

Sunny Island 4500

Additional Features



Explanation of Symbols used in this Document

This symbol indicates information that is essential for a trouble-free and safe operation of the product. Please read these sections carefully in order to avoid any damages of the equipment and for optimal personal protection.



This symbol indicates information that is required for the optimal operation of the product. Read these sections carefully in order to ensure an optimal operation of the product and all its features.



This symbol indicates an example.



Revision History

| Document number | Changes | Author |
|-----------------------|----------------------------|---------|
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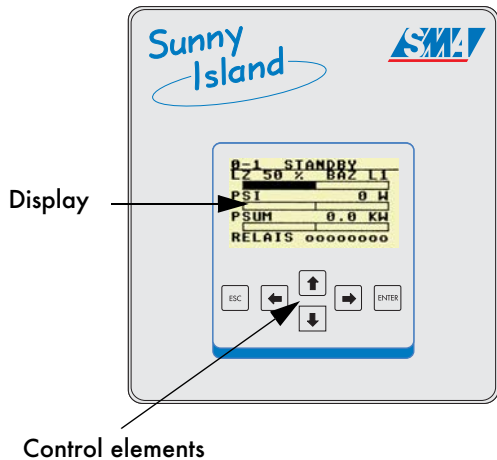
1 Introduction

This document describes the new functions and changes existing in the Sunny Island 4500 with a firmware level > 3.0. This document is a supplement to the installation and operating manuals for the Sunny Island 4500. This document contains the necessary information for installers and operators to configure the new functions.

Before setting any parameters using the Sunny Island menu, ensure that the Sunny Island 4500 is correctly connected according to the installation and operation manual. The parameters are editable after entering the installer password. You can find a current list of all configurable system parameters in chapter 4 "All configurable system parameters" (page 35) of this document.

1.1 Operating instructions

Observe all instructions relating to the display, control elements, key layout and edit mode of the Sunny Island 4500, found in the installation and user manual under "Operating instructions".



1.2 Menu structure

The menu tree has four basic branches, which may be selected using the control elements once the appropriate password has been entered.

| Menu branch | Description |
|-------------|---|
| DATA | Overview display of the most important operating data; display of the system measurements |
| OPERAT | Sunny Island operating functions, generator configuration |
| SETUP | Configuration possibilities for data and parameters |
| DIAG | Information on fault diagnosis and correction, status and fault history |

Table 1.1: Content of the four menu branches

To hinder the operator from accidentally altering the parameter settings, menus containing critical parameters can only be accessed by entering the installer password. These protected menus are shaded grey in Figure 1.1: "Menu structure" (page 9).



Configuration and changes to system parameters may only be performed by specially trained personnel.

The menus displayed with a white background can be seen by the operator without a password. These menus are used for the normal daily operation and monitoring of the Sunny Island and the system components that it controls.

The following figure shows the menu structure of the Sunny Island. The menus shown in this figure are described in chapters 7 to 10 of the installation and operating manual and/or this document.

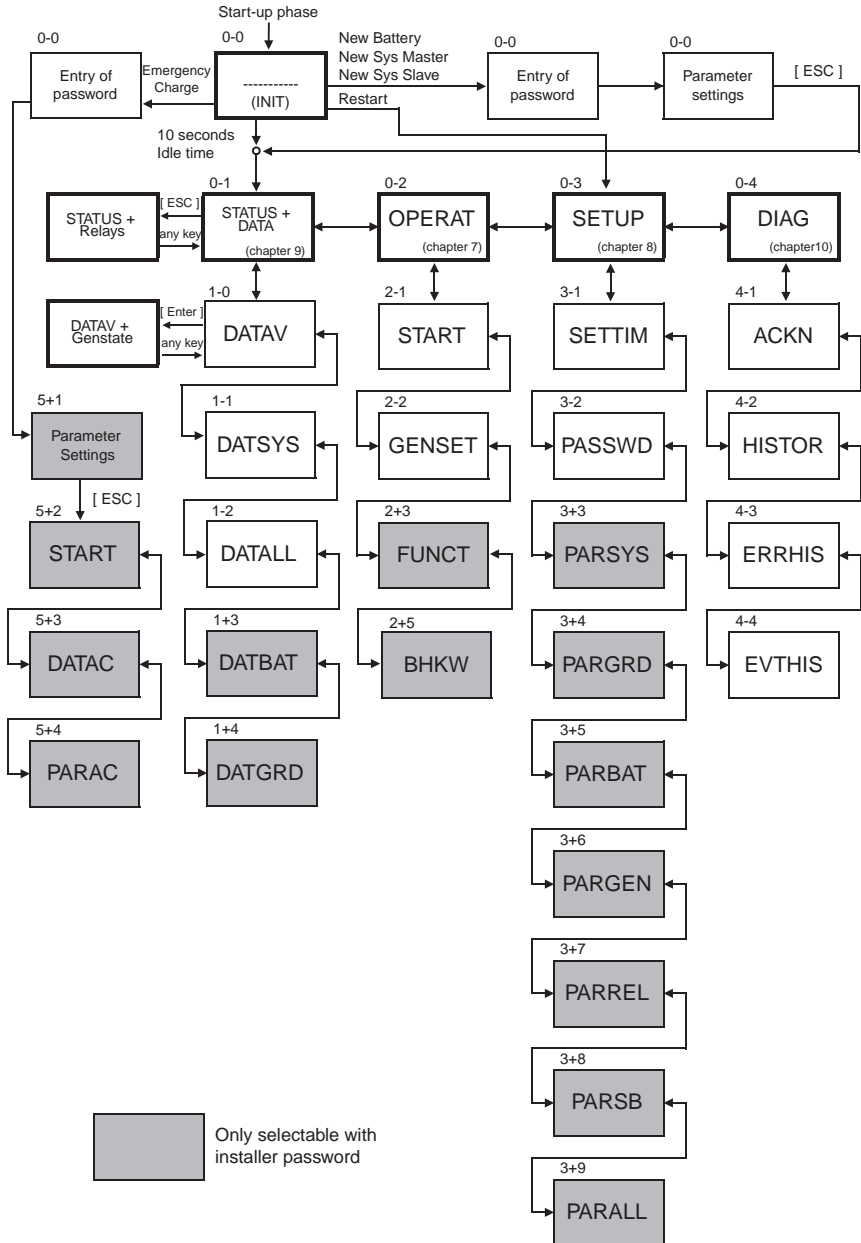


Figure 1.1: Menu structure

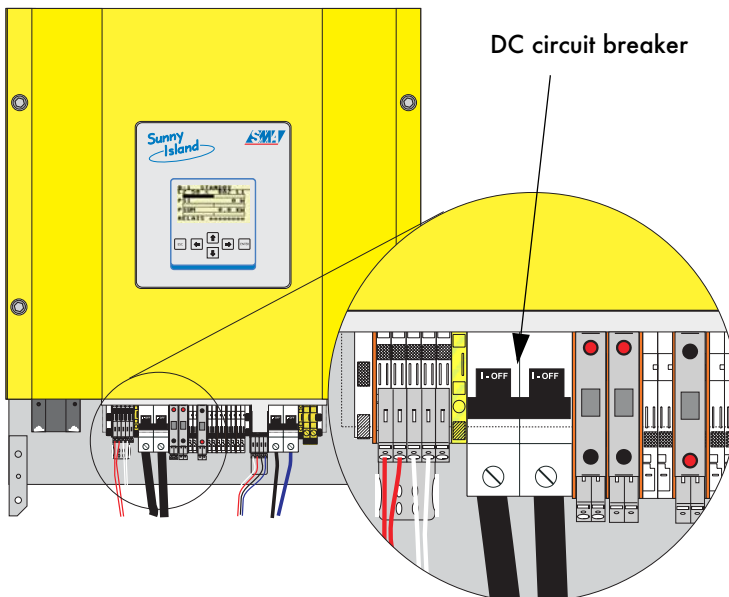
2 New functions

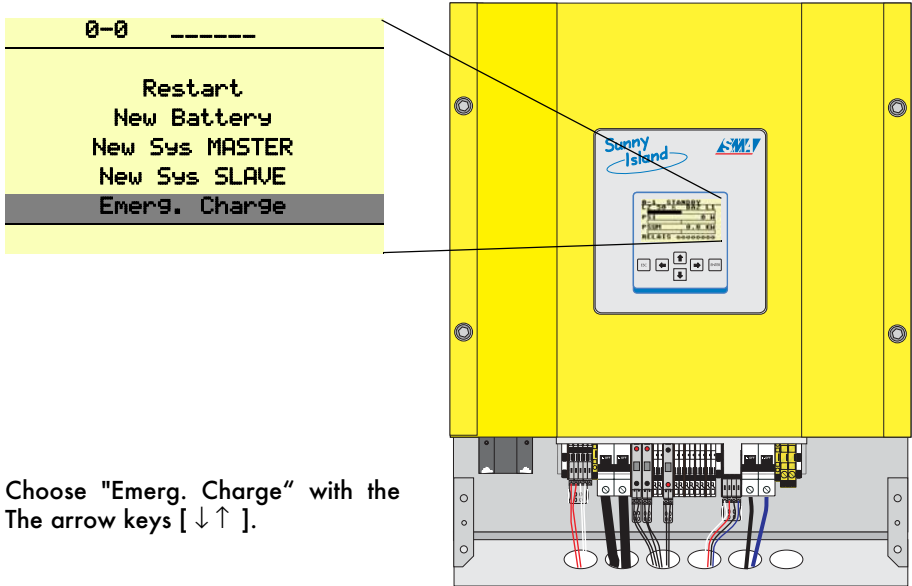
2.1 "Emergency Charge"

If it is necessary to charge batteries whose voltage lies below the normal limits of the Sunny Island 4500 (e.g. when new batteries are not sufficiently charged or no energy for charging the batteries was available for a long time), the menu item "Emergency Charge" allows emergency charging of the batteries with the help of a generator.

You require a "Level: 1" (Installer) password to be able to select the "Emergency Charge" menu item.

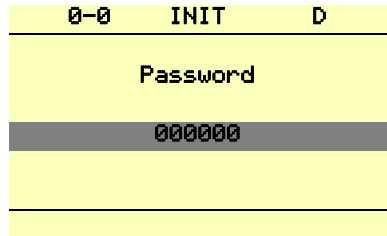
Once the DC circuit breaker of the Sunny Island 4500 has been switched on, you come to the "INIT" (0-0) menu - as described in chapter 5 of the installation and operating manual: "Starting the Sunny Island for the first time".





Choose "Emerg. Charge" with the The arrow keys [↓ ↑].

After pressing the [Enter] key, you are then asked for the installer password "Level: 1".



2.1.1 "Parameter settings" menu (5+1)

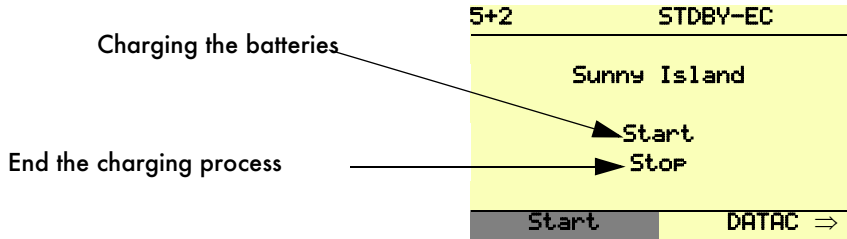
Once the password has been entered, you come to a menu (5+1) where you can set selected important parameters relating to emergency charging operation (see Table 2.2 on page 12). You also navigate in this window using the arrow keys [↓↑] up or down.

| Parameters | Default setting | Description |
|--------------|--------------------|---|
| 501_Cbat nom | 350 Ah | 10 hour nominal battery capacity (C10). This must always be entered according to the relevant manufacturer's specifications, also in the case of older batteries! If no 10 hour capacity is available from the manufacturer, the entry closest to the 10 hour capacity should be chosen. |
| 502_Bat Type | Lead acid | Choose the battery type according to the manufacturer's specifications: 0 = Gel* 1 = NiCd 2 = Lead Acid * The "Gel" setting can also be used for Absorbed Glass Mat (AGM) batteries. |
| 503_Ubat nom | 60.0 V (48.0 V) | Nominal battery voltage. Generally 60 V or 48 V should be set here. For exceptions to this rule, please refer to chapter 2.2.4 of the installation and operating manual. |
| 607_lgen max | 0 A - 500 A | Max. generator current (per phase) |

Table 2.2: Parameters to be entered when configuring "Emergency Charging" operation

Once you have checked that all settings are correct, pressing the [ESC] key will bring you into the emergency charging menu structure.

2.1.2 "Start" menu (5+2)



The "Start" menu (5+2) allows you to start battery charging or stop charging with the STOP menu item.

- Use the arrow keys to navigate to the desired menu item and press the [ENTER] key. Charging of the batteries is indicated by "RUN_EC" in the display.
- When emergency charging is stopped, "STDBY_EC" is displayed in the menu window.
- Use the [ESC] key to again exit the "Start" menu.

