between the components of a solar installation, precautions must be taken to avoid damage from induced surges caused by lightning. Although the power modules are designed to withstand overvoltages, Mastervolt recommends to consult a specialist on lightning protection systems for advice.
4.8 THREE PHASE AC CONFIGURATION

4.8.1 Phase balance protection circuit
Depending on local regulations, all power modules must switch off immediately as soon as one of the phases of the AC-grid fails in operation. To achieve this, communication between the power modules is necessary. This is done by means of communication cables.

Take the following steps to configure the power modules for three phase operation:

- Connect the MasterBus communication cables and the MasterBus terminating devices as indicated in figure 10. The MasterBus communication ports can be found at the bottom side of the power modules (figure 2).

  Make sure that you neither connect the MasterBus communication cables nor the MasterBus terminating devices to the RS485 communication ports (see figure 10)!

- The default setting of DIP switch 1 (3-phase block) is ON. Do NOT change the setting of the DIP switches (see figure 2).

4.8.2 Monitoring wiring RS485
For correct monitoring the three power modules have to be connected serially, using RS485 cables. These are to be inserted into the Communication ports, see figure 11.

4.8.3 AC Wiring is intended for use
The Sunmaster XL is intended for use in a permanent installation, connected to a separate three phase AC distribution group, to which no other electrical equipment is connected.

All electrical connections must comply with local codes and regulations.

The AC-outputs of the three power modules must be arranged in a 230 V AC three-phase star configuration.

The cabling between the junction box or electric cable duct and the Sunmaster XL must be double insulated. Use an appropriate cross section, so that the cable loss is well below 1%.

Recommended cross sections for 10m cable length:

<table>
<thead>
<tr>
<th>Model</th>
<th>Minimum cross section:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunmaster XL 10kW</td>
<td>2.5mm²</td>
</tr>
<tr>
<td>Sunmaster XL 15kW</td>
<td>4.0mm²</td>
</tr>
</tbody>
</table>

See figure 12 for a typical three phase AC configuration.
4.9 DC CONNECTIONS

4.9.1 General

The Sunmaster XL consists of three separate inverters, indicated as “SOLAR 1”, “SOLAR 2” and “SOLAR 3”. Refer to figure 13.

A: MasterBus communication cable (see section 4.8.2)
B: PE terminal block
C: N terminal block
D: Three phase circuit breaker

Recommended rating:
- Sunmaster XL 10kW: 25A
- Sunmaster XL 15kW: 32A

Figure 12: AC wiring

4.9.2 Specifications of the PV-installation

The PV-installation should meet the following specifications:
- Double isolated PV-wiring, fitted with MultiContact connectors must be used.
- The maximum power connected to each power module may not exceed 4600Wp (XL3301) or 6700Wp (XL5000).
- The total input power must be distributed equally over the three power modules as much as possible.
- All connection devices (wiring, terminal blocks, fuse holders, fuses, switches, etcetera) must be suitable for the applicable voltage (up to 600V DC) and current ratings (up to 30A DC) of the solar installation.
- The maximum open circuit string voltage for each power module at lowest possible temperature of the PV modules may not exceed 550V (XL3301) or 600V (XL5000).

To avoid miswiring, check the open circuit voltage and polarity of each string with a suitable DC voltage meter before connection. The nominal value of the open circuit string voltage (Voc) is calculated for each string as follows:

\[
[\text{Nominal String Voc}] = [\text{PV module Voc}] (\text{(*)}) \times [\text{number of modules}].
\]

(*) For PV module Voc value, refer to the specifications of the modules.
Depending on temperature and irradiation on the PV module array, the measured value should be equal to 70-100% of the calculated value. To match the specifications of the Sunmaster XL power modules, the measured voltage should be as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Measured Voc:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunmaster XL 10kW</td>
<td>290 - 550VDC</td>
</tr>
<tr>
<td>Sunmaster XL 15kW</td>
<td>225 - 600VDC</td>
</tr>
</tbody>
</table>

**CAUTION!**
Do not install the Sunmaster XL if the solar-system does not comply with the above mentioned stipulations.

See section 4.10 for examples of typical PV-installations.

### 4.9.3 DC Switch

Depending on local applicable regulations the use of a DC switch between the PV modules and the power modules may be mandatory. For example international standard IEC60364-7-712 prescribes a DC switch in solar electric installations in buildings. Refer to chapter 9 for ordering information.

Connections to be made by means of DC DIN-rail mounted terminal blocks

![Diagram](image)

*Figure 14: Connection of six strings*

### 4.10 TYPICAL PV-INSTALLATIONS

Note that the maximum power connected to each power module may not exceed 4600Wp (XL3301) or 6700Wp (XL5000) and that the total input power must be distributed equally over the three power modules as much as possible.