2.1.3 "DATAAC" menu (5+3)

The "DATAAC" menu (5+3) allows the following operating data to be seen (use the arrow keys to navigate the menu, as described above):

| Parameters | Description |
|-------------|--|
| Ubat nom | Nominal battery voltage |
| Uchrg act | Battery voltage set point |
| Ibat mean | Present battery current |
| Tbat mean | Present battery temperature |
| tUconst chg | Time for constant V phase in normal charging |
| Charge Oper | State of the battery management process (charging) |
| Iconv eff | Effective mains current |
| Pconv | Present effective power of the Sunny Island |

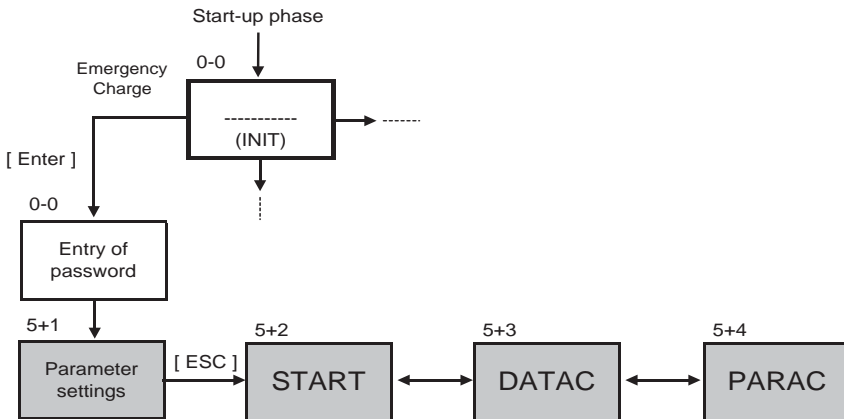
Table 2.3: Displays in the "DATAAC" (5+3) menu

2.1.4 "PARAC" menu (5+4)

The "PARAC" menu (5+4) allows you to limit the generator current by using the parameter "607_Igen max". This also affects the battery charging current at the same time.

| | |
|--------------|--------|
| 5+4 | RUN-EC |
| 607_Igen max | |
| 0 | |
| DATA C | PARAC |

You can leave the emergency charging mode at any time by switching the DC circuit breaker of the Sunny Island 4500 to [OFF].



Please note that the emergency charging mode can only be left via a restart of the device (switch on and off). All parameter settings for this type of operation only remain set during emergency charging. The parameters changed for emergency charging are not permanently stored. If these parameter changes must be permanent, leave the emergency charging mode and follow the instructions in the "Restart" chapter 6.3 of the installation and operating manual.



Emergency charging is only possible on a single device. Parallel or three phase operation is not possible during emergency charging.

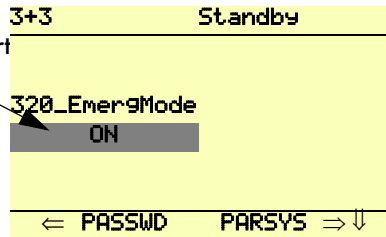
2.2 "Emergency Mode"

2.2.1 Function

"Emergency Mode", under the "PARSYS" menu (3+3), has been implemented as a new function to allow special switching of two Sunny Islands in three phase systems. This enables the future practical use of Sunny Islands in three phase systems when only one or two devices are used. This parameter also allows emergency operation in three phase systems when individual Sunny Islands (slaves) within a cluster drop out due to faults. The faults could occur within the devices or in the communication with the "slave" Sunny Islands.

The Sunny Island installation and operating manual (chapter 8.3 among others) describes how to reach the "PARSYS" (3+3) menu. Within the menu, you can use the arrow keys [↓ ↑] to navigate to the "320_EmergMode" parameter.

By pressing the [ENTER] key, you can either start the emergency mode by activating "ON" or end emergency mode by activating "OFF"



| Parameters | Default setting | Description |
|-------------------|-----------------|---|
| 320_EmergMode (D) | OFF | If one or more slaves drop out of a cluster, or the communication with the slaves drops out, activating "ON" will place the cluster in emergency mode |

Please note that changes to the interface parameters ("PARSYS" menu) only take effect after the next restart of the Sunny Island (by switching off and on or by selecting the "Restart" option in the "FUNCT" menu (2-3)). Please follow the instructions in chapter 8 "Setup" of the handbook.



For "Emergency Mode", make sure that when a Sunny Island drops out, the communications cables and also all DC and AC cables are disconnected from the faulty device.



2.2.2 System configuration example

The following section describes an example of a system constellation with two Sunny Island 4500 devices in a three phase stand-alone mains grid, whose energy is provided by PV generators and a generator unit (see Figure 2.1: "PV hybrid system (2- or 3-phase) in emergency operation with 2 Sunny Islands and a generator" (page 17)). Please also pay attention to the instructions in chapter 11 of the installation and operating manual.

In a normal situation, voltage and frequency are determined by two Sunny Islands (master and slave) on two phases. If extra energy is required by the system, the Sunny Island (master) activates the generator as a mains grid forming element and switches to parallel mode (RUN_I). Voltage and frequency are now defined by the generator and three phase devices can now also be operated.



Also in stand-alone networks with weather independent power generation, it is recommended that the Sunny Island can switch off certain power consumers (using a free relay). This ensures that the most important consumers will receive energy for as long as possible when a fault occurs (defective generator, empty diesel tank etc.).

This allows the emergency operation to be designed as efficiently as possible.

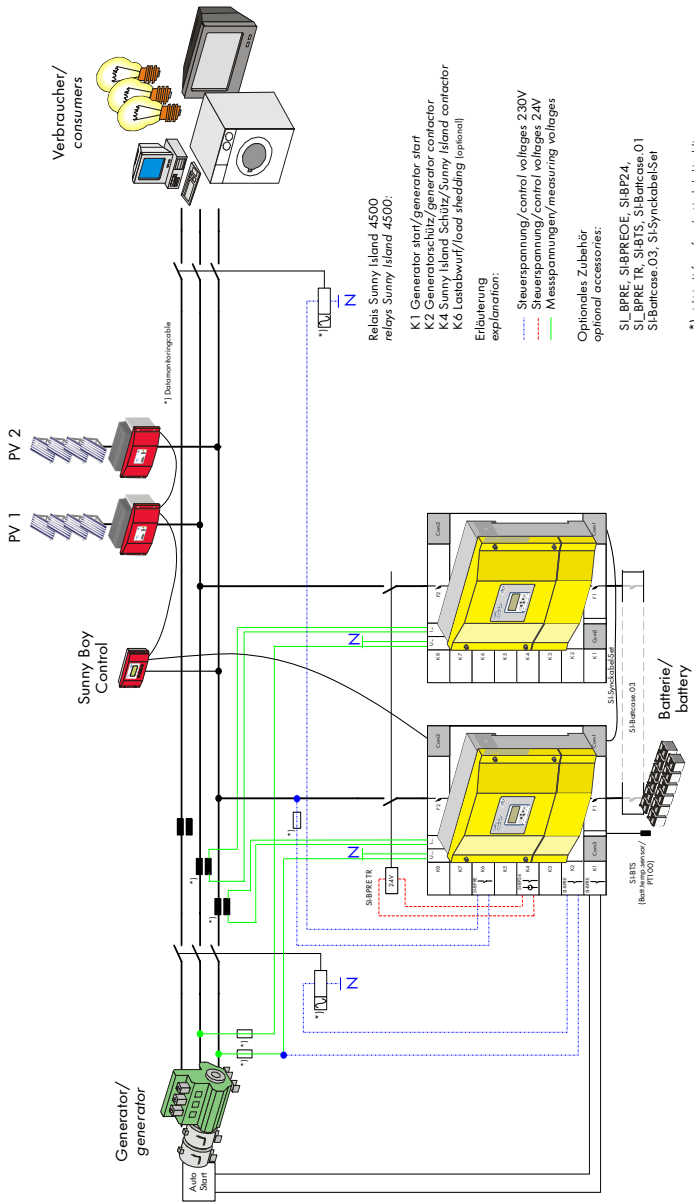


Figure 2.1: PV hybrid system (2- or 3-phase) in emergency operation with 2 Sunny Islands and a generator

Parameter settings necessary for this configuration

The following parameters must be set for correct operation of the Sunny Island.

| Parameters | Unit | De- fault | Description | Master | Slave |
|--|-------------------|--------------------|--|-----------------------|----------------------|
| 320_EmerMode | | ON | Special operation (Emergency Operation) | | |
| 401_Phase Mode | | | Device settings | 3Phs_Mstr1 Set | 3Phs_Slv1L 2/L3 |
| 501_Cbat nom | Ah | 350 | Nominal battery capacity (C10) | ? | x |
| 502_Bat Type | | Lead- Acid | Battery type | ? | x |
| 503_Ubat nom | V | 60 | Nominal battery voltage | 60 (?) | x |
| 504_Ubat min | V | 51 | min. permissible battery voltage | 51 (?) | 51 (?) |
| 505_Ubat max | V | 84 | max. permissible battery voltage | 81 (?) | 81 (?) |
| 602_GenSet Interf | | NONE | Generator type | fast Grid form (?) | x |
| 603_GenSet Interf | | NONE | Generator interface | Type 1 (?) | x |
| 604_GenSet Ctrl | | OFF | Generator loading limits | I_GEN (?) | I_GEN (?) |
| 606_CurTrfRatio | Ain/ 5 Aout | 5 | Transformation ratio of the current transformer | ? | ? |
| 607_Igen max | A | 0 | Max. generator current (per phase) | ? | ? |
| 701_Man K1 | | OFF | K1 operating mode | AUTO | x |
| 702_Man K2 | | OFF | K2 operating mode | AUTO | AUTO |
| 704_Man K4 | | OFF | K4 operating mode | AUTO | x |
| 706_Man K6 | | OFF | K6 operating mode | AUTO | x |
| 801_Sunny Boys | | Not in- stalled | Type of Sunny Boy control system | Frequency (?) | Not installed (?) |
| x = setting irrelevant; ? = system dependent; <value>(?) = preferred setting, but system dependent | | | | | |

Parameter settings recommended for this configuration

The following parameters should be checked for correctness. The system usually functions well with the standard settings, but small adjustments are recommended in certain cases.

| Parameters | Unit | De-fault | Description | Master | Slave |
|--|------|----------|---|----------|-------|
| 310_Auto Start | | 0 | Number of autostart attempts | 3 (?) | x |
| 506_acid density | kg/l | 1,24 | Nominal acid density according to manufacturer's specifications | 1,24 (?) | x |
| 509_Tbat max | °C | 40 | max. permissible battery temperature | 40 (?) | x |
| 710_K1 t2 begin | h | 0 | Start of special time period t2 for relay K1 | ? | x |
| 711_K1 t2 end | h | 0 | End of special time period t2 for relay K1 | ? | x |
| 712_K1 On t1 | | N4 | Switch-on threshold for K1 | ? | x |
| 713_K1 Off t1 | | N1 | Switch-off threshold for K1 | ? | x |
| 714_K1 On t2 | | N4 | Switch-on threshold for K1 within the special time period t2 | ? | x |
| 715_K1 Off t2 | | N1 | Switch-off threshold for K1 within the special time period t2 | ? | x |
| 740_K6 t2 begin | h | 0 | Start of special time period t2 for K6 | ? | x |
| 741_K6 t2 end | h | 0 | End of special time period t2 for K6 | ? | x |
| 742_K6 On t1 | | N3 | Switch-on threshold for K6 | ? | x |
| 743_K6 Off t1 | | N3 | Switch-off threshold for K6 | ? | x |
| 744_K6 On t2 | | N3 | Switch-on threshold for K6 within the special time period t2 | ? | x |
| 745_K6 Off t2 | | N3 | Switch-off threshold for K6 within the special time period t2 | ? | x |
| x = setting irrelevant; ? = system dependent; <value>(?) = preferred setting, but system dependent | | | | | |

There are many other parameters that affect the system. However, the standard settings should not be changed without good reason. Detailed information about this and other parameters can be found in chapter 4 "All configurable system parameters" (page 35).

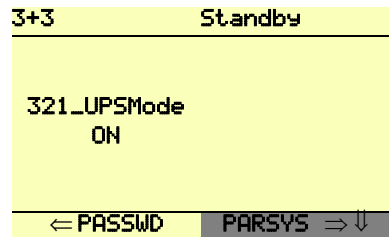
2.3 Grid dropout recognition - "UPS Mode"

If a short circuit occurs in the public mains grid, the Sunny Island will provide maximum short circuit current for 5 seconds before switching off with an "AC current limitation" fault.

In systems constructed as mains grid replacement systems that are working in "Droop Mode", mains grid dropout recognition can be activated by setting the parameter "321_UPSMoDe" to "ON". This function allows the Sunny Island to be switched out within the brief time frame of 10 - 20 ms, as soon as a short circuit is detected and a current flow towards the public mains grid is recognized. After switching out of the mains grid, the Sunny Island continues operating in inverter mode and continues to supply the connected power consumers, almost without interruption.

To be able to select the mains grid dropout recognition you require a "Level: 1" (Installer) password. The Sunny Island handbook (chapter 8.3 among others) describes how to reach the "PARSYS" (3+3) menu. Within the menu, you can use the arrow keys [↓ ↑] to navigate to the "321_UPSMoDe" parameter.

By pressing the [ENTER] key, you can either start the "UPS-Mode" by activating "ON" or reset it by choosing "OFF".



The parameter "321_UPSMoDe" is normally set to "ON" as default.



An external current transformer is required for this parameter setting to operate correctly.

| Parameters | Default setting | Description |
|--------------------|-----------------|---|
| 321_UPSMODE (D) | ON | <p>Mains grid dropout recognition is activated when:</p> <ol style="list-style-type: none"> 1. The Sunny Island is operating in "Droop Mode" 2. Parameter "321_UPS-Mode" is set to "ON" <p>If a mains grid short circuit occurs, and the Sunny Island detects a flow of current into the mains grid, the device will disconnect from the mains grid within 10 ms - 20 ms. The connected consumers continue to receive power, almost without interruption.</p> |

Please note that changes to the interface parameters ("PARSYS" menu) only take effect after the next restart of the Sunny Island (by switching off and on or by selecting the "Restart" option in the "FUNCT" menu (2-3)). Please follow the instructions in chapter 8 "Setup" of the handbook.



2.4 "Reverse Power" limit

The mains grid dropout recognition system monitors the power that is allowed to be fed into the mains grid or a generator. If this reverse power exceeds a specified value, configurable using parameter "645_RevPower", then the Sunny Island disconnects from the generator or mains grid and switches to the RUN_U mode operation. Once the mains grid is stable again, the Sunny Island switches back to the mains grid in a synchronized manner, after a time period configurable using parameter "429_GrdValTime".

The following parameters can be set using the menu "PARGRD" (3+4). Parameter "645_RevPower" can also be changed via the "PARGEN" (3+6) menu. The menus can only be accessed after entering a "Level: 1" installer password.

Within the menu, you can use the arrow keys [↓ ↑] to move to the desired parameter.

```

3+4          Standby
401_Phase Mode
  1Phs_Single
402_Uconv nom
  230.0 V
403_Fconv nom
  50.00 Hz
← PARSYS          PARGRD → ↓

```

Power limit

The parameter "645_RevPower" defines the power limit that, when exceeded, causes the Sunny Island to switch off. This parameter is set to -0.5 kW as factory default.

Mark the parameter
"645_RevPower".

Press the [ENTER] key.

Enter a value between
-100 kW + 100 kW.

| 3+4 | Standby |
|--------------|------------|
| ... | |
| ... | |
| 645_RevPower | |
| -0.5 kW | |
| ... | |
| ... | |
| ← PARSYS | PARGRD ⇒ ↓ |

You confirm the entry, and immediately have the changed setting take effect, by pressing the [ENTER] key one more time.

'Stable Mains Grid' recognition - "GrdValTime"

The parameter "429_GrdValTime" allows a time period to be set, after which the Sunny Island 4500 will reconnect to a stable mains grid once detected. A minimum time period of 0 minutes and a maximum of 15 minutes can be defined between recognition of a stable mains grid and synchronized reconnection. This parameter is set to 1 minute as factory default.

Mark the parameter
"429_GrdValTime".

Press the [ENTER] key.

Enter a value between
0 and 15 minutes.

| 3+4 | Standby |
|----------------|------------|
| ... | |
| ... | |
| 429_GrdValTime | |
| 1 min | |
| ... | |
| ... | |
| ← PARSYS | PARGRD ⇒ ↓ |

You confirm the entry, and immediately have the changed setting take effect, by pressing the [ENTER] key once.

You exit the "PARGRD" (3+4) menu by pressing the [ESC] key.

2.5 Nickel-Cadmium (NiCd) batteries

You can take the valid default values of individual voltages and times for NiCd batteries from the following tables.

You must be absolutely sure to choose the correct battery type, using "NewSysMaster/NewSysSlave" or "New Battery", when initializing the system! The various different parameter limits of the two battery types mean that setting the wrong parameter values in the Sunny Island can lead to dangerous accidents and personal injury or damage the installation.



You access this parameter from the "PARBAT" (3+5) menu, after first entering the Level 1 installer password.

Press the [ENTER] key.

Use the arrow keys to navigate through the menu

Press the [ENTER] key again, in order to set the desired parameter to

| | |
|--------------|------------|
| 3+5 | Standby |
| 501_Cbat nom | |
| 350 Ah | |
| 502_Bat Type | |
| Lead Acid | |
| 503_Ubat nom | |
| 60.0 V | |
| ← PARGRD | PARBAT → ↓ |

You then confirm your selection of the newly defined value by pressing the [ENTER] key.

| Parameter designation | Unit | min | max | Def ault | Description |
|--------------------------|------|-----|-----|-------------|---|
| 518_tset full (A)+(R) | d | 1 | 180 | | Time span after which a full charge should be done. |
| | | | | 14.0 | Gel |
| | | | | 14.0 | Lead Acid |
| | | | | 14.0 | NiCd |

| Parameter designation | Unit | min | max | Def ault | Description |
|-------------------------------|------|------|-----|-------------|--|
| 519_tset equal (A)+(R) | d | 7 | 365 | | Time span after which an equalization charge should be done. |
| | | | | 90.0 | Gel |
| | | | | 90.0 | Lead Acid |
| | | | | 90.0 | NiCd |
| 520_U float (A)+(R) | V | 1.39 | 2.4 | | Maintenance charge voltage per cell |
| | | | | 2.25 | Gel |
| | | | | 2.23 | Lead Acid |
| | | | | 1.50 | NiCd |
| 527_tcharge (A*)+(R) | min | 1 | 600 | | Charging time for normal charging |
| | | | | 120 | Gel |
| | | | | 90 | Lead Acid |
| | | | | 120 | NiCd |
| 528_tcharge full (A*)+(R) | h | 1 | 20 | | Charging time for full charge |
| | | | | 5.0 | Gel |
| | | | | 5.0 | Lead Acid |
| | | | | 5.0 | NiCd |
| 529_tcharge equal (A*)+(R) | h | 1 | 48 | | Charging time for equalization charge |
| | | | | 10 | Gel |
| | | | | 10 | Lead Acid |
| | | | | 8 | NiCd |
| 530_Ucharge (A*)+(R) | V | 1.39 | 2.5 | | Charging voltage for normal charge, per cell |
| | | | | | If an electrolyte circulation system is installed, the value should be reduced to 2.45 V (for Lead Acid batteries) |
| | | | | | The specifications of the battery manufacturer must be observed. |
| | | | | 2.40 | Gel |
| | | | | 2.50 | Lead Acid |
| | | | | 1.64 | NiCd |

| Parameter designation | Unit | min | max | Def ault | Description |
|-------------------------------|------------------|------|------|-------------|--|
| 531_Ucharge full (A*)+(R) | V | 1.39 | 2.5 | | Charging voltage for full charge, per cell If an electrolyte circulation system is installed, the value should be reduced to 2.45 V (for Lead Acid batteries) The specifications of the battery manufacturer must be observed. |
| | | | | 2.40 | Gel |
| | | | | 2.50 | Lead Acid |
| | | | | 1.64 | NiCd |
| 532_Ucharge equal (A*)+(R) | V | 1.39 | 2.50 | | Charging voltage for equalization charge, per cell The specifications of the battery manufacturer must be observed. |
| | | | | 2.40 | Gel |
| | | | | 2.50 | Lead Acid |
| | | | | 1.64 | NiCd |
| 538_Iloss nom (A) | mA/ 100 Ah | 0 | -100 | | Specific leakage current of the battery during maintenance charging at 20 °C Typical values: -30 mA/100 Ah for new batteries -80 mA/100 Ah for heavily aged batteries This value is NOT automatically determined by the Sunny Island. Occasional manual adjustment can thus further optimize battery management. |
| | | | | -30 | Gel |
| | | | | -30 | Lead Acid |
| | | | | -55 | NiCd |

Parameter settings for Absorbed Glass Mat (AGM) batteries are not included. If you wish to use AGM batteries in the system, use the Sunny Island settings for Gel batteries.

2.6 Manual battery charging process

The parameter "541_ManChgeMod" allows the battery charging process to be manually specified by the user. The following five charging methods are available:

- "Equalize" Equalization charge
- "Float" Maintenance charge
- "Full" Full charge
- "Normal" Normal charge
- "None" Automatic charging operation of the battery management system (BMS) (default setting)

Depending on the manually set parameters, the Sunny Island stops the current charging process and begins the process that you have chosen.



When this occurs, the value "None" will appear in the display immediately after you have chosen the parameter, even though the Sunny Island has actually completely performed the selected process.

This is intentional, to avoid a manually chosen charging process being permanently chosen. The current level of charge can be checked by using the "Charge Oper" display in the "DATALL" (1-2) or "DATBAT" (1+3) menus (see also chapter 5 "Overview: Displayed measurement values" (page 63)) . After the manually chosen process is complete, the battery management functions automatically again.

The parameter "541_ManChgeMod" can be set from within the "PARBAT" (3+5) menu. This menu can only be accessed after entering a "Level: 1" installer password.

Within the menu, you can use the arrow keys [↓ ↑] to move to the desired parameter.

Mark the desired setting

Then press the [ENTER] key

```

3+5          Standby
-----
541_ManChgeMod
  Equalize
   Float
   Full
  Normal
  None
← PARGRD          PARBAT →
  
```

The desired battery charging process is now activated.

2.7 Power factor compensation

The parameter "648_ReactCtrl" allows the user to choose how power factor compensation is to be controlled when in "Droop Mode".

The parameter can be set via a communications system (e.g. Sunny Data Control) or manually at the device using the "PARGEN" (3+6) menu, which allows setting of parameters relating to connected generators. This menu can only be accessed after entering a "Level: 1" installer password. Using the setting

- CONV you can allow the Sunny Island to control power factor compensation
- NONE deactivates the power factor compensation

If an Ecopower mini CHP (combined heat and power) plant is operated in the system then the power factor compensation is always performed by the Sunny Island, the "648_ReactCtrl" parameter is ignored, meaning that power factor compensation cannot be disabled. This parameter is set to "CONV" at the factory.

Changes to this parameter first take effect when the slaves are restarted and the master is stopped, or put to Standby mode, and then restarted.

3 Reworked functions

3.1 Battery preservation mode - "Enhanced Low Bat Mode"

To protect the batteries from deep discharge, the Sunny Island 4500 provides the battery preservation mode. This preservation mode has three levels, with each level being allocated to a particular battery state.

Step 1

If the battery charge level sinks to a value definable in the "535_State Step1" parameter (factory setting: L2), the Sunny Island 4500 switches to Standby mode for a particular special time period (e.g. overnight) but operates normally outside this time. This special time period is defined by the parameters "533_Stdbyt beg" and "534_Stdbyt end".

Step 2

The battery state for level 2 is defined by the "540_State Step2" parameter (default setting: L3). In all operating states lower than the value defined in the "540_State Step2" parameter, the Sunny Island 4500 enters Standby mode at night. During the day, it is activated for 5 to 60 minutes (configurable using parameter "517_BsTstop") every 4 hours, to allow AC generators to feed the mains grid. The Sunny Island 4500 remains in normal operation as long as a charging current larger than 1 A is detected. If the charging current falls below 1 A then the Sunny Island 4500 returns to Standby mode.

Step 3

If the battery charge level sinks below L4, then the Sunny Island 4500 operates in Standby mode both day and night. In this case, the Sunny Island 4500 only enters normal operation for a period of 5 minutes when it is manually restarted.

If Sunny Boy devices are integrated into the system (parameter "801_Sunny Boys" = "Installed"), then the Sunny Island 4500 will **always** set battery preservation level 2 when a battery charge level of L4 is detected. In this case, level 3 is deactivated.

The "533_Stdbyt beg", "534_Stdbyt end", "535_State Step1" and "540_State Step2" parameters described above can be set via the "PARBAT" (3+5) menu. This menu can only be accessed after entering a "Level: 1" installer password.

The changed settings only take effect after a restart of the Sunny Island.

3.2 Parameter change - "Clust Mode"

This parameter setting is suitable for systems operated with a single generator and more than one cluster. It satisfies the requirements for communication between several clusters and also implements a master hierarchy so that a particular Sunny Island always assumes control of the generator and so that the Sunny Islands are able to synchronize the stand-alone mains grid to the generator.

Several three phase Sunny Island clusters can be connected in parallel. Every cluster requires its own battery. In order to control a generator, the clusters must be able to communicate the energy status to each other. A communications cable is required for this purpose (additional to the communications cable on COM1). This cable is connected to the COM2 port of each Slave2 in each cluster.

For devices with a firmware version < 3.0, the parameter "647_ClustMode" (see handbook) must be set via the "PARGEN" (3+6) menu.

For devices with a firmware version > 3.0, the parameter "647_ClustMode" (see handbook) must be set via the "PARGEN" (3+6) menu, in order to be able to configure the individual Sunny Islands within a cluster.

Depending on its function (Master, Slave1, Slave2), the parameter "427_ClustMode" for every single Sunny Island in the system must be set as follows:

- SupMstr Sunny Island (Master) of a cluster, and assumes the control of the generator
- ClstMstr Sunny Islands (Master) of the remaining clusters
- Reprtr All Sunny Islands of the individual clusters that are configured with Slave2, perform cluster communications between each other. These devices are connected to each other with a communications cable and set to "Reprtr".

3.3 K4 function

The Sunny Island 4500 has numerous monitoring functions. The stand-alone mains grid voltage is monitored for overvoltage. However, the Sunny Island itself has no way of disconnecting from the stand-alone mains grid when damaging overvoltage is present.

In a system where "SI-BPRETR" (contactor for connection of the Sunny Islands with a stand-alone mains grid) is used, this can now also be used for rapid disconnection of the cluster from the stand-alone mains grid when an overvoltage situation exists.

For this purpose, the slaves must be equipped with a plug-in relay ("SI-BPRE") in their K4 socket and the "704_Man K4" parameter set to "Auto".

As usual, socket K4 of the master is equipped with an auxiliary voltage output ("SI-BP24"), which is controlled by the "SI-BPRETR" contactor as normal but is also controlled by the series connected contacts of the slave K4 plug-in relays.

Setting the "704_Man K4" parameter

Use the arrow keys (→ ←) to navigate through the "SETUP" (0-3) menu branch to the "PARREL" (3+7) menu. This menu can only be accessed after entering a "Level 1" installer password.

- Use the arrow keys to scroll through the menu
- Mark the desired parameter
- Press the [ENTER] key.
- Use the arrow keys ↓ ↑ to set the parameter to "AUTO"
- You confirm the changed entry by pressing the [ENTER] key.
- Use the [ESC] key to exit the "PARREL" (3+7) menu.

The changed setting takes effect as soon as you press the [ENTER] key.