#### 4.10.1 Connection of six strings
See figure 14.

If two strings are connected to the same power module, DIN-rail mounted terminals blocks must be applied to combine the strings. The strings connected to the same power module should exist of an equal number of identical PV-modules.
4.10.2 Connection of more than six strings
See figure 15.
If more than two strings are connected to the same Solar-input, string fuses must be integrated in both the positive and negative legs of the string cabling. Fuse ratings should be chosen 50% higher than the MPP current of the PV modules used. DIN-rail mounted terminals blocks and/or fuse holders can be applied to combine the strings. The strings connected to the same Solar-input should exist of an equal number of identical PV-modules.

4.11 REMOTE MONITORING
Each power module is provided with two RS485 connectors for connection of the QS Databus. See figure 2.
Mastervolt provides several monitoring solutions like PC software, dataloggers, remote monitoring and so on. Consult our web-site at www.mastervolt.com for a comprehensive overview of all possibilities.

Make sure that you do not mistake the RS485 Databus for the MasterBus communication ports (see figure 2)!

Figure 15: Connection of more than six strings
5 INSTALLATION AND COMMISSIONING

5.1 THINGS YOU NEED FOR INSTALLATION
Make sure you have all the parts you need to install the Sunmaster XL:
- Sunmaster XL enclosure (included)
- Three power modules (included)
- Cable glands and grommets (included)
- 2 MasterBus communication cables (included)
- 2 MasterBus terminating devices (included)
- Bolts and dowels to fix the Sunmaster XL enclosure to the ground. Use mounting materials that are suitable for the application
- 2 DIN-rails (50cm) for mounting of breakers, fuse holders, switches, terminal blocks
- DIN-rail mounted terminal blocks to connect the DC-wiring
- DIN-rail mounted DC-switches to switch off the solar strings (if applicable; see section 4.9.3)
- DIN-rail mounted fuse holders and fuses for the connection of the solar strings (if applicable; see section 4.10.2)
- DIN-rail mounted terminal blocks, to configure the AC outputs of the power modules for three phase grid connection
- Three phase AC circuit breaker, see section 4.8
- Wiring

Required tools:
- Tools to fix Sunmaster XL enclosure to the floor
- Hexagon socket wrench (5mm) to open and close the enclosure of the Sunmaster XL
- Socket wrench 10 mm to remove and fix the support bar (see section 4.6)
- Tools to install the wiring.

CAUTION!
Read chapters 2 and 4 prior to installation.

WARNING
Be sure that all wiring is disconnected from any power source during the entire installation.

CAUTION!
- Short circuiting, reverse polarity or interchanging of PV strings may lead to damage to the Sunmaster XL, the cabling and/or the terminal connections.
- Follow all steps of the installation instructions in order of succession as described.
- If applied, both the DC switches and the AC circuit breaker(s) should stay in the OFF-position (or “O”-position) during the entire installation.

CAUTION!
Danger of damaging the power module in case of mis wiring. To avoid mis wiring, check the open circuit voltage and polarity of each string with a suitable DC voltage meter before connection; see section 4.9.2.

WARNING
High voltages (up to 600 VDC) may exist on the PV-strings! Connection of the DC-cabling may only be carried out if the DC-cables are voltage free. Therefore the PV-modules must be disconnected from the DC-cabling (for instance by disconnecting the MultiContact connectors at the PV-modules).
5.2 INSTALLATION STEP BY STEP

1. Fix the enclosure of the Sunmaster XL to the floor. Determine the mounting spots on the basis of figure 19. Use suitable screws and dowels.

2. Open the enclosure of the Sunmaster XL (see section 4.5).

3. Connect system grounding (section 4.7).

4. Place the power modules in the enclosure (see section 4.6).

5. Configure the power modules for three phase operation (see section 4.8.1).

6. Connect the AC-wiring (see section 4.8.3).

7. Check whether the PV-installation matches with the specifications of the power modules (see section 4.9). Then connect the DC Solar wiring (see section 4.10).

8. Option: connect the QS Databus to the RS485 connectors of the power modules (see section 4.11).

5.4 COMMISSIONING AFTER INSTALLATION

To check the correct operation of the Sunmaster XL, commissioning should be carried out during daytime only.

5.4.1 Switching on

Follow the steps described below to switch on the Sunmaster XL:

1. Check whether the DC switches (if applied) and the AC circuit breaker(s) are still in the OFF position.

2. Move the DC-switch (if applied) of the solar array to the ON position.

3. Check the part number on the power module identification label (see section 1.7). If the part number ends with 01 or 00 (e.g. 131103301 or 131115000) the Sunmaster XL must be configured in accordance with the local regulations for grid connection first. Refer to the APPENDIX.

As long as the Sunmaster XL is not configured in accordance with the local regulations for grid connection, the power modules will stay in idle mode. This means that no power can be converted.

4. Switch on the AC grid.

5. Check the AC voltage at the grid side of the AC circuit breaker using a suitable AC voltmeter. The voltages should be as follows:

<table>
<thead>
<tr>
<th>AC Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 N 230V AC (184-276V)</td>
</tr>
<tr>
<td>L2 N 230V AC (184-276V)</td>
</tr>
<tr>
<td>L3 N 230V AC (184-276V)</td>
</tr>
<tr>
<td>L1 L2 400V AC (320-475V)</td>
</tr>
<tr>
<td>L2 L3 400V AC (320-475V)</td>
</tr>
<tr>
<td>L3 L1 400V AC (320-475V)</td>
</tr>
</tbody>
</table>

6. If the AC voltages are correct, move the AC circuit breaker to the ON position.

If connection has been made correctly and solar irradiation is sufficient, the Sunmaster XL will switch on automatically. This may take a few seconds.

7. Close the enclosure of the Sunmaster XL (see section 4.5).
6 OPERATION

6.1 GENERAL
After installation and commissioning the Sunmaster XL will switch on automatically if solar irradiation is sufficient. The Sunmaster XL operates automatically: there is no need for operating it. If the irradiation of the PV-modules is insufficient, for instance at night, the Sunmaster XL switches off automatically. When switched off, none of the LED indications on front of the power modules will illuminate.

The Sunmaster XL has no ON/OFF switch; In the event of decommissioning, refer to section 7.2.

CAUTION!
Never disconnect the MultiContact plugs during operation of the Sunmaster XL.
Not complying with this instruction may cause a spark or an electric arc. Should an arc develop, both plug and socket of the Sunmaster XL must be replaced.

6.2 USER INTERFACE
The operation of the Sunmaster XL is displayed by means of LED indicators at the front side of each power module (figure 17).

6.2.1 Normal operation
If the module is operating normally (the yellow and the red indicator are not illuminated or flashing), the green LED-indicators show the amount of power that is fed into the grid: the more LED’s illuminate, the more power is converted.

As long as the red and yellow LED’s are not illuminated, no failure is detected: the Sunmaster XL is operating normally!

If the irradiation of the PV-modules is insufficient, for instance at night, the LED indicators will switch off automatically. This is a normal situation!

Power conversion (Wac)

<table>
<thead>
<tr>
<th>Sunmaster XL 10kW</th>
<th>Sunmaster XL 15kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050–2870</td>
<td>3100–4350</td>
</tr>
<tr>
<td>2870–3465</td>
<td>4350–5250</td>
</tr>
<tr>
<td>1220–2050</td>
<td>1850–3100</td>
</tr>
<tr>
<td>400–1220</td>
<td>600–1850</td>
</tr>
<tr>
<td>0–400</td>
<td>0–600</td>
</tr>
</tbody>
</table>

The inverter is starting up.
This can take up to 300 sec.

Figure 17 LED illumination during normal operation of the inverter modules
6.2.2 Failures

If one or more of the phases of the AC-grid fails in operation the yellow “3 phase block” LED will illuminate on all power modules. See also section 4.8.1

In case of a hardware failure on one of the power modules, the red “diagnostic” LED illuminates or flashes in combination with one or more green LEDs.

Refer to chapter 7 for an explanation of the power- and failure indications. Consult an installer, if you cannot solve the problem by means of this table.

<table>
<thead>
<tr>
<th>PV Insulation: Leak current between PV-modules and grounding. Contact your supplier.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature: Temperature of the inverter is too high. Is the airflow of the inverter blocked?</td>
</tr>
<tr>
<td>Grid quality: Fault created by the ENS-unit. The grid quality is outside normal limits. Check the grid connection.</td>
</tr>
<tr>
<td>Solar high: The DC voltage of the Solar input is too high. Contact your supplier.</td>
</tr>
<tr>
<td>Grid fault: The grid is cut off or outside its limits. Check the grid connection.</td>
</tr>
</tbody>
</table>

Internal error in the Sunmaster XL. Consult an installer for replacement of the inverter module.

One or more of the phases of the AC-grid fails in operation. Check the AC grid.

Figure 18: LED illumination in case of a failure
6.3 FORCED COOLING
For an optimum internal temperature control each inverter module is provided with three cooling fans. At low power the cooling fans start running slowly. If the power increases, the cooling fans will run at a higher speed. This is a normal effect which has a positive influence on the efficiency and lifetime of the Sunmaster XL.