3.4 Changes to the data display

3.4.1 Energy Counter

There are now 3 additional entries in the "DATA" menu branch under the "DATALL" (1-2) menu. These display values are not parameters and can therefore not be set or changed.

| Display | Description |
|---------|---|
| EgenIn | Counts the energy transferred from the generator to the Sunny Island while the Sunny Island is running. |
| EgenOut | Counts the energy transferred from the Sunny Island to the generator |
| hgen | Counts the hours of operation of the generator |

In the "OPERAT" (0-2) menu branch, where the current operating mode of the Sunny Island 4500 and any connected generator is displayed, the above mentioned meters can be reset to "Null" using the "FUNCT" (2+3) menu, after entering the Level 1 installer password. To do this, activate the "Reset Gen Cnt" setting in the "FUNCT" (2+3) menu.

3.4.2 Corrections to ampere-hours meter

General data for controlling the operation of the Sunny Island 4500 can be seen in the "DATALL" (1-2) menu. The previously faulty meter values

- Batt. Ah In
- Batt. Ah Out

have been corrected and now provide the cumulative present values of energy flowing in/out of the battery in ampere hours.

3.4.3 Changes to the "DATBAT" (1+3) menu

The following values are no longer displayed in devices with a firmware level > 3.0 :

- t Uconst chg Time for constant V phase in normal charging
- t Uconst full Time for constant V phase in full charging
- t Uconst equal Time for constant V phase in equalization charging

In the "DATBAT" and "EMERG.CHARGE" menus is now the following new display

- TabsorbLeft

This value displays the remaining charging time for the battery. This time reflects the remaining run time of the diesel generator, when this is charging the batteries, because the Sunny Island 4500 is performing either "FULL" or "Equalize" charging.

4 All configurable system parameters

General information: To ensure that the parameter changes made are actually stored, you should proceed as follows:



- Perform all desired configuration.
- Choose "Store Permanent" in the "FUNCT" (2+3) menu (or wait a minimum of 30 seconds without pressing any keys).
- Restart the Sunny Island by choosing "Restart" in the "FUNCT" (2+3) menu (confirm the question that appears with <YES>, by pressing the [ENTER] key).

For some parameters, a simplified process may be followed. Some of the settings take effect immediately after the [ENTER] key has been pressed. The annotations (A), (A*), (B), (C), (D) and +(R) allocated to each parameter describe how the setting is updated.

- (A): The changes take effect as soon as the [ENTER] key has been pressed.
- (A*): The changes take effect as soon as the charge level has changed.
- (B): The changes take effect as soon as the Sunny Island has been restarted. This means that if the changes are made while the Sunny Island is in operation, then the Sunny Island must be restarted (using menu „START“ (2-1)).
- (C): To activate the changed setting, the slaves must be restarted (as described under "General information" above) and the master must be stopped (or put in Standby mode) and then restarted.
- (D): To activate the changed setting, the master and slaves must be restarted (as described under "General information" above) .
- +(R): This setting can also be remotely changed, e.g. via Sunny Data Control.

Parameter changes should always be performed with the device in Standby mode. If this is not done, then accidental wrong changes may be immediately adopted by the device once the [ENTER] key has been pressed and this may cause damage to the system or connected devices.



All configurable system parameters are listed in the following table. This overview updates and supersedes the "PARALL" (3+9) overview table in the handbook. Newly added/corrected parameters are shaded in the table.

| "PARALL" (3+9) | | | | | |
|------------------------------|-------------|------------|------------|----------------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| 310_Auto Start (A) | | 0 | 255 | 0 | <p>Number of autostart attempts (0: autostart off) within one hour. The meter is reset after one hour.</p> <p>Autostart means that the Sunny Island automatically restarts approx. 10 seconds after switching off (due to a fault or some other reason).</p> <p>When the autostart function is activated, the Sunny Island also automatically starts when the DC voltage is switched on.</p> <p>Battery preservation operation requires a value of >0, so that the device can independently restart.</p> |
| 312_COM1 Proto (A) | | 0 | 2 | 1 | <p>Communications protocol COM1:</p> <p>0: None Interface is not used</p> <p>1: SMANET Interface uses the SMANet protocol</p> <p>2: SUNNYNET Interface uses the SunnyNet protocol</p> <p>SUNNYNET should be set here when communicating with Sunny Boys.</p> |
| 313_COM1 Baud (D) | | 0 | 9 | 6 | <p>COM1 Baudrate (Bit/s)</p> <p>2: 1200</p> <p>5: 9600</p> <p>6: Reserved Cluster</p> <p>1200 should be set here when communicating with Sunny Boys or Sunny Boy Controls.</p> <p>For three-phase operation, all devices must be set to "Reserved Cluster".</p> |
| 316_COM2 Proto (D) | | 0 | 2 | 2 | <p>Communications protocol COM2:</p> <p>0: None: Interface is not used</p> <p>1: SMANET: Interface uses the SMANet protocol</p> |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|----------|--|
| Parameter designation | Unit | min | max | De-fault | Description |
| | | | | | 2: SUNNYNET Interface uses the SunnyNet protocol SUNNYNET should be set here when communicating with Sunny Boys. |
| 317_COM2 Baud (D) | | 0 | 9 | 2 | COM2 baudrate (Bit/s) 2: 1200 5: 9600 6: Reserved Cluster 1200 should be set here when communicating with Sunny Boys or Sunny Boy Controls. The "Reserved Cluster" setting is only used for systems with several clusters. |
| 320_EmergMode (D) | | | | OFF | If one or more slaves drop out of a cluster, or the communication with the slaves drops out, activating "ON" will put the cluster in emergency mode |
| 321_UPSMODE (D)+(R) | | | | ON | Mains grid dropout recognition is activated when: 1. The Sunny Island is operating in "Droop Mode" 2. Parameter "321_UPS-Mode" is set to ON If a mains grid short circuit occurs, and the Sunny Island detects a flow of current into the mains grid, the device will disconnect from the mains grid within 10 ms - 20 ms. The connected consumers are further provided with power, almost uninterrupted. |
| 322_ErrAck (A)+(R) | | 0 | 1 | 0 | This setting can only be changed via a communications link (e.g. Sunny Data Control). It allows the resetting of installer level faults. 0: None 1: ErrAck (Confirm fault) |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|--------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| 401_PhaseMode (D) | | 0 | 17 | 0 | <p>For this mode of operation, the devices must be connected with a synchronization cable.</p> <p>0: 1Phs_Single Single phase operation, single device</p> <p>1: 1Phs_Psingle Single phase cluster parallel operation with one battery per device (no mains grid and no generator are possible!) ["DroopMode" active]</p> <p>2: 1Phs_Mstr2 Single phase master-slave parallel operation with two devices on one battery, the device is the Master ["DroopMode" active]</p> <p>3: 1Phs_Mstr3 Single phase master-slave parallel operation with three devices on one battery, the device is the Master ["DroopMode" active]</p> <p>4: 1Phs_Slv2 Single phase master-slave parallel operation with two or three devices on one battery, the device is Slave2 ["DroopMode" active]</p> <p>5: 1Phs_Slv3 Single phase master-slave parallel operation with three devices on one battery, the device is Slave 3 ["DroopMode" active]</p> |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|--------------|--|
| Parameter designation | Unit | min | max | De- fault | Description |
| | | | | | 6: 3Phs_Mstr1 Set Three phase operation, the device is the Master (L1) |
| | | | | | 7: 3Phs_Parallel Three phase cluster parallel operation with three devices on one battery ["Droop Mode" active] |
| | | | | | 10: 3Phs_Slv1L2 Three phase operation, the device is a Slave (L2) |
| | | | | | 11: 3Phs_Slv1L3 Three phase operation, the device is a slave (L3) |
| 402_Uconv nom (A) | V | 200 | 260 | 230 | Desired value of the AC voltage that the Sunny Island is to make available as network controller (RUN_U) |
| 403_Fconv nom (A) | Hz | 40 | 70 | 50 (60) | Desired value of the AC frequency that the Sunny Island is to make available as network controller (RUN_U) |
| 404_Uext nom (A) | V | 150 | 260 | 230 | Nominal AC voltage (RUN_I) |
| 405_Uext min (A)+(R) | V | 150 | 260 | 200 | Lower AC voltage limit |
| 406_Uext max (A)+(R) | V | 150 | 260 | 255 | Upper AC voltage limit |
| 407_Fext nom (A) | Hz | 40 | 70 | 50 (60) | Nominal AC frequency, Sunny Island working "parallel to the grid" (RUN_I), 50 Hz (60 Hz) version |
| 408_Fext min (A)+(R) | Hz | 40 | 70 | 47 (57) | Lower AC frequency limit, 50 Hz (60 Hz) version |
| 409_Fext max (A)+(R) | Hz | 40 | 70 | 56 (66) | Upper AC frequency limit, 50 Hz (60 Hz) version |
| 411_lac chrg mx (A) | A | 0 | 16 | 12 | Maximum AC current that the Sunny Island in operation "parallel to the grid" may take from the AC grid (RUN_I, the battery will be charged). |

| "PARALL" (3+9) | | | | | |
|-----------------------|------------------|-----|-----|--------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| 420_DroopFreq (D) | Hz/ P_{nom} | -5 | +5 | -1,000 | When the system frequency deviates from the nominal value specified here, the Sunny Island feeds P_{nom} in Droop Mode into the stand-alone mains grid (see chapter 2.1.3). |
| 421_DroopVolt (D) | %/ Q_{nom} | -25 | +25 | -6,000 | When the system frequency deviates from the nominal value specified here, the Sunny Island feeds Q_{nom} in Droop Mode into the stand-alone mains grid (see chapter 2.1.3). |
| 422_Ps2off (D) | kW | 0 | 10 | 0,00 | Relates to system configurations with 2 or 3 Sunny Islands in master-slave parallel operation (see chapter 11.6.1 of the handbook): If the total power of all Sunny Islands falls below this limit, the the Slave2 Sunny Island enters idle operation. If one of the 422, 423 or 424 parameters is set to a value other than 0.00, then the other two parameters must be set to a sensible value. |
| 423_Ps2on3off (D) | kW | 0 | 16 | 0,00 | Relates to system configurations with 2 or 3 Sunny Islands in master-slave parallel operation (see chapter 11.6.1 of the handbook): When the total power of all Sunny Islands lies below this limit, the Slave3 Sunny Island switches to idle mode and the Slave2 Sunny Island begins operating when the total power exceeds this limit. Of one of the 422, 423 or 424 parameters is set to a value other than 0.00, then the other two parameters must be set to a sensible value. |
| 424_Ps3on (D) | kW | 0 | 16 | 0,00 | Relates to system configurations with 2 or 3 Sunny Islands in master-slave parallel operation (see chapter 11.6.1 of the handbook): If the total power of all Sunny Islands falls below this limit, then the Slave3 Sunny Island begins operation. Of one of the 422, 423 or 424 parameters is set to a value other than 0.00, then the other two parameters must be set to a sensible value. In systems without a Slave3 device, this parameter must have the same value as the "423_Ps2on3off" parameter. |

| "PARALL" (3+9) | | | | | |
|--|------|-----|-----|----------|--|
| Parameter designation | Unit | min | max | De-fault | Description |
| 425_SlvTimeHyst (D) | s | 0 | 240 | 0 | Relates to system configurations with 2 or 3 Sunny Islands in master-slave parallel operation (see chapter 11.6.1 of the handbook): The time after which a slave enters idle mode once an appropriate condition is reached (compare with "422_Ps2off" and "423_Ps2on3off"). |
| 426_RevCurrent (A) | A | 0 | 200 | 0 | If the current flowing back into the mains grid exceeds this value, then this is evaluated as a mains grid fault and the Sunny Island disconnects from the mains grid. This function is only activated when the "602_GenSet Type" parameter is set to "DroopMains" or "Droop-MainsForm". 0: Reverse current monitoring deactivated |
| 647_ClustMode (Firmware < 3.0) 427_ClustMode (Firmware > 3.0) | | | | OFF | Setting for systems with a generator and more than one cluster. Allows communication between several clusters and creates a master hierarchy so that only one Sunny Island assumes control of the generator. The parameter must be set as follows in the individual Sunny Islands: SupMstr Sunny Island (master) of a cluster, and assumes the control of the generator ClstMstr Sunny Islands (masters) of the remaining clusters, which have no effect on generator control Reptr All Sunny Islands of the individual clusters that are configured with Slave2, perform cluster communications between each other. The devices are connected to each other with a communications cable and set to the "Reptr" parameter. |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-------|--------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| 429_GrdValTime | min | 0 | 15 | 1 | This defines the time after which the Sunny Island will connect to a stable mains grid, once this has been detected (switching occurs after RUN_UEXT). |
| 501_Cbat nom (A) | Ah | 100 | 10000 | 350 | 10 hour nominal battery capacity (C10); this must always be entered according to the manufacturer's specifications, also with older batteries! |
| 502_Bat Type (A) | | 0 | 2 | 2 | Battery type according to manufacturer's specifications 0: Gel* Gel 1: NiCd Liquid electrolyte 2: Lead-Acid Liquid electrolyte * The "Gel" setting can also be used for Absorbed Glass Mat (AGM) batteries. |
| 503_Ubat nom (A) | V | 48 | 60 | 60 | Nominal battery voltage. 60 V is usually set here. For exceptions to this rule, please refer to chapter 2.2.3 of the installation and operating manual. |
| 504_Ubat min (A) | V | 40 | 70 | 51 | min. permissible battery voltage |
| 505_Ubat max (A) | V | 45 | 83 | 82 | max. permissible battery voltage |
| 506_acid density (A) | kg/l | 1.1 | 1.35 | 1.28 | Nominal acid density according to manufacturer's specifications (only used when starting from "New System" or "New Battery" (compare with chapter 6)) |
| 508_Tbat Sense (A) | | 0 | 1 | 1 | Battery temperature sensor installed 0: Not installed 1: Installed In single phase systems, or masters in three phase and single phase parallel systems, this is automatically set to 1, otherwise it is set to 0. Can be set to 1 in slaves that have an extra temperature sensor. |
| 509_Tbat max (A) | degC | 30 | 55 | 40 | Maximum permissible battery temperature |