6.4 MAINTENANCE
If necessary, use a soft clean cloth to clean enclosure of the Sunmaster XL. Never use any liquids, acids and/or scourers.

6.4.1 Air filter
The Sunmaster XL is standard supplied with an air filter which is placed at backside of the front plate (figure 18). Filter maintenance depends on environmental contamination. Check the air filter at least every 6 months. See section 4.5 to open the housing of the Sunmaster XL. Clean or replace if necessary. See section 9 for ordering information.

6.4.2 Electrical connections
Examine your electrical installation on a regular base, at least once a year. Defects such as loose connections, burnt wiring etc. must be corrected immediately.
7 TROUBLE SHOOTING

7.1 FAULT FINDING TABLE
Consult an installer, if you cannot solve the problem by means of the table below.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>What to do?</th>
</tr>
</thead>
<tbody>
<tr>
<td>All LED indicators are off.</td>
<td>Insufficient irradiation. Nothing. Irradiation of the PV modules is insufficient (for instance during night time).</td>
<td></td>
</tr>
<tr>
<td>DC-switch (if applied) in OFF position.</td>
<td>Move DC-switch to the ON position.</td>
<td></td>
</tr>
<tr>
<td>DC fuse (if applied) defect.</td>
<td>Check string fuses.</td>
<td></td>
</tr>
<tr>
<td>No power from the PV modules.</td>
<td>Check DC voltage. It should be 220-600V (XL10K) or 180-600V (XL15K). Consult an installer if the display does not show any information during daytime.</td>
<td></td>
</tr>
<tr>
<td>LED &quot;3 phase block&quot; at one or more power modules is illuminated yellow.</td>
<td>Sunmaster XL is not configured in accordance with the local regulations for grid connection. See Appendix to configure the power modules.</td>
<td></td>
</tr>
<tr>
<td>One or more of the phases of the AC-grid fails in operation.</td>
<td>Check the AC grid voltages.</td>
<td></td>
</tr>
<tr>
<td>One of the MasterBus communication cables is loose.</td>
<td>Check MasterBus communication cables.</td>
<td></td>
</tr>
<tr>
<td>MasterBus communication cables connected to the RS485 port(s)</td>
<td>MasterBus communication cables must be connected to the MasterBus ports. See section 4.8.1</td>
<td></td>
</tr>
<tr>
<td>No terminating device placed at the ends of the MasterBus network</td>
<td>See section 4.8.1</td>
<td></td>
</tr>
<tr>
<td>LED “Diagnostic” constantly illuminated red and LED ‘on’ blinking slowly green.</td>
<td>Start-up Nothing. After the Sunmaster XL was (re)connected to the AC grid, it checks the quality of the AC grid before it starts operating normally. This may take up to 5 minutes.</td>
<td></td>
</tr>
<tr>
<td>Red LED “Diagnostic” at one or more power modules is illuminated red.</td>
<td>Installation fault or grid fault See section 6.2.2</td>
<td></td>
</tr>
<tr>
<td>Red LED “Diagnostic” at one or more power modules is blinking red</td>
<td>Internal error in the Sunmaster XL power module. Write down which LED's are lighting or blinking. Consult an installer for replacement of the power module.</td>
<td></td>
</tr>
</tbody>
</table>

7.2 DECOMMISSIONING
If it is necessary to put the Sunmaster XL out of operation, follow the instructions in order of succession as described below:

CAUTION!
Follow below mentioned instructions in order of succession as described.

1 Cut off the grid voltage by switching off AC distribution switch in the meter cupboard.
2 Move the AC circuit breaker to the OFF position.
3 If such is applied, move the DC switch to the OFF-position.
4 Check with a suitable voltage meter whether the inputs and the outputs of Sunmaster XL are voltage free.
5 Disconnect the MultiContact connectors from the Sunmaster XL.
6 Disconnect the AC wiring.

Now the Sunmaster XL can be demounted in a safe way.
### 8 SPECIFICATIONS

#### 8.1 TECHNICAL SPECIFICATIONS

**GENERAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Sunmaster XL 10kW</th>
<th>Sunmaster XL 15kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article number</td>
<td>See chapter 4.3</td>
<td></td>
</tr>
<tr>
<td>Typical string length</td>
<td>5-9 modules (72 cells), 7-12 modules (54 cells) or 10-18 modules (36 cells)</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20°C to 60°C ambient, full power up to 45°C, thereafter derating -3%/°C, (fully protected against over temperature)</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20°C to 60°C</td>
<td></td>
</tr>
<tr>
<td>Relative humidity</td>
<td>max. 95%; PCB has anti-moisture coating</td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP55</td>
<td></td>
</tr>
<tr>
<td>Safety class</td>
<td>class I</td>
<td></td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>class II</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>See section 8.2.</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>95 kg [209 lbs] without power modules, 135 kg [298 lbs] including power modules</td>
<td></td>
</tr>
</tbody>
</table>

**SOLAR INPUT (DC)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Sunmaster XL 10kW</th>
<th>Sunmaster XL 15kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power module type</td>
<td>XL3300+</td>
<td>XL5000</td>
</tr>
<tr>
<td>Recommended PV power range</td>
<td>9kWp – 14 kWp</td>
<td>14kWp – 20 kWp</td>
</tr>
<tr>
<td>Maximum input power</td>
<td>3x 3750W DC</td>
<td>3x 5600W DC</td>
</tr>
<tr>
<td>Continuous power @ 40°C</td>
<td>3x 3550W DC</td>
<td>3x 5325W DC</td>
</tr>
<tr>
<td>Start-up power</td>
<td>3x 10W</td>
<td>3x 15W</td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>100 – 550V DC, nominal 400V</td>
<td>100 – 600V DC, nominal 400V</td>
</tr>
<tr>
<td>MPP voltage range</td>
<td>220 – 440V DC</td>
<td>180-480V DC</td>
</tr>
<tr>
<td>Maximum voltage</td>
<td>550V DC</td>
<td>600V DC</td>
</tr>
<tr>
<td>Number of input</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rated current</td>
<td>3x 15A</td>
<td>3x 30A</td>
</tr>
<tr>
<td>MPP tracker</td>
<td>3 MPP trackers (Fraunhofer algorithm)</td>
<td>3 MPP trackers (Fraunhofer algorithm)</td>
</tr>
<tr>
<td>DC connections</td>
<td>MC2 (4 mm type)</td>
<td>MC2 (4 mm type)</td>
</tr>
</tbody>
</table>

**GRID OUTPUT (AC)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Sunmaster XL 10kW</th>
<th>Sunmaster XL 15kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage*</td>
<td>3x 230V AC (184-276V*) (3ph-star)</td>
<td>3x 230V AC (184-276V*) (3ph-star)</td>
</tr>
<tr>
<td>Nominal power at 40°C ambient</td>
<td>3x 3300W AC</td>
<td>3x 5000W AC</td>
</tr>
<tr>
<td>Maximum power*</td>
<td>3x 3465W AC (3x333W AC for Belgium)</td>
<td>3x 5250W AC</td>
</tr>
<tr>
<td>Nominal current</td>
<td>3x 15A</td>
<td>3x 22A</td>
</tr>
<tr>
<td>Frequency*</td>
<td>50 Hz (48 – 52 Hz) or 60 Hz (57 – 63 Hz)</td>
<td>50 Hz (48 – 52 Hz) or 60 Hz (57 – 63 Hz)</td>
</tr>
<tr>
<td>Power factor</td>
<td>&gt;0.99 at full power</td>
<td>&gt;0.99 at full power</td>
</tr>
<tr>
<td>Harmonic distortion:</td>
<td>THD &lt; 3% at full power; UL1741 / IEEE1547(2003) / IEEE 1547.1(2005) compliant</td>
<td></td>
</tr>
<tr>
<td>DC current injection</td>
<td>galvanic grid disconnection at 1000 mA DC (to VDE 0126-1-1:2006)*</td>
<td></td>
</tr>
<tr>
<td>Stand-by power</td>
<td>3x &lt; 0.5W</td>
<td>3x &lt; 0.5W</td>
</tr>
<tr>
<td>EU efficiency</td>
<td>95% @ Unom</td>
<td>95% @ Unom</td>
</tr>
<tr>
<td>Maximum efficiency</td>
<td>96%</td>
<td>96%</td>
</tr>
<tr>
<td>AC connections</td>
<td>AC and DC glands on detachable plate in bottom of connection compartment. Power modules supplied with 3 x 4 mm2 cable. DIN rail, connection equipment, fuses, terminal blocks etc. not included.</td>
<td></td>
</tr>
<tr>
<td>Fuse</td>
<td>Three ceramic fuses 6.3x32 mm, 250V/30A T (in power modules).</td>
<td></td>
</tr>
</tbody>
</table>