| "PARALL" (3+9) | | | | | |
|---------------------------|------|-----|------|--------------|--|
| Parameter designation | Unit | min | max | De- fault | Description |
| 511_Bat Fan (A) | | 0 | 1 | 0 | Battery ventilator installed 0: Not installed 1: Installed |
| 512_Acid Pump (A) | | 0 | 1 | 0 | Only for lead acid batteries with liquid electrolyte: 0: Not installed Electrolyte circulation pump is not installed 1: Installed Electrolyte circulation pump is installed If "Installed" is selected, the electrolyte circulation pump is switched on according to the parameters 513 and 516. Regardless of the battery values, a minimum of one and a maximum of 9 circulations are done per day. |
| 513_Circ time (A) | s | 1 | 3600 | 300 | Run time for electrolyte circulation (per circulation run) |
| 516_Circ Qd (A) | % | 0,1 | 50 | 10 | Electrolyte circulation is started as soon as the battery is charged to the relevant ampere hour capacity (cumulative) |
| 517_BsTstop (A)+(R) | min | 0 | 60 | 5 | Configurable time period for level 2 battery preservation operation, during which the Sunny Island can check if an AC charging current >1A exists (see parameter "540_State Step2") |
| 518_tset full (A)+(R) | d | 1 | 180 | | Time span after which a full charge should be done 14.0 Gel 14.0 Lead Acid 14.0 NiCd |
| 519_tset equal (A)+(R) | d | 7 | 365 | | Time span after which an equalization charge should be done 90.0 Gel 90.0 Lead Acid 90.0 NiCd |

| "PARALL" (3+9) | | | | | |
|----------------------------------|------|-----------|-----|----------|--|
| Parameter designation | Unit | min | max | De-fault | Description |
| 520_U float (A*)+(R) | V | 1.39 | 2.4 | | Maintenance charge voltage per cell |
| | | | | 2.25 | Gel |
| | | | | 2.23 | Lead Acid |
| | | | | 1.50 | NiCd |
| 527_tcharge (A*)+(R) | min | 1 | 600 | | Charging time for normal charging |
| | | | | 120 | Gel |
| | | | | 90 | Lead Acid |
| | | | | 120 | NiCd |
| 528_tcharge full (A*)+(R) | h | 1 | 20 | | Charging time for full charge |
| | | | | 5.0 | Gel |
| | | | | 5.0 | Lead Acid |
| | | | | 5.0 | NiCd |
| 529_tcharge equal (A*)+(R) | h | 1 | 48 | | Charging time for equalization charge |
| | | | | 10 | Gel |
| | | | | 10 | Lead Acid |
| | | | | 8 | NiCd |
| 530_Ucharge (A*)+(R) | V | 1.39 | 2.5 | | Charging voltage for normal charge, per cell |
| | | | | | If an electrolyte circulation system is installed, the value should be reduced to 2.45 V (for Lead Acid batteries) |
| | | | | | The specifications of the battery manufacturer must be observed. |
| | | | | 2.40 | Gel |
| | 2.50 | Lead Acid | | | |
| | 1.64 | NiCd | | | |

| "PARALL" (3+9) | | | | | |
|---|------|------|-----|----------------------|--|
| Parameter designation | Unit | min | max | De-fault | Description |
| 531_Ucharge full (A*)+(R) | V | 1.39 | 2.5 | 2.40 2.50 1.64 | Charging voltage for full charge, per cell If an electrolyte circulation system is installed, the value should be reduced to 2.45 V (for Lead Acid batteries) The specifications of the battery manufacturer must be observed Gel Lead Acid NiCd |
| 532_Ucharge equal (A*)+(R) | V | 1.39 | 2.5 | 2.40 2.50 1.64 | Charging voltage for equalization charge, per cell The specifications of the battery manufacturer must be observed Gel Lead Acid NiCd |
| 533_Stdbby t beg (C)+(R) | h | 0 | 23 | 0 | Beginning of the time period (special time SZ), in which battery preservation operation is allowed (see "535_State Step1") |
| 534_Stdbby t end (C)+(R) | h | 0 | 23 | 0 | End of the time period (special time SZ), in which battery preservation operation is allowed (see "535_State Step1") |
| 535_State StopT (Firmware < 3.0) 535_State Step1 (Firmware > 3.0) (D)+(R) | | 0 | 10 | L2 | Setting the battery preservation operation Step 1 (see chapter 2.2.2. of the handbook): To preserve the batteries from deep discharge, the device switches to Standby mode for a definable period of time (see "533_Stdbby t beg", "534_Stdbby t end"). The Sunny Island runs normally outside this configured time period. Battery state (BAZ) at which battery preservation operation may begin: 0: L4 1: L3 2: L2 3: L1 4: N4 |

| "PARALL" (3+9) | | | | | |
|-----------------------|-----------|-----|------|----------|--|
| Parameter designation | Unit | min | max | De-fault | Description |
| | | | | | 5: N3 6: N2 7: N1 8: O1 9: O2 10: O3 Battery preservation operation requires a value of < 0 in the "310_Autostart" parameter. |
| 536_Fan on del (A) | min | 0 | 1440 | 1 | Switch-on delay for battery room ventilator "511_Bat Fan" must be set to "Installed" in order to use this setting. |
| 537_Fan off del (A) | min | 0 | 360 | 60 | Switch-off delay for battery room ventilator "511_Bat Fan" must be set to "Installed" in order to use this setting. |
| 538_lloss nom (A) | mA/100 Ah | 0 | -100 | | Specific leakage current of the battery during maintenance charging at 20 °C Typical values: -30 mA/100 Ah for new batteries -80 mA/100 Ah for heavily aged batteries This value is NOT automatically determined by the Sunny Island. Occasional manual adjustment can thus further optimize battery management. |
| | | | | -30 | Gel |
| | | | | -30 | Lead Acid |
| | | | | -55 | NiCd |
| 539_Line Resist (A) | mΩ | 0 | 500 | 0 | This setting optimizes the determination of the battery charge level. In single phase systems the lead resistance of the battery should be entered here. For multi-phase systems it can be more sensible to set this value to "Null". |

| "PARALL" (3+9) | | | | | |
|----------------------------|------|-----|-----|--------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| 540_State Step2 (D)+(R) | | | | L3 | <p>Setting battery preservation operation Step 2:</p> <p>When the battery becomes deeply discharged (battery charge level sinks below the value set in "535_State Step1") the Sunny Island enters standby mode to preserve the battery. Between 6 am and 6 pm, the device runs for (e.g.) 5 minutes (configurable using parameter "517_Bs Tstop") every four hours. If an AC charging current > 1 A is present, then the Sunny Island remains in operation. With a charging current < 1 A AC, the device returns to Standby mode.</p> <p>If Sunny Boys are installed in the system then, when battery charge level L4 is reached, battery preservation Step 2 is set. Without a Sunny Boy (see parameter setting "801_Sunny Boys: Not Installed") the device always remains in battery preservation operation Step 3 (Standby).</p> <p>Battery charge level at which battery preservation mode begins (see chapter 2.2.2. of the handbook):</p> <p>0: L4 1: L3 2: L2 3: L1 4: N4 5: N3 6: N2 7: N1 8: O1 9: O2 10: O3</p> <p>Battery preservation operation requires a value < 0 in the "310_Autostart" parameter.</p> |

| "PARALL" (3+9) | | | | | |
|-------------------------|------|-----|-----|--------------|--|
| Parameter designation | Unit | min | max | De- fault | Description |
| 541_ManChge Mod (A) | | | | NONE | Manual definition of the battery charging process is possible via: Equalize Float Full Normal None The value "None" appears in the display immediately after choosing the battery charging process. After the manually chosen charging process has finished, the device returns to normal battery management. |
| 601_GenSet Oper (A)+(R) | | 0 | 3 | 2 | <p>0: Auto: The generator is automatically started and stopped by the Sunny Island.</p> <p>1: Man. Start: Generator is immediately* started.</p> <p>2: Man. Stop: Generator is immediately* stopped.</p> <p>3: Man. Ackn: Waiting time because of fault or parameter settings is ended.</p> <p style="text-align: right;">*Defined delay times are maintained</p> |
| 602_GenSet Type (A) | | 0 | 5 | 0 | <p>0: NONE No generator is present in the stand-alone grid</p> <p>1: Grid forming Generator forms a mains grid</p> <p>3: Mains The Sunny Island is connected to a local electricity supplier mains grid</p> <p>4: BHKW-Mains The Sunny Island is operated together with the Ecopower CHP plant and a local electricity supplier mains grid.</p> |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|----------|---|
| Parameter designation | Unit | min | max | De-fault | Description |
| | | | | | 5: BHKW-Island The Sunny Island is operated together with the Ecopower CHP plant. |
| | | | | | 6: Mains form The Sunny Island is operated together with a mains grid generator and a local electricity supplier mains grid. |
| | | | | | 7: fast Grid form The generator forms a mains grid and switching between the generator and the Sunny Island occurs without interruption (special installation measures are necessary here). |
| | | | | | 8: fast Mains The Sunny Island is connected to a local electricity provider mains grid and switching between the grid formed by the Sunny Island and the local electricity supplier grid occurs without interruption (special installation measures are necessary here). |
| | | | | | 9: fast Mains form The Sunny Island is operated together a mains grid generator and a local electricity supplier mains grid. The switching occurs without interruption (special installation measures are necessary here). |
| | | | | | 10: Droop Gen Droop Mode active with generator |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|--------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| | | | | | 11: DroopMains Droop Mode active with mains grid connection 12: DrpGen-Mains Droop Mode active with generator and mains grid connection 13: BHKW-IsL-Therm |
| 603_GenSet Interf (A) | | 0 | 4 | 0 | 0: NONE The generator is not started by the Sunny Island 1: Type 1 Autostart, relays K1+ K2 2: Type 2 3 contact run/start Relays K1, K2, K5 3: Type 3 3 contact start/stop Relays K1, K2, K5 4: EcoPower Ecopower CHP plant (see chapter 16 of the installation and operating manual: Start phase sequences for different generator types) |
| 604_GenSet Ctrl (C) | | 0 | 3 | 0 | The Sunny Island reduces its current consumption in charging operation (RUN_I)... 0: OFF ...not 1: F_MAINS ...depending on the generator frequency 2: I_GEN ...depending on the maximum permissible generator current "607_lgen max" (current transformer required, see chapter 0) |

| "PARALL" (3+9) | | | | | |
|-----------------------|----------------------------|-----|------|----------|--|
| Parameter designation | Unit | min | max | De-fault | Description |
| | | | | | 3: BOTH ...depending on the generator frequency and current (current transformer required) |
| 605_GenStRetr (C) | | 1 | 30 | 3 | Maximum number of start attempts before entering "Fail Locked" status (see parameter "618_tGen failo"). The meter is reset after the minimum run time of the generator has passed. |
| 606_CurTrfRatio (A) | $\frac{A_{in}}{5 A_{out}}$ | 1 | 1000 | 5 | Current transformer ratio (in A per 5 A) for measuring the generator current |
| 607_tGen max (A)+(R) | A | 0 | 500 | 0 | Max. generator current (per phase) |
| 608_tGen switch (D) | msec | -40 | +40 | -10 | Time required to compensate for the switching time of the Sunny Island contactor (SIBPRETR). The optimized value will NOT exactly reflect the activation time of the contactor! |
| 610_tGen glow (C) | s | 1 | 180 | 15 | Time that the relays are controlled for pre-heating of the generator. |
| 611_tGen crank (C) | s | 1 | 60 | 10 | Time that the relays are controlled for starting the generator. |
| 612_tGen warm (C) | s | 1 | 900 | 15 | Generator warm up time |
| 613_tGen minrun (C) | min | 1 | 180 | 5 | Minimum generator run time |
| 614_tGen cool (C) | s | 60 | 900 | 60 | Generator run-down time |
| 615_tGen Stop (C) | s | 1 | 900 | 10 | Time that the relays are controlled for stopping the generator. |
| 616_tGen lock (C) | min | 1 | 180 | 5 | Once the generator has been stopped, the Sunny Island CANNOT restart it within this time period. (This time can be reduced using "Acknowledge" in the "GENSET" (2-2) menu) |