* model dependent
**SAFETY DEVICES**

<table>
<thead>
<tr>
<th>General</th>
<th>galvanic separation between DC and AC side, by means of a class II transformers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Island protection*</td>
<td>An AC fault in any of the phases will disable all 3 power modules. QNS versions: Redundant voltage and frequency window monitoring ENS versions: Independent cut-off by means of 2 pole relay and solid state switch according to VDE 0126-1-1:2006.</td>
</tr>
<tr>
<td>Temperature protection</td>
<td>Thermal switch off at power module internal over temperature</td>
</tr>
<tr>
<td>DC side</td>
<td>• DC-to-earth isolation resistance monitoring • DC over-voltage detection (LED warning and switch off) • DC inverse polarity protection (diodes) • DC current limiting by up-shifting operating voltage • Transients (varistors and buffer capacitor) • Overload (power limiting and temperature controlled power derating)</td>
</tr>
<tr>
<td>AC side</td>
<td>• AC current limiting • DC current injection protection • short circuit (ceramic fuse) • transients / surge up to 4 kV (varistors)</td>
</tr>
<tr>
<td>Reclosure time*</td>
<td>10-300 sec</td>
</tr>
</tbody>
</table>

**MONITORING / DIAGNOSTICS / COMMUNICATION**

| User interface | 7 status LED’s for each power module |
| External communication | 2 galvanic isolated RS485 QS databus connections |
| Indicator | Backlit display with indication of power and diagnostic messages |
| External communication | 2 surge protected RS485 connections Up to 10 Sunmaster XLs can be connected to one Data Control Pro datalogger |

**REGULATIONS & DIRECTIVES**

| CE conformity | Yes |
| EMC directive | EMC 89/336/EEG |
| Emission | EN 55022 |
| Harmonics | EN 61000-3-2, IEEE1547 |
| Dips, variations and flicker | EN 61000-4-11, EN 61000-3-3 |
| Immunity | EN 61000-6-2 |
| LV directive | 2006/95/EC |
| Safety | EN 60950 |
| Anti islanding* | VDE 0126-1-1: 2006 |

* model dependent
8.2 OUTLINE DRAWINGS

Figure 20: Outline drawings of the Sunmaster XL. All dimensions are in mm [inch]
### 9 ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>See section 4.3</td>
<td>Sunmaster XL power module 3.3kW (for Sunmaster XL 10kW); see section 4.3, table 1</td>
</tr>
<tr>
<td>See section 4.3</td>
<td>Sunmaster XL power module 5kW (for Sunmaster XL 15kW); see section 4.3, table 1</td>
</tr>
<tr>
<td>130506000</td>
<td>DC Connection kit for Sunmaster XL (as required by IEC60364-7-712) Includes: DC switch, 3 inputs 600V 30A with each 4 string connections, 3 outputs, over voltage protections (varistors)</td>
</tr>
<tr>
<td>130504000</td>
<td>Air filter for Sunmaster XL</td>
</tr>
<tr>
<td>77040000</td>
<td>MasterBus terminating device</td>
</tr>
<tr>
<td>77040020*</td>
<td>MasterBus connection cable (UTP patch cable), 0.2m / 0.6ft</td>
</tr>
<tr>
<td>77040050*</td>
<td>MasterBus connection cable (UTP patch cable), 0.5m / 1.6ft</td>
</tr>
<tr>
<td>77040100*</td>
<td>MasterBus connection cable (UTP patch cable), 1.0m / 3.3ft</td>
</tr>
<tr>
<td>77030100</td>
<td>MasterBus - USB interface (required as interface between your PC and the Sunmaster XL power modules for configuration of the power modules with the local regulations for grid connection; see Appendix)</td>
</tr>
<tr>
<td>77010100</td>
<td>MasterView Classic. (monitoring and control panel for configuration of the power modules with the local regulations for grid connection; see Appendix)</td>
</tr>
<tr>
<td>130394000</td>
<td>QS Data Control 'Basic' – Free software package to monitor your photovoltaic (PV) system using your PC or notebook. Use of QS PC Link is compulsory.</td>
</tr>
<tr>
<td>130391010</td>
<td>QS PC Link, RS485/232 converter (up to 3 Sunmasters XL)</td>
</tr>
<tr>
<td>130391020</td>
<td>QS PC Link Industrial, RS485/RS232 converter for the connection of more than 3 Sunmasters XL or for cable lengths of more than 100 meters.</td>
</tr>
<tr>
<td>130391040</td>
<td>QS PC-Link Industrial, RS485/USB converter for the connection of more than 3 Sunmasters XL or for cable lengths of more than 100 meters.</td>
</tr>
<tr>
<td>130396000</td>
<td>QS Data Control 'Premium' II local – Datalogger to monitor up to 6 Sunmaster XL inverters locally</td>
</tr>
<tr>
<td>130396100</td>
<td>QS Data Control 'Premium' II remote – Datalogger to monitor up to 6 Sunmaster XL inverters over the Internet</td>
</tr>
<tr>
<td>130396200</td>
<td>QS Data Control 'Pro' Analogue – Datalogger to monitor up to 10 Sunmaster XL inverters (= 30 Sunmaster XL power modules) locally or over the Internet</td>
</tr>
<tr>
<td>130396210</td>
<td>QS Data Control 'Pro' ISDN – Datalogger to monitor up to 10 Sunmaster XL inverters (= 30 Sunmaster XL power modules) inverters locally or over the Internet</td>
</tr>
<tr>
<td>130396220</td>
<td>QS Data Control 'Pro' GSM – Datalogger to monitor up to 10 Sunmaster XL inverters (= 30 Sunmaster XL power modules) inverters locally or over the Internet</td>
</tr>
<tr>
<td>130396230</td>
<td>QS Data Control 'Pro' Ethernet – Datalogger to monitor up to 10 Sunmaster XL inverters (= 30 Sunmaster XL power modules) inverters locally or over the Internet</td>
</tr>
<tr>
<td>130010905</td>
<td>RS485 modular communication cable, cross wired, 8 pole, 1 meter / 3 ft</td>
</tr>
<tr>
<td>130010906</td>
<td>RS485 modular communication cable, cross wired, 8 pole, 5 meter / 16 ft</td>
</tr>
<tr>
<td>130010910</td>
<td>RS485 modular communication cable, cross wired, 8 pole, 10 meter / 33 ft</td>
</tr>
<tr>
<td>130010915</td>
<td>RS485 modular communication cable, cross wired, 8 pole, 15 meter / 49 ft</td>
</tr>
<tr>
<td>120107000</td>
<td>Complete set to assemble RS485 modular communication cables. Delivery includes: 100 meter modular cable, 100 pcs. modular jacks and crimping tool</td>
</tr>
</tbody>
</table>

*Other lengths of MasterBus connection cables upon request

See section 5.1 for an overview of parts that are standard included with the delivery of the Sunmaster XL Mastervolt offers a wide range of products for both grid connected and independent autonomous electrical installations. See our website www.mastervolt.com for an extensive overview of all our products
10 SELF TEST ITALY

GENERAL
The Italy Self Test is meant to check the upper and lower limits of the AC voltage and AC frequency at which the inverter will shut off.

The Italy Test is included in the MasterAdjust software, available as free download, see below.

Connect the masterBus USB interface to a MasterBus connector on the inverter. See for instructions “USB Connect” at the last page of this document.

The Italy Self Test will show only if the unit is configured for Italy.

To perform the test, select the MasterAdjust “Configuration” tab. See figure 21.

You can choose all four tests together (All) or one individual test.

With option “All”, the four tests are done in this sequence:

- UH (high off limit AC voltage);
- UL (low off limit AC voltage);
- FH (high off limit AC frequency);
- FL (low off limit AC frequency).

Press “Start Test” to let the test begin. Testing may take up to 10 seconds.

Refer to the individual tests to learn more about the operating principle of these tests.

After each test you have to confirm the test result (button “Confirm”) before the inverter starts the Reclosure Time. During the test, reclosure time is reduced to 10s.

After the last test and after reconnecting to the grid the inverter will continue in normal operation.

The test accuracy is better than 1V/0.1Hz if grid voltage and frequency are stable.

Select: products/instrumentation/miscellaneous
UH-TEST

See figure 22. Start the UH test by pressing “Start Test”.

The screen shows:

- **AC Voltage or UG** = the grid voltage measured during the test;
- **U (Lim)** = the high voltage limit UH of the inverter, decreasing by rate -11.5V/ sec during test;
- **UT (Lim)** = the measured UH;
- **Elapsed Time** = the measured test time.

The test ends when UH reaches UG. The inverter will disconnect and the grid fault LED on the inverter illuminates. UT (Lim) and elapsed Time are shown.

Write down UT (Lim), UG and Elapsed Time.
After confirming, the next test overwrites all values.

Calculation by hand:

\[ UT = UG + (\text{Elapsed Time} \times 11.5). \]

Example: if UG = 230.0V and Elapsed Time = 4.00 seconds, the result UT is \(230.0 + (4.00\times11.5) = 276V\)

After Confirming the inverter starts the reclosure time count down to reconnect to the grid.

Figure 22
UL-TEST

See figure 23. Start the UL test by pressing "Start Test".