| "PARALL" (3+9) | | | | | |
|------------------------------|-------------|------------|------------|-----------------|---|
| Parameter designation | Unit | min | max | De-fault | Description |
| 617_tGen fail (C) | min | 1 | 180 | 5 | Once the generator has been stopped with a generator fault, the Sunny Island CANNOT restart it within this time period. (This time can be reduced using "Acknowledge" in the "GENSET" (2-2) menu) |
| 618_tGen failo (C) | h | 1 | 168 | 6 | Once the number of generator startup failures specified in "605_GenStRetr" has been reached, the Sunny Island CANNOT restart the generator within this time period. (This time can be reduced using "Acknowledge" in the "GENSET" (2-2) menu) |
| 625_PldL GenOn (A) | % | 0 | 100 | 0 | Switch-on threshold, in %, of the nominal power on a single phase for a power dependent generator start or for the power dependent relays (K5 or K6 only). If the relays are switched power-dependent then the parameters "705_Man K5" and/or "706_Man K6" must be set to "LOAD". |
| 626_PldL GenOff (A) | % | 0 | 100 | 0 | Switch-off threshold, in %, of the nominal power on a single phase for a power dependent generator start or for the power dependent relays (K5 or K6 only). If the relays are switched power-dependent then the parameters "705_Man K5" and/or "706_Man K6" must be set to "LOAD". |
| 627_PldS GenOn (A) | % | 0 | 100 | 0 | Switch-on threshold, in %, of the nominal power based on the total power in a three phase system for a power dependent generator start or for the power dependent relays (K5 or K6 only). If the relays are switched power-dependent then the parameters "705_Man K5" and/or "706_Man K6" must be set to "LOAD". |
| 628_PldS GenOff (A) | % | 0 | 100 | 0 | Switch-off threshold, in %, of the nominal power based on the total power in a three phase system for a power dependent generator start or for the power dependent relays (K5 or K6 only). If the relays are switched power-dependent then the parameters "705_Man K5" and/or "706_Man K6" must be set to "LOAD". |
| 629_TavgLdLx (A) | s | 5 | 60 | 10 | Messaging time for power calculations per phase (see "625_PldL GenOn" and "626_PldL GenOff") |
| 630_TavgLdSum (A) | min | 1 | 20 | 1 | Messaging time for total power calculations in three phase systems (see "627_PldS GenOn" and "628_PldS GenOff") |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-------|----------|---|
| Parameter designation | Unit | min | max | De-fault | Description |
| 631_PldLzMin (A) | % | 0 | 100 | 60 | Lower limit for the charge level at which the Ecopower CHP plant is always started. |
| 632_PldLzMax (A) | % | 0 | 100 | 85 | Upper limit for the charge level at which the Ecopower CHP plant is never started. |
| 633_PconsMin (A) | kW | 0 | 2 | 1 | Lower limit of the consumer power (total power over all three phases, determined over the time period defined in parameter "630_TavgLdSum") above which the Ecopower CHP plant is started, even though the charge level lies between "631_PldLzMin" and "632_PldLzMax". |
| 634_PconsMax (A) | kW | 0 | 10 | 3 | Upper limit for consumer power consumption (total power over all three phases, determined over the time period defined in parameter "630_TavgLdSum") at which the Ecopower CHP plant is started, even when the charge level lies at "632_PldLzMax". |
| 635_PchargeMax (A) | kW | 0 | 16 | 3 | Desired value for the charging power that the Sunny Island takes from the Ecopower CHP plant. |
| 636_PDump1 (A) | kW | 0 | 8 | 0,5 | Power rating of Dumpload 1 that must be connected to relay output K1 of the Sunny Island when operating connected to the Ecopower CHP plant ("701_Man K1" = Auto). |
| 637_PDump2 (A) | kW | 0 | 8 | 2 | Power rating of Dumpload 2 that must be connected to relay output K6 of the Sunny Island when operating connected to the Ecopower CHP plant ("706_Man K6" = Auto). |
| 638_PBHKWMin (A) | kW | 0 | 4 | 2 | Minimum Ecopower CHP plant power |
| 639_PBHKWMax (A) | kW | 0 | 10 | 4,7 | Maximum Ecopower CHP plant power |
| 640_BHKW_Ton (A) | s | 0 | 10000 | 300 | Minimum run time for the Ecopower CHP plant |
| 641_BHKW_Toff (A) | s | 0 | 10000 | 300 | Minimum pause time for the Ecopower CHP plant |
| 642_BHKW_Tmax (A) | s | 0 | 20000 | 0 | Maximum run time of the Ecopower CHP plant in mode 2 (rapid control) |

| "PARALL" (3+9) | | | | | | | | | | | |
|--|--|------|-------|----------|--|---------|--|----------|--|-------|--|
| Parameter designation | Unit | min | max | De-fault | Description | | | | | | |
| 644_PldOnLx (A) | W | 0 | 15000 | 0 | Requirements of the Ecopower CHP plant in the case of excessive loading on a single phase | | | | | | |
| 645_RevPower (A) | kW | -100 | 100 | -0,5 | Limits the power that may be delivered to the mains grid or the generator. If the reverse power exceeds this value, then the generator/mains grid is disconnected and the Sunny Island switches to RUN_U mode. Once the mains grid is again operating normally, the Sunny Island again connects to the mains grid (RUN_UEXT) after a specified time (see parameter "429_GrdValTime"). | | | | | | |
| 646_PDump3 (A) | W | 0 | 8000 | 4500 | Power rating of Dumpload 3 that must be connected to relay output K2, while the Ecopower CHP plant is operating ("702_Man K2" = Auto). | | | | | | |
| 647_ClustMode (Firmware < 3.0) 427_ClustMode (Firmware > 3.0) | | | | OFF | Setting for systems with a generator and more than one cluster. Allows communication between several clusters and creates a master hierarchy so that only one Sunny Island assumes control of the generator. The parameter must be set as follows in the individual Sunny Islands: <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding-left: 20px;">SupMstr</td> <td>Sunny Island (master) of a cluster, and assumes the control of the generator</td> </tr> <tr> <td style="padding-left: 20px;">ClstMstr</td> <td>Sunny Islands (Master) of the remaining clusters</td> </tr> <tr> <td style="padding-left: 20px;">Reptr</td> <td>All Sunny Islands of the individual clusters that are configured with Slave2, perform cluster communications between each other. The devices are connected to each other with a communications cable and set to the "Reptr" parameter.</td> </tr> </table> | SupMstr | Sunny Island (master) of a cluster, and assumes the control of the generator | ClstMstr | Sunny Islands (Master) of the remaining clusters | Reptr | All Sunny Islands of the individual clusters that are configured with Slave2, perform cluster communications between each other. The devices are connected to each other with a communications cable and set to the "Reptr" parameter. |
| SupMstr | Sunny Island (master) of a cluster, and assumes the control of the generator | | | | | | | | | | |
| ClstMstr | Sunny Islands (Master) of the remaining clusters | | | | | | | | | | |
| Reptr | All Sunny Islands of the individual clusters that are configured with Slave2, perform cluster communications between each other. The devices are connected to each other with a communications cable and set to the "Reptr" parameter. | | | | | | | | | | |

| "PARALL" (3+9) | | | | | |
|--------------------------|------|-----|-----|--------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| 648_ReactCtrl (C)+(R) | | | | | <p>Control of the Sunny Island power factor compensation in "Droop Mode"</p> <p>CONV = yes</p> <p>NONE = no, no power factor compensation</p> <p>If a CHP plant is used as a generator, then "648_ReactCtrl" is ignored and power factor compensation is done by the Sunny Island.</p> |
| 701_Man K1 (A)+(R) | | 0 | 11 | 0 | <p>Operating mode of the K1 relay</p> <p>0: OFF Switch-off relay K1</p> <p>1: ON Switch-on relay K1</p> <p>2: AUTO The Sunny Island automatically controls relay K1.</p> <p>3: RUN Relay is only switched on when the Sunny Island is working.</p> <p>4: RUN_I Relay is only switched on when the Sunny Island is working with the mains grid or generator.</p> <p>5: RUN_U Relay is only switched on when the Sunny Island is working as a grid forming device.</p> <p>6: SYNC_HD Relay is switched during the transition from "grid forming" → "grid parallel".</p> <p>7: SYNC_TK Relay is switched during the transition from "grid parallel" → "grid forming".</p> |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|--------------|---|
| Parameter designation | Unit | min | max | De- fault | Description |
| | | | | | <p>8: SYNC_HDTK Relay is switched during the transition from "grid parallel" ↔ "grid forming".</p> <p>9: RUN_UEXT Relay is only switched on when the Sunny Island is working with the mains grid or generator in Droop Mode.</p> <p>10: LOAD The relays are switched depending on the load (s. 625 - 630)</p> |
| 702_Man K2 (A) | | 0 | 11 | 0 | Relays K1 to K8 are controlled in a unified manner. The possible parameter settings for relay K2 reflect the operating mode of relay K1 (see "701_Man K1"). |
| 703_Man K3 (A) | | 0 | 11 | 0 | Relays K1 to K8 are controlled in a unified manner. The possible parameter settings for relay K3 reflect the operating mode of relay K1 (see "701_Man K1"). |
| 704_Man K4 (A) | | 0 | 11 | 0 | Relays K1 to K8 are controlled in a unified manner. The possible parameter settings for relay K4 reflect the operating mode of relay K1 (see "701_Man K1"). |
| 705_Man K5 (A) | | 0 | 11 | 0 | Relays K1 to K8 are controlled in a unified manner. The possible parameter settings for relay K5 reflect the operating mode of relay K1 (see "701_Man K1"). |
| 706_Man K6 (A)+(R) | | 0 | 11 | 0 | Relays K1 to K8 are controlled in a unified manner. The possible parameter settings for relay K6 reflect the operating mode of relay K1 (see "701_Man K1"). |
| 707_Man K7 (A) | | 0 | 11 | 0 | Relays K1 to K8 are controlled in a unified manner. The possible parameter settings for relay K7 reflect the operating mode of relay K1 (see "701_Man K1"). |
| 708_Man K8 (A) | | 0 | 11 | 0 | Relays K1 to K8 are controlled in a unified manner. The possible parameter settings for relay K8 reflect the operating mode of relay K1 (see "701_Man K1"). |

| "PARALL" (3+9) | | | | | |
|----------------------------|------|-----|-----|--------------|--|
| Parameter designation | Unit | min | max | De- fault | Description |
| 710_K1 t2 begin (C)+(R) | h | 0 | 23 | 0 | Start of special time period t2 for K1 |
| 711_K1 t2 end (C)+(R) | h | 0 | 23 | 0 | Start of special time period t2 for K1 |
| 712_K1 On t1 (D)+(R) | | 0 | 10 | 4 | <p>The battery state that must be reached before K1 is switched on:</p> <p>0: L4 Deep discharge</p> <p>1: L3</p> <p>2: L2</p> <p>3: L1</p> <p>4: N4</p> <p>5: N3</p> <p>6: N2</p> <p>7: N1 Battery full</p> <p>8: O1 Overcharged</p> <p>9: O2</p> <p>10: O3</p> |
| 713_K1 Off t1 (D)+(R) | | 0 | 10 | 6 | <p>The battery state that must be reached before K1 is switched off:</p> <p>0: L4 Deep discharge</p> <p>1: L3</p> <p>2: L2</p> <p>3: L1</p> <p>4: N4</p> <p>5: N3</p> <p>6: N2</p> <p>7: N1 Battery full</p> <p>8: O1 Overcharged</p> <p>9: O2</p> |

| "PARALL" (3+9) | | | | | |
|------------------------------|-------------|------------|------------|----------------------|--|
| Parameter designation | Unit | min | max | De- fault | Description |
| | | | | | 10: 03 |
| 714_K1 On t2 (D)+(R) | | 0 | 10 | 3 | Switch-on threshold for K1 within the special time period t2 (compare with 712) |
| 715_K1 Off t2 (D)+(R) | | 0 | 10 | 7 | Switch-off threshold for K1 within the special time period t2 (compare with 713) |
| 716_K2 t2 begin (C) | h | 0 | 23 | 0 | Start of special time period t2 for K2 (compare with 710) |
| 717_K2 t2 end (C) | h | 0 | 23 | 0 | End of special time period t2 for K2 (compare with 711) |
| 718_K2 On t1 (D) | | 0 | 10 | 5 | Switch-on threshold for K2 (compare with 712) |
| 719_K2 Off t1 (D) | | 0 | 10 | 5 | Switch-off threshold for K2 (compare with 713) |
| 720_K2 On t2 (D) | | 0 | 10 | 5 | Switch-on threshold for K2 within the special time period t2 (compare with 714) |
| 721_K2 Off t2 (D) | | 0 | 10 | 5 | Switch-off threshold for K2 within the special time period t2 (compare with 715) |
| 722_K3 t2 begin (C) | h | 0 | 23 | 0 | Start of special time period t2 for K3 (compare with 710) |
| 723_K3 t2 end (C) | h | 0 | 23 | 0 | End of special time period t2 for K3 (compare with 711) |
| 724_K3 On t1 (D) | | 0 | 10 | 5 | Switch-on threshold for K3 (compare with 712) |
| 725_K3 Off t1 (D) | | 0 | 10 | 5 | Switch-off threshold for K3 (compare with 713) |
| 726_K3 On t2 (D) | | 0 | 10 | 5 | Switch-on threshold for K3 within the special time period t2 (compare with 714) |
| 727_K3 Off t2 (D) | | 0 | 10 | 5 | Switch-off threshold for K3 within the special time period t2 (compare with 715) |
| 728_K4 t2 begin (C) | h | 0 | 23 | 0 | Start of special time period t2 for K4 (compare with 710) |
| 729_K4 t2 end (C) | h | 0 | 23 | 0 | End of special time period t2 for K4 (compare with 711) |