The screen shows:

- **AC Voltage or UG** = the grid voltage measured during the test;
- **U (Lim)** = the **low voltage limit UL** of the inverter, increasing by 11.5V/sec during test;
- **UT (Lim)** = the **measured UL**;
- **Elapsed Time** = the measured test time.

The test ends when UL reaches UG. The inverter will disconnect and the grid fault LED on the inverter illuminates. UT (Lim) and elapsed Time are shown.

Write down UT (Lim), UG and Elapsed Time.

After confirming, the next test overwrites all values.

Calculation by hand:

\[
UT = \text{UG} - (\text{Elapsed Time} \times 11.5)
\]

Example: if UG = 230.0V and Elapsed Time = 4.00 seconds, the result UT is 230.0 - (4.00*11.5) = 184V

After Confirming the inverter starts the reclosure time count down to reconnect to the grid.

Figure 23
FH-TEST
See figure 24. Start the FH test by pressing “Start Test”.

The screen shows:
• AC Frequency or FG = grid frequency measured during the test;
• F (Lim) = high frequency limit FH of the inverter, decreasing with a rate of -0.05 Hz/sec;
• FT (Lim) = the measured FH;
• Elapsed Time = the measured test time.

The test stops when FH reaches FG. The inverter will disconnect and the grid fault LED on the inverter illuminates. FT (Lim) and elapsed Time are shown.

Write down FT (Lim), FG and Elapsed Time.

After confirming, the next test overwrites all values.

Calculation by hand:
FT = FG + (Elapsed Time*0.05).
Example: if FG = 50.00 Hz and Elapsed Time = 6.00 seconds, the result is 50.00 + (6.00*0.05) = 50.30 Hz.

After Confirming the inverter starts the reclosure time count down to reconnect to the grid.

Figure 24

FL-TEST
See figure 25. Start the FL test by pressing “Start Test”.

The screen shows:
• AC Frequency or FG = grid frequency Fg measured during the test;
• F (Lim) = low frequency limit FL of the inverter, increasing with a rate of 0.05 Hz/sec;
• FT (Lim) = the measured FL;
• Elapsed Time = the measured test time.

The test stops when FL reaches FG. The inverter will disconnect and the grid fault LED on the inverter illuminates. FT (Lim) and elapsed Time are shown.

Write down FT (Lim), FG and Elapsed Time.

After confirming, the next test overwrites all values.

Calculation by hand:
FT = FG - (Elapsed Time*0.05).
Example: if FG = 50.00 Hz and Elapsed Time = 6.00 seconds, the result is 50.00 - (6.00*0.05) = 49.70 Hz.

After Confirming the inverter starts the reclosure time count down to reconnect to the grid. As the FL-test is the last test, the inverter will return to normal operation.

Figure 25
11 CERTIFICATES

11.1 EC DECLARATION OF CONFORMITY

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

Herewith declares that:

Product: Sunmaster XL 10kW          Sunmaster XL 15kW
         Power module XL3300          Power module XL5000
         Power module XL3300+

is CE-marked and complies with the following standards:

EMC directive: EMC 89/336/EEG
Emission:
   EN 50081-1
   EN 55011 class B (VDE 0875-11)
   EN 55014-1
   EN 55022
   VDE 0871 class B
Harmonics:
   EN 61000-3-2
   IEEE 929
Flicker:
   EN 61000-3-3
Electro static discharges (ESD):
   EN 61000-6-1 / EN60082-1
Radiated Immunity:
   EN 61000-6-1 / EN50082-1
Electrical fast transients (EFT):
   EN 61000-6-1 / EN50082-1
Conducted immunity:
   EN 61000-6-1 / EN50082-1
LV directive:
   2006/95/EC
Electrical safety:
   EN 60950
ENS:
   DIN VDE 0126

Amsterdam,

[Signature]

P.F. Kenninck,
CEO MASTERVOLT
Certificate of compliance

Applicant: Mastervolt International B.V.
Snijdersbergweg 93
1105 AN Amsterdam
Netherlands

Product: Automatic disconnection device between a generator and the public low-voltage grid

Model: XL 3301; XL 5000

Use in accordance with regulations:
Automatic disconnection device with single-phase mains surveillance in accordance with DIN V VDE V 0126-1-1:2006-02 for photovoltaic systems with a single-phase parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter. This serves as a replacement for the disconnection device with insulating function which the distribution network provider can access at any time.

Applied rules and standards:

The safety concept of an aforementioned representative product corresponds at the time of issue of this certificate to the valid safety specifications for the specified use in accordance with regulations.

Report number: 07KFS057-VDE0126 & 08TH0004-VDE0126
Certificate number: U10-230
Date of issue: 2010-05-14 Valid until: 2013-05-14

Achim Hänchen