| "PARALL" (3+9) | | | | | |
|-------------------------|------|-----|-----|----------|--|
| Parameter designation | Unit | min | max | De-fault | Description |
| 730_K4 On t1 (D) | | 0 | 10 | 5 | Switch-on threshold for K4 (compare with 712) |
| 731_K4 Off t1 (D) | | 0 | 10 | 5 | Switch-off threshold for K4 (compare with 713) |
| 732_K4 On t2 (D) | | 0 | 10 | 5 | Switch-on threshold for K4 within the special time period t2 (compare with 714) |
| 733_K4 Off t2 (D) | | 0 | 10 | 5 | Switch-off threshold for K4 within the special time period t2 (compare with 715) |
| 734_K5 t2 begin (C) | h | 0 | 23 | 0 | Start of special time period t2 for K5 (compare with 710) |
| 735_K5 t2 end (C) | h | 0 | 23 | 0 | End of special time period t2 for K5 (compare with 711) |
| 736_K5 On t1 (D) | | 0 | 10 | 5 | Switch-on threshold for K5 (compare with 712) |
| 737_K5 Off t1 (D) | | 0 | 10 | 5 | Switch-off threshold for K5 (compare with 713) |
| 738_K5 On t2 (D) | | 0 | 10 | 5 | Switch-on threshold for K5 within the special time period t2 (compare with 714) |
| 739_K5 Off t2 (D) | | 0 | 10 | 5 | Switch-off threshold for K5 within the special time period t2 (compare with 715) |
| 740_K6 t2 begin (C)+(R) | h | 0 | 23 | 0 | Start of special time period t2 for K6 (compare with 710) |
| 741_K6 t2 end (C)+(R) | h | 0 | 23 | 0 | End of special time period t2 for K6 (compare with 711) |
| 742_K6 On t1 (D)+(R) | | 0 | 10 | 5 | Switch-on threshold for K6 (compare with 712) |
| 743_K6 Off t1 (D)+(R) | | 0 | 10 | 5 | Switch-off threshold for K6 (compare with 713) |
| 744_K6 On t2 (D)+(R) | | 0 | 10 | 5 | Switch-on threshold for K6 within the special time period t2 (compare with 714) |
| 745_K6 Off t2 (D)+(R) | | 0 | 10 | 5 | Switch-off threshold for K6 within the special time period t2 (compare with 715) |
| 746_K7 t2 begin (C) | h | 0 | 23 | 0 | Start of special time period t2 for K7 (compare with 710) |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|----------|---|
| Parameter designation | Unit | min | max | De-fault | Description |
| 747_K7 t2 end (C) | h | 0 | 23 | 0 | End of special time period t2 for K7 (compare with 711) |
| 748_K7 On t1 (D) | | 0 | 10 | 5 | Switch-on threshold for K7 (compare with 712) |
| 749_K7 Off t1 (D) | | 0 | 10 | 5 | Switch-off threshold for K7 (compare with 713) |
| 750_K7 On t2 (D) | | 0 | 10 | 5 | Switch-on threshold for K7 within the special time period t2 (compare with 714) |
| 751_K7 Off t2 (D) | | 0 | 10 | 5 | Switch-off threshold for K7 within the special time period t2 (compare with 715) |
| 752_K8 t2 begin (C) | h | 0 | 23 | 0 | Start of special time period t2 for K8 (compare with 710) |
| 753_K8 t2 end (C) | h | 0 | 23 | 0 | End of special time period t2 for K8 (compare with 711) |
| 754_K8 On t1 (D) | | 0 | 10 | 5 | Switch-on threshold for K8 (compare with 712) |
| 755_K8 Off t1 (D) | | 0 | 10 | 5 | Switch-off threshold for K8 (compare with 713) |
| 756_K8 On t2 (D) | | 0 | 10 | 5 | Switch-on threshold for K8 within the special time period t2 (compare with 714) |
| 757_K8 Off t2 (D) | | 0 | 10 | 5 | Switch-off threshold for K8 within the special time period t2 (compare with 715) |
| 801_Sunny Boys (A) | | 0 | 3 | 0 | <p>0: Not installed The Sunny Island does not control any Sunny Boys.</p> <p>1: Installed The Sunny Island controls Sunny Boys.</p> <p>2: Inst. Mains Sunny Island only controls Sunny Boys when no mains feed can occur.</p> |

| "PARALL" (3+9) | | | | | |
|-----------------------|------|-----|-----|----------|---|
| Parameter designation | Unit | min | max | De-fault | Description |
| | | | | | <p>3: Frequency The Sunny Island controls the Sunny Boys using the mains grid frequency (this process only functions when the firmware of the Sunny Boys is above a certain level).</p> <p>If "not installed" is set, when the battery charge status reaches an appropriate level, constant battery preservation operation - Step 3 - is possible (see chapter 2.2.2. of the handbook).</p> |

5 Overview: Displayed measurement values

| "DATSYS" (1-1), password level 0 | | | | | |
|----------------------------------|------|-----|-----|---------|--|
| Parameter designation | Unit | min | max | Default | Description |
| SN | | | | | Device serial number |
| Vers | | | | | Firmware versions of the BFR and the DSP |
| UP | h | 0.0 | | | Operation hours |

All measurement values displayed by the device are listed in the following table. The display values marked with

- (R): are also visible via (e.g.) the Sunny Data Control. Recording of these channels is possible with the Sunny Boy Control.

In the table header you will find the menu (e.g. "DATALL") and the password level required to access the data.

Newly added/corrected display values are shaded in the table.

| "DATALL" (1-2), password: user level 0 | | | | | |
|--|------|-----|-----|---------|---|
| Parameter designation | Unit | min | max | Default | Description |
| Mode (R) | | 0 | 13 | 2 | Current operating status 0 INIT Initialization 1 INIT Initialization 2 STANDBY Wait status 3 SLAVE Slave mode (three-phase operation) 4 STARTUP Start 5 RUN_U Inverter operation (stand-alone grid) 6 RUN_UEXT Generator/mains grid connected in Droop operation |

| "DATALL" (1-2), password: user level 0 | | | | | | | |
|--|------|------|-----|---------|--|--------------|---|
| Parameter designation | Unit | min | max | Default | Description | | |
| | | | | | 7 | RUN_I | Charging operation on mains grid or generator |
| | | | | | 8 | GEN_MAN U | man. generator start has been recognized |
| | | | | | 9 | HD_CTRL | Transfer from RUN_U to RUN_I |
| | | | | | 10 | TK_CTRL | Transfer from RUN_I to RUN_U |
| | | | | | 11 | SHUTDOWN | Power down |
| | | | | | 12 | ERRSHDW N | Power down due to fault |
| | | | | | 13 | Disturbance | Fault status |
| Batt. Ah In | Ah | | | | Ah into the batteries (Energy meter) | | |
| Batt. Ah Out | Ah | | | | Ah out of the batteries (Energy meter) | | |
| E_Total_In (R) | Wh | | | | AC-side input energy (energy meter) | | |
| E_Total_Out (R) | Wh | | | | AC-side output energy (energy meter) | | |
| Energy Count | sec | | | | Run time energy meter | | |
| Up Time | h | | | | The time passed since the last switch-on ("Up Time") | | |
| Pconv Sum (R) | kW | -320 | 320 | 0 | Mains grid total effective power SI (three phases) | | |
| Qconv Sum | kVar | -320 | 320 | 0 | Mains grid total power factor compensation SI (three phases) | | |
| Sconv Xum | kVA | -320 | 320 | 0 | Mains grid total apparent power SI (three phases) | | |
| Iconv Sum (R) | A | 0 | 640 | 0 | Inverter current (three phases) | | |

| "DATALL" (1-2), password: user level 0 | | | | | |
|--|------|------|-----|---------|---|
| Parameter designation | Unit | min | max | Default | Description |
| Pext Sum (R) | kW | -320 | 320 | 0 | Generator total effective power (three phases) If an Ecopower mini CHP plant is installed, this is the total of the power from the Sunny Island and the CHP plant, as transmitted over COM3 to the Sunny Island. |
| Pext L2 (R) | kW | -320 | 320 | 0 | Generator effective power on phase 2 |
| Pext L3 (R) | kW | -320 | 320 | 0 | Generator effective power on phase 3 |
| Iext Sum | A | 0 | 640 | 0 | Total generator current (three phases) |
| Uconv 2 | V | 0 | 500 | 0 | Slave 2 voltage |
| Uconv 3 | V | 0 | 500 | 0 | Slave 3 voltage |
| Pconv (Psi L1) (R) | kW | -320 | 320 | | Mains grid effective power for Sunny Island phase 1 |
| Psi L2 (R) | kW | -320 | 320 | | Mains grid effective power for Sunny Island phase 2 |
| Psi L3 (R) | kW | -320 | 320 | | Mains grid effective power for Sunny Island phase 3 |
| Bat State (R) | | L4 | O3 | L1 | Present battery state: 0 L4 deep-cycle discharge 1 L3 2 L2 3 L1 4 N4 5 N3 6 N2 7 N1 battery full 8 O1 overcharge 9 O2 10 O3 |

| "DATALL" (1-2), password: user level 0 | | | | | |
|--|------|------|-----|---------|--|
| Parameter designation | Unit | min | max | Default | Description |
| SOC act (R) | % | -100 | 110 | 0 | Battery charging status |
| Pbat Sum | kW | -32 | 32 | 0 | Sunny Island total battery power (three phases) |
| Ibat Sum (R) | A | -320 | 320 | 0 | Sunny Island total battery current (three phases) |
| GenState (R) | | 0 | 10 | 0 | Generator state: 0 = none Not active 1 = off Off 2 = glow Preheat 3 = crank Start 4 = warm Warmup 5 = run Operation 6 = cool Run down 7 = Stop Stop 8 = lock Locked after operation 9 = fail Faults 10 = fail_lock Locked after multiple faults |
| GenFail | | 0 | 6 | 0 | Generator fault status: 0 = none No fault 1 = F_crank Fault when starting 2 = F_warm Fault during warmup 3 = F_run Fault during operation 4 = F_Runlim Limits for generator frequency, voltage or reverse current have been exceeded. |

| "DATALL" (1-2), password: user level 0 | | | | | |
|--|------|------|-----|---------|---|
| Parameter designation | Unit | min | max | Default | Description |
| | | | | | 5 = F_cool Fault during run-down |
| | | | | | 6 = F_Stop Fault while stopping (could not be stopped) |
| GenReqSrc (R) | | | | 0 | Generator requested by: 0: --- (=None, i.e. generator not requested) 1: Cluster 2: Load 3: Bat State 4: Manual 5: Detected (external start) |
| K1 State (R) | | 0 | 1 | 0 | Relay state 0 = off 1 = on |
| K2 State (R) | | 0 | 1 | 0 | Relay state |
| K3 State (R) | | 0 | 1 | 0 | Relay state |
| K4 State (R) | | 0 | 1 | 0 | Relay state |
| K5 State (R) | | 0 | 1 | 0 | Relay state |
| K6 State (R) | | 0 | 1 | 0 | Relay state |
| K7 State (R) | | 0 | 1 | 0 | Relay state |
| K8 State (R) | | 0 | 1 | 0 | Relay state |
| SB Step | % | -100 | 100 | 0 | Present step value for Sunny Boy shutdown (over COM2) |

| "DATALL" (1-2), password: user level 0 | | | | | |
|--|------|------|-----|---------|--|
| Parameter designation | Unit | min | max | Default | Description |
| Egen In (R) | Wh | | | | Energy into the generator (energy metering) |
| Egen Out (R) | Wh | | | | Energy out of the generator (energy metering) |
| h - Gen (R) | sec | | | | Generator hours of operation |
| Fext (R) | Hz | 0 | 100 | 0 | Present frequency at the Diesel U input |
| Uext eff (R) | V | 0 | 500 | 0 | Effective voltage at Diesel U input |
| Iext eff | A | 0 | 500 | 0 | Present generator current (from converter) |
| Pext (R) | kW | -320 | 320 | 0 | Present generator effective power When an Ecopower mini CHP plant is installed, this is the power from the CHP plant to the Sunny Island, as transmitted over COM3. |
| Ubat mean (R) | V | 0 | 200 | 0 | Mean battery voltage |
| Ibat mean | A | -150 | 150 | 0 | Mean battery current |
| Pbat mean | kW | -32 | 32 | 0 | Mean battery power |
| Tbat mean (R) | °C | -25 | 125 | 0 | Mean battery temperature |
| Vzw Cuk mean | V | 0 | 500 | 0 | Mean intermediate circuit voltage |
| Tcuk mean (R) | °C | -50 | 170 | 0 | Heatsink temperature |
| Trafo mean (R) | °C | -50 | 170 | 0 | Transformer temperature |
| Fconv (R) | Hz | 0 | 100 | 0 | Current grid frequency |
| Uconv eff (R) | V | 0 | 500 | 0 | Present actual mains grid voltage |
| Iconv eff | A | 0 | 320 | 0 | Effective mains current |
| Pconv (R) | kW | -32 | 32 | 0 | Sunny Island mains grid effective power |

| "DATALL" (1-2), password: user level 0 | | | | | |
|--|----------------------------|------|-------|---------|--|
| Parameter designation | Unit | min | max | Default | Description |
| Sconv | kVA | -32 | 32 | 0 | Sunny Island mains grid apparent power |
| Qconv | kvar | -32 | 32 | 0 | Sunny Island mains grid power factor |
| Tconv mean (R) | °C | -50 | 170 | 0 | Heatsink temperature |
| Uchg act (R) | V | 0 | 200 | 0 | Desired battery charging voltage |
| Cbat act (R) | Ah | 50 | 10000 | 100 | Present capacity |
| SOC diff AHB | % | 0 | 100 | 50 | Charge level error calibrated via a full charge |
| Qdn full | -10000 bis 10000 Ah/100 Ah | | | 0 | Charging throughput (discharge) since the last full charge |
| Qdn equal | -10000 bis 10000 Ah/100 Ah | | | 0 | Charging throughput (discharge) since the last equalization charge |
| tpast full | d | 0 | 3700 | 0 | Time since the last full charge |
| tpast equal | d | 0 | 3700 | 0 | Time since the last equalization charge |
| Tabso rb Left | h | 0 | 10 | 0 | Time remaining for currently executing battery charging process |
| ChargeOper (R) | | 0 | 5 | 1 | State of the battery management process (charging) 1 = None LSV state BMS 2 = Normal Normal charge 3 = Full Full charge 4 = Float Maintenance charge 5 = Equalize Equalization charge |
| SOC diff (R) | % | 0 | 100 | 50 | Uncertainty in the charge level calculations |
| SOC AHG | % | -100 | 110 | 50 | Charge level calibrated via full charge |
| SOC RSK | % | -100 | 110 | 50 | Charge level calibrated via open-circuit voltage |

| "DATBAT" (1+3), password: Installer level 1 | | | | | | | |
|---|-------|------|-----|---------|---|----|----------------------|
| Parameter designation | Unit | min | max | Default | Description | | |
| Bat State (R) | | 0 | 10 | 0 | Present battery state: | | |
| | | | | | 0 | L4 | deep-cycle discharge |
| | | | | | 1 | L3 | |
| | | | | | 2 | L2 | |
| | | | | | 3 | L1 | |
| | | | | | 4 | N4 | |
| | | | | | 5 | N3 | |
| | | | | | 6 | N2 | |
| | | | | | 7 | N1 | battery full |
| | | | | | 8 | O1 | overcharge |
| | | | | | 9 | O2 | |
| 10 | O3 | | | | | | |
| SOC act (R) | % | -100 | 110 | 0 | Battery charging status | | |
| Ubat mean (R) | V | 0 | 200 | 0 | Mean battery voltage | | |
| Uchrg act (R) | V | 0 | 200 | 0 | Desired battery voltage | | |
| Ibat mean | A | -150 | 150 | 0 | Mean battery current | | |
| Ibat Sum (R) | A | -320 | 320 | 0 | Sunny Island battery current sum (three phases) | | |
| Tbat mean (R) | deg C | -25 | 125 | 0 | Mean battery temperature | | |
| Pbat mean | kW | -32 | 32 | 0 | Mean battery power | | |
| Pbat Sum | kW | -32 | 32 | 0 | Sunny Island total battery power (three phases) | | |
| SOC RSK | % | -100 | 110 | 50 | Charge level calibrated via open-circuit voltage | | |
| SOC diff RSK | % | 0 | 100 | 50 | Fault SOC calibrated via the open-circuit voltage | | |

| "DATBAT" (1+3), password: Installer level 1 | | | | | |
|---|----------------------------|-----|-------|---------|--|
| Parameter designation | Unit | min | max | Default | Description |
| Cbat act (R) | Ah | 50 | 10000 | 100 | Present capacity |
| Qdn full | -10000 bis 10000 Ah/100 Ah | | | 0 | Charging throughput (discharge) since the last full charge |
| Qdn equal | -10000 bis 10000 Ah/100 Ah | | | 0 | Charging throughput (discharge) since the last equalization charge |
| Tabsorb Left | h | 0 | 10 | 0 | Time remaining for currently executing battery charging process |
| tpast full | d | 0 | 3700 | 0 | Time since the last full charge |
| tpast equal | d | 0 | 3700 | 0 | Time since the last equalization charge |
| t Uconst chg | h | 0 | 10 | 0 | Time for constant V phase in normal charging |
| t Uconst full | h | 0 | 20 | 0 | Time for constant V phase in full charging |
| t Uconst equal | h | 0 | 40 | 0 | Time for constant V phase in full charging |
| Charge Oper (R) | | 0 | 5 | 1 | State of the battery management process (charging) 1 = None LSV State BMS 2 = Normal Normal charge 3 = Full Full charge 4 = Float Maintenance charge |
| | | | | | 5 = Equalize Equalization charge |
| SOC AHB | | | | | Charge level calibrated via full charge |

| "DATGRD" (1+4), password: Installer level 1 | | | | | |
|---|------|-----|-----|---------|-----------------------------------|
| Parameter designation | Unit | min | max | Default | Description |
| Uconv eff (R) | V | 0 | 500 | 0 | Present actual mains grid voltage |
| Fconv (R) | Hz | 0 | 100 | 0 | Current grid frequency |
| Iconv eff | A | 0 | 320 | 0 | Effective mains current |

| "DATGRD" (1+4), password: Installer level 1 | | | | | |
|--|-------------|------------|------------|----------------|--|
| Parameter designation | Unit | min | max | Default | Description |
| Iconv Sum (R) | A | 0 | 640 | 0 | Inverter current (three phases) |
| Pconv (R) | kW | -32 | 32 | 0 | Sunny Island mains grid effective power |
| Pconv Sum (R) | kW | -320 | 320 | 0 | Sunny Island mains grid total effective power (three phases) |
| Qconv | kvar | -32 | 32 | 0 | Sunny Island mains grid power factor |
| Qconv Sum | kvar | -320 | 320 | 0 | Sunny Island total mains grid power factor (three phases) |
| Sconv | kVA | -32 | 32 | 0 | Sunny Island mains grid apparent power |
| Sconv Sum | kVA | -320 | 320 | 0 | Sunny Island mains grid total apparent power (three phases) |
| Uext eff (R) | V | 0 | 500 | 0 | Effective voltage at Diesel U input |
| Fext (R) | Hz | 0 | 100 | 0 | Present frequency at the Diesel U input |
| Iext eff | A | 0 | 500 | 0 | Present generator current (from converter) |
| Iext Sum | A | 0 | 640 | 0 | Total generator current (three phases) |
| Pext (R) | kW | -320 | 320 | 0 | Present generator effective power |
| Pext Sum (R) | kW | -320 | 320 | 0 | Generator total effective power (three phases) |

6 Fault and status messages

The following list provides an overview of the possible Sunny Island fault and status messages. These are used (e.g.) in the "DIAG" menu branch or are briefly directly shown in the display in the case of an acute fault.

The status messages allow determination of the status of the system and also assist in optimum configuration of the system settings.

If fault messages repeatedly appear in the display - which cannot be properly explained (e.g. through operator mistakes) - please note the fault message and contact the manufacturer.

The fault and status messages are readable over the special service interface (COM3). Please pay attention to the published description: "Reading the parameter settings, fault history and event logs of the Sunny Island", document number SI-DATA-BFR_50-11:FD0703.

Newly added/corrected messages are shaded in the table.

6.1 Fault messages

| No. | Ackn | Display | Cause |
|---------------|------|-----------------------|--|
| A0001, A0002 | | Internal Error | Comparison data is not correct |
| A0003 | x | Internal Error | Fault during hardware test |
| A0004 | | Internal Error | Watchdog Reset |
| A0005 | x | Internal Error | Fault during startup |
| A0006 | x | Internal Error | Flash memory data is incorrect |
| A0007 - A0011 | | Internal Error | Plausability limits exceeded |
| A0012 | x | Internal Error | Regulation fault |
| A0013 - A0022 | x | Internal Error | Limit values exceeded (DC side) |
| A0023 - A0031 | x | Internal Error | Limit values exceeded (AC side) |
| A0027 | x | AC current limitation | Current limits exceeded, based on seconds |
| A0032 - A0037 | | Internal Error | Plausability limits exceeded for internal measurements |
| A0038 | x | Internal Error | DSP timeout |
| A0039 | | Overtemp Battery | Maximum battery temperature exceeded (parameter) |

| No. | Ackn | Display | Cause |
|-------|------|-------------------------|---|
| A0040 | x | Critical Battery State | Critical battery state - battery state lies below the limit value L4 or a parameter value |
| A0041 | | Battery Temp Sense fail | Battery temperature sensor faulty (open circuit, short circuit) |
| A0042 | | Battery Voltage Low | Battery voltage is too low |
| A0043 | | Battery Voltage High | Battery voltage is too high |
| A0044 | | High Grid Volt | Mains grid voltage is too high (parameter or fixed DSP limit) |
| A0045 | | Low Grid Volt | Mains grid voltage is too low (parameter or fixed DSP limit) |
| A0046 | | High Grid Freq | Mains grid frequency is too high (parameter or fixed DSP limit) |
| A0047 | | Low Grid Freq | Mains grid frequency is too low (parameter or fixed DSP limit) |
| A0048 | x | Unexp Grid State | Unexpected mains voltage / frequency at inverter input |
| A0049 | x | Contact or Fuse | Mains grid relay fault or broken fuse |
| A0050 | x | Sync error | Switching of operating mode did not succeed |
| A0051 | | Genset start failed | Generator start did not succeed |
| A0052 | | Genset Reverse Power | Energy was fed back into the generator |
| A0053 | | Sync signal failed | DSP sync signal dropped out |
| A0054 | | SI Communication error | Communications failure in interconnected operation (COM1) |
| A0055 | | Slave Errors | One of the slave devices reported a fault |
| A0056 | | Ovrld OFF | A short circuit was detected on the mains grid side while operating in mains mode (reverse current into the mains grid) |

Table 6.4: Fault messages

6.2 Status messages

| No. | Message | Description |
|--------|--------------------|---|
| E0001 | Reset | Restart of the system |
| E0002 | Set Date/Time | The date and time were set |
| E0003 | Inval EE SIH | Invalid comparison data detected - device is using the default values |
| E0004 | Inval EE CNV | Invalid comparison data detected - device is using the default values |
| E0005 | Inval EE CUK | Invalid comparison data detected - device is using the default values |
| E0006 | Parameter Default | Parameter set to the default value |
| E0007 | BMS: New System | Restart of the battery management system via "New System", 'learned' values about the battery properties have been reset |
| E0008 | BMS: New Battery | Restart of the battery management system via "New Battery", 'learned' values about the battery properties have been reset |
| E0009 | BMS: Restart | Restart, the battery management system continues to use the 'learned' values about the battery properties |
| E00095 | BMS: Emerg. Charge | Emergency charging operation |
| E0012 | SYSINIT | Initialization state |
| E0014 | STANDBY | Standby operating mode |
| E0015 | SLAVE | The device has been reconfigured as a slave |
| E0016 | STARTUP | Startup process |
| E0017 | RUN_U | Grid forming operation |
| E0018 | RUN_UEXT | "Grid parallel" operation in "Droop Mode" |
| E0019 | RUN_I | "Grid parallel" operation |
| E0020 | GEN_MANU | A running generator was recognized at startup |
| E0021 | SYNC_HD | Transfer from RUN_U to RUN_I |
| E0022 | SYNC_TK | Transfer from RUN_I to RUN_U |
| E0023 | SHUTDOWN | Transfer to Standby mode |
| E0024 | ERRSHDWN | Transfer to Standby mode due to a fault |
| E0025 | Disturbance | Fault status |
| E0026 | MANUAL | "Manual" mode of operation |
| E0027 | Bat L4 | Battery state (BAZ) L4 reached |
| E0028 | Bat L3 | Battery state (BAZ) L3 reached |
| E0029 | Bat L2 | Battery state (BAZ) L2 reached |
| E0030 | Bat L1 | Battery state (BAZ) L1 reached |
| E0031 | Bat N4 | Battery state (BAZ) N4 reached |
| E0032 | Bat N3 | Battery state (BAZ) N3 reached |

| No. | Message | Description |
|-------|-----------------------|---|
| E0033 | Bat N2 | Battery state (BAZ) N2 reached |
| E0034 | Bat N1 | Battery state (BAZ) N1 reached |
| E0035 | Bat O1 | Battery state (BAZ) O1 reached |
| E0036 | Bat O2 | Battery state (BAZ) O2 reached |
| E0037 | Bat O3 | Battery state (BAZ) O3 reached |
| E0038 | K1 ON | Relay K1 is switched on |
| E0039 | K1 OFF | Relay K1 is switched off |
| E0040 | K2 ON | Relay K2 is switched on |
| E0041 | K2 OFF | Relay K2 is switched off |
| E0042 | K3 ON | Relay K3 is switched on |
| E0043 | K3 OFF | Relay K3 is switched off |
| E0044 | K4 ON | Relay K4 is switched on |
| E0045 | K4 OFF | Relay K4 is switched off |
| E0046 | K5 ON | Relay K5 is switched on |
| E0047 | K5 OFF | Relay K5 is switched off |
| E0048 | K6 ON | Relay K6 is switched on |
| E0049 | K6 OFF | Relay K6 is switched off |
| E0050 | K7 ON | Relay K7 is switched on |
| E0051 | K7 OFF | Relay K7 is switched off |
| E0052 | K8 ON | Relay K8 is switched on |
| E0053 | K8 OFF | Relay K8 is switched off |
| E0054 | Frequency increm. ON | Frequency incrementation is active (see chapter 8.8 of the handbook) |
| E0055 | Frequency increm. OFF | Frequency incrementation has finished |
| E0056 | Frequency decrem. ON | Frequency decrementation has started (only in special systems) |
| E0057 | Frequency decrem. OFF | Frequency decrementation has finished (only in special systems) |
| E0058 | SI Autostart | Automatic start of the Sunny Island is proceeding |
| E0059 | SI Man Start | Manual start of the Sunny Island is proceeding (via menu) |
| E0060 | SI Man Stop | Manual stop of the Sunny Island is proceeding (via menu) |
| E0061 | Genset Autostart | Automatic start of the generator is proceeding (controlled by battery state) |
| E0062 | Genset Man Start | Manual start of the generator is proceeding (via menu) |
| E0063 | Genset Man Stop | Manual stop of the generator is proceeding (via menu) - min. runtime will be observed if set |
| E0064 | Genset Man Ackn | Confirm faults, waiting times are overwritten - generator is immediately stopped if necessary |

| No. | Message | Description |
|-------|-----------------|--|
| E0065 | SLAVE STANDBY | Sunny Island has switched to Standby mode as a slave |
| E0066 | SLAVE DCLINK | Sunny Island has switched to DC Link status as a slave |
| E0067 | SLAVE CONV | Sunny Island has switched to RUN_U status as a slave |
| E0068 | SLAVE CONVDR | Sunny Island has switched to Droop Mode as a slave |
| E0069 | SLAVE CHARGE | Sunny Island has switched to RUN_I status as a slave |
| E0070 | SLAVE ERROR | Sunny Island has entered fault mode as a slave |
| E0071 | SLAVE ACKN | Sunny Island has received Acknowledge as a slave |
| E0072 | MAINS Reverse | Sunny Island has switched off due to overload |
| E0073 | Low Batt Mode 1 | Battery preservation operation level 1 is active |
| E0074 | Low Batt Mode 2 | Battery preservation operation level 2 is active |

